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Using Activity Theory to Explore the Perspectives of Participants on an Initial Teacher Education Programme for Science Teachers in the Kingdom of Saudi Arabia

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By

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

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Abstract

This research discusses the issue of education reform in the Kingdom of Saudi Arabia (KSA) through an exploration of the perspectives of a range of participants involved in the preparation programme for science teachers which is run through an existing relationship between the University of Taibah and public schools in Medina city in the Kingdom of Saudi Arabia. The research examines the perspectives of participants in the university and the school (university supervisors, university coordinators, headteachers, collaborating teachers and science student teachers). It discusses teacher preparation issues in the multiple contexts reported in the literature. Teacher preparation in other contexts has revealed models which could be useful in the Saudi context.

Activity Theory (AT) was used as the theoretical framework to achieve this study's objective of exploring the academic systems of the university/school and the relationship between them in science teacher preparation, focussing on the contradictions that create conflicts for student teachers learning to teach the modern science curriculum. Activity Theory was a useful tool in organizing this research as it permitted the exploration of the relationships between systems, analysing the rich data collected on the relationship between university and school. Activity Theory acted as a link between the need for a more expansive unit of analysis in initial teacher education (ITE) studies and appropriate and effective research methods. This research is situated within the interpretative paradigm. It usescase study with mixed methods as an appropriate methodology, using multiple methods of data collection, namely semi-structured interviews as the main tool, questionnaires and documentary evidence.

This research revealed the utilitarian nature of the relationship between the university and the school, which did not reach the level of a cooperative partnership, and which contained many contradictions that created conflicts for science teachers when learning the teaching skills required of modern science curricula.

TABLE OF CONTENTS

List of Tables

List of Figures

Chapter One

Introducing the Study

1.1 Introduction

Education is a major priority of governments and societies across the world, as it is a pillar of progress and an important mechanism for realization of human development, enriching individuals' understanding of the world and providing people with information and skills which increase their effectiveness and productivity. Kadzamira and Rose (2003) indicated that, "over the past decade, primary education has been a priority amongst governments and international agencies" (p.501). Clearly, educational reform is seen to be an important way to improve a country's situation and it can be beneficial in political, economic, cultural and other fields.

The world is constantly changing, so the issue of educational reform needs to be continually addressed. Due to the development of science and technology, rapid developments in the breadth of knowledge, and changes in understanding how people learn, most countries strive to reform their education systems, recognising that education needs to keep pace with these changes in order to develop our life in society. This reform encompasses several aspects, such as curriculum, teaching methods, means of education, teachers and the education structure as a whole. Maroun et al. (2008) confirmed this by stating that there is no one recipe for education system reform in different contexts. Also, one of the difficulties facing the system of education is that it influences, and is influenced by, other systems. Abdul Halim (2005) pointed out that there are systems above the education system that affect it, such as the social, political, and economic systems, and there are other systems that depend upon it, including human resources such as employment systems. There is a weak relationship between these systems, leading to isolationism in educational planning, and this inhibits the development of the curricula (and thereby of the learners) through their weak but complex interaction.

Like most countries in the world, the Kingdom of Saudi Arabia (KSA) is ambitious and interested in developing education. It keeps abreast of the process of education reform and it spends a lot of the state budget on education. This spending is equal to 7.7% of GDP, by which means it has doubled the number of universities and public schools in the state during the period (2005-2013). For example, Lindsay (2010) mentions that, under King Abdullah, in the previous seven years Saudi Arabia spent generously on higher education. There is, however, a problem of separation in the public education system in KSA because the Ministry of Higher Education is responsible for university education while the Ministry of Education is responsible for public education in schools. This is especially important in the field of teacher education which relies on partnerships between universities and schools. Despite the introduction of universities, schools, and curricula developed for science at great cost to the state budget, the preparation and training of science teachers did not receive any commensurate development in this area. There was also a lack of coordination between the university-based teacher preparation and training programmes and the new school curricula. Elyas and Al-Sadi (2013) asserted that "it is very clear that the country needs to look critically in its own education system if it needs to accompany other nations in such a globalized world" (p.61).

Therefore, exploring the problems and conflicts caused by the contradictions in the teacher preparation programme is important. These contradictions affect pupils' education and student teachers' professional learning. Therefore this research explores perspectives on the teacher preparation programme and on the way in which teachers are trained, in order to develop proposals for the improvement of the educational environment.

The researcher's own background in relation to the teacher preparation programme in the KSA is relevant to improving the programme. The researcher obtained a Bachelor's degree in educational sciences and science teaching through the teacher preparation programme at Teachers College in Al Madinah, followed by a Master's degree from the other education college in the KSA (Umm Al-Qura University). My Master's research into the efficiency of teacher preparation programmes in the KSA addressed the provision of scientific culture to science student teachers. In addition, I taught as a lecturer at the College of Education and supervised science student teachers. This led me to try to explore the relationship between the teacher preparation programme and the situation in the school and the compatibility between them in the development of the student teachers.

This chapter presents detailed information on the education system and philosophy of education as understood in the context of the KSA. It includes information about the stages of study in public education, the higher education system, the administration of the education system, teacher education, the structure and content of the Higher Diploma in Education (H.D.Ed) programme, and the College of Education at the University of Taibah which is responsible for the H.D.Ed programme. The significance, purposes and aims of the research will be given, as well as the research background and the structure of the thesis.

1.2 Background of the education system in the KSA

According to Danielewicz (2001) in Chong et al. (2011), “forming a teaching identity is a complex and culturally-based process, which occurs within a specific context, within multiple learning institutions” (p.30). The present study was carried out in the context of the Kingdom of Saudi Arabia. Therefore, it provides detailed information on the educational system in Saudi Arabia, with a focus on the fundamental aspects of the science teacher preparation programme and the relationship between the university and the schools that participate in this preparation, as these are relevant to this research.

1.2.1 Philosophy of education in the KSA

The educational philosophy in the Kingdom of Saudi Arabia is derived from Islam. All aspects of life in KSA are strongly influenced by the principles of Islamic religious belief, worship, ethics, law, rules, and an integrated system of life. Its education system provides the opportunity for young people to understand Islam in the right way. Tolerance, coexistence and acquiring knowledge and human skills are an essential part of the philosophy of the state. Alsonbol et al. (1998) described the philosophy of education in Saudi Arabia as one of commitment to instilling the Islamic faith and spreading it among young people, to understanding Islam properly, and to providing young people with its values and virtues, together with appropriate knowledge and skills. The philosophy is that it is right and proper to raise succeeding generations on the basis of religion. Islam has a great interest in education, and this is reflected in the purpose of education in the KSA, which is for the understanding of Islam, planting the Islamic faith, equipping students with Islamic values and teachings, providing good role models, improving knowledge and skills, and developing constructive attitudes and behaviours. Overall, the aim is the development of society economically, socially, culturally, and the creation of useful members to build the society (Education Policy in Saudi Arabia, 1970).

Islam respects the role of the teacher, learner and education process, as well as confirming the necessity of the teacher having good morals, patience and other noble qualities. Al-Salloom (1989) mentioned:

> "Islam dictates that learning is an obligation for every Muslim, man or woman. This obligation, which gives education the status of a religious duty, is the cornerstone of education in the Kingdom of Saudi Arabia. It is the foundation upon which the state builds its educational responsibilities, and in light of which, the citizen performs duties towards himself, his community, and his religion. The roots of education in Saudi Arabia therefore, go deep into the Islamic education which started in the mosque and led to the establishment of schools and universities around their pillars." (p. 37)

1.2.2 Stages of education

Education in the Kingdom of Saudi Arabia is free and compulsory. All members of Saudi society, at any age or level of education from early childhood until the end of undergraduate study, are eligible to have their costs covered. In addition, some financial help is available for university students to help them fulfil the requirements of university study, as a monthly financial reward which equivalent to £ 200. The stages of education in the KSA are as follows:

1.2.2.1 Pre-school

This stage is not mandatory and is divided into two phases:

<u>Nursery School</u>

Children are accepted from birth until three years of age. This stage is considered an extension of the home environment, providing child care in terms of moral, mental and physical growth and training through play (Education Policy in the Kingdom of Saudi Arabia, 1970). The number of private nurseries is very limited because funding for this stage is not covered by the government, and because most Saudi Arabian households have baby sitters.

Kindergarten

Kindergarten, like Nursery School, is not mandatory and covers the ages of three up to six years. The staffing at the pre-school stage is limited to females only. The objective of this phase is the preparation of children for primary school enrolment by providing necessary skills and knowledge (Education Policy in the Kingdom of Saudi Arabia, 1970). Most kindergartens are run by private institutions. There is a limited number of kindergartens supported by the government and charging a nominal fee; these are cheaper than private kindergartens. Rugh (2002) confirmed that "Saudi citizens have a number of different opportunities for schooling. Before they are six years old ... they may attend pre-school and kindergarten. At this level, education is optional and most schools are co-educational. The majority of these schools were under the General Presidency of Girls' Education" (p. 45). But, since 2000, the Ministry of Education has been responsible for this stage and for all stages of female education.

1.2.2.2 Public education

The public education system consists of three stages at present (elementary, intermediate and secondary) and is carried out in public schools and some private schools. The government supports the public schools so all stages in these schools are free. Education in all stages is segregated, and female students are separated from male students, resulting in completely separate schools for girls and for boys. Oyaid (2009) indicated that, "in accordance with the Islamic law practiced in the country, girls' and boys' education is strictly segregated at all levels in terms of school buildings and teaching staff" (p.17). In addition, curricula and textbooks are not fully standardized. Some curricula are completely different between males and females at each stage; for example, male students have sports (PE) but female students have sewing and cooking. However, some of the curricula, such as science and mathematics, are similar and differ only in the drafting of textbooks in order to serve all genders. Details of each individual stage are given below.

Elementary stage

The duration of this stage is six years. It starts from the age of six and lasts until twelve years of age. Progression from year to year depends on success in the evaluation process in each of the two terms of the academic year. This process measures the progress of the student in acquiring the skills necessary to move up to the higher level. The elementary stage focuses on developing pupils' skills in reading, writing, Islamic studies, mathematics and science, as well as sports and art activities, and the now newly introduced study of English as a foreign language starting from fourth grade. At the end of this stage students move to the intermediate stage.

If the student fails and does not complete the school year successfully, they cannot transition to the next school year. In this case they repeat the school year, which can happen twice. If a student exceeds a specified age they can present their case to the director of the local education authority, asking for alternative arrangements, such as studying at evening school, as a distance-learning student, or moving to another school. That will take place after the case is examined by the committee formed under the chairmanship of exams, the admissions department, the guidance and counselling department, educational supervision and adult education. The director of the local education authority should also take into account the conditions of students in remote village schools (Admission and registration guide at the stages of public education, 2010).

Intermediate stage

This stage is a critical one for students as it coincides with the age of pupils at the beginning of adolescence. It extends from the age of 12 to 15 years, covering a three-year period. The aim is to provide students with knowledge appropriate to their age and develop their skills. Here students study various subjects, namely: Islamic studies, Arabic studies, social studies, arts, science and mathematics and, as previously mentioned, some curricula are restricted to boys and others to girls. But the role of religion is dominant: there is, for example, no music education. The progression in this stage and the next stage that is secondary stage still dependent on achievement in the same way as in the elementary stage.

Secondary stage

The duration of this stage is the same as the intermediate stage, namely three years, and extends from the age of 15 to 18 years of age. At this stage students continue to study the same subjects, but in greater breadth and depth. In addition, they take the new subject of computer science. This stage focuses mainly on the development of their skills and provides them with appropriate knowledge. After the first year of this stage, students can specialize in one of the following paths: Natural Science, Social Sciences or Administration.

1. The focus of the Natural Science path is mainly on scientific modules, such as physics, chemistry, biology, geology, mathematics and computer science, while other modules, such as Arabic, English, Islamic and social studies, receive less concentrated attention.

2. On the Social Sciences path, students focus on literary modules such as, Arabic, English, history, geography, psychology and Islamic studies, while science and mathematics are absent.

3. On the Administration path, students study management, accounting, business administration, law and mathematics, omitting science and with less focus on Arabic and Islamic studies.

Completion of this stage is a prerequisite for entering university. However, due to the limited number of places offered by universities, it is difficult to accept all students graduating from secondary school, so some students go on to technical or health colleges, or enter the labour market.

Male students in the secondary stage have more choice than female students. Rugh (2002) argued that:

> "Most of the boys attend schools operated by the Ministry of Education. Some elect to attend secondary schools run by the Islamic University or the Imam Muhammad Ibn Saud University, which are in effect religious

> preparatory institutes giving special emphasis to the study of Islam and Arabic. Saudi boys can also elect to enter secondary vocational and technical schools operated by a government agency called the General Organization for Technical Education and Vocational Training. These schools offer technical, industrial, commercial and agricultural courses." (p.45)

Recently, since 1993, vocational and technical schools have been opened for females, in design and sewing and other disciplines, in order to provide them with skills and experience in business. There are also some military institutes that are equivalent to secondary schools, which are under the military ministries.

1.3 Higher education in the KSA

Undergraduate education occurs after the age of 18 years. The period of university study is from five to seven years according to specialization; in some disciplines such as languages and literature courses last for at least four years, in science for five years, while others such as engineering and pharmacy last for six years, and medicine for seven years. The study of education in an integrated system (see below) lasts four years, but in the sequential system only one year. In addition, most Saudi universities offer postgraduate programmes such as Master's and PhD degrees.

The universities accept 70% of secondary school graduates, 25% go to technical and vocational training, and 5% go directly to the labour market, according to the Saudi government directives. For example, the number of secondary school graduates in 2013/1015 was about 380,000, while the number entering university was around 271,000 (127,000 males and 143,000 females) which is equivalent 70%. (Ministry of Education Statistics; Middle East Journal, 2013). The criteria for admission to universities are determined by universities based on government directives, and each college at the university decides a specific cumulative grade point average (GPA), and other specific standards to accept graduates from secondary students according to specific measurement tests.

1.3.1 Administration of the educational system

There are three major authorities in the supervision of the educational system in the KSA.

The Supreme Committee of Education Policy was established in 1963 and was the highest authority in the field of education. It was consolidated with the Council of Higher Education in 2004 under the name of the Supreme Education Council. This Council is headed by the King and is responsible for public policy in state education, and for approval of educational plans and education funding.

The Ministry of Education (MOE) was established in 1953 and is responsible for the supervision of all educational levels up to the end of the secondary stage, and for all local education authorities across the country. Schools for both male and female students are under the supervision of the Ministry of Education.

The Ministry of Higher Education (MOHE) was established in 1975. Its responsibilities include supervision of all 34 Saudi universities, scholarships, international university relations, and cultural bureaux abroad.

1.3.2 Teacher education

Because of the focus of this thesis, detailed information about the KSA teacher education system will be presented next.

There are two systems for the education of teachers in the Arab world:

The sequential system, in which students get a bachelor's degree in one academic discipline and then join the Higher Diploma in Education programme through a College of Education for a full academic year; this is the main current system in Saudi Arabia.

The integrated system, in which students study an educational preparation programme along with academic preparation in their field of specialization, takes four years. This results in a Bachelor's degree in education with one academic discipline. This system has begun to fade over the past three years because most teachers' colleges which used to provide this integrated system have become affiliated to Saudi universities as colleges of education and now provide the sequential system.

1.3.3 College of Education at the University of Taibah

Teachers' colleges, which provide pre-service and in-service teacher training, were established by the Saudi government at the beginning of 1954 and continue to this day. One of these colleges, the College of Education at the University of Taibah, is the subject of my research, therefore, it is described in more detail, as follows.

The College of Education in the University of Taibah was established as a branch of King Abdul Aziz University in Al Madinah Al Munawarah in 1977. It was founded to provide facilities for the continuous improvement of the quality of educational performance in the different stages of education, through a relationship between the staff at the University and the Ministry of Education, including the local education authority (LEA). The partnership between the university and the school occurs through a relationship of exchange, where most schools offer places for student teachers while the university offers teachers to the schools and helps unqualified teachers to access the H.D.Ed programme. The partnership aims to achieve excellence in the preparation of student teachers, conduct research, and provide educational programmes and development policies at the level of undergraduate and postgraduate studies among other Saudi and Arab colleges of Education based on the Islamic identity in thought and behaviour.

1.3.3.1 Academic departments

The college has eight academic departments, as listed below:

- **Department of Educational Foundations;**
- **Department of Educational Psychology;**

- **Department of Educational Technology;**
- **Department of Physical Education;**
- **Department of Art Education;**
- **Department of Special Education;**
- **Department of Educational Administration;**
- **Department of Curricula and Instruction.**

These departments seek to achieve the College of Education's vision, mission and values and, are committed to work on the following main objectives that were obtained from the College of Education at the University of Taibah.

1. Offering distinguished education through providing a high quality of education for contributing to the preparation and training of teachers and graduates, to qualify them academically, culturally and professionally to carry out teaching in the general education system, in special needs, or in various other educational disciplines;

2. Developing scientific research and postgraduate studies in the educational and psychological field to improve the quality of educational outcomes;

3. Fostering and constructing a genuine partnership with the Arab and Saudi community by convening lectures, courses, seminars and conferences, and conventions related to the educational process. The educational policy makers, the university staff, and everyone who is involved in education should attend these events;

4. Improving the academic and administrative systems in the college to create a positive learning environment which supports the relationships with the other educational institutions outside the college (University of Taibah, n.d.).

Enrolment in the H.D.Ed programme requires a Bachelor's degree from one of the colleges at the university because the system of teacher preparation at Taibah University is still sequential. This programme is also available to those graduates who started to teach without following the H.D.Ed programme. There are many reasons why people may have done this. For example, in the past, a large number of graduates from colleges other than education have been employed as teachers in public schools due to the teacher shortage and to the lack of coordination between the Ministries of Education and Higher Education. This shortage is not limited to science teachers so there are also teachers in other disciplines who have not followed the H.D.Ed programme. The introduction of new curricula in schools, without any advance planning or coordination with the Ministry of Higher Education to provide a sufficient number of teachers to teach these curricula, may also have contributed in this situation where some teachers have not followed the H.D.Ed programme. For example, when introducing the computer curriculum for the first time in the schools, a large number of graduates from the Computer Science colleges were employed who had not been through the H.D.Ed programme. There are many other examples like this, as where the Ministry of Education recently introduced the English language curriculum at the elementary stage, or the administration path at the secondary stage employing teachers from the Management and Economics colleges.

1.3.3.2 Structure and content of the H.D.Ed programme

The H.D.Ed programme includes 36 credit hours weekly of study over two semesters, including a total of 29 credit hours of educational theory modules, and 14 credit hours of practical, including 8 credit hours of teaching practice in schools through the educational module called Methods of Teaching Science (2), (every two hours of practical modules are counted as one hours credit, while every two hours of theoretical modules are counted as two hours credit). In addition, the teaching practice takes place in the second semester only through the so-called Methods of Teaching Science (2).

The content of the H.D.Ed programme consists of theoretical subjects as well as practical education. It includes theories of education, history and comparative education, experimental education, pedagogy, general and special teaching methods, school administration and the education system in the KSA, educational problems, the study of curriculum and its objectives and analysis, the goals of the school and its problems, the school system, contemporary educational trends, the preparation of lessons and the duties performed by the teacher. It also includes an introduction to educational psychology, developmental psychology, mental health, school health, educational evaluation, psychological counselling and educational guidance.

Educational and psychological studies are seen as important in teacher preparation to provide student teachers with the necessary skills. For example, psychology provides a lot of information to help with understanding the nature of learners and identifying their characteristics, stages of growth and, most importantly, their problems, as well as introducing learning theories, teaching methods, tools and acquisition of skills. Some modules, such as Developmental Psychology and Educational Psychology, are taught to the student teachers to learn how to deal with the age characteristics of school pupils and the individual differences between them in learning. Therefore, the College of Education is interested in the development of these studies as it is responsible for the Department of Psychology and other departments, which has been mentioned previously.

This H.D.Ed programme is offered to all students enrolled in the teacher preparation programme, but the students follow their specialties in their modules on teaching methods (1) and teaching practice at schools. For example, students in the science specialization study the module of science teaching methods through teaching methods (1) and practise teaching the science curriculum at school through teaching methods (2) in the second semester for four days a week. This is presented in Table 1.1, showing the modules in the two semesters before 2015.

Table 1.1: The structure and content of the semesters of the H.D.Ed programme

Module No.	semester	Course Title	Practical	Theoretical	Module Credits on the KSA System	Module Credits on the UK system
1	1	Curriculum Foundations	0	3	3	45
2		Methods of Teaching Science (1)	2 Practical at university	2	3	45
3		Science Curriculum at General Education Stage	2 Practical at university	2	3	45
4		Foundations of General and Islamic Education	0	3	3	45
5		School administration	0	2	2	30
6		Introduction to Educational Psychology	0	2	2	30
7		Developmental Psychology	0	2	2	30
8	2	Educational and Media Technology	2 Practical at university	2	3	45
9		Methods of Teaching Science (2)	8 Teaching practice at school	2	6	90
10		Islamic Education and Society Development	0	2	2	30
11		Education in K.S.A	0	2	2	30
12		Educational Evaluation	0	3	3	45
13		Psychological health	0	2	2	30
All Courses			14	29	36	540

1.4 Research background

Previous research has demonstrated that the teachers' 'preparation programmes can make a difference' in teachers' professional identity formation, through of 'their own teaching and learning experiences' (Chong et al., 2011, p.30). Therefore, further in depth discussion of teacher preparation programmes will be presented in the literature section.

The Kingdom of Saudi Arabia has, over the past decades, created plans for the development of Saudi Arabia as a developing country. In these plans one of the most important objectives was the development of human resources. Therefore, the civil service system allowed the contracting of non-Saudis to temporary contracts but only until the alternative for the Saudi citizens to fill these positions was possible. The civil service system does not depend in this country on the system of short-term contracts in government jobs, but on stable jobs that give Saudi citizens financial stability in life through employment and therefore the contracting system for non-Saudis is a temporary system of government jobs (Alhugeal, 1992).

The State considers that the human energy of teachers is the main focus for investing all of its energies in development (Alhugeal, 1992). In addition it is committed to move towards the creation of a Saudi identity in education, which reflects the culture of the Kingdom and its principles and policies in education after having been forced to import educational curricula and teachers from neighbouring countries which played a major role in the early stages of the establishment of the educational system.

The first development plan (1970-1975) and the second (1975-1980) recognized the huge shortage of human resources necessary to support the implementation of development plans in Saudi Arabia (Al-Asmari, 2001). Education and development are two sides of a single currency, centered on the citizen. The education and development of the citizen is a key goal in its own right, and also enables that citizen to serve as the means of broader development in the society.

The efficiency of investment in any sector of development therefore depends on the efficiency of investment in the education sector (Mahbob, 2011). This has made the Saudi government take great interest in development of the educational sector.

As is the case worldwide, teacher education in Saudi Arabia occupies the centre of attention of the educational authorities. Sahlberg (2007) considers that the "global education reform movement that has emerged since the 1980s has increasingly become adopted as an official agenda in many parts of the world" (p.150). Therefore, in 2006, the Saudi government introduced the King Abdullah bin Abdulaziz Project for the Development of Education. This was followed, in 2016, by “Vision 2030” through which the government is pursuing the development of the educational system in all its components. The assumption has been that better education of teachers in general would lead to better learning outcomes for their students and help in preparing a new generation to face the challenges of this new century. Science teacher education has been a particular focus of interest in Saudi universities, where science teachers are being prepared in large numbers to satisfy the need to Saudi-ize (nationalize) the teaching force. The Education Ministry of Saudi Arabia has taken further action within the framework of its plan aimed at Saudi-ization of educational jobs by bringing in Saudi teachers to replace foreign nationals. This is according to a systematic directive of the Ministry of Education, and in line with the government's decision number 2/M36/1415, in 30/11/1994. This is partly because of the strategic importance of the human development that was discussed above but is also an attempt to eliminate unemployment, which reached about 11% in the year 2016. This unemployed rate may reflect the fact that, over the past three decades, Saudi Arabia has recorded a high level of population growth at an average of 5% (Asmari, 2001). Al-Bazzar (1989) and Hoeml and Alanadi (2015) confirm that, perhaps as a result of these pressures, the teacher preparation programmes in Saudi Arabia have focused on quantity rather than quality due to the newness of educational expansion and the urgent need for graduate teachers. There has now become a much greater need to focus on quality in teacher preparation in order to advance the Saudi education system.

International tests and competitions revealed the deteriorating situation in Saudi education by comparing the level of students in a number of countries around the world in mathematics and science: they show that Saudi Arabia ranked 43rd of the total number of States of 45 (Mahbob, 2011) This has ascribed to low performance in science learning outcomes, therefore to the quality of science teacher education at the pre-service level. For example, Al-Qarny (1993) showed weaknesses in the quality of the science teacher education programme. Also, Al-Ruweishid (1994) highlighted (as noted in the research literature) serious drawbacks in the initial education programme content for science teachers that led to weak outcomes of teachers. Al-Ghouny's (1995) study indicated that the science departments in teachers' colleges in Saudi Arabia did not satisfy expectations related to the education of teachers, either pedagogically, academically (i.e. in terms of subject matter knowledge), or culturally. This finding coincided with, and was supported by, the finding obtained by Al-Shahry (1999) (as noted in the research literature), which was conducted on the subjects of specialization of teacher education programmes. Al-Shahry showed that these specialization curricula did not satisfy expectations, because they were not sufficient to provide the teacher with the information needed to keep pace with the public education curriculum. Any student of this problem will find that this isolationism between the programmes of teacher education in universities and science curricula in schools has an old history.

The research at school level showed a lack of integration of science curricula, such as in the study by the Arab Centre for Educational Research in the Arab Gulf Countries (2001) which evaluated the unified science curricula at different school levels in the Arab Gulf countries. Their findings indicated that these curricula were not integrated between science and technology, and called for alternative curricula to achieve this integration. In addition, it called for science teacher preparation programmes to take this into account in science teacher preparation, in order to be consistent with societal needs and world concerns. Albadry (2008) asserted that the preparation programmes suffered from a lack of planning concerning the linkage between programmes and for the needs of the national development plans, as well as a failure of the academic programmes and teaching aids to keep up with educational developments.

Based on the above, interest in having a quality science teacher education programme has been raised and placed amongst the major concerns of those interested in science education generally and in science teacher education per se, hence the interest of this study.

Over the past few years, the Saudi government has developed the field of education by opening new universities (twice the pre-existing number) and doubling the number of colleges of education specializing in teacher preparation. This development included general education, with more public and private schools to provide a good learning environment, and curriculum development. Dr Al Roumi, Undersecretary of the Ministry of Education for the development of education, confirmed that the draft curriculum development in science and mathematics in the Kingdom of Saudi Arabia cost about £200 million and yet a lack of coordination between this project and teacher education programmes was one of the blocks to educational reform, which aimed at improving the performance of the educational process. Saudi Arabia spent nearly £200 million to develop the science and mathematics curricula in 2010 for all grades, based on a series of textbooks published by McGraw-Hill that use active/exploratory/inquiry-based learning. However, the teacher training colleges have not been doing any relevant development to correspond with the requirements of this twenty-first century approach. Alzahrani (2012) confirms that teacher preparation programmes in the KSA need to be developed in the light of the teaching competencies that are needed in the schools.

Questions have arisen about the compatibility of the college preparation of science teachers with the new curricula and the requirements of the twenty-first century. Is there cooperation between the schools and the College of Education through a genuine partnership seeking to develop the education process? Also, is there a participatory role for the University to develop the school curricula? Are these curricula appropriate for the environment of the Kingdom of Saudi Arabia? Many questions surround this issue.

1.5 The purposes and aims of the research

1.5.1 The purposes of the research:

Teacher education programmes in the KSA had not been amended for a long time, as I knew from my work in the College of Education since 1997 and my continuing connection with it, but over the previous year some changes were made, as discussed in Chapter Eight. This research investigates pre-service science teacher preparation through the two systems which share the preparation process, namely the school and the university.

The overall purpose of this research is to examine current practice in light of the literature and related theory, namely third generation Activity Theory (AT). This is a suitable framework to explore the relationship between two or more systems involved in achieving a goal or several common goals. Further detailed information about AT is given in the third chapter of the thesis. The research aims to improve the processes and their outcomes in pre-service science teacher preparation, which has not previously been explored in depth. The purposes include elucidation of the challenges facing the programme and to make informed suggestions as to how these could be overcome. The crucial element in the research is the teacher preparation systems and their influence on the process as a whole.

1.5.2 The aims of the research

The research aims to explore participants' perspectives on the science teacher preparation programme in the university/school. The participants are people closely associated with the programme, namely the science student teachers who study modules at the university and undergo teaching practice, the university staff who supervise and coordinate student teachers' learning in the university system, and the school staff who supervise and coordinate student teachers' learning during teaching practices in the school system. The research aims to identify the challenges that faced the relationship between the school and university systems, such as the compatibility between what students learn in the university and what they practise within the school.

1.6 Significance of the research

The potential significance of this research lies in its contribution to providing useful knowledge to support staff working in the field of teacher preparation, who are training teachers in general, and science teachers in particular, in the educational system in the KSA. It is hoped that the results of this research will be of interest in various ways. The significance can be divided into three levels: general, personal and research level.

1.6.1 The significance at the general level

1- The research should supply those responsible for teacher preparation with new information related to the issues that need to be considered, and provide information which will help policy makers to improve teacher preparation programmes.
2- The research, by investigating science teacher education and the partnership between schools and the university, should be able to show how this relationship could be improved to become an effective cooperative partnership.
3- The research should provide information about the tensions and contradictions within and between the activity systems.
4- The research should highlight the importance of the availability of appropriate learning tools in the H.D.Ed programme, and in the teaching practice for science student teachers.

1.6.2 The significance at the personal level

1- I worked from 1998 until 2006 as head of a field education office. This office supervised everything related to practical education for all students at the College of Education, such as distributing students to schools, distributing supervisors to the students, coordinating between students and schools, and making follow-up evaluations, in addition to supervising science student teachers. This research will add to my previous knowledge through my reading of the relevant research on the process of teacher preparation.

2- This research will stimulate my reflections and thinking on how to create an effective cooperative partnership by looking at partnership models in developed countries, in particular the models at Oxford and Exeter Universities, and how they could be applied in the Saudi context, with its differences from the British context.

3- The practice of interpretive research will provide a good experience for me to discuss the issues in more depth; it may also open the field to discussing other issues in the future, and this will be very meaningful for me.

1.6.3 The significance on the research level

1- This research will perhaps open the way for more in-depth research on teachers, and thereby help to form a clear vision about the future of education in the KSA context.

2- It may provide an example of qualitative research in the context of the KSA, where quantitative research is a more commonly used approach. It should provide a variety of new perspectives through the use of AT, through which the relationships between systems can be explored and rich information about their interactions revealed.

3- It will perhaps provide an example of the interpretive approach to research by using the AT as a theoretical framework, which will be one of very few such studies in the KSA and perhaps the Arab world. This research may the first in the context of Taibah University in the field of educational research and in science teacher education, according to my knowledge. University staff may benefit from this study through developing their understanding of an interpretative approach to research.

4- It may provide an example of triangulation of research methods that make the data more trustworthy, through questionnaires, semi-structured interviews and documentary evidence. In particular, it is not usual in the KSA to use computer programmes to help in the interview analysis process, such as (Max-Q Data) or other programmes. Researchers in KSA may develop their understanding of these approaches to research and apply them in the KSA.

1.7 Outline of thesis structure

The thesis consists of eight chapters, as follows:

This first chapter has introduced the focus of the research, related key issues, and background of the education system in the KSA. It has outlined some information about the background and context of the research, exploring the gaps, the significance of the research, its purposes, objectives and research questions.

The second chapter is the literature review which examines some academic issues in science teacher education and describes successful experiences of the partnership between school and university in the United Kingdom context, through the models of Oxford and Exeter universities.

The third chapter, entitled ‘Framework for the Research’, explains the use of Activity Theory as the underlying theoretical framework in this research. It gives detailed information about the history and background of Activity Theory, its principles and how it shapes my work, highlighting the relevance of this particular framework to understanding the interactions, complex relationships and contradictions among different activity systems.

The fourth chapter focuses on the research design, and justifies the research paradigm and the philosophical assumptions; ontology, epistemology, and methodology are presented in this chapter. In addition, it details the data collection methods, tools, procedures of data analysis, and ethical considerations relating to this research, and presents the challenges faced by the researcher.

Chapter Five presents the quantitative data analysis and discusses the findings of the research according to the main elements of Activity Theory, and the detection of statistically significant differences among different groups of participants.

In Chapter Six, the qualitative data findings are set out, identifying key themes and codes, which are displayed in tables at the beginning of each section, under the elements of Activity Theory, as a prelude to the discussion in the next chapter.

Chapter Seven summarizes the research findings in relation to the research questions, discusses the findings, and identifies issues related to the university context, the school context, and the context of the relationship between the university and school, with their surrounding interactions, complexities and contradictions.

The eighth and final chapter presents the recommendations, suggestions for further research, implications that could help in developing the partnership between school and university in science teacher education, and finally the conclusions of this research.

1.8 Summary of the chapter

This chapter has presented an introduction to the research, and given detailed information about the context of the research, the Saudi philosophy of education, and the structure of teacher education in Saudi Arabia. It has explored the gap in the existing research, the potential significance of the current research, and its purposes, objectives and questions. Finally, it has outlined the structure of the thesis.

Chapter Two

Literature Review

2.1 Introduction

In this section, relevant literature is reviewed in four main sections. These are: definitions, curriculum and academic issues in teacher education in the KSA, university and school partnership in teacher education, and some British models of teacher preparation programmes with partnerships.

Within these main sections there are sub-sections as follows:

Within the first section, on definitions, the sub-sections are: academic issues, teacher preparation, curriculum, and partnership between school and university.

Within the second section, on curriculum and academic issues in teacher education in KSA, the first sub-section addresses curriculum issues and is divided into three parts: curriculum development, curriculum in schools, and curriculum in teacher education programmes. This is necessary because Chapter 1 identified curriculum issues as problematic in KSA because of a lack of coordination between curriculum development and teacher preparation. The second sub-section addresses some academic issues in teacher education in KSA, and is divided into pre-service preparation programmes for science teachers, the gap between theoretical knowledge and the practice of teaching, and teacher education research. The interaction between curricular and academic issues forms the third sub-section, which may show us some of the contradictions that affect the academic work and how it harmonizes with curricula.

Within the third section, on the partnership between school and university in teacher education, key aspects of partnerships in multiple contexts are outlined to make use of the experience of developed countries with a view to focus on creating successful and effective partnership that can be the first step for coordination between two separate systems to bridge the gap and create hybrid space between them. As well-developed partnerships are a novel aspect of teacher education in KSA, understanding of school-university partnerships may help us to understand the partnership between the two ministries and, whether different power relationships within these partnerships support or hinder reform of teacher education programmes in the KSA.

Within the fourth section, two models of teacher preparation programmes with partnerships at British universities are discussed. These are the Oxford Internship Scheme, which is presented as a successful experience in reforming teacher education and the partnership between school and university in the UK context. The second model is the Exeter University Model teacher preparation programme. How they could be utilised in the Saudi context is discussed. While reform of the teacher education programme needs to be analysed and understood in the context in which it takes place, it is still useful to review teacher education reform in developed countries such as the UK as it can provide useful experience for improving the teacher education programme in the KSA. As Leavitt (1992) asserts, if we want to provide a great viewpoint on our own problems of teacher education, we should study the problems associated with teacher education in other countries.

Education in the Kingdom of Saudi Arabia had previously been associated with the American education system, but has recently began to look at the experience of other countries with successful education systems, such as Japan and Malaysia. In this research I am not in the process of comparing education systems *per se*, but looking at the UK experience of teacher preparation by virtue of my studying in the UK, and in light of its long history and many successful models. Teacher preparation in the KSA had been also re-designed from an integrated to a sequential system, similar to the PGCE system in the UK. Consequently, the review of these models may be useful in the Saudi context and may open new horizons to cross existing borders.

Finally, conclusions from the reviewed literature and its contributions to the current study and to the forming of the research questions are presented.

2.2 Definitions

There are some concepts in this study that need to be defined so that the reader is clear about my initial thinking about them. The key concepts are presented below.

2.2.1 Teacher preparation

Hallinan and Khmelkov (2001) defined teacher education as "a series of educational experiences aimed at preparing entrants to the profession for successful teaching careers and at providing continuing education for those already engaged in teaching. These experiences include pre-service programmes and in-service training" (p.175). Al-Ahmad (2004) described pre-service teacher preparation in the KSA as an educational system consisting of inputs, processes and outputs. Its inputs include the objectives of seeking to form a student to become a teacher in the future, and a plan of study containing the four components of general culture, academic specialization, professional specialization and practical education. The processes of the system are the methods, techniques and evaluation methods used to achieve the goals of the system. The outputs are the teachers who are able to begin their service at the educational level expected of them.

Preparation and training programmes need both theoretical and practical aspects in order to be effective; therefore, the preparation of teachers by the university alone is not enough without the school as a partner in the provision of professional experience in the context of teaching. However, when discussing educational systems one must keep in mind the following considerations: the context of the country, the goals of the education system, and the teachers' beliefs, knowledge, skills, attitudes and needs. Activity Theory (AT) is useful to understand the nature of, and relationships amongst, these issues, and to reveal the relationship between the school and university systems which share the objective of teacher preparation, to shed light on the existing partnership between them and to provide us with information on the interaction between the two systems. Further information about AT will provided in the next chapter.

2.2.2 Education curriculum

Marsh and Willis (2003) defined the curriculum as the set of learning experiences provided to students to enable them to attain basic skills and theoretical knowledge at a variety of learning sites. Curriculum is key, both the teacher preparation curriculum and the curriculum taught by the teacher to their students, and, as noted above, there is a large gap between them in KSA. Therefore the inconsistencies between the teacher preparation curriculum and the school curriculum should be highlighted and investigated. Activity Theory is appropriate as a lens to detect interactions within and between these different systems.

2.2.3 Partnership between school and university

Partnerships can be characterised as working to achieve common goals and commitment to duties and responsibilities, in the sense that there should be joint cooperation and clearly defined roles (McCall, 2006). Kruger et al. (2009) defined the partnership between school and university as a "social practice achieved through and characterised by trust, mutuality and reciprocity among pre-service teachers, teachers and other school colleagues and teacher educators" (p. 16). Also Bezzina (1999) considered these partnerships as “collaborative relationships among educators in schools and those within the Faculty to promote educational renewal” (p. 2). That is, engaging teachers in university-school partnerships in order to reconstruct teacher education. I propose that Activity Theory would be a very useful analytical tool for exploring the interaction and complex relationships between school and university in terms of teacher education in the Saudi Arabian context.

Partnership in the current Saudi context may be a little different from that in Western countries, as partnership in the Saudi context is a relationship that does not yet rise to the level of cooperation. In my own professional experience it is designed as a utilitarian relationship based on the benefit to each of the parties, which may be unequal.

However, more complex models are beginning to emerge. Al-Sayegh (2014) defined the partnership as a mechanism for closer ties between school and university, assembling the capabilities of both sides to share work and responsibilities; it is seen as a new approach to reducing the gap between schools and universities.

Activity Theory maybe useful here in providing rich information by tracing these complex relationships and the interactions between them.

2.3 Some curriculum and academic issues in teacher education in KSA

There are certain academic and curriculum issues which often hinder the development of teacher education in KSA. This part will focus on some of the fundamental issues related to the subject of this research through evidence from educational research studies and my own experience in this field.

2.3.1 Some curriculum issues in KSA

When considering the curriculum in Saudi Arabia, it is necessary to understand its development in the context of the nation’s history, where education for males differs from that for females. The curriculum offered to females is different from that offered to males. Until 2002, female educational institutions only focused on what matters to females in the home, such as cookery. In the sphere of religious education, despite its accession to the same ministry which oversees the education of males, the curriculum still focussed on how to be good women, such as good mothers, and ignored other issues in education that were provided for males, such as how to be successful leaders. The system did not allow females to participate in sport in schools. These issues were not even addressed in 2006 at the beginning of the King Abdullah Project for the Development of Education in which the curriculum was consolidated and for which the important objectives were continuing professional development for all employees in the field of education, developing the curriculum, and improving the school environment to promote education (Alharbi, 2014). As pointed out by Alzhrani (1997), there are significant deficiencies in the teacher preparation institutions' attitude to fundamental issues, such as this gender issue, in the teacher preparation curriculum. In addition, Al-Bazzar (1989) noted weaknesses in the integration and interdependence between the cultural, professional and scientific curricula. For these reasons it is important to discuss the development of curricula in the KSA.

2.3.1.1 Curriculum development

Paykoç et al. (2004) said that: "Curriculum development is a problem solving process and it involves the consideration of the needs and problems for the improvement of the programmes and the implementation of solutions and alternatives for learners and their contexts. Curriculum is a reflection and a product of the society and can contribute to the change in the society" (p.1). They considered change to be an important process in curriculum dynamics and that change should be understood through studying it and managing it for a better future (Ayersman & Reed, 1995). In order to cope with change and its associated complications, a proactive conception of change should be adopted which sees solving problems as a life-long process, predicts future problems, thinks about how to solve them, and then actualizes these procedures for the amelioration of individuals, society and culture. AT sees contradictions as points for growth and is therefore consistent with this proactive conception of change.

Education began in Saudi Arabia in 1926 with a curriculum borrowed from neighbouring Arab countries (Alhugeal, 1993). In its infancy this education was weak in terms of quantity and quality; for example, in the preparation of teachers, educational resources and curricula. These curricula, which were copied from those of Egypt and Syria (Aljoudi & Saleh, 1985), were introduced as they were, without adaptation, and most were unsuitable for the Saudi environment in their form and content. These curricula then began to be developed, but at a superficial level limited to the textbook and the classroom, without a fundamental change in the substance.

In 1968 serious attempts to develop the curriculum began. This development was limited but included parts of the science curriculum, which was previously the least developed curriculum and which had not kept pace with the rapid development of knowledge, technology and industrial development that existed in other parts of the world. It was recognized by the Ministry of Education that the curriculum did not fulfil the requirements of the current era. Reform was started with the formation of committees to study the curriculum and to adapt it to the environment of Saudi Arabia (Alhugeal, 1993).

Over the past ten years the number of universities in the Kingdom of Saudi Arabia has increased, with a corresponding increase in the number of university professors and researchers. This has contributed to the beginning of the reform of the wider education system and the development of the curriculum. Studies have been carried out to identify the appropriate weight to assign to parts of the curriculum, the teaching of basic skills and the various curriculum subjects. The studies have looked at the possibility of combining materials, determining the minimum teaching time requirements and appropriate shares allotted to the various subjects, such as religious education, Arabic, mathematics, science, foreign languages and social studies, at each stage. In addition, other curriculum-related topics, such as the learning environment, use of computers in education and application of information technology, have been studied, as well as the improvement of textbooks and a range of extra-curricular activities (Arab Bureau of Education for the Gulf States, 2002).

However, the existence of two separate ministries, the Ministry of Education and the Ministry of Higher Education, responsible for schools and universities respectively, leads to difficulties, as the partnership between them is not always clear. There is centralization by the Ministry of Education in the development of the curricula; therefore the bridge of communication between the Ministry and universities that prepare teachers is missing. Al-Sayegh (2014) asserted that, despite the mutual relationship between universities and schools, the most basic partnership system is lacking. In addition, there is no role for universities in the development of the school, and there is no plan for a partnership between the universities and the Ministry of Education.

Centralization is one of the characterising features of the administration of the educational system in the KSA. Within a centralized structure, Eden (2001) asserted that: “Domination is maintained by control; this is related to influence and power, so whoever controls has the power and ability to influence” (p.97). Leavitt (1992) indicated that: “This basic issue of centralized versus decentralized control of teacher education is a burning problem fraught with political overtones, as reported in fourteen countries: the six Arab Gulf States, Australia, Brazil, Canada, China, England / Wales, Germany, Japan, and Nigeria” (p. xii).

In the Saudi context, centralization is a key problem facing the education system at the level of the Ministries of Education and Higher Education, as both ministries suffer from many shortcomings. However, in terms of teacher education and the partnership between school and university in Saudi Arabia, the centralization is clear and occurs in certain ways, such as when changing the curriculum without involving university faculty members (Alzaydi, 2010). In addition, Almazroa and Al-Shamrani (2015) indicated that there is centralization “for setting policies and making decisions on the kinds of professional development that will be supported and implemented” (p.4).

2.3.1.2 Curriculum in schools

These days we hear the terms ‘knowledge society’ and ‘knowledge economy’ and the importance of the transition to them. This shift towards a knowledge society requires a high quality education that takes into account the times and needs of the community, and highlights the development of science and mathematics education as two of the most important components.

The Kingdom of Saudi Arabia looks forward to the establishment of a knowledge society so that it can compete globally, and recognizes the importance of the development of education because it is the backbone of economic development. The basis of this reform focuses on science and mathematics education as well as the expansion of e-learning, in order to build a society with a sufficient level of scientific education to produce knowledge and investment (Journal of Knowledge, 2009).

With this idea in mind, officials at the Ministry of Education searched for suitable methods to reform the science curriculum and selected a series, "American Global Curriculum McGraw-Hill", as mentioned by the Ministry of Education (2006) as meeting the following requirements:

1- Learning centred on the learner

2- Excitement-based multimedia

3- Learning through multiple modes

4- Exchange of knowledge and communication through multiple modalities

5- Learning through collaborative work

6- Active learning based on exploration and inquiry

7- Development of thinking skills.

8- Development of self and decision-making

9- Developing the capacity of the learner to take the initiative

10 - Linking learning to real-life contexts.

While new curricula are very important, it is also important to create the appropriate environment in which they can be applied correctly. Almazroa and Al-Shamrani (2015) insisted that curriculum reform would not succeed without being reflected in the classroom practices of teachers, who need to be able to contextualize these practices and to implement high standards.

Another problem has been the population growth of recent times, so there has been a steady increase in the number of students entering schools, but the Ministry of Education has not been able to open new schools to meet this demand. Consequently, the Ministry has rented buildings to be used as schools but, unfortunately, these were not designed for the application of the new curriculum. These buildings were originally prepared for housing, but there was a need to rent them in spite of not meeting school building specifications, so most of the rooms are not fit to be classrooms. These rented buildings lack many facilities; there is no possibility of enabling students to engage in activities due to the small rooms that do not accommodate even moderate numbers of pupils, as well as the unavailability of a library or laboratory, the lack of health requirements in terms of ventilation and lighting, and other problems. The results of much educational research, such as that of Al-Natour (1987), Atkheis (1994), AL-Muqrin (2000), Al-Zu'air (2000) and Altaher (2007), confirm that there are many problems with school buildings in general. Therefore, these buildings cannot achieve the goals of education but, instead, cause a negative impact on the performance of the members of the school community. Altaher (2007) added that rented schools do not have laboratories for teaching science, only a small percentage have teaching aids and, even if these are available, they are often not used due to safety concerns. Atkheis (1994) argued that, although there is resentment at the poor quality and design of school buildings, there is interest on the part of administrators, planners and educators in the specifications and design of school buildings according to scientific standards, in order to keep abreast of the rapid changes occurring in the area of education.

This is a result of the lack of forward planning to develop the school environment, or to involve university researchers in studying the development needs or to anticipate the consequences of development. Consequently, the question arises that if the relationship between the Ministry of Education (representing schools) and the Ministry of Higher Education (representing universities) is not based on a strong partnership, will there be development of curricula without teacher preparation programmes, and will these modern curricula find a suitable physical environment in which to be implemented?

Therefore the implementation of the new curricula has been inconsistent. Many studies, such as Alerini (2003), Al-Assaf (2004) and Altaher (2007), confirmed that there is a clear lack of cooperation between universities and schools in training, development, supervision and authority, due to the weak bridging partnership between the Ministry of Education and the Ministry of Higher Education. This is may the result of the absence of a third common space between them. It has been pointed out by Bullough and Kauchak (1997) that: “Unless enough resources are available to provide opportunities to support the extended conversation required to establish a common schedule, and unless there is a greater commitment to participate consistently, partnership styles will still be separate” (p.231).

2.3.1.3 Curriculum in the teacher education programme

Development of teacher preparation programmes is a concern for all countries in the world, and all countries are eager to develop accreditation of their programmes to conform to the requirements of the community. For example, the British experience in 1997 followed this approach to achieving quality assurance in higher education using the Quality Assurance Agency in Higher Education to verify the educational programmes offered to qualified teachers, and using the Office for Standards in Education (Ofsted) to verify the quality of initial teacher education programmes.

Centralization, funding and lack of freedom to make decisions are severe problems impeding the development of teacher preparation programmes in Saudi Arabia. Almazroa and Al-Shamrani (2015) indicated that there is "centralization for setting policies and making decisions on the kinds of professional development that will be supported and implemented" (p.4).

The H.D.Ed programme may have good modules as shown in Table 1.1 regardless of the program's structure. The programme includes three aspects, that are psychology and educational administration, curricula and teaching methods, and education technology, however, the content of the curricula still needs to be constantly reviewed and adaptations to be consistent with the school curriculum during the development. Despite this need, the curricula of higher education programmes rarely develop holistically in KSA. The university representatives involved in ITE curriculum development often have not heard of new elements included in existing school curricula or programmes which might be relevant to teacher preparation programmes. These teacher preparation programmes have not been updated despite previous attempts, resulting in the teacher education programmes developing separately from the curriculum in schools. This may be due to:

- Weak partnership between school and university. In this regard the Directorate-General for Education and Culture (2007) mentioned that policy plays an essential part in establishing partnerships by intentional steering, while allowing some degree of freedom for both school and university to design the partnership between them according to their local conditions and needs. However, this centralized 'intentional steering' of decision-making was, according to Bokhari (1994), the most important problem facing academic departments at universities because it restricted the ability of individuals to initiate and share in decision-making and thereby speed development.

- Absence of proper funding to start the development as the financial burden on the Ministry is very large. Alkhedair (1999) emphasized that higher education was in need of government funding, either partly or as a whole, because of the high cost of higher education and to ensure the quality of programmes. However, I do not think that government funding is the problem as, after the King Abdullah Project for the Development of Education in 2006, spending on education and higher education were increased significantly, but the problem now lies in how to plan to take advantage of financing in curriculum development and professional development.

Despite the opening of several new universities, their programmes follow those offered by the older, traditional universities. Alaqail (2005) confirmed that new Saudi universities did not seek to develop their own curricula and limited themselves to making minor and superficial changes. For this reason, the curriculum has not been part of a complete process of development which would respond to the requirements and needs of the community and the labour market.

Alarfag (2015) indicated that the teachers' colleges were merged with the nearest colleges of education under the supervision of the universities, for both genders. The educational curriculum in the teachers' college programme was established in 1996 based on an integrated system while the curriculum in education colleges that followed universities also had an integrated system before its transformation into a sequential system, as in the H.D.Ed programme. One of the goals of the teachers' colleges is preparing the teachers for the primary stage, while the education colleges prepare teachers for middle and secondary stages. This resulted in the duplication of teacher preparation in the KSA, with teacher colleges under the MOE while the education colleges in universities are under the MOHE. Because of education officials’ awareness of this duplication, in 2007 teachers’ colleges were merged with the nearest universities to come under the responsibility of the Ministry of Higher Education until all the students had completed the programme. A key issue arising from these changes is that after the disappearance of teachers' colleges, the H.D.Ed programme in the colleges of education became the main vehicle for preparing teachers for all stages of public education (elementary, middle and secondary), although the curriculum in this H.D.Ed programme was not amended to be consistent with primary school teacher preparation.

In 2015 some superficial changes were made which eliminated some modules and added or renamed others. However, some modules, such as Professional Development, do not have specified goals or learning outcomes so these are still up to the individual who teaches them. These modules are delivered to all students in the H.D.Ed programme, followed by teaching practice at schools.

Regarding assessment, recent trends involve several stages of assessment during teaching practice, in addition to the modules studied by the student teacher alongside teaching practice, and take into account the professional development needs of the student teacher. This resembles many international models which rely on the school/university partnership. This means that the curriculum of this programme needs to be revised in accordance with the context in which it is situated.

There are many questions about how the curriculum has been developed and whether the schools participated in this development or whether it occurred in isolation. Therefore there has to be thinking about how to stimulate the relationship between the school and the university to become a partnership within which the curriculum requirements can be addressed. Successful international models of effective partnership could be investigated. Alshaya and Abdul Hamid (2011) noted that the curricula of teacher preparation programmes in the KSA do not enable teachers to acquire the constructivist way of thinking that is needed in the modern science and mathematics curricula. There is also insufficient training for science teachers.

Gady (2008) confirmed this by saying that the teacher preparation programmes did not offer student teachers the concepts, theories and skills which would support their preparation, and the content of the basic programme modules did not contribute what would be necessary adequately to prepare the student teacher. In addition, the programmes did not involve cooperation with participating departments in public education.

This section of literature provided a conceptualization for the research questions that related to the school system as well as a framework for analyzing the relationship between the school and university systems then selection the research theory AT, which they can detect the contradictions in the relationship between systems.

2.3.2 Some academic issues in teacher education in KSA

2.3.2.1 Teacher pre-service preparation programmes

Teacher development is an important issue in education reform and thus teacher preparation programmes should be one of the important issues. Wallace and Loughran (2012) confirmed that the teacher is the backbone of any reform project for education. Alshaya (2009) added that any reform project for education in the KSA not accompanied by the development of the teacher would be useless, and would therefore not achieve the goals of development.

Research studies on teacher education such as those of Alarfaj (2015), Hoeml & Alanadi (2015), Alzahrani (2012), Albadry (2008), Sete (2001), Al-Shahry (1999), Al-Ruweishid (1994), Al-Qarny (1993), and Al-Ghouny (1993), agree about several weaknesses to science teacher pre-service preparation programmes. For example, these programmes should:

- be adapted with new styles and techniques in science teachers' learning, and be more consistent with the new science curricula;
- focus on quality in ITE, rather than the previous emphasis on quantity;
- be developed in light of the teaching competencies needed in schools;
- keep pace with the current needs of the community;
- provide sufficient specialization curricula to provide the teacher with the information needed to keep pace with the public education curriculum;
- be properly planned to form links between programmes and the needs of development;
- up-date their academic programmes and teaching aids to keep pace with current educational developments.

Alshaya (2013) emphasized the reality of low teacher professional development associated with the development of mathematics and sciences in general education in KSA. Ghanemah (1996) added that these programmes face a lot of criticism as a result of their many problems, including the lack of clear and specific goals for the programme as a whole, as well as not relying on the results of prior scientific studies. In addition, Al-Bazzar (1989) noted that the Arab Gulf states had sought to develop teacher preparation in general, and science teacher preparation in particular, and had made significant shifts in this area, but teacher preparation policy suffered from problems such as the expansion in student numbers at the expense of development of the qualitative aspects.

2.3.2.2 The gap between theoretical knowledge and the practice of teaching

The problem of the school/university interface in teacher education is one experienced internationally. This may be due, in part, to the different systems and structures in different educational institutions in which initial teacher education occurs. Any university-based input to teacher preparation will not have real value, regardless of its quality, unless accompanied by the student teachers' practical training and the development of the necessary related skills. Korthagen et al. (2001) indicated that, in some countries, the main part of pre-service teacher education is now the responsibility of the school; this is often attributable to political response to limitations in the traditional methods of teacher preparation in preparing potential teachers for the reality of the classroom.

Teaching practice it is one of the most fertile periods in the life of the future teacher and for his/her preparation for professional life. Teaching practice relies on the relationship between the university and school. However, in general, I think the notion of partnership means that the distinction can be quite subtle. I think Oxford (and Exeter) see the training as integrated, with the university being responsible for introducing insights from theory and research and helping students to understand the range of possible practice, whereas schools are responsible for interpreting theory in their own context and choosing the particular practice that is best suited to that context. The concepts of theory and practice focus on the interpretation, development, evaluation and application of scientific, behavioural and educational theories; in the end, theoretical knowledge must be developed by, and put into practice in, the reality of the classroom. The power of theory is evident from the idea that “Practices are changed by changing the ways in which they are understood” (Carr and Kemmis, 1986, p 91). Therefore, teaching practice is an essential part of the student teacher’s professional preparation as it provides adequate opportunities to relate theoretical knowledge and applied practice in the classroom so that both are developed. It may be useful to note that other UK teacher education programmes may be based on explicit views of the theory/practice relationship, but the Exeter and, especially, Oxford models are particularly well researched and documented, so have been an important influence on the development of this thesis.

A lot of research has addressed itself to the issue of theory and practice, to the importance of applying and practising skills. For example, I think engineers and medical educators would question the idea of simply practicing what they have learnt to develop their skills for which they have the foundation in theoretical knowledge. Thus teachers also need to put into practice the theoretical knowledge they have gained from their academic study at the university in real school classrooms, and therefore this constitutes an important part of the school’s responsibility for pre-service teacher education.

Studies carried out on the various models of teacher education across the world have shown weaknesses that result in severe problems for teachers once they have left their pre-service teacher education (Korthagen, 2004). In addition, Hennissen et al., (2017) asserts that there are doubts about the effectiveness of teacher education with regard to the professional behaviour of pre-service teachers. Korthagen, (2001) confirmed what others had reported, namely that, teachers, during induction into the profession, faced a huge gap between theory and practice. This is often interpreted as evidence for the irrelevance of educational theory. This view might be justified if we rely the familiar model of the theory/practice relationship which has been used in several countries (including KSA): namely a ‘theory into practice’ model which is sometimes called the traditional approach that is based on ‘technical-rationality’ model. This model basically involves university experts teaching future teachers about the available knowledge relating to teaching and learning which the student teachers then simply apply in their teaching practice. Even in its own terms, this model has been failing because the teaching methods provided by the expert teachers to new teachers gets ‘washed out’ and used less and less as time goes on. However, if we take the view of the relationship between theory and practice that is outlined above, the fact that students and others find the theory/practice gap to be problematic may simply show that teacher preparation does not help students to understand the subtle relationship between the two. This is why it is important to carry out research relating to the problems of teacher education internationally and to discuss the new theories which have been proposed and applied (Korthagen, 2004).

Hennissen et al., (2017) noted that, many researchers consider that the gap in teacher education between practice and theory is a classic argument between two different types of concepts of knowledge. The first is Plato's concept of rationalism ‘episteme’, which is the theoretical or conceptual knowledge that the teacher may use to analyze the situation with a set of general assertions that apply to many different situations and problems. The second is Aristotle’s concept of practical wisdom ‘phronesis’, which is the knowledge that the teacher can use to identify the profiles of the practice situation and to act on them in order to solve the problem. That the gap is therefore a gap between, on the one hand the model of rationalism that takes the deductive approach and the conceptual knowledge as a starting point for the teacher education process, and on the other hand, the realistic model that takes the inductive approach, which was launched since the 1980s and which adopts practical experience as a starting point for pre-service teacher education.

From this perspective, although, there will be a gap between theoretical and practical knowledge when the student teachers practise their teaching in the classroom (Hascher et al., 2004), this should not be seen as a problematic gap but, on the contrary, it should be a growth point. For example, practitioners in some disciplines of education may adhere to theories in their particular field, but in reality these theories are not reflected in their practice. Griffiths and Tann (1992) explained this gap as “mismatch between the observer's theory and the practitioner's own theory" (p.70). This may be due to their misunderstanding the theory or its wrong application in a particular context, or to the insufficiency of the theory itself (Stones, 1983). This gap may be generated if the student teacher’s pre-training experiences or the impact of the teaching practice context have a more powerful influence than the teacher preparation programme as a whole (Cheng et al., 2010). Zeichner and Tabachnick (1981) indicated that most of the theories acquired from studying in teacher preparation programmes are ‘diluted’ by the first encounter in teaching practice. However, as is discussed elsewhere in the thesis from the perspective of Activity Theory, the gap may be inevitable: what matters is that the gap is used as a stimulus for creative development and not as an excuse to dismiss either the theory or the current practice as fundamentally flawed. It is interesting to note that this view of the theory/practice gap is consistent with the Oxford view that is discussed above.

Hennissen et al., (2017) imagine two important aspects to bridging the gap. First, it is important that experiments begin in practice and develop into theory (inductive). To connect practice to theory in this inductive way, Korthagen (2001) calls for an inductive method of training called "real teacher education", which begins the process of learning from concrete experiences and pre-service teachers' concerns. Second, it is important to learn how to use theory in practice (deductive). Although the first model leads to an understanding of the value of theory that consists of generalised insights from practice, it does little to explain how formal theory that might be derived in different ways can inform practice. Both models could be supported by the view of the theory/practice gap discussed above (i.e., as conceptualised in the Oxford model).

The discussion above perhaps helps to clarify the reasons for the non-application of theories taught in teacher preparation programmes by new teachers within classroom contexts – even where the taught theories are potentially highly relevant to the observed practice. These causes which should be controlled to reduce this gap. Without the perspective provided by Activity Theory, it is very difficult to maintain a creative unity of theory and practice through a short period at school for teaching practice, (Ashcroft & Griffiths, 1989, Korthagen, 2001). Hobson et al. (2008) confirmed that student teachers felt there was a lack of linkage between the university-based teacher preparation programme and the school-based teaching experience. This suggests that developments may be needed in university and school provision in the ways that partnerships are conceived and in the ways that gaps between the two elements are conceptualised.

Allsopp et al. (2006) emphasised that the teacher educator's role is vital in the school to university connection; consequently it is imperative to see how the two institutions can work together and progress to give positive outcomes. An example of this in KSA is that a long-standing objective for the preparation of teacher programmes is to combine theory with practice. Professional Development Schools (PDS) models were introduced to strengthen the link between theory and practice. They also helped provide a link between educational institutions so that teachers and students could share their knowledge amongst themselves and achieve professional growth. In general, the PDS model in schools is related to student teachers and involves professional models that give rise "to skills of inquiry, reflection, problem solving and collaboration" (Rock &Levin, 2002). Having an actual school setting is an excellent way in which student teachers can acquire their practical experience in a realistic school setting. Merrill (2002) stated that when theoretical knowledge is used in accordance with a sound model of the nature of the relationship between theory and practice, then good learning. For effective learning, application of knowledge and skill is a necessary condition.

Goodlad (1990) regarded the preparation of the teacher as a translation of the theory of good quality education into practical reality. However, in teacher education programmes in the KSA, there is an especially extensive and unproductive gap between the theoretical knowledge taught in modules and actual teaching practices. That has been shown to be due to the differences between the university curricula and current teaching practice; therefore the student teachers are not able to implement the theoretical knowledge they have learned (Alaqail, 2005). Nevertheless, when teaching practice is organized and planned well, it can be effective in engaging the student teachers with good experiences in the field of specialization. Therefore, initial teacher education programmes need to develop effective partnerships between the institutions (usually higher education institutes and schools). However, there is not a plan in KSA to motivate the universities and schools to establish a carefully conceptualised successful partnership between universities and schools that could work to reduce the gap between theoretical knowledge and its application, or help to make this gap a source of creative development.

2.3.2.3 Teacher education research

It can be helpful to distinguish between research for teacher education and research on teacher education. The first is research that could inform teaching such as, close-to-practice research on effective classroom practices or more basic research on pupil learning or motivation, and the other is research on the processes or effectiveness of teacher education.

McLaughlin and Black-Hawkins (2004) argued that "our experiences suggest that there is no single shared understanding of the concept of a research partnership amongst members of the schools and the university" (p. 274), while McIntyre (1997) indicated that “it is important that programmes of initial teacher education should be planned in the light of good research-based understandings of the nature of teaching” (p.4). He added that: “It is only through research and evaluation studies, however, that one can discover whether or not any particular conception of school-university partnership does in practice offer clear shared understandings, and whether or not it is both viable and effective in achieving its purposes” (p.5).

Teacher education research experiences problems in all countries of the world, but in some countries, such as the United Kingdom, we find that there is some political orientation to support the conduct of research in the teacher-education context and serious attempts have been made along this line in recent years. Several schemes have been put in place, namely the Teaching and Learning Research Programme (TLRP) which has operated across the UK since 2001, the Applied Educational Research Scheme (AERS) which operated over a five-year period from 2003 to 2008, the Welsh Educational Research Network (WERN), and recently the UK-wide Strategic Forum for Research in Education (SFRE) (Menter & Murray, 2009). Buchberger et al. (2000) confirmed that the importance of teacher education and research on teaching were priorities for European Commission action plans. According to Brown (2007), this research leads to cooperation with the authorities responsible for education at the policy level and in the classroom. This relationship is necessary to maintain the continuous development of education through research, which aims to influence education by looking closely at the fine details of the educational process and exploring and assessing their value.

According to Houston et al. (2010), "Other studies (Kreber, 2002; Atkinson, 2001) make similar distinctions between the work of teacher educators and more formal researchers, although we note that they looked at institutions where teaching traditionally held a dominant role. The potential contribution of action research in other professional fields – or those in which the possibility of a 'research-practice gap' might be posited – is very much a matter of ongoing and current debate; for instance, in nursing (for example, Blair & Minkler 2009) and business management (for example, Syed, Mingers, & Murray 2010). (p.558).

Alaqail (2005) maintained that research in teacher education in Saudi Arabia suffers from many problems. The university teacher educators are busy teaching large numbers of students and, consequently, have insufficient time to conduct research. They also lack experience and funding in conducting research and suffer from the bureaucracy which surrounds the awarding of research scholarships; also expansion in student numbers in higher education in the KSA has resulted in a lack of research in universities. There is an imbalance between expansion of universities and the rate of production of research on education. Even engaging practitioners at schools in education research may be almost absent.

Borg and Alshumaimeri (2012) concluded, from their research, that there were several measures which could activate the mechanism for educational institutions to encourage teachers and teacher educators to produce in-depth research, and that such research could contribute to the expansion of education and the goals of their institutions. They suggested the following measures:

1. Create mechanisms by which to gain information about teacher educators and their attitudes towards research, as this would make it possible to make informed decisions about "how to support teacher educators' research engagement" (p.355);

2. Provide financial support and other incentives, workshops and training in research. This would support educational institutions to increase the production of active research and help them to achieve their goals;

3. Encourage educators to work together and support them in understanding the diversity of research models and approaches. This could contribute to the process of enquiry that could promote the educational value of active research;

4. Involve teachers with teacher educators in understanding and implementing educational research, in order to produce research that represents the factual reality of education in schools. This is because there are a lot of problems in the preparation of the teacher, which do not appear on the surface, and this is the result of a lack of research in the field of education in the KSA. These problems have not been discussed closely and practitioners in the field of education have not been involved, so that the work on the results of this research needs to be applied in a more systematic and realistic manner. Perhaps this is due to the weakness of institutions and systems of education in building bridges of

cooperation and joint work on educational research in a manner to ensure the investigation into the educational process comes back to benefit everyone. This was confirmed by Roth and Tobin (2002) who were concerned to deepen the concept of partnership and research production in a positive way, where they stated that: “Despite the persistence of the problems in teacher education, there is a lack of research that attempts to understand the situation in ways that retain the complexity of learning to teach in schools, and to enact practices that lead to positive change” (p.109).

2.3.3 Interaction between curricular and academic issues

The curriculum of the educational system cannot change and develop without affecting the rest of the elements of the education system, and cannot reflect its success in achieving its goals except in the light of the development of all elements of the system to ensure the achievement of the system goals as a whole. Institutions working and developing separately and independently within the educational system do not achieve the goals that are sought.

Making any educational change and updating the curriculum and teaching methods, whether at the university or school, will not achieve its goals without the teachers being well prepared. Therefore the interaction of curriculum issues with other academic issues, such as the preparation and teacher training programmes at the university, results in a lack of realism in education research without the participation of practitioners, and in a weakness of effective relationship between the university and the school. Alzaydi (2010) also pointed out that some administrative problems lead to academic problems, such as the lack of financial resources leading to unimproved teaching methods and a low level of production of education research. One of the most influential issues is planning the priorities in educational expenditure, such as providing training opportunities for teachers through workshops and other programmes, as well as the production of realistic research that addresses the requirements of teachers and schools.

The previous section of literature helps to select research theory AT as a framework for analyzing the school and university systems and to deal with the gap between them, and how to make them a growth point as we mentioned earlier. In addition, opening the thinking to the idea of expanded learning, helps to shape the research questions.

2.4 Partnership between school and university

The partnership between the university and the school is not limited to the provision of teaching practice policy; in addition it should create opportunities for teachers to develop their professional skills, and should provide research experience in the school. In order for it to be an effective partnership, we must know what should be included in this partnership and how it can provide support for the advancement of professionalism in education, for example by valuing the different perspectives of researchers and teachers and using these differences creatively. Finding a partnership and setting the relationship between school and university are sources of concern in many countries, and stand in the way of contributing to the development of teacher education. Although this is a long-standing concern (e.g. Hewett (1971) asserted that: “In recent years there has been growing concern over the relationship between schools and colleges” (p.102)), it is also a matter of recent debate. For example, Chambers and Armour (2012) pointed out that equality of status “is one of the most important (elements) of successful collaboration during the placement of students on teaching practice (TP); therefore, (one can say) that school and university personnel should be equal partners if the collaboration is to be effective”(p.159).

There are many benefits to the partnership between the university and school, which can take advantage of university members’ research, and pedagogical researchers at the university may be teacher education specialists, and may be able to provide consultation and new experiences in the field of teaching.

From my point of view, the practice of accommodating student teachers provides the schools with new information held by the student teachers, and this new information can come together with the expertise of teachers at the schools to constitute a significant benefit. The new information can be blended with experienced teachers' expertise to help the professional development of all teachers in school through the updating of their knowledge about learning and teaching. University members can also supply the teachers, schools and education officials with new perspectives on the educational process. They can evaluate the performance of the school, and provide them with modern strategies in education through quantitative and qualitative research carried out on teaching and teacher education.

Rudduck (1992) mentioned some important points about the benefits of the partnership as follows:

> "First, the university can offer help with specialist content in curriculum areas where staff have a particular expertise. …Second, the partners can use the combined skills available to them to offer schools, or groups of schools, support with the crucial task of understanding their own progress and achievements. … Third, the university and the school board together can provide a secure environment for justifiable educational experiment in which both new and experienced teachers can feel supported in trying out new ideas; they will need explicitly to signal their readiness to protect a climate in which educationally justifiable risk-taking is valued more highly than never trying anything different." (p.207)

Therefore, partnerships should be improved by confirmation of the trust between the partners, with equality and commitment to their responsibilities and roles, in order to achieve the objectives of the partnership.

McCray et al. (2011) mentioned some of the characteristics that make partnerships successful and that contribute to their positive impact and sustainability. These are: confidence among participants, open communication, mutual respect and a willingness to work collectively. Another characteristic of effective partnerships is the clear commitment of the leaders of organizations to participate. This is reflected in the commitment of leaders who strive to gain a comprehensive understanding of all their constituents' needs, to maintain flexibility in meeting these needs and those of the partnership, fulfil their promises and ensure that goals are met, thereby contributing in a positive way to the reform of teacher education and to educational innovation.

McCall (2006) pointed out that, in many countries, schools participate in the preparation of teachers, leading to closer partnership between schools and those responsible for teacher preparation.

The need to narrow the gap between theoretical knowledge and practice, and to use any such gap creatively, may be a great incentive for teacher education institutions and could lead to closer cooperation with schools. This joint cooperation may stimulate improvement in teacher education by putting the student teachers into a higher quality learning environment. Therefore, it takes into account teacher education, which is a major part of the curriculum (Korthagen et al., 2001).

Snoek (2007) confirmed that researchers differ in their focus on the relationship between university and schools, in terms of the advantages, interests, responsibilities and roles in relation to initial teacher education. They emphasise that these partnerships have a much wider potential, such as focussing on procedures for improving school environments, curricula and theoretical frameworks for the professional development of trainee teachers and the expansion of knowledge about education. The student teachers, if they had the opportunity, would not be a burden on the school but could contribute to assisting with the implementation of research activities. Spending a long time at the school during teaching practice, if planned to involve this kind of developmental work for the school, as well as opportunities for the student teachers to teach pupils and get feedback that could help them develop their own skills, could be seen as providing opportunities for the renewal of the activity of school work in all aspects.

This allows for the renewal of the curriculum, school development, professional development of student teachers and educators, and the expansion of educational knowledge by practising various types of research in schools; these are interrelated and create synergy.

Previous studies conducted in different contexts on various topics are outlined below.

Greany and Brown (2015) studied the partnerships between schools and universities in England to identify the co-factors, obstacles and difficulties that affect the possible development of these partnerships. They looked at various practices and how these contribute to the development of three important aspects in initial teacher education, such as school programmes and professional development, research and education. This study indicated that partnerships between universities and schools in England were in a dynamic state of change in response to the historical needs of the system and self-development of the school. These relationships have been driven by the policy of providing a stronger role to schools in Initial Teacher Education, and have assumed that schools will either go in their own direction in this work or else form strong partnerships with distinct universities, in the interest of professional development for both parties of staff in terms of mutual cooperation and the common responsibility of working together.

A further study, by Officer et al. (2013), investigated the strengthening of community schools through university partnerships in the USA. It noted that the school, community and university partnerships were not a new event and that universities had a responsibility to work with schools and collaborate in professional preparation. Therefore, the commitment to schools and communities requires more collaboration in the professional development of workers and the enhancement of the concept of Professional Development by university members in partnership with all involved parties, whether in school or community.

Also of interest is Villers and Mackisack's (2011) study, an analytical critical study that looked at optimizing opportunities to learn during practicum, in terms of improving collaborative partnerships between the university and school in New Zealand. It investigated the achievement of the professional and academic objectives of the partnership between the school and university, through the development of a successful model in terms of opportunities to develop professional learning and to strengthen links between the school and university in practical training. The study's result showed the university should provide academic mentors under the commitment to access professional development for university faculty, cooperating teachers, and school coordinators and, in turn, that schools had a basic role in the provision of teaching practice coordinators.

Alzaydi's (2010) study focused on educational administrative problems that interacted with academic issues through initial teacher education in the Saudi context. The results of the study revealed a set of inner contradictions which led to misalignment between the objectives of student teachers joining the teacher education programme and the objectives of the school and university in teacher education. The centralisation in the work mechanism by the university administration and the local authority resulted in many obstacles which hindered partners from carrying out their roles properly.

Other partnership studies have looked at the development of the teacher before and after their service, and beyond university and school to other communities. An example in the American context is Zeichner's (2010) article, which discussed one of the central problems causing a disjuncture between the campus and school-based components of programmes that were supposed to link preparation programme courses and field experiences in university-based pre-service teacher education. This confirmed the necessity to reduce the gaps between the university and school in teacher education and the gaps between both of these and the communities that surround them. A new hybrid space could be created to link practitioner and academic knowledge, which can be understood through 'hybridity theory'. Zeichner argued that the old model, based on the teacher's preparation through the university only without sharing with the school, does not take into account the hierarchical interaction between the roles of the school and university. On this model, the academy is believed to be the trusted source of knowledge but this ignores the role of practitioners and community in the provision of expertise. He argued that this model needed to be changed to provide greater participatory roles in the preparation of teachers by expanding their learning opportunities to be able to enact complex teaching practices.

Aingleis (2008) carried out a qualitative study based on constructivist theory to investigate the partnership between school and university from the viewpoint of student teachers in Ireland. The results indicate that schools wanted a systematic role in the student teachers' learning through the teaching practice experience but that they did not want to be responsible for teaching practice as they believed that the university was expert in all matters of student teachers' learning. The study showed the need for a set of national standards for the organization of student teacher learning because the schools' involvement in initial teacher education was "largely unstructured, unsystematic and had no statutory basis" (p.1).

One of the important studies was that of Edwards and Mutton (2007), who studied professional learning in the partnerships between school and university in teacher education in the UK. It depended on evidence collected from the teachers who were involved in initial teacher education in schools as part of a training partnership arrangement with universities. The study indicated that many of the schools were cooperating through the partnership with more than one higher education institution. The reason behind this was to gain mutual support from each other, and to ensure that student teachers could benefit from expertise in several curriculum areas. Furthermore, accepting a reasonable number of student teachers meant that initial teacher education could be part of the school context. It also revealed some of the contradictions, such as insufficient time or financial resources, and inherent contradictions in the concentration on the student teachers as learners at school and together working on the performance of the pupil through standards and accountability within a framework of partnership support. Moreover, it referred to the possibility of a third sort of contradiction, in requiring student teachers to work in ways that were not part of the accepted practice at the school, or when higher education institutions indicated a change in the partnership arrangements.

In addition, Saito et al. (2007) made a case study of the partnerships between schools and universities to enhance science and mathematics education in

Indonesia. The study examined the impacts and challenges of the school and university partnership, which included school teachers and university faculty. The results showed that mutual lesson planning, observations, and reflections, which represent the piloting activities (PA), had developed the teaching styles and strategies as well as raised the level of fellowship within schools and among the university faculty and teachers, and they considered that under PA the students became more participative.

Another important study is that of Yamagata-Lynch and Haudenschild (2006), which examined socio-political structures that complicate teacher professional development in the American context by using second generation Activity Theory to explore contradictions that impose tensions on participants' work settings, as a result of conflicting situations. Their findings indicated four level of contradictions: primary, secondary, tertiary and quaternary; they are as follows:

❖ Level 1 Primary contradiction

Indicates that "individual teachers, local education authorities and universities do not share a common value system on how to spend time and money on professional development activities";

❖ Level 2 Secondary contradiction

The local education authorities and "universities do not take into account the new responsibilities introduced to teachers from sustained and intensive professional development programmes that entail difficulty in meeting other daily teaching responsibilities";

❖ Level 3 Tertiary contradiction

The new methods for teaching provided in professional development programmes are not necessarily appropriate for teachers' daily classroom practices;

❖ Level 4 Quaternary contradiction

> Indicates that one area of change to teachers' daily classroom practice interacts with other activities in the classroom and necessitates more change. (p.25)

McLaughlin and Black-Hawkins (2004), through their investigation of the models and complexities in research partnerships in the UK context, explored the conditions which should be available for beneficial practice-based research within the school-university research partnership. Their study revealed six models of partnership based on research. The first model is school-bound, in which individual teachers become mentored through university research experts. In this model, which is commonly reflected in much research activity, the teachers are supported by the university in carrying out their research. The activity's impacts are frequently reflected in the classroom experiences of each individual teacher. The second model is school-wide, but enhanced by the university supporter as a close adviser. This model goes beyond the individual to the collective in the classroom to include groups of teachers and students. In the third model the university research expert comes to the school. This traditional model is where the research activities are led by the university staff and the school is considered as a place to carry out the research. The fourth model takes place across schools. Individual teachers are mentored by university research experts. This is similar to the first model, but it differs in the individual teachers not only being mentored by university research experts but they can also form a larger group with other teachers from a set of schools that are researching the same areas. The fifth model takes place inside and across schools, and is enhanced by the university support as a close adviser. This conception of a school and university partnership is similar to the second model but it differs in that the research activities are school-led, school-wide and engage a set of teachers and students. The faculty members from the university enhance these activities in the role of close advisers. However, the fifth model goes beyond this conception of partnership to merge the idea of schools researching and developing their practice together, and the university coordinating activities to assist this. The sixth model is inside and among institutions; all partners are experts and advisors to one another. This model is similar to some extent to the fifth model in that the research activities include schools working and learning together, and the university steers away from the idea of the expert. Where there is no dominance of the members, including the university, the valuable achievements and complementary roles are acceptable to everyone.

A different approach was taken by Brady (2002), who studied school-university partnerships from the viewpoint of school principals in Australia. The study survey found that there was strong support for a considerable number of partnership initiatives in the development of student teachers' learning, pupils' learning and the professional development of university tutors and teachers. Support was evident for supervision and mentoring, collaborative teaching initiatives, common research, professional development, common planning and school support. It was evident that schools were ready to adopt partnership initiatives. The focus of concerns was about the theoretical knowledge provided to the student teachers before teaching practice and how it could be helpful to them.

Some studies discussed the development of cooperation between the school and university, such as that by Prater and Sileo (2002). In this study, school-university partnerships in the special education field were investigated by a national survey conducted on the special education teacher preparation programme; this took place at universities, while the schools provided the field experiences for the pre-service teachers. The study described and evaluated the relationships between the two institutions. The study showed that nearly three-fourths of the institutions of higher education had formal written partnerships with local education authorities and that the short duration of teaching practice was not enough to prepare teachers for their classrooms.

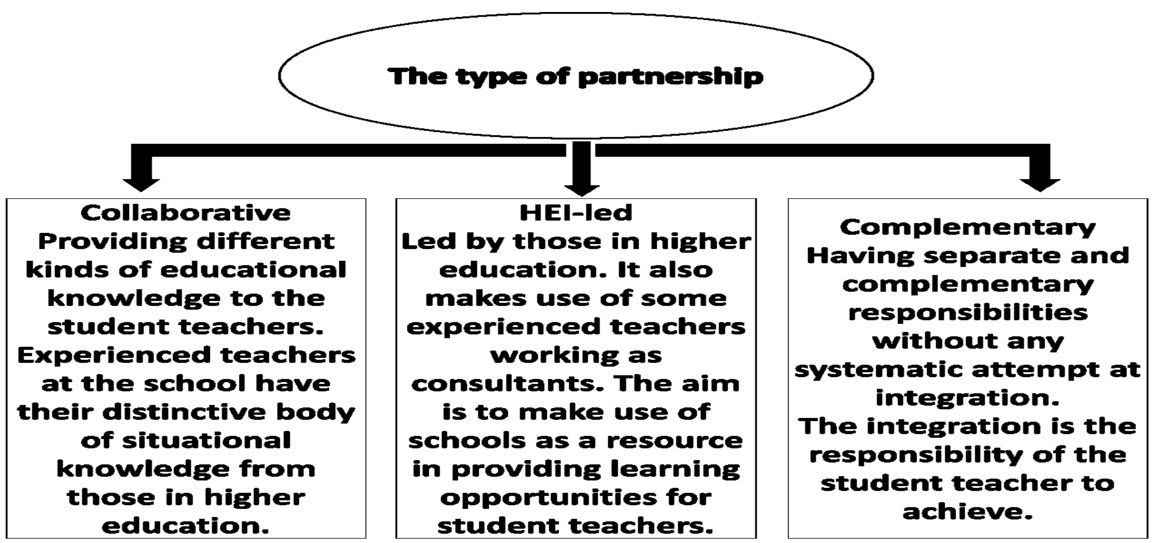
Further studies were conducted by Clark (1999), who investigated the school-university partnership and professional development, in order to create partnerships to help professional development of schools (PDSs) to form innovative institutions to support for professional learning in a real-world setting in which practice takes place. Darling-Hammond,(1995) adds that the PDSs support the learning of prospective and experienced teachers, while simultaneously restructuring schools and the schools of education. The article reported that, given the right conditions, the school and university partnerships could successfully create Professional Development of Schools that, in turn, could successfully produce the teachers needed for successful schools. Some general considerations were postulated for educational institutions that wanted to create and access successful partnerships, through building on previous successful experiences of partnerships, and also on past failures that provided a guide to what should be avoided; building trust between partners; participants having the same clear understanding of the collaboration's purpose and function; and having a training strategy and the resources to carry out it.

2.4.1 Types of partnership between university and school

The following figure identifies types of partnerships that may exist between the school and the university.

Figure 2.1: Types of partnership between university and school

(Furlong et al, 2000; Smith et al, 2006)



According to Furlong et al. (2000) and Smith et al. (2006), there are three types of partnership model. These are described as follows:

The collaborative model

This model provides multiple forms of knowledge to the student teacher through the contribution of the university staff and the school staff. It is characterized by equal roles. This model requires regular opportunities for the university staff to visit and meet with the school staff to plan programmes and collaborative work. This approach is exemplified by the University of Oxford PGCE programme;

The HEI-based model (duplication and integration)

This model is the partnership approach based on Higher Education Institutions, and it has been described by Furlong as integration while described by Cameron-Jones and O'Hara as duplication in the relationship between university and school. This model is based on the integration of the students' training to practice in the world of school, while blurring of the boundaries between the school teacher and university tutor. The university benefits from the practical experience provided by the school teachers. The university works as consultants with a small strategy group of school staff, but with a minimum of formal responsibilities from them;

The complementary model (separatist)

The complementary model contrasts with HEI-based approach. The complementary model of partnership eliminates duplication and is characterized by the separation of the roles and responsibilities of the university staff and school staff. Integration here is the responsibility of the student teacher.

2.4.2 Improved the partnership through the Third Space

The concept of the 'third space' emerged in the nineties in the work of Bhabha (1990, 1994) and, later, Zeichner (2010) through their theories of hybridization spaces and border crossing. Zeichner (2010) indicated that the third space includes integration and rejects dichotomies such as ‘theory’ and ‘practice’, or ‘academic knowledge’ as unique to the university and ‘practice’ as unique to the school. Klein et al. (2013) reported that Zeichner had taken the meaning of third space "from the fields of urban planning, geography, cultural studies, and most recently critical literacy", depending on Bhabha (1994), Gutierrez (2008), Moles (2008), Routledge (1996) and Soja (1996) to identify this space as a common space that combines the features of separate systems (p.28).

Much of the research on initial teacher education agrees that the activity systems intersect and overlap with each other, as the school and university systems intersect in the activity of initial teacher education. This intersection and overlap is accompanied by many tensions and contradictions within and across activity systems. It is therefore difficult to cross the border to find common areas if there is no third space to serve as a common room to identify the roles, responsibilities and agreements between the two systems. This space is shared so that no one system can impose its hegemony on the other system. “Creating third spaces in teacher education involves an equal and more dialectical relationship between academic and practitioner knowledge in support of student teacher learning” (Zeichner, 2010, p.92).

Williams (2014) argued that "working in the third space involves managing shifting identities between teacher and teacher educator, responding to changing perspectives on learning and teaching, and negotiating sometimes finely balanced and difficult relationships" (p.315). This means theoretical hybridization of practices between the two institutions involved in the objective of student teacher preparation. The third space is an area of understanding and expanding dialogue, and agreements to expand learning by integrating the expertise of both institutions. Martin et al. (2011) indicated that the conversations between university and school in teacher education within the third space could enhance new understanding around their practices.

The concept of partnership implies equality, though hierarchy still exists in initial teacher education and therefore tensions exists between the university and the school in the training of student teachers. These two systems are therefore often seen by the student teachers as separate and this affects their ability to apply their theoretical knowledge (Lewis, 2012). The idea of the third space reduces this hierarchy to the level of joint action, and therefore one of the benefits of the third space is to maintain communication between communities such as the school and university. In this vein, Williams (2014) noted that "collaboration in the third space provides an opportunity for all participants to work together to gain new knowledge and understandings about teaching and learning and to develop boundary practices that enhance the learning of teachers, teacher educators, student teachers, and ultimately school students"(p.325). Lewis (2012) mentioned that "several new approaches [have been tried] for locating and utilising a third space as a way of bridging the theory–practice gap"(p.32).

This overview of the levels and the benefits of partnerships and the factors that can sustain them has brought out many important issues of common interest. One of these is that of multiple partnership levels, which looks beyond the simple partnership between school and university to include partnerships with other institutions in society. These discussions about partnerships produced ideas about how to cross the border from the narrow concept of partnership in student teacher teaching, to highlight the issue of teacher research. These perceptions and perspectives can be factors helping to begin creating effective partnerships that can achieve the goals of the educational institutions in the Kingdom of Saudi Arabia.

The previous discussion of the partnership has helped to reach a conviction in the use of theoretical framework through activity theory which carries a good perspective in exploring partnerships by exploring relationships between and within systems as well as, helping to form the perceptions about questions and research tools as well as enriching the debate on the third space.

2.5 Some British models of teacher preparation programmes using partnerships

In this section, two models of teacher preparation are presented, namely the Oxford University model and the Exeter University model. The first part of this section looks at the Oxford model, which has been studied by many researchers (Allsop & Scott, 1990; Brisard et al., 2005;Hagger,1992; Hagger et al.,1993; McIntyre, 1990; McIntyre & Pendry, 1994; Pring, 2008). They looked at this model in terms of its history, its objectives, some of the existing problems that prompted its development, its principles, the phases of preparation and development of the teacher, and its theoretical framework. In the second part, the Exeter model is presented in terms of objectives, theoretical framework, and the phases of preparation and development of the teacher. However, some comments will be made on certain aspects taking into account the context in which the Oxford or Exeter model has been implemented, which is different from what would occur in the Saudi context. Following each model, some points are made on how to benefit from it in science teacher education in the Saudi context.

The focusing on models such as, Oxford and Exeter helps to present ideas about partnerships and how they were created through a rich experience background that can help connect theory and practice with a clear concept. It will also provide many views on teacher education programmes as well as, solved or unresolved problems that will become apparent clearly when developing teacher education programmes in another context.

2.5.1 Oxford University Model teacher preparation programme

2.5.1.1 The history of the Oxford model

A sense of the importance of partnership and interaction between the school and the university arose out of political interest in England in the 1980s, not only on the level of preparation, but going beyond to the continuing education of teachers.

The first major study to look at the role of the school in initial teacher education was commissioned by the DES in 1982 from Furlong and colleagues at the University of Cambridge in terms of partnership forms. They concluded that initial teacher education had much to gain from an effective division of responsibilities between school teachers and university lecturers and they urged innovation in order to promote reflective professional learning for student teachers. One of the earliest and most effective partnership-based approaches was the 'Oxford internship scheme', developed by the University of Oxford in conjunction with the Oxfordshire Local Education Authority and some local schools, which was inspired by the medical training model, with clear definitions of roles and responsibilities in the training process. This was initiated by Dr Harry Judge who, before appointment as Director of Oxford University's Department of Educational Studies, had been the head teacher of a large comprehensive school. The scheme was developed under the leadership of Donald McIntyre who incorporated the profiling of beginning teachers against a set of competences. In 1985, Judge presented a proposal to head teachers and local education authority representatives for adopting a new model for the partnership between the school and university; twelve teachers from the local education authority joined with university tutors to build up the new format. In July 1987, a conference was held at which all the invited schools were represented, with the aim of informing, inducting and starting the new scheme and holding discussions on the development of the partnership between schools and universities. The detailed planning took place from 1985 to 1987 (Brisard et al., 2005).

The Secretary of State for Education and Science in England declared, in January 1992, the Government's decision that “the schools should play a much larger part in initial teacher training as full partners of higher education institutions” (DES, 1992, p. 1). Thus, the school was granted a greater role in teacher education.

McIntyre and Hagger (1992) pointed out, after the announcement, that both parties were committed to moving vigorously to more school-based ITE. The standard and quality of the schemes for early teacher education in accordance with the new rules would rely on the basic thinking and hard work of teacher education institutions and of the schools with which they made partnerships. It was seen as ideal to spend two-thirds of students' time in school, and effective programmes of basic teacher preparation became possible within this restriction. Also, the strong relationship and carefully worked out partnerships between schools and higher education institutions, which were necessary for the effectiveness of these programmes, had a variety of other fundamental benefits for the participants in the partnership. One of the potential benefits was to make professional development a lot easier for both student teachers and experienced teachers.

2.5.1.2 Objectives of the Oxford model

The purpose of the teacher education programme which emerged from the planning of the Oxford Internship Scheme was to resolve the common mistakes and problems of teacher education, which needed to be corrected to achieve quality in education.

McIntyre (1990) listed the objectives to be achieved by trainee teachers by the end of the teacher education programme through this partnership, as follows:

1- To acquire skills of classroom management and teaching strategies;

2- To understand criticism and the regulations of the curriculum and linking all curricula with each other;

3- To appreciate social problems and understand the needs of the community to achieve justice;

4- To be knowledgeable about all aspects of the new curricula;

5- To link theoretical knowledge to practice in teaching and be aware of the tensions between the university and the school;

6- To deal with individual differences among students in a class;

7- To be able to assess personal competence and accept criticism from others;

8- To be able to adapt to different patterns of teaching practice;

9- To be able to make decisions and hold discussions on various areas of teaching.

2.5.1.3 Problems that led to the development of the Oxford model

Allsop and Scott (1990) listed the problems with existing teacher training programmes identified by Oxford University Department of Educational Studies which contributed to their development of this course. They are summarised as follows:

1- The schools did not respect the student teachers and discriminated between them and the school staff on the basis of their level of authority and knowledge; therefore the student teachers did not feel like real teachers.

2- The educational theories taught at the school of education were often unrelated to the difficulties and critical issues that faced student teachers in the schools, leading to a wide gap between educational theory and practice at the school.

3- The opportunities to try out ideas in schools was very limited, even practical ideas from the university tutors. Giving more such opportunities would resolve the mismatch between the thinking of university tutors and the practice of experienced teachers.

4- The monitoring by experienced teachers was considered marginal and of little value, and this was believed to result in impaired learning from such monitoring. Therefore, little knowledge of teaching from experienced teachers was passed on to student teachers.

5- Student teachers were given little help and not enough support to criticise the range of practice they observed in schools. Although the student teachers may learn little from experienced teachers about teaching, they may be influenced by different patterns of teaching that are used by experienced teachers.

6- There were significant differences in the quality of diagnostic assessment by supervising teachers in the teaching of student teachers.

7-University tutors often visited the school to examine student teachers' competence, not for guidance or support.

8- There were differences between the university and school in the criteria and standards that they believed should be met by student teachers. University tutors were concerned with the research evidence, educational theory and social values embodied in different practices, whereas cooperating teachers were concerned with the value of different practices taking into consideration political, resource, expertise and time constraints. This imposed different demands upon student teachers in their work.

9- The student teachers learned about teaching in the school by trial-and-error but in the university by scholarly reflection. This entailed distraction and problems in their thinking.

10- Student teachers, tutors and cooperating teachers all tended to be concerned with subject teaching at the expense of curricular concerns such as multicultural education, equal opportunities, special needs and information technology, which may be neglected.

Furthermore, as Alzaydi (2010) mentioned, the majority of these endemic problems are not restricted to the UK context but face teacher education programmes all over the world, including Saudi Arabia. This makes partnership between school and university in teacher preparation of international importance in solving problems and contradictions in teacher education. These partnerships between the two different activity systems should be guided according to well formulated principles.

The problems listed above shed light on the contradictions which need to be overcome by the design of new teacher preparation programmes, namely in adopting partnerships and convergence of views, bridging the gap between theoretical knowledge and practice, and applying research findings in this area.

2.5.1.4 Principles of the Oxford model

Pring (2008) stated that the training model at the University of Oxford demands a partnership between the university, local education authority and schools to achieve integration in the preparation of future teachers. He summarized the principles upon which this model is based as follows:

"(i) The training of future teachers takes place within a partnership between University and schools;

(ii) Each brings to that training distinctive kinds of knowledge: the contextual, craft and professional knowledge of the teacher, and the research based knowledge of the University;

(iii) The setting for the bringing together of these two types of knowledge is the school, and therefore the university tutor works with the teachers in a joint programme in the school itself;

(iv) The school, therefore, becomes ‘a training school’—a ‘professional centre’—with a substantial number of ‘interns’ (eight to twelve) attached to it, each mentored by the subject specialist and each participating in the broader analysis of the context of learning under the ‘professional tutor’;

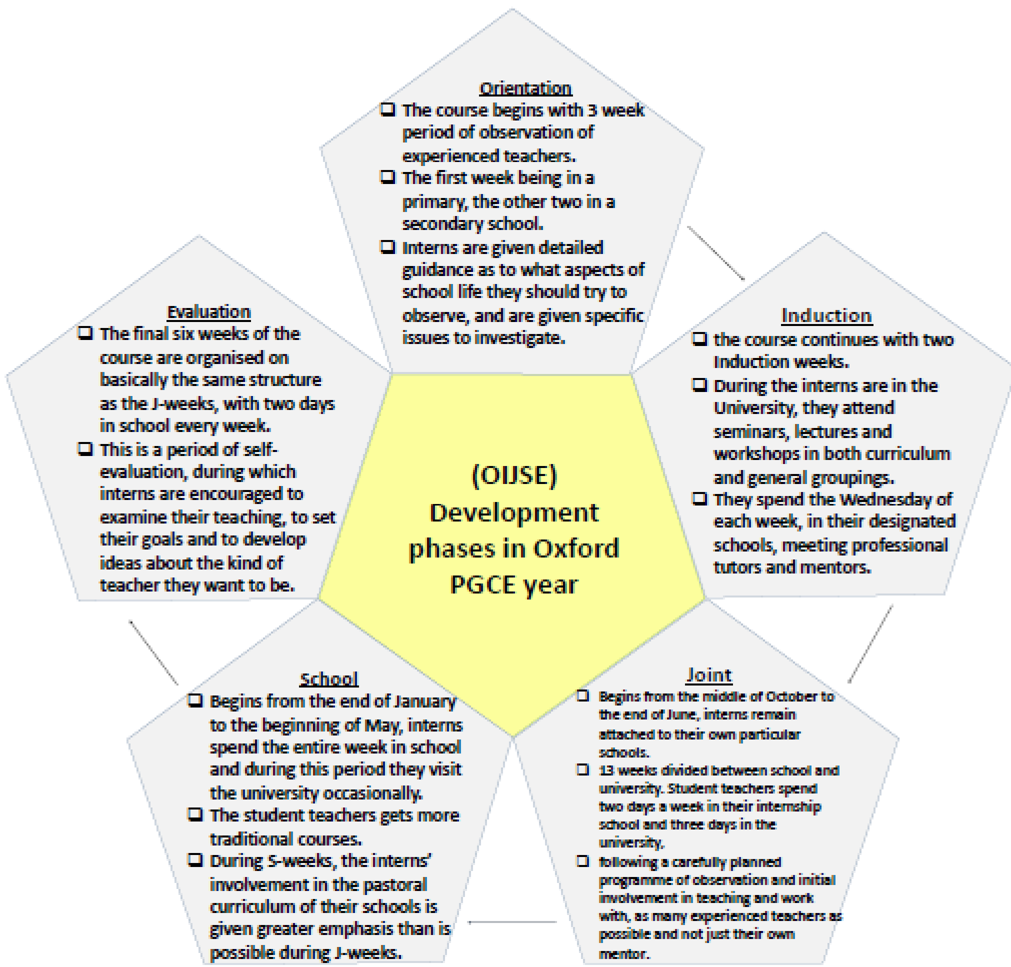
(v) There is a recognition that the interns, through the programme, need to develop their own teaching style and their own educational thinking on important matters;

(vi) In doing so, the interns need to test their ideas within the wider learning group of interns, mentors, professional tutors and university staff—against, in other words, the contextualised experience of the teachers, the growing knowledge of the other interns and the decontextualized knowledge and research introduced by the university tutor." (p.230).

2.5.1.5 Phases of the Oxford model

One of the substantial differences between the Oxford Internship Scheme and the H.D.Ed programme in Saudi Arabia is the internal shape of the programme year. The Oxford Internship Scheme year consists of five stages: Orientation, Induction, Joint, School and Evaluation, It could be called (OIJSE) stages, as well as being represented according to the description found in (Allsop & Scott, 1990; Hagger et al., 1993) as in the following figure:

Figure 2.2: Phases of the Oxford model



"O" (Orientation) Weeks: This stage is a three-week period spent by trainees in two schools, one primary and the other secondary, under the supervision of experienced teachers within the school, during which trainees receive information on all aspects of the school environment. This is one of the key periods in that trainees are faced with concrete reality while they investigate some school issues.

"I" (Induction) Weeks: This stage is a two-week period spent by trainees upon arrival at Oxford University. Information is provided to trainees through lecture sessions, seminars, workshops and discussions on curriculum and general subjects. The trainees attend designated schools one day a week to meet the professional teachers and monitors.

"J" (Joint) Weeks: This is a thirteen-week stage where the trainees are placed with their internship schools. They divide their time between the school and university, spending two days a week in the school and three days in the university. Trainees are encouraged to do some teaching through a programme that is carefully planned under the supervision of experienced teachers.

“S” (School) Weeks: This is a thirteen-week stage which trainees in their internship schools as a period of in-depth teaching practice. During this period they visit the university occasionally for more courses, while they have access to direct experiences in the school.

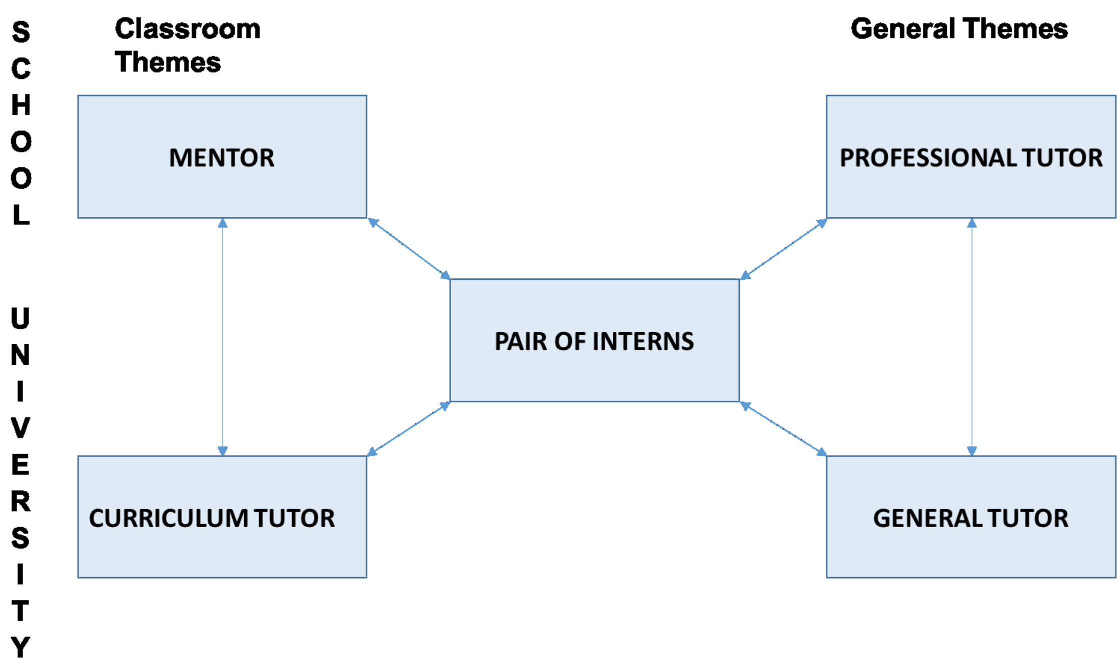
“E” (Evaluation) Weeks: For this final stage, trainees spend six weeks shared between university and schools, as in the J-weeks stage. The trainees carry out self-evaluation of their teaching and of their ideas and they are encouraged to develop their own teaching goals.

The continued development of this programme makes it one of the most exciting and interesting training programmes. Through this organized scheme, we find attention and care that enable trainees to understand the curriculum they teach and the ways of teaching it. The partnership between professional tutor at university and teachers at schools who are creating the integrated programme focuses on areas which are concerned with whole-school, cross-curricular issues; equipping trainees with lectures, seminars, and workshops within the carefully planned programme of school, university and coordinated by both the university supervisor in conjunction with the school teacher. The student teachers have the opportunity to develop their ideas through discussions, dialogue and seminars that facilitate their overall development and give them confidence in themselves to bring out their creative energies and share the opinions and experiences of teachers of various subjects. Also, the roles and responsibilities within the scheme are fully explained in the mentor and professional tutor handbook.

2.5.1.6 Partnership framework of the Oxford model

The framework refers to the system that works through a network of responsibilities and communications that are integrated in teacher preparation and development, even at the level of implementation of the curricula between the university and the school, as illustrated in the following figure:

Figure 2.3: Framework of responsibilities and communication network in the Oxford model (Allsop & Scott, 1990, p. 2)



An example of the interrelated activities of one theme in the General Programme is ‘education for a multi-ethnic society’ and how this subject is managed through the General Programme at schools.

Table 2.1: How the activities are related to the themes of the general programme (Allsop & Scott, 1990, p. 6)

Multi-ethnic workshop	Introductory activities, in university, in school groups with general tutor
Introduction to multi-ethnic policies and practice	Presentation and follow-up seminar with general tutor in the university
Multi-ethnic considerations in a particular school	Investigations and seminars in school organised by general and professional tutor
Multi-ethnic considerations in teaching a specific subject	Activities in the university and school organised by curriculum tutor and mentor
Education for a multi-ethnic society	Assignments carried out by the intern based on university and school activities together with individual reading and reflection

We find from the previous figure that there is coverage of all aspects of the issue through the presence of student teachers in the university or school, allowing them the opportunity to get a large amount of information from several specialists, such as curriculum tutor or general and professional tutor, as well as acquiring expertise through the school staff.

2.5.1.7 Oxford model and its advantages in the Saudi context

The Oxford Internship Scheme is one of the best documented models of partnership between school and university, and is well regarded not only in the British context but also in the global context. It has gained widespread fame and could be applicable to many international contexts and, in particular, the Saudi context. The benefits that could be drawn from this scheme in the Saudi context can be summarized as follows:

1 –The Oxford model is often considered to be the epitome of effective and meaningful partnership between the two systems, school and university, in

teacher preparation. This should highlight the importance of this kind of partnership to accelerate the process of teacher education reform.

2 – It provides visions of a joint operation and mutually beneficial relationship between school teachers, who have experience and expertise, and university staff, who have the theoretical perspectives, this system should achieve a successful intellectual model to serve the teaching process and contribute to helping student teachers to understand the reality of the school. This stage will help student teachers to modify existing perceptions about the profession of education, and enhance or construct new perceptions (Cheng, 2005).

3 – It creates dialogues, discussions and seminars to work towards convergence of views, the system allows the exploration of trends in education and linking theoretical knowledge in practice.

4 – It suggests that periodic and continuous evaluation of schools and teacher preparation programmes should be conducted to ensure overall quality.

5 – It suggests that joint planning for implementing the curriculum should include teaching methods and design of lessons. This should allow the university to prepare appropriate student teacher activities to enable them to discover the curriculum that will be taught and how to deal with it. McIntyre and Hagger (1992) and Pendry (1994) confirmed that the partnership between school and university assists student teachers by supporting and helping them to learn a lot about the profession of teaching, the curriculum and the development of actual practice.

6 - It would give student teachers the opportunity to learn close-up about the school context, such as teachers, classrooms, curricula, school facilities and administrative work that are part of the school, and to note the roles and interrelationships within the school and to discuss issues that revolve around the teachers' tasks as a form of psychological initiation for the student teacher. Hagger and McIntyre (2006) confirm that: "Whatever student teachers need to learn to do as teachers in schools for their future careers, it is in schools that they need to learn to do these things" (p. 65).

7- Application of such a model of partnership contributes to the continuing professional development of teachers in schools.

8- The establishment of a system of partnership between the school and the university needs to research efforts to support and develop this partnership and therefore research must be enabled that contributes to the establishment of such a partnership.

9- Useful in this programme is the communication network and the roles and responsibilities that take place during this interactive large dynamic model.

These ideas from the Oxford model would be very useful if applied in the H.D.Ed programme in the Saudi context, because it includes a common space between the school and the university. In this space are managed the contents of roles and responsibilities. It is also possible to take advantage of the theoretical philosophy to begin creating this common space to reduce the contradictions.

2.5.2 Exeter University teacher preparation model

2.5.2.1 Objectives of the Exeter model

The handbook for PGCE Primary and School Direct at Exeter (2015-16) shows the aims of this programme. It seeks to enable the student teachers and other trainees to:

1. Expand the perceptions of the trainees about educational knowledge to include the curriculum of the primary school and its assessment strategies.

2. Expand knowledge of the trainees' understanding of the relevant roles and responsibilities through the government's criteria in the Teachers' Standards (2012).

3. Expand knowledge of the trainees' understanding of term and of the development of pupils' learning performance.

4. Develop the trainees' understanding of the teaching plan in all stages of the school curriculum, to support other colleagues by giving advice from their different knowledge of pedagogy, curriculum content, teaching methods, and assessment that are related to their subject context.

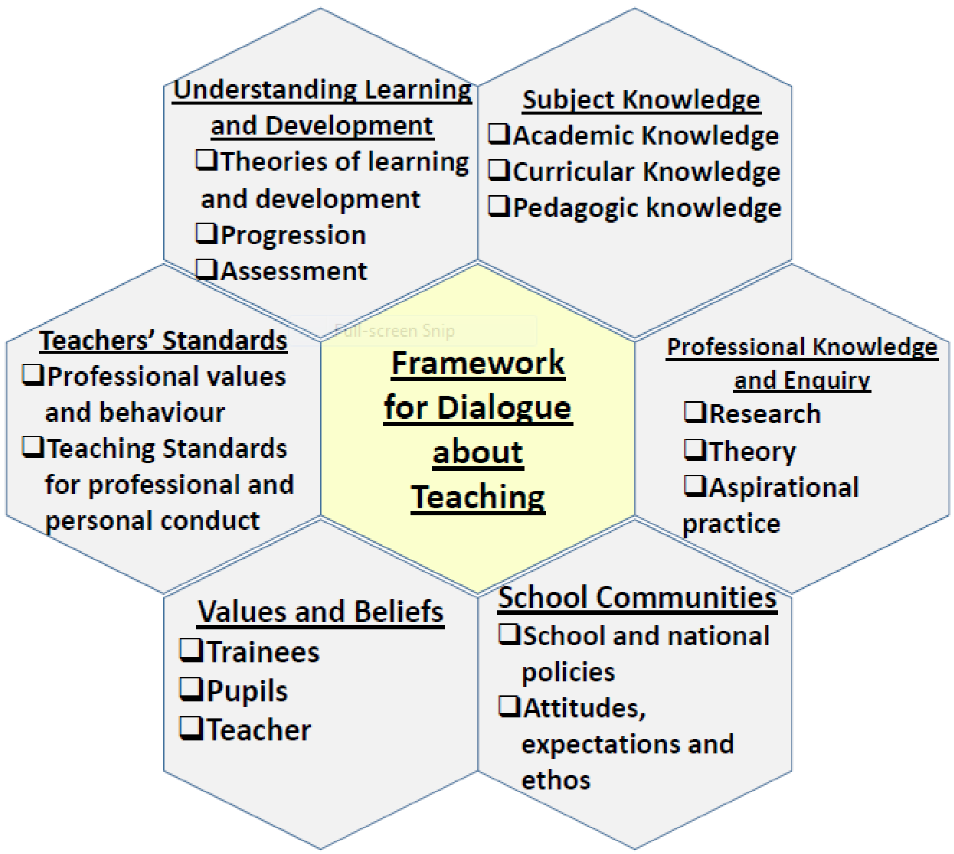
5. Develop the confidence of the trainees at the school as new colleagues in order to acquire different skills, such as reviewing, monitoring, teamwork, and evaluation of their work, to achieve success in creative teaching.

6. Expand knowledge of the trainees' understanding of aspects such as reflective practice and critical thinking, and give them the courage to be able to make informed decisions, and thereby support their continuing professional development.

2.5.2.2 Framework For Dialogue About Teaching (FFDAT)

The FFDAT is one of the several tools that were developed to support student learning. The framework indicates a number of influences which bear upon and may affect the student teachers' and other trainees' planning, teaching and assessment, supports critical conversations about their practice in the classroom, and encourages them to implement and benefit from reflective evaluation. Transactions made through this framework make up a huge network, distinct from the cooperation and communication between the school and the university. This allows continuous support to the student teachers with feedback that is useful to them, through use of discussions with school tutor, head teacher, university visiting supervisor and mentor to evaluate the lessons and identify the educational issues that are going on in the programme. The FFDAT is shown in the following figure:

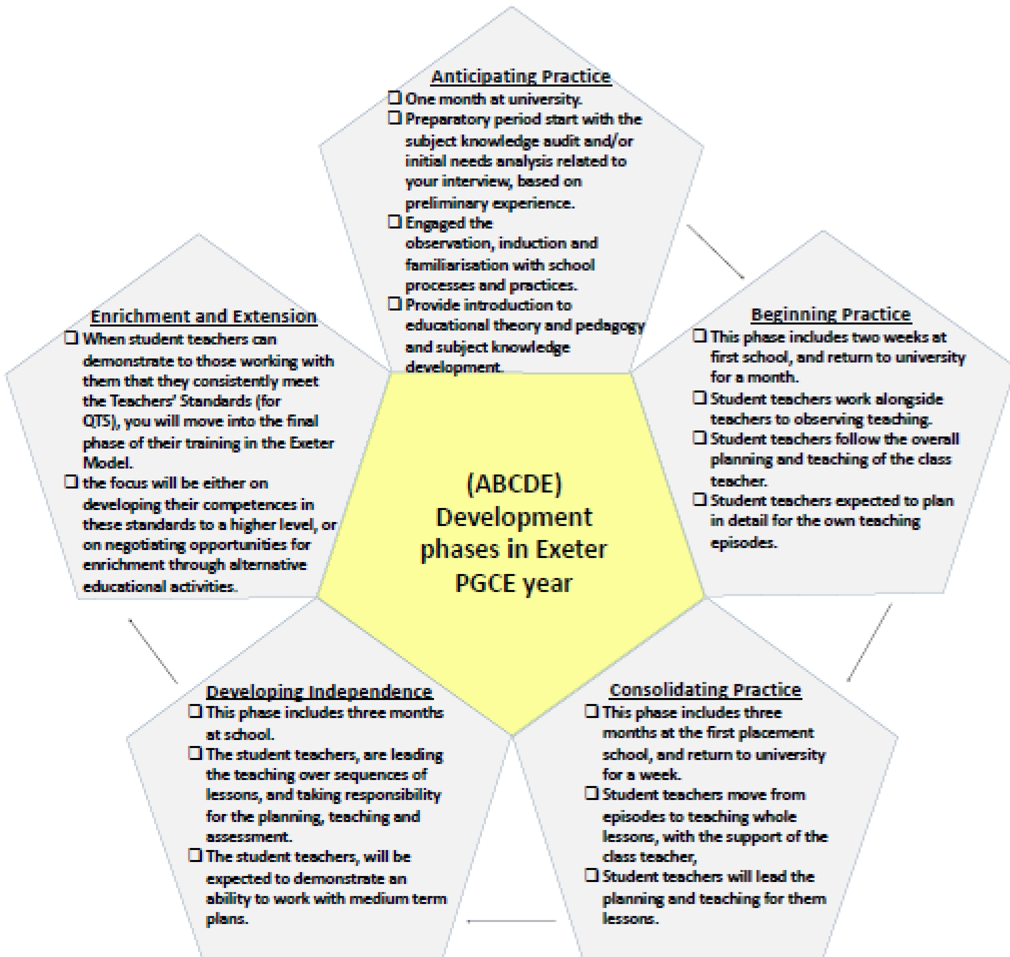
Figure 2.4: Framework for Dialogue about Teaching on the Exeter model (Handbook for PGCE Primary and School Direct at Exeter, 2015-16)



2.5.2.3 Phases of the Exeter model

The University of Exeter model is based on the principle of gradual development for the teacher to learn through five phases. It is represented in the following figure:

Figure 2.5: Phases of the Exeter model



Preliminary experience

Before the student teachers begin the programme, they visit a school for 'preliminary experience' activities, for nearly two weeks. This prior experience is important for the student who wants to enter the programme to observe the teaching process closely. I think this is a great generator of questions for the student teacher, and it also suggests areas of weakness he/she might have.

"A" Anticipating Practice

This phase lasts for one month at the university. An initial needs analysis is conducted, which is related to the interview and based on the previous preliminary experience weeks at the school. At this stage, the student teachers are engaged with teaching practice skills which will help them develop in pedagogy and subject knowledge.

“B” Beginning Practice

This phase lasts for two weeks at the first placement school, followed by a return to the university for a month. Student teachers work alongside teachers to observe teaching, in terms of planning at a general level or classroom lessons and assistance in class in order to begin teaching in some lessons. The university is present in this phase and this is what makes the partnership really effective.

“C” Consolidating Practice

This phase includes three months at the first placement school, followed by return to university for a week. This period is a real practice for student teachers in which they are responsible for the full teaching of their classes and planning lessons with the support of the class teacher.

“D” Developing Independence

This phase includes three months in the second school placement. The student teachers, are leading the teaching of lessons with responsibility for three main skills, namely, planning including medium-term plans, teaching, and assessment.

"E" Enrichment and Extension

When student teachers acquire the necessary skills to teach that meet the teacher standards requirements (for Qualified Teacher Status), they will move to the final phase of the training programme to develop their competencies in these standards through providing opportunities for other educational activities.

While not all student teachers or trainees arrive at this phase, the PGCE programme enables trainees with faster development to make great progress in their training year.

The Exeter model includes the contents of a distinct philosophy in terms of the development of the trainees in critical thinking and self-assessment, as well as taking into account the role of the school context in learning to teach from its values and morals, and student teachers' beliefs during teaching practice. A set of strongly interrelated processes are working within the period of training to motivate and encourage trainees to develop their own learning and promote their skills. All staff in this partnership, both at the university and in the schools, who are involved in Initial Teacher Education, use the Exeter Model of Teacher Education as a framework that provides a common space for their work with student teachers. The Exeter model is an integrated model in terms of details, it stems from a detailed theoretical basis, and makes clear how this theory relates to the model's key tools, with a full description of the roles and responsibilities of all participants in the programme.

2.5.2.4 The Exeter model and its advantages in the Saudi context

1- The Exeter model allows sufficient duration and convenient sub-divisions in the phases of the programme, in that the student remains in school two-thirds of the time and one-third in the university; this allows students to experience the reality of teaching during the largest part of the learning.

2- The programme provides the opportunity to teach, not just in one school but in two schools, which is a government requirement. This system gives an equal weight to the two schools.

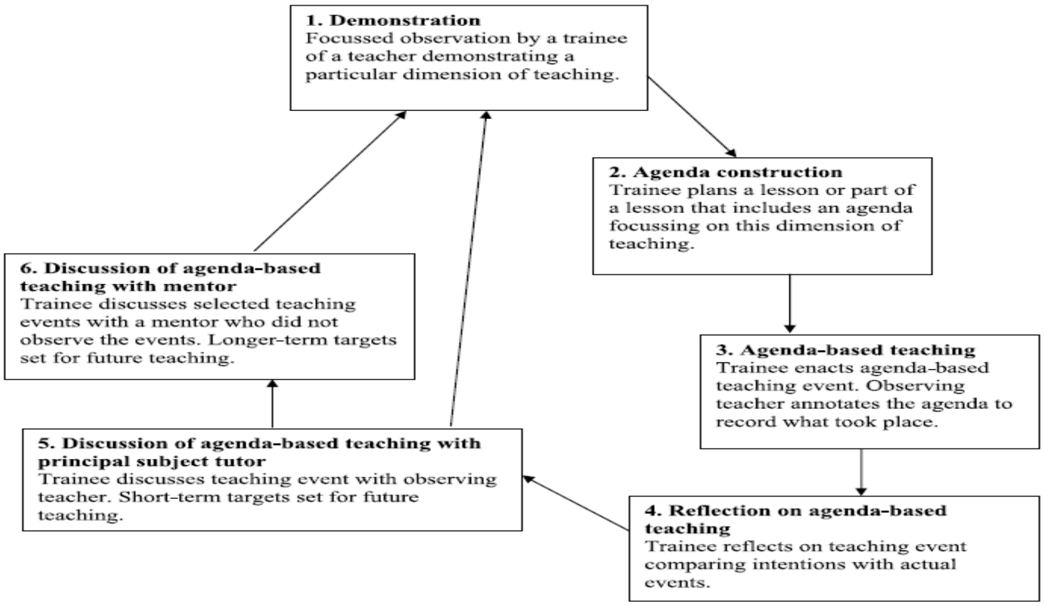
3- The programme includes constant observation and monitoring of the professional development of student teachers, through a network of communication. Distinctive cooperation allows the existing partnership between the university and the school to reduce any contradictions in the understanding of student teacher learning, increase the credibility of assessment, and reveal students' weaknesses and ways of overcoming these.

4- The programme offers courses to the student teachers at the university to help them overcome the difficulty of teaching the wide curriculum. This solves the problem of student science teachers who have to teach the whole range of sciences, but they have specialization in biology or chemistry or physics. The programme offers development in professional, educational and specialization aspects.

The programme helps student teachers in self-assessment of their progress in professional development through their student portfolio, in which is written all that they have undertaken and all their projects carried out since the preliminary experience, with attachments of all evidence for this. The Individual Development Portfolio (IDP) is a record of progress and development and is a key document for the student teachers or trainees. It should be a progressive collection enabling reflection on, and documentation of, achievements and training needs, and this is assessed by the university and the practice schools. There is also another type of assessment in addition to the previous assessment, but here it is the role of the school and the university to write their evaluation through the so-called 'Agendas'. The Agenda focuses on student teachers learning about how to teach and is a central element of the learning process embedded in the Exeter Model. Skinner (2010) pointed out in his study on developing a curriculum for initial teacher education through the teacher preparation model at Exeter University that the model has Agendas at its core. Using the cycle of events set out in figure 2.5 helps students to learn from experienced practitioners through careful reflection on specific aspects of their teaching.

Figure 2.6. A summary of the intended demonstration/agenda-based observation, planning and reflection cycle.

(Skinner, 2010, p 282)



2.6 Comment on the literature review

This study differs from previous studies in that it takes place in the Saudi Arabian context, and focuses on teacher preparation, in particular science teacher preparation, and on the partnership between school and university in teacher preparation. All the literature reviewed has helped in choosing an appropriate theoretical framework, namely, Activity Theory. Third generation Activity Theory is a good model for understanding partnerships between the regulations and the actual space common of these partnerships by exploring relationships between systems, and extracting information about them, to reveal the challenges facing these systems. Kuutti (1996) described Activity Theory as “a philosophical and cross-disciplinary framework for studying different forms of human practices as development processes” (p.25). Kuutti also indicated the contradictions that are central components of activity systems that appear as problems, tensions, conflicts within the activity system or between different systems. The literature reviewed helped in choosing a methodology that helped in selecting methods of data collection. It also helped in formulating the research questions by looking for gaps in the literature.

2.7 Research questions

Many of the issues discussed in this literature review have contributed to the reconfiguration of the vision of initial teacher education in the Saudi Arabia context through a partnership between the school and the university. The review has identified the type of partnership in this context, the tensions and contradictions existing within this partnership, and ways of exploring and minimizing the impact of contradictions between these systems. The Oxford and Exeter models have given valuable perceptions regarding the content of partnerships, and how the processes within these partnerships can work through the distribution and proper organization of roles and responsibilities. This could be an important factor in the creation of an effective common space between the different systems, which should lead to effective professional development. Therefore, the review of the literature helped reshape the research questions, as follows:

1. Does the science teacher preparation programme at the university support the students in learning teaching?

Emanating from the main question, several questions arise:

(A) Is the type of programme compatible with modern trends in the education of the teacher?

(B) Are the modules of the university preparation programme compatible with the curricula applied in schools?

(C) Is the duration of the science teachers' preparation programme at the university appropriate?

2. Does the teaching practice in schools support the student science teachers' learning?

Emanating from the main question, several questions arise:

(A) Do the schools provide a good environment for teaching practice for student science teachers?

(B) Is the duration of the teaching practice programme appropriate for science student teachers to learn to teach?

3. Does the relationship between the school and the university support science student teachers to learn teaching?

Emanating from the main question, several questions are as follows:

(A) What kind of partnership is the relationship between the university and the school?

(B) How can a third space be created for the relationship between the university and the school to become a partnership?

4. What are the challenges and contradictions in the teacher preparation programme?

Emanating from the main question, several questions arise:

(A) What are the contradictions that produce the conflicts faced by science student teachers in their learning from the teacher preparation programme at the university?

(B) What are the contradictions that produce the conflicts faced by science student teachers in their learning from the teaching practice programme in the school?

(C) What are the challenges facing the relationships for science student teachers learning to teach?

Chapter Three

Theoretical Framework

3.1 Introduction

This chapter discusses the theoretical framework of the research through two main sections. In the first section, the theoretical framework of Activity Theory (AT) is introduced and its history, background and principles are described. Following this, the second section discusses how Activity Theory has shaped my research. This also includes an overview of the uses of Activity Theory in relation to research into teacher education, and a discussion of how 'activity' is used as a unit of analysis. According to Chambers and Bax (2006), teacher preparation is a complex process and it is necessary to understand the interrelationships between key factors in the reality of the life of the student teacher. Since the life of a student teacher lies between two different systems, namely the school system and the university system, it is a complex social phenomenon which requires a depth of understanding of the relationships between the different systems (Somekh, 2007). The student teacher is subject to the practices of teaching and learning at the same time through the school and the university. Therefore, student science teachers are building expertise through education practitioners as well as university supervisors and therefore will be influenced by different views on the education of the teacher. Bakhurst (2009), argues that activity theory does not deserve to be called a theory because "it is a theoretical representation of the general structure of activity systems" but rather than being a theory it is better thought of as "a model or schema that has minimal predictive power" and as "a universal, but generally vacuous schema, that turns out to be a useful heuristic in reference to certain kinds of activity" (p. 206). In addition, Bakhurst describes the activity systems as dynamic systems where transformations take place so argues that it is not appropriate to describe them using stable representations like the diagrams that are used to represent activity systems, and there are also differing interpretations of the nature of the object of activity – whether it means the purpose or aim of the activity or what the activity system is acting on.

Although AT can be criticised as being weak as a predictive theory it is still useful as a heuristic (an approach to studying something in order to find something out). Nussbaumer (2012) indicated that "'This theory's importance lies in organizing, sifting, sorting, and clarifying complex phenomena found in activity, in and beyond the classroom" (p. 45). This is consistent with the way in which I have used it.

Whilst I could have used another approach such as constructivism, which reflects its principles of construct knowledge and a focus on the learning of individuals, Activity Theory is a much broader approach which enables to focus on the complexities of the whole system in which individuals learn and enables me to consider ways in which the activity system as a whole can be analysed and suggestions made for changing or improving the system.. Kuutti (1996) affirmed that "Activity Theory and the concept of activity seem to be particularly suited to being used as the starting point in studying contextually embedded interactions" (p.37), such as this one. I believe that the theory of activity "is well positioned to provide a powerful and expansive unit of analysis which can address this issue"(Westberry, 2009, p. 56). This is supported by Jaworski and Potari (2009, 222) who argue that Cultural Historical Activity theory (CHAT) ". . . has power to deal with the complexity in educational systems".

This chapter aims to provide justification for the methodology used in this research by basing it on the conceptual framework of the research, using Activity Theory as a link between the search for an expansive unit of activity analysis in initial teacher education studies and effective research methods. Jonassen and Murphy (1999) described Activity Theory as an analytical tool for the process of educational activity: "Activity Theory provides an alternative lens for analyzing learning methods, procedures and outcomes that explores more of the complexity and integratedness with the context and community that surround and support it" (p.68).

3.2 An overview of Activity Theory

Activity Theory (AT) is a framework based on social theory which provides an expanded analytical unit to analyze human activities and the processes and relationships within these activities. It is composed of a group of fundamental principles that lead to the formation of a general conceptual structure. Therefore, it is a philosophical framework, a conceptual framework and an analytical framework. As confirmed by Morf and Weber (2000), "Activity Theory is a conceptual framework based on the idea that activity is primary, that doing precedes thinking, that goals, images, cognitive models, intentions, and abstract notions like ‘definition’ and ‘determinant’ grow out of people doing things”(p.81). Activity theory is based on the principle that cognitive development originates in cultural and social dimensions (Vygotsky, 1978; Lantolf and Thorne, 2006). Dayton (2006) suggests that activity theory can be used as a flexible framework in professional development research. Thus, it can deal with human practices and development processes. Kaptelinin et al. (1999) indicated that the human mind could be understood through the circumstances in which the individual interacts with his/her environment. This interaction is the ‘activity’, and it may be socially and culturally determined.

According to (Verenikina, 2001) in (Hashim & Jones, 2007, p.1), Activity Theory, also known as Cultural Historical Activity Theory (CHAT), has its roots in the socio-historical branch of psychology which was based on "the work of Vygotsky and his student Leont’ev from their studies of cultural-historical psychology in the 1920s".. Their ideas were in response to the need to overcome the prevailing psychological concepts of behaviourism and Piaget’s developmental theory, that they regarded as individually oriented but not socio-culturally oriented (Igira & Gregory, 2009; Verenikina, 2001). Activity Theory developed over three stages or generations. The first stage looked into mediation which is goal oriented behaviour mediated by tools including the tool of language. This stage emphasized the essentially social nature of learning, reflecting the fact that Vygotsky’s theory is essentially a social theory in which people learn together, supported by the language. The second stage expanded the previous stage to include other social aspects of activity set in a cultural context – with all the expectations, attitudes, rules and power structures that are features of that cultural context. The third stage looked at building on activity systems and the coming together of these activities in terms of recognition that much goal oriented behaviour takes place where two or more systems as described in the second generation of the Activity Theory interact. The history of activity theory is actually complex and interesting, and Vygotsky, Luria, and Leontiv used this concept in somewhat different ways. This has made many researchers try to experiment with it and discover its uses and add to it based on their interpretive views.

The humans in any society are doing various activities that are oriented towards some objects. The basic idea behind the activity theory as (Engeström, 1999), is that the activities do not occurs in a vacuum, but rather are events occurs within a system of collective activity.

A first generation Activity Theory analysis involves three analytical components: the subject, the object, and tools. The person engaged in the activity is the subject in the system, and the motive behind (or purpose of) the activity is the object, while the tools are intermediate components between the subject and object through which the action is done (Hasan, 1998). In the second generation of AT, Vygotsky's original theory was amended by Engestrom to include three additional elements that directly affect how activities work. Firstly, there are 'rules' which are groups of conditions which help to identify "how individuals may act and why?" and are a consequence of social conditioning. Secondly, there is 'division of labour', by which the actions and operations are distributed within "a community of workers" (Hashim &Jones, 2007, p.5). These two elements affect the third, which is the 'community'. Through this group of activities and community of individuals, which can be analysed (Hyland, 1998; Verenikina, 2001). The three generations of Activity Theory will now be discussed in more detail in the next section.

3.3 First generation of Activity Theory: The concept of cultural mediation

The first generation of Activity Theory is based on the ideas of Vygotsky (1978) that provided the concept of mediation. This is the perception that the human mind cannot reach the world without mediation and therefore humans' interactions with the environment are not direct but are mediated through tools (Igira &Gregory, 2009). Hasan and Kazlauskas (2014) added that "Vygotsky saw human activity as quite distinct from that of most non-human entities in that it is mediated by tools, the most significant of which is language" (p.9). Vygotsky's original model may be represented through a triangle consisting of subject, object and tools as shown in Figure 3.1:

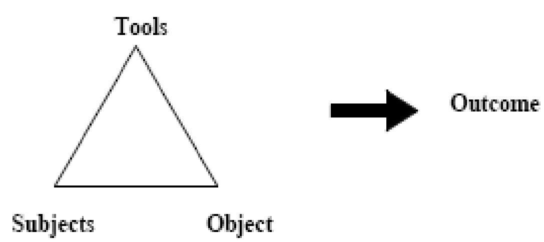


Figure 3.1: Basic Activity Theory representation
(Issroff & Scanlon, 2002, p.78)

The 'subject' is the individual under study, and the 'object' is the thing to be achieved by the subject as a target through the activity using the tools (Hassan, 1998).

Vygotsky's theory aroused admiration amongst some researchers, prompted some to criticize it in order to develop it, and others to interpret the perspectives around it to get out multiple benefits from it. Hutchinson (2008) indicated an important point that is "Vygotsky differentiated between spontaneous concepts, occurring naturally and through the process of direct engagement, and scientific concepts developed through deliberate pedagogical acts. He posited that spontaneous learning is unmediated whereas scientific learning uses a range of culturally developed tools and artefacts to develop learning" (p. 60). Therefore, "The teacher's scientific, deliberately pedagogic approach to this learning task engages the pupil in ways that they could not have been engaged if this had been left to natural, spontaneous, processes. The process of learning in this way is explained by Vygotsky (1978, p. 163) as the 'zone of proximal development' (ZPD), the gap that exists between what a person can do on their own and what they can achieve with help from a more knowledgeable person, the gap between spontaneous and scientific learning. A more expert person, such as a teacher, engages with the learner at a social level as the learner internalises social experiences" (ibid., p.61).

However, Vygotsky's theory was also criticized as being incomplete. Therefore his colleague, Leont'ev, sought to develop a conceptual framework to include clarification of the nature of the activity (Crawford & Hasan, 2006). It was also criticized as being a simple model that did not take into account the collective nature of the activity rather than being an individual activity. Igira and Gregory (2009) explained that "Leont'ev and Engeström extended Vygotsky's fundamental concept of mediated action from the individual to collective activity" (p.436). Scanlon (2010) added that the first generation of Activity Theory could not deal "with the relations between an individuals and their environment in an activity" (p.6). This led Leont'ev and Engeström to develop Vygotsky's theory, and this became the second generation of Activity Theory.

3.4 Second Generation Activity Theory: Relating the individual to the collective

The second generation of Activity Theory arose from the work of Leont'ev, who proposed differentiating between the established objectives and the general objectives of the activity through the representation of activity as three hierarchical levels: (operations - actions - activities). The highest level of this hierarchical model is an *activity* that is shaped by the motivation that guides the activity. The activity consists of separate *actions* which make up the activity.

Each action is shaped by what is necessary to complete its part of the overall task. In carrying out actions, individuals use their skills and knowledge and the tools and procedures available to them. The *operations* constitute the base of the hierarchy and are the (largely routine) steps that make up each action. These operations are shaped by the particular circumstances of the situation.

Hutchinson (2008) indicated that Leont'ev's ideas contributed to the development of an analytical framework that centred on the cultural and historical nature of the system and on 'the tensions and contradictions that could exist in multi-expression systems'. This points out that tensions and contradictions can exist between two systems, such as the university and the school, because of the different cultural and historical nature of these institutions. Hutchinson noted that two important dimensions were added through these ideas, firstly, "the contribution that is made to the activity of the wider society or communities, and secondly the temporal relationship as activity rooted in its history develops over time"(p. 63).

In addition, Engeström developed the theory by bringing in the community unit and then the rules and division of labour units (Westberry, 2009). Leont'ev (1981) explained the crucial difference between individual and collective activity and illustrated these abstract concepts with his famous example of the primitive collective hunt.

> *A beater, for example, taking part in a primaeval collective hunt, was stimulated by a need for food or, perhaps, a need for clothing, which the skin of the dead animal would meet for him. At what, however, was his activity directly aimed? It may have been directed, for example, at frightening a herd of animals and sending them toward other hunters, hiding in ambush. That, properly speaking, is what should be the result of the activity of this man. And the activity of this individual member of the hunt ends with that. The rest is completed by the other members. This result, i.e. the frightening of game, etc. understandably does not in itself, and may not, lead to satisfaction of the beater's need for food, or the skin of the animal. What the processes of his activity were directed to did not, consequently, coincide with what stimulated them, i.e. did not coincide with the motive of his activity; the two were divided from one another in this instance. Processes, the object and motive of which do not coincide with one another, we shall call 'actions'. We can say, for example, that the*

beater's activity is the hunt, and the frightening of game his action. (p.187)

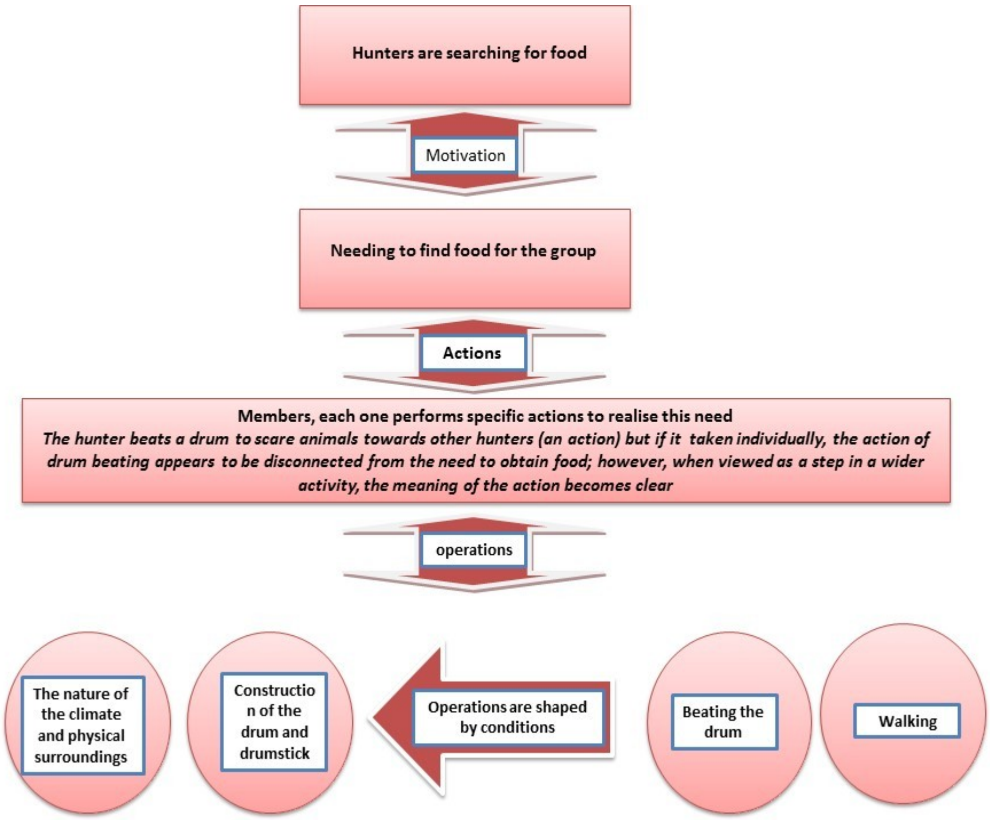


Figure 3.2: The difference between individual and collective actions and how they relate to one another in Leont'ev's (1981) example

Westberry (2009) added:

> Leont'ev's (1981) hierarchy can be extended to learning settings. A group of students may be focused on working with others in order to create an oral presentation – a collective object which is shared with the immediate group (the community). However, while the activity is oriented toward a collective object, the actual work consists of numerous individual actions such as searching for and evaluating academic literature in order to contribute to group discussions about the construction of the presentation. In turn, these individual actions consist of a myriad of operations which occur as habitual routines, such as typing, reading, and

> navigating through websites. These operations are shaped by conditions in the setting. For example, typing usually requires an individual to sit down, look at a computer screen and depress various keys. (p.61)

The directed objectives are originally activities. Kaptelinin et al. (1999) explained that "every activity is directed towards something that objectively exists in the world, that is, an object" (p. 28). Engeström (1993) mentioned: "The object is the ‘raw material’ or ‘problem space’ at which the activity is directed and which is moulded or transformed into outcomes with the help of physical and symbolic, external and internal tools (mediation, instruments, and signs)" (p. 67). Motivation to convert the object to an outcome is what helps to develop the activity. In other words, motives of subjects stimulate participation in the activity, to meet their needs. Westberry and Franken (2015) confirmed that "the need to transform the object into an outcome drives the activity" (p.302). In addition, Westberry (2009) reported that "people draw upon their intentions or objectives to make sense of the object, and these intentions shape the transformation of the object into an outcome" (p. 63). In other words: "the intentions of the activity system are manifest" (Jonassen, 2000, p. 99).

The subject is the person under study who brings a personal history to his or her activity system and uses the tools that are part of the mediation system by which the implementation of the work can be achieved (Hassan, 1998). For example, the subject brings a personal history to his or her activity system. The subject brings expertise and values such as education is a moral function. Such values include ideas of who is a good teacher and what is meant by a good education (Alzaydi, 2010).

The tools used are either tangible or psychological tools. The tools are used by the subject through mediation to achieve the desired results. Kozulin (1998) confirmed that both types of tools are configurations, material or artificial. Material tools control processes in nature (e.g. computer, projector). Psychological tools establish control over the natural behavioural and cognitive processes of the individual, “e.g. language, signs, strategies” (Cole & Engeström, 1993, p 6). Material tools are directed towards the outside while psychological tools are directed towards the inside to convert internal and natural psychological processes into higher functions of the mind. According to Vygotsky "The use of artificial means, the transition to mediated activity, fundamentally changes all psychological operations just as the use of tools limitlessly broadens the range of activities within which the new psychological functions may operate. In this context, we can use the term higher psychological function, or higher behaviour as referring to the combination of tool and sign in psychological activity." (Engeström, 1987, p.79). Lantolf and Abel (1994) confirmed that symbolic tools are oriented towards mediation of the mental processes of the individual, while Bedny and Harris (2005) asserted that “when a subject is able to perform mental actions on images, concepts, propositions and other sign systems, those sign systems become internal psychological tools for action. The ability to use signs as tools is essential for the practical application of knowledge” (p.140). It is beneficial to understand the concept of ‘tools’ in order to understand the activity system of teacher education because we need to understand the environment, which has both internal and external activities, and the means of dialogue with the ideas of others.

Rajkumar (2006) noted that “Activity Theory became a leading theoretical approach in Russian psychology, leading to many studies being carried out that used this approach”(p.1). Although the first generation of Activity Theory, through Vygotsky, became common, it faced some criticism by a group of researchers. According to Issroff and Scanlon (2002), first generation Activity Theory could not deal with the relations between individuals and the environment in which the activity takes place. Kuutti (1996) added that the structure of Activity Theory is very simple and does not address the overall relationship between the individuals and their environment in any activity. Therefore we can say that the theory in its first generation obscured the role of the community. Barab et al. (2002) argued that Vygotsky did not fully develop the concept of activity in his short life and that he left this task to his colleague, Leont’ev, to clarify the nature of the activity.

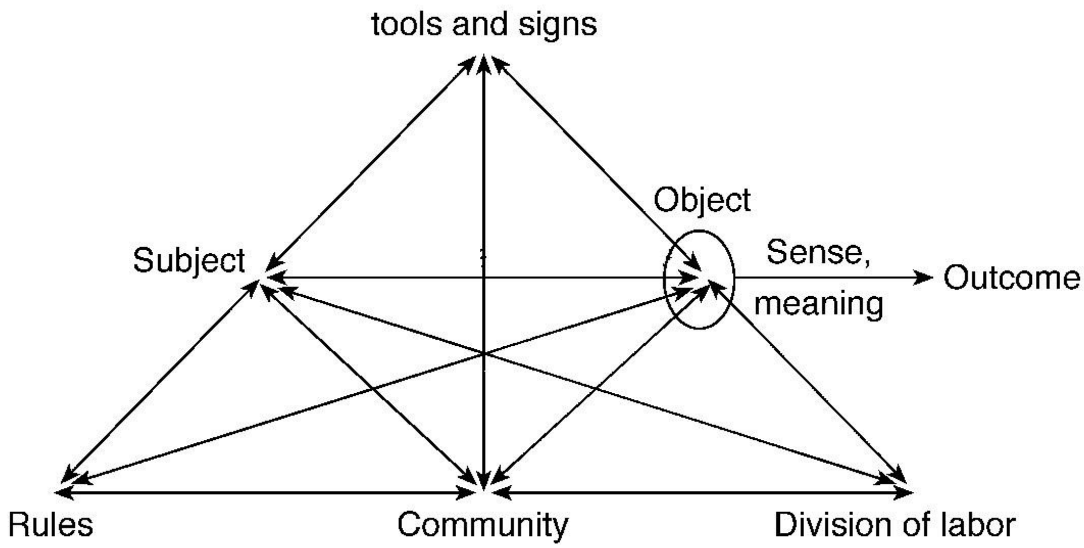


Figure 3.3: The structure of a human activity system
(Engeström, 2001)

Figure 3.3 shows the six components of an activity system and the ways in which they are related. Yamagata-Lynch and Haudenschild (2006) considered that the 'rules' are regulators of the subject's behaviour while taking part in an activity; the 'community' is the group of people or the institution of which the subjects are part; and the 'division of labour' is the participatory roles and responsibilities in the activity specified by the community. Therefore, the components of the activity system are interrelated with each other and every member of the community has roles and responsibilities to carry out. The rules regulate the activity; however, all the components work together to achieve the desired outcome. Sometimes (indeed, usually) there are tensions between the different components (and tensions between the different aspects of any one component). It is these tensions that can generate creative energy and lead to new action.

They can be summarized in the six units of the system, as follows:

The subject is the individual under study and who wants access to the object, which is the aim of the system activity. However, he/she cannot get to this object without the tools needed as mediators to achieve this object. Also we cannot understand this object in isolation from the community; this makes it a collective activity to understand the object within the overall context. The community creates two other units, which are the rules and the division of labour. The rules are the regulations that represent the activity within its context, while labour is divided among the members of this community through the division of labour unit. There are interactions between these units, which in their entirety form the activity system.

3.5 Third generation Activity Theory: Inter-activity perspectives

The second generation of Activity Theory provided for the important role of the community in understanding the activity system; however, it faced genuine challenges for dealing with the interaction between more than one activity system with a common object. Engeström (2001) noted that:

> When Activity Theory went international, questions of diversity and dialogue between different traditions or perspectives became increasingly serious challenges. It is these challenges that the third generation of Activity Theory must deal with; in addition it needs to develop conceptual tools to understand dialogue, multiple perspectives, and networks of interacting activity systems. (p.135)

Activities within each system are intertwined and interact with each other and may be affected and impact with other activities. Kuuti (1996) mentioned that: "Where the activities are not isolated units but are more like nodes in crossing hierarchies and networks, they are influenced by other activities and other changes in their environment" (p. 34). Activity Theory evolved to include other systems that did not feature in the previous generations of the theory. Engeström (2001) confirmed that third generation Activity Theory "expands the unit of analysis from one activity system to at least two interacting activity systems as the minimal unit of analysis" (p.133). Therefore, in this way, the relationship between different spaces, such as school and university preparation, can be re-conceptualized as the interaction between activity systems (Young et al., 2003). As an example, Engeström (2001) “investigated the relationships and tensions between multiple activity systems in a healthcare system, and sought ways to transform working practices to resolve contradictions in patient care" (Westberry, 2009, p.66).

Third generation Activity Theory can deal with two interacting activity systems such as university and school to understand and make use of contradictions in the processes taking place as student teachers develop their practice. Learning occurs within and across the boundaries among the different activity systems. Thus, the new unit of analysis expands from one activity system to "two or more collaborating activity systems that are embedded in a social, cultural and historical process" (Young et al., 2003, p. 10).

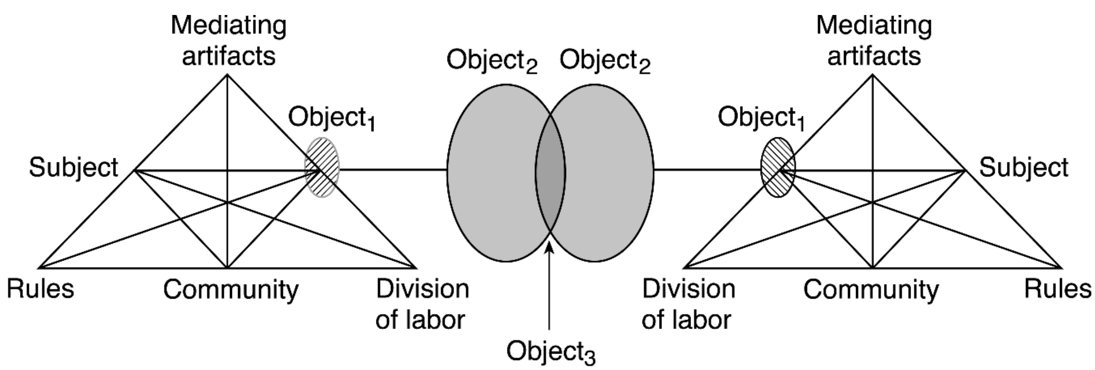


Figure 3.4: Two interacting activity systems
(Engeström, 2001, p.136)

According to Engeström (2001), the "*object 1 moves from an initial state of unreflected, situationally given 'raw material' to a collectively meaningful object constructed by the activity system*, *and to a potentially shared or jointly constructed object The object of activity is a moving target, not reducible to conscious short-term goals*" (p.136). Therefore, the objects of current research are: object 1; e.g., Students wanting the H.D.Ed programme qualification, object 2, e.g., the student constructed as a specimen of future teachers and thus as an instantiation of the general object of learning, and object 3; e.g., a collaboratively constructed understanding of the student situation and providing learning experience for students through education plan. In the sense, this third object is collaboratively constructed understanding taking account of the university and the school activity systems.

The concept of learning across the boundaries of activity systems has been used for the purpose of transporting the ideas, concepts and instruments from one community of practice to another. Engeström (2001) applied this idea to the field of further education to investigate relationships between work and university through the experiences of students who were at the same time studying in a teacher education programme and working as teachers. Finlay (2008) indicated that the students can use a variety of tools, for example ideas, teaching plans, strategies, theories and theoretical knowledge, taken from the learning setting, to help them in the workplace. Finlay also posited that moving, such as from school activity system to a university system, supplied students with a set of tools that had been customized as resources in the school, and that this created opportunities for learning. Hutchinson, (2008) mentioned that "Some of the resources drawn on in both systems could be complementary and some could be contradictory, and by using third generation activity theory it is possible to speculate on the potential for expansive learning".(p.65). Thus, the third generation of Activity Theory provides an expansion of the field of view from the inner workings of individual activity systems to the relationships between at least two activity systems, these ideas will be discussed in more detail in next section (3.6). AT provides a structured approach for education researchers to look at the ways in which student teachers interact with and learn from the systems of their university and their placement schools in the context of the activity system. This is very useful in the current research to in-depth understanding of the interaction and relationships between the university and placement schools during the teaching practice in the final semester.

3.6 Activity Theory applied in research

Much of the research conducted on Activity Theory since Vygotsky has focused on framing the theory regarding the concept of community, such as attempts by Leont'ev (1981) to distinguishes between action and activity, between object and motive, and the modelling of activity systems. The research has also worked to expand the units of analysis, draw out the principles, and explain emerging tensions in relations in the proceedings and the process, such as the contributions of Engeström (1993, 1999, 2000, 2001). Furthermore, research has been carried out on the application of Activity Theory to other areas, such as health and patient care, information systems, psychology, management, culture and information systems (Hashim & Jones, 2007). Their study confirmed the usefulness of Activity Theory in the humanities for analysing activities through their procedures and processes. Welch (2007) studied the possibility of applying Activity Theory in music education through a case study which explored the contradictions in the activity system. Other researchers have pointed to the uses of Activity Theory in education research, such as human-computer interaction (Kaptelinin, 1996; Kuutti, 1996; Nardi, 1996), and technology in education (Issroff & Scanlon, 2002; Jonassen, 2000; Yamagata-Lynch, 2003).

Furthermore, there has been increasing interest in studies focusing on the concept of 'contradiction', such as the work of Hasan and Kazlauskas (2014) who attempted to apply Activity Theory to study the complexities of real world situations, such as in community groups, workplaces and places of learning. The study confirmed that the main advantage of Activity Theory was to provide a holistic lens for understanding the many patterns of activity among cases in different areas and in different cultural contexts. Teacher education was examined by Wilson (2014) through Cultural-Historical Activity Theory and this indicated the usefulness of the concept of boundary crossing. It confirmed that Activity Theory was in a strong position to be applied to teacher education, both as a unit of analysis and as a motivation to change. The study by Yamagata-Lynch and Haudenschild (2006) examined social structures in the context of the school/university partnerships that complicate teacher professional development in a US state. They also studied the activities of teacher professional development with school district/university by conducting an activity systems analysis, exploring the misalignment that contributes to various sources of tension which can be an obstacle for teachers to develop their classroom practices through curriculum-based interventions. Despite these tensions can be the stimulus for change for the better.

Activity Theory has been used to explore learning and teaching, such as by Van Aalst and Hill (2006) who used it as a framework for improving pedagogy aimed at knowledge building. Yamagata-Lynch (2003) created a diagrammatic representation of four stages of the process (before - during - immediately after - one year later) of the programme through using Activity Theory. Issroff and Scanlon (2002), confirmed that technology could be used to support students in Higher Education, highlighting the problematic features of the learning and teaching setting.

This makes Activity Theory useful in educational contexts for exploring new perspectives, as a tool for analysing the operations of social structures, and for exploring the contradictions to find appropriate solutions to end the conflicts that hinder system activity. Bakhurst (2008), confirms that on look for contradictions in AT itself "You have to look for “contradictions”, not just within the subject matter the model discloses to you, but between the model and that very subject matter"(p. 208). Therefore, this leads to thinking about effective means or ideas to these contradictions and, most importantly, how to deal with these by providing a hybrid space (the third space) to contain these contradictions and deal with them in terms of dialogue designed to help understand them that can help to stimulate effective partnership between participatory systems. This dialogue may sometimes lead to a simple resolution of the contradiction (e.g. through correction of a misunderstanding, or simple changes to a procedure), but it may also lead to more fundamental, creative developments that significantly change the participatory systems, or the partnership, or both. It is this possibility for fundamental change that makes AT a valuable theoretical framework for this research.

The nature of tensions and contradictions in the current study will be represented in the relationship between the university and the school. Zeichner (2010), indicated that "... within colleges and universities there are various cultures that are often in tension with each other within and outside of the schools, colleges, and departments of education" (p. 89). He noted that hybrid spaces are being created in teacher education by the boundary crossings. Analyzing the interaction between different activity systems through activity theory may help to explore contradictions. However, by creating hybrid spaces these contradictions may be controlled, so that the more fundamental response to contradictions that was outlined above can be encouraged. It is therefore useful to consider these contradictions from the perspective of the third space.

The concept of the ‘third space’ emerged in the nineties in the work of Bhabha (1990, 1994) and, later, Zeichner (2010) through their theories of hybridization spaces and border crossing. Zeichner (2010) indicated that the third space emphasises integration and rejects dichotomies such as ‘theory’ and ‘practice’, or ‘academic knowledge’ in the university and ‘practice’ in the school. Klein et al. (2013) reported that Zeichner had taken the meaning of third space "from the fields of urban planning, geography, cultural studies, and most recently critical literacy", depending on Bhabha (1994), Gutierrez (2008), Moles (2008), Routledge (1996) and Soja (1996) to identify this space as a common space that combines the features of separate systems (p.28).

Much of the research on initial teacher education agrees that the activity systems intersect and overlap with each other, as the school and university systems intersect in the activity of initial teacher education. This intersection and overlap is accompanied by many tensions and contradictions within and across activity systems. It is therefore difficult to cross the border to find common areas, if there is no third space to serve as a common room to identify the roles, responsibilities and agreements between the two systems. This space is shared so that no one system can impose its hegemony on the other system. “Creating third spaces in teacher education involves an equal and more dialectical relationship between academic and practitioner knowledge in support of student teacher learning” (Zeichner, 2010, p.92). In my view, it is helpful to regard the notion of partnership in teacher education as this third space – making it a far more powerful and complex notion than simply an administrative relationship between the university and the schools.

Williams (2014) argued that "working in the third space involves managing shifting identities between teacher and teacher educator, responding to changing perspectives on learning and teaching, and negotiating sometimes finely balanced and difficult relationships" (p.315). This means theoretical hybridization of practices between the two institutions involved in the objective of student teacher preparation. The third space is an area of understanding and expanding dialogue, and agreements to expand learning by integrating the expertise of both institutions. Martin et al. (2011) indicated that the conversations between university and school in teacher education within the third space could enhance new understanding around their practices.

The concept of partnership implies equality, though hierarchy still exists in initial teacher education and therefore tensions exists between the university and the school in the training of student teachers. These two systems are therefore often seen by the student teachers as separate and this affects the students’ ability to make use of their theoretical knowledge (Lewis, 2012). The idea of the third space reduces this hierarchy to the level of joint action, and therefore one of the benefits of the third space is to maintain communication between communities such as the school and university. In this vein, Williams (2014) noted that "collaboration in the third space provides an opportunity for all participants to work together to gain new knowledge and understandings about teaching and learning and to develop boundary practices that enhance the learning of teachers, teacher educators, student teachers, and ultimately school students"(p.325).

Lewis (2012) mentioned that "several new approaches [have been tried] for locating and utilising a third space as a way of bridging the theory–practice gap"(p.32). The present research sheds a light on how the creation of a third space between the two systems could ease unnecessary tensions and contradictions and use inevitable tensions and contradictions creatively, thus helping to the partnership to be truly effective in the interest of educating new science teachers.

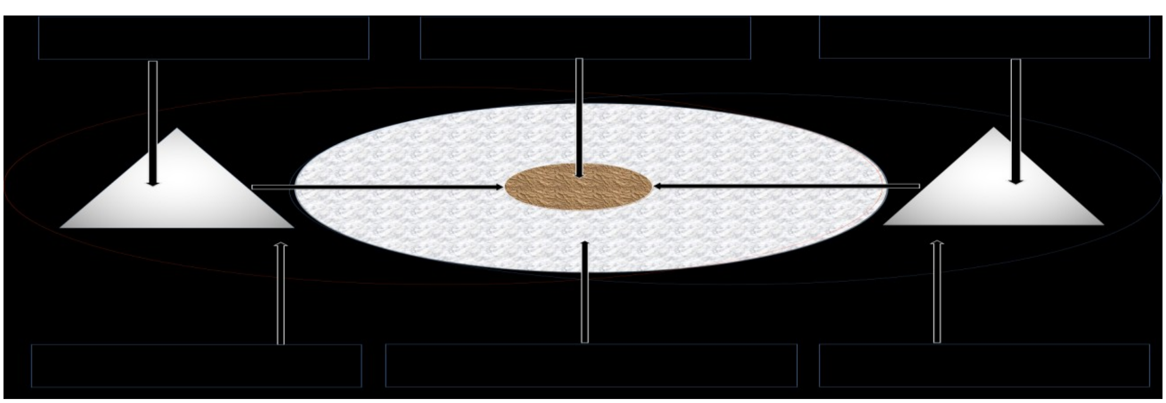
I believe that many of the inherent contradictions occur in the small spaces of the partnership. If the shared space in the partnership between the two systems is small, limited to just sharing a unified goal, this creates many contradictions. Where each system has a large space in which they work alone and without confluence with the other system, but just share the small space about the goal, this weakens the partnership between the two systems, increases the problems and tensions, and leads to sharp contradictions between them.

The biggest challenge facing the two systems is to create a Third Space Model (TSM) to create a broad and powerful partnership to eliminate the problems and contradictions in science teacher preparation and create a better environment for learning. Without doubt, teacher education in Saudi Arabia needs a big improvement in coordination. Williams (2014) argued that "coordination occurs when particular processes or procedures are put in place within boundary spaces (third space) that help to establish and maintain an effective working relationship", which is done through intensive communication (p.317). However, the changes will be deeper than this better coordination. In addition, Martin (2011) emphasized that work within this space promotes relations between the two systems to support coordinated activity. Such a model (TSM) would encompass a broader partnership between the school and the university. It would create hybridization of workspaces to give the third space greater importance. Working in this area would be by cooperation in the development of strategies, plans and agreements to develop joint action, and "allows learning in and from practice to be processed fully" (Lewis, 2012, p.32). This model works according to the third generation of Activity Theory. This useful analytical tool provides a lot of information about participants' perceptions. Williams (2014), Engeström and Sannino (2010), and Engeström (2004) indicated that horizontal movement and hybridized spaces between the systems in common professional practice are considered important elements in learning, which takes place through the overlapping systems' spaces and their interaction with each other. This is useful for identifying the relationships between systems and the contradictions between systems. Pratt et al. (2015) considered that the tensions and contradictions "take place, mediated by the social, cultural and historical aspects of the spaces they inhabit focused on objects shared within and across the interconnecting spaces"(p.46).

While Williams (2014) emphasized that the "importance of understanding the nature of working in this third space is underlined by the changing educational policy context of many governments in relation to teacher education programs and teacher quality" (p.315). Lewis (2012), as well, stressed the need to find a third space location in initial teacher education to further partnership between university and school.

The following figure shows the type of Third Space Model (TSM) of the partnership between the university and the school in the context of Saudi Arabia that needs to be developed.

Figure 3.5: The Third Space Model (TSM)
(Source: Designed by the researcher for current research)



3.7 Activity Theory in the present study

Activity Theory can help to explore the relationship between the school and the university, providing a useful theoretical framework for research in this area. In this research, which is of an exploratory nature, the use of Engeström's Activity Theory system of the third generation in analysing different activity systems with a common object, namely teacher education, is discussed. The purpose of this study is to conduct a quantitative and qualitative investigation to analyse academic activity systems in university-school relationships in science teacher education and to explore the contradictions among these different activity systems. These contradictions are central elements of activity systems that appear as obstacles, tensions and conflicts within or between activity systems (Kuutti, 1996). The contradictions can also exist at different levels of the activity system or inside each node of an activity system levels, as the examples given by Yamagata-Lynch and Haudenschild (2006) of the tensions within the subject or between nodes, such as the tools, object, division of labour and the community. Contradictions can also occur between different activity systems, for example between the school and the university (Barab et al., 2004). Westberry (2009) added that the "contradiction between nodes could develop when a new tool is introduced into a community which lacks understanding of how to use it" (p.66)

What the researcher is trying to find out is how the different activity systems work to support student science teachers in learning to teach the modern science curriculum and what contradictions are inherent in student teachers' learning, from the perspectives of all stakeholders (i.e. the university coordinators, university supervisors, science student teachers, cooperating teachers and head teachers). The study mainly focuses on how academic activity systems work in the university, school and school-university relationship to support science student teachers' learning. It focuses on understanding the interaction among these different activity systems as being the key elements that have an influence on behaviour and human learning. The research uses Activity Theory to formulate an effective methodology for better understanding the inherent tensions that act within a set of activity systems.

3.8 How does Activity Theory shape my research?

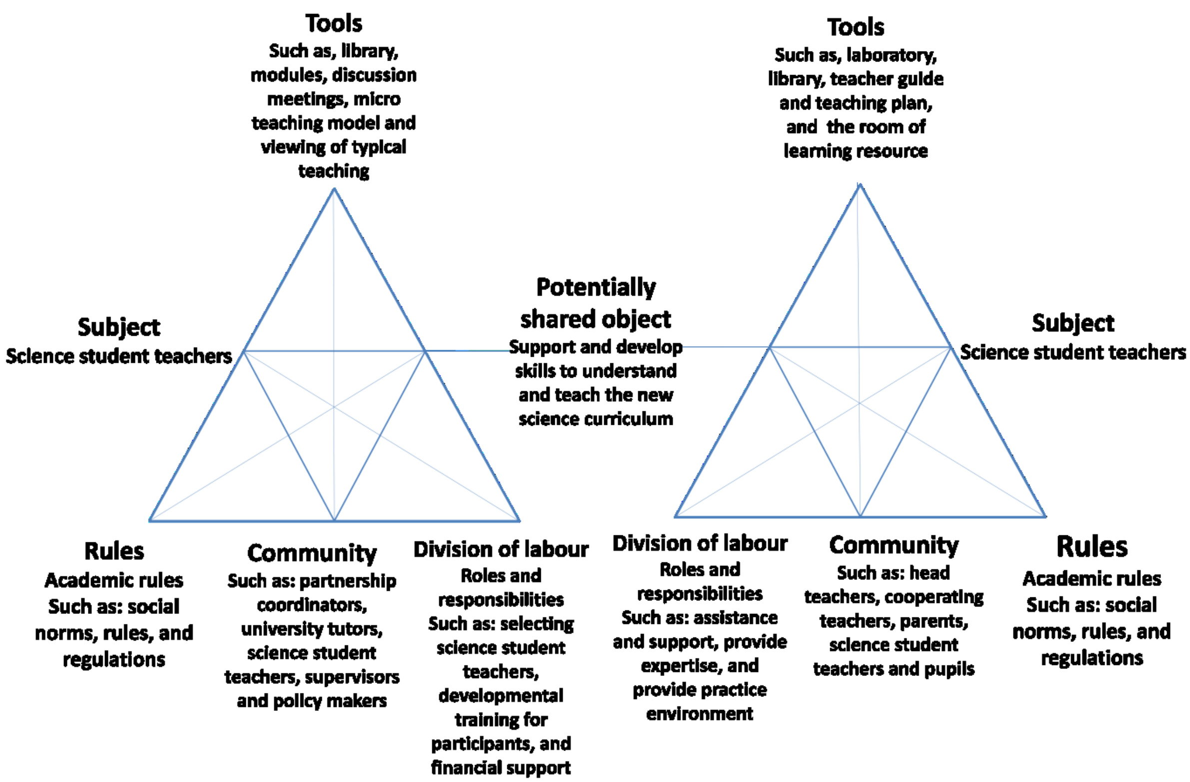


Figure 3.6: University-school partnership activity systems for teacher education in H.D.Ed programme

(Source: Designed by the researcher for current research)

Figure 3.6 refers to the systems studied in the present research, namely the systems of university and school, which participate in the preparation of the science teacher in accordance with the activity theory of the third generation, which allows study two or more systems as mentioned earlier, and each element of activity theory will be explained according to the current research as follows:

The subject is defined as an individual or individuals involved in the central activity, according to Engeström (1987). In Figure 3.6, the subjects in the university and school activity systems are science student teachers.

According to Engeström (2001) and Wilson (2004), the object indicates to the problem space at which the activity is directed. In this research, the potentially shared object of this university–school activity system is teacher education. In this case, it is to ensure that the science student teachers have the opportunity to develop skills to be able to understand and teach the new science curriculum. The final goal of the intervention is to convert this object into an outcome; in this system, it is to provide a group of guiding principles that will inform the science student teachers' practice in the future.

This conversion will take place with the help of tools. These are positioned within both parts of the system – the university and school. The tools to be used in the conversion process include, within the university, academic activities such as observations, discussions, meetings, microteaching models and viewing of typical teaching; in the school, they include the laboratory, library, teacher guide and teaching plan.

The community is formed of the subject and other participants who are brought together by a common object (Engeström, 1996). The community links participants together through social rules that govern themand division of labour. The partnership community in the university activity system includes partnership coordinators, university tutors, science student teachers, supervisors and policy makers. The partnership community in the school activity system includes head teachers, cooperating teachers, parents, science student teachers and pupils.

The rules include the potentially shared social norms, rules and regulations in the university-school activity system.

The division of labour comprises the responsibilities and roles determined by the community. According to Galton et al. (1999) in Wilson (2004), "the division of labour is clearly defined and agreed by all members within the rules of the partnership" (p.596). The university activity system provides carefully selected science student teachers, developmental preparation for participants and financial support. The university/school activity system works to provide perfect training through the partnership. The school activity system provides the opportunity for the science student teachers to further develop skills within an authentic supportive setting. By analysing the university-school partnership activity systems as in Figure 3.6, it is clear that these different activity systems have a potentially shared object, namely education of teachers to teach the new curriculum. This model (Figure 3.6) will be revisited in the discussion chapter to show how the study results enriched it.

Furthermore, the study will address the contradictions brought about by these different activity systems for teacher education in the H.D.Ed programme. These contradictions constitute the gap between the actual outcomes and intended outcomes of the H.D.Ed programme. Contradictions could be seen as a source of development because what the good teacher does is to face the obstacles and try to find appropriate solutions. In addition, investigating these contradictions helps in solving them. This was made clear by Engeström (2001), who stated that "internal contradictions are considered as the driving force of change and improvement in activity systems" (p.133).

Within these conditions, the contradictions among school and academic activity systems in university-school partnerships in teacher education in the Saudi context need to be explored. Therefore, the researcher seeks an analytical tool that will enable him to address four main issues:

- Firstly, the complex relationships and interactions among these different activity systems;
- Secondly, the contradictions among them;
- Thirdly, the achievement of consistency between the analytical tool and the methodological assumptions of the study;

- Fourthly, investigation in the shared space between two systems.

"Whilst it is possible to conceive of answers to such questions in any particular educational context without drawing on the Activity Theory perspective, Engeström and others believe that the theory provides a framework by which a more holistic and environmentally sensitive conceptualisation of learning is possible" (Welch, 2007, p.27).

The research also confirms that Activity Theory provides “a framework for analysing data about emerging patterns of human activity in terms of changing purposes, awareness, focus of attention, and tools" (Crawford & Hasan, 2006, p.10). In other words, Activity Theory is concerned with the “dialectic relationship between subject (human) and object (purpose) mediated by tools and community” (Crawford & Hasan, 2006, p.6).

3.9 Summary

In this chapter, the three generations of Activity Theory have been discussed in order to provide a theoretical framework for this study. Some previous studies that used Activity Theory have been reviewed, and that has helped in the selection of an appropriate model for this study. Activity Theory of the third generation was found to be the most appropriate framework for analysing the two educational systems that share in teacher preparation in the Saudi context. Therefore, the chapter has shown how Activity Theory shapes this research. Finally, the next chapter will present the methodology chosen for this research commensurate with the theoretical framework.

Chapter Four

Research design

4.1 Introduction

Every piece of research has its own characteristic design that helps the researcher to proceed on the right lines. An appropriate design should follow from the philosophical assumptions and formulation of research questions, leading to the selection of a methodology with its suitable methods of data collection and analysis.

This chapter discusses several elements of the research design, such as the research paradigm and its theoretical and philosophical assumptions, including its ontology, epistemology and methodology. Detailed information is provided about the research methods, including the questionnaires, interviews and documentary evidence. The selection of the population and sampling are discussed. In addition, the difficulties that faced the researcher during data collection are presented, as well as the ethical dimensions considered by the researcher.

4.2 Research paradigm

A research paradigm acts as a map to provide the researcher with a plan of the research steps and how and why they are carried out. Creswell (2013) mentioned that the research paradigm constitutes the “plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation" (p.31).

This research seeks to explore views on science student teacher education on the H.D.Ed Programme through the existing relationship between the university and the school in the western sector of the KSA, specifically in Al Madinah Al Munawarah, and it does this through the interpretative paradigm. Radnor (2001) explained that interpretive educational research has the explanatory ability that helps to present a comprehensive vision of human situations. The interpretative paradigm is usually associated with qualitative approaches to research and with an interest in understanding the meaning of phenomena from the participants' subjective points of view.

4.3 Theoretical and philosophical assumptions

Theoretical and philosophical assumptions underpin the design of research; these assumptions include the three important elements of ontology, epistemology and methodology (Guba &Lincoln, 1994).Guba (1990) suggested that, for research to achieve a specific goal, it is implicitly located within a study paradigm with its characteristic ontology, epistemology, theoretical perspective and methodology. The discussion that follows will explain the philosophical and theoretical assumptions of this research study.

4.3.1 Ontology

Crotty (1998) identified the word 'ontology' as concerning being; it emphasizes the question "what is the nature of existence?" (p.10). According to Guba (1990), the nature of reality is the target of the ontological question. The views of the nature of reality that educational research seeks to discover are divided into at least two types. The first type is the realist stance which holds the view that there is a reality existing 'out there', irrespective of the researcher, and which is available to be discovered. The other type is the interpretivist view that says that reality is subjective, and which denies the existence of ultimate truth (Pring, 2000). On the interpretivist view, reality depends upon people's interpretations, and they construct their own meanings for reality.

The ontology of this study is interpretivist because it looks at the social construction of the 'reality' of how the academic activity systems in the university and school work, through of the relationship between them, to support science student teachers while they learn to teach the modern science curriculum, and to explore the contradictions that face the science student teachers in their learning. The tensions and contradictions among these different activity systems are socially constructed from the multiple perspectives of all participants.

Nevertheless, the reality of the nature of the relationship between school and university in science teacher education exists outside the mind of the researcher and needs to be explored and will be constructed from the multiple perspectives of multiple participants.

4.3.2 Epistemology

Epistemology is the philosophy that addresses the nature and scope of knowledge (Crotty, 1998). The epistemological is a question which investigates the nature of the relationship between the "knower" and the "knowable" or what can be known (Guba &Lincoln, 1994). While the scientific approach predominantly demands to explore the objective reality that exists ‘out there’ in the world, the social constructionist approach is that “meanings are constructed by human beings as they engage with the world they are interpreting” (Creswell, 2013, p.38).

The epistemology of this study is constructionist. The purpose is to illuminate how participants construct their understandings of the workings of the academic activity systems in the university and school and the relationship between them. The knowledge to be gained in the current study is constructed socially through the multiple perspectives of the participants in science teacher preparation in their different activity systems. According to Crotty (1998), the constructionist epistemology adopts the belief that there is no objective truth to be discovered: “meaning is not discovered but constructed” (p.9).

4.3.3 Methods and Methodology

One of the important decisions facing a researcher at the beginning of a journey of scientific research is the selection of the research methodology. Wellington

(2000) confirmed the significance of choosing an appropriate research methodology which helps the researcher to identify the aims and goals of their research. There are various approaches to conducting research, so the researcher needs to design an appropriate methodology for his/her particular study. Methodologically, there are three types of design that can be adopted by researchers, depending on the intended knowledge and the nature of the results: quantitative, qualitative and mixed methods approaches.

The quantitative approach helps in understanding a phenomenon through a large number of individuals with an attempt to study many elements. Such a quantitative study is limited as it will not be in-depth. In contrast, the qualitative approach can lead to in-depth understanding through the study of a small number of individuals. According to Creswell (2013), quantitative research aims to test objective theories through analysing numerical data statistically, while qualitative research seeks to explore and understand meanings by interpreting the participants' engagement and dealing with social problems. Mixed methods research combines two type of methods that are quantitative and qualitative approaches.

The strategy in this research is based on mixed methods, first collecting and analysing data using a quantitative method, and then applying qualitative methods to achieve a more in-depth understanding of the issues. This research uses mixed methods in order to be trustworthy, to avoid researcher bias in data collection, and to study the phenomenon from different perspectives. However, the focus in this research is more on the qualitative approach, as this should lead to in-depth discussion of the issues.

Robson (2002) indicated that the case study is one of the strategies used in research to study and empirically investigate existing phenomena that occur in the real world context through using many sources of evidence. Morris and Wood (1991) added that the case study provides a rich understanding to researchers from the processes and procedures of their research. This strategy also provides answers to the questions of 'What?', 'Why?' and 'How?' (Martrilla, et al., 1999).

This study will have an exploratory nature. Exploratory studies are considered useful in evaluating phenomena and generating questions to find out 'what is happening' in order to gain new insights (Robson, 2002). The current study has adopted the case study as a methodology. It attempts to investigate participants' perspectives in depth through using multiple methods to collect the data: questionnaire, interviews and documentary evidence. The case study can use mixed quantitative and qualitative data to present rich and valuable information about a limited situation. It is also consistent with Activity Theory because it examines a special case and explores the interactive processes within that case. (Alzaydi, 2010). The 'case' in question is the College of Education at Taibah University in the Kingdom of Saudi Arabia and the schools that are involved in science teacher preparation, through of the H.D.Ed programme.

4.4 Population and sampling

It is important to select an appropriate study sample (Cohen et al., 2005). Gorard (2010) distinguished between a population and a sample as follows: "The group you wish to study is termed the population, and the group you actually involve in your research is the sample" (p.10).The sample in this research was drawn as part of the actual population involved in the relationship between school and university. It consisted of school staff (including teachers and headteacher), university staff (including supervisors and coordinators), and the focus of the relationship between them in the H.D.Ed programme, namely the science student teachers. The sample included both males and females in order to obtain a comprehensive perspective from all the parties to this relationship. The largest possible number of the aforementioned participants were contacted during the application of the questionnaire, which formed the first phase of data collection.

The participating schools in each phase, whether questionnaire or interview, were selected in terms of the following conditions:

• They provide teaching practice experience for science student teachers;

• They cooperate by encouraging their staff to participate in this research;

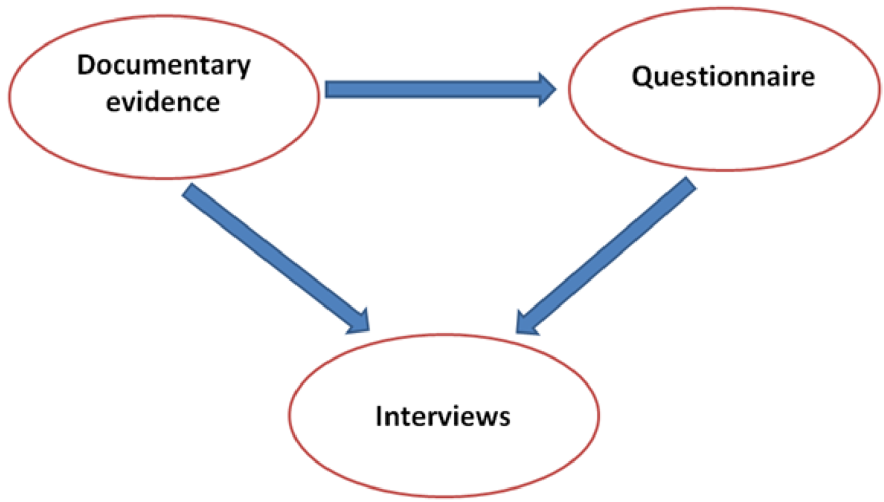
• They are located in Medinah City, which makes the data collection possible in the required time;

• They have one or more science student teachers so that they have current practical experience about the preparation of the student teachers during teaching practice.

4.5 Research tools

A variety of tools usually are used in educational research, but the most common are: questionnaires, interviews, observations, experiments, and documentary evidence. These tools are selected and constructed on logical grounds, in order to access the required data and therefore achieve the goals of the research. When choosing the appropriate tool for any research, the researcher should be clear what the research problem is and review the relevant literature to find out what work has been done previously in that academic area. The researcher should find out the actual population of the study and select a suitable sample. He/she should then design the research tools, that are commensurate with the nature of the problem and the research methodology used. Each research tool has a finite character which forces the researcher to collect particular sorts of data. A tool that the researcher uses to collect data about one topic may not be useful in collecting information on another topic. The educational researcher may use these tools individually or collectively, depending on the nature and goals of the research, research trends and available possibilities. Therefore the research tools to be used in this research are questionnaires, interviews and documentary evidence.

Figure 4.1 Relationship between data collection methods



It is clear from the figure that these three tools are different but integrated and work with each other. They generate rich quantitative and qualitative data.

The questionnaire was designed to explore issues raised in the literature, those evident from the researcher's personal experience of teacher education in KSA, and those suggested by the theoretical framework of Activity Theory, which guided the project. Such issues were often quite subtle and this gave rise to concern about how participants could be prompted to reveal their thinking about them without unduly influencing their opinions. The design that was developed involved a broad statement of an issue followed by specific questions which focussed on important aspects and required answers in a 'Lickert response format' which made clear that disagreement or agreement with the statements was acceptable. The set of specific questions provided quantitative data for the study but also served to exemplify the broad statement of the issue. Participants were then asked to give their own free-response comments about the issue which provided qualitative data and gave richer insights into their thinking than could be obtained by Lickert-type items alone. This structure is evident throughout the questionnaire but, for convenience, is also illustrated below:

Figure 4.2 The questionnaire structure designed

NO.	Questions	SA	A	N	D	SD
6	**The important academic resources available in the school to help science student teachers to learn about the science curriculum and teaching science to pupils are:**					
6-1	Meetings with experienced science teachers.					
6-2	Observing science teachers teaching.					
6-3	Science teaching plans made by experienced science teachers.					
6-4	Science teaching aids.					
6-5	Science labs.					
6-6	Short courses and workshops about teaching the science curriculum.					
6-7	Please add any other reasons not covered above.					

My research questions call for detailed qualitative information. These can be obtained by interview and from open-ended questions on a questionnaire. The questionnaire can also generate useful quantitative data that allow for different insights from different sorts of analysis. The questionnaire allows me to collect data from a wide range of people. The interviews allow me to follow this up in depth. The focus for enquiry for both of these tools is informed by analysis of documents about teacher education in the university and school, e.g. by revealing the student numbers and the regulations governing the H.D.Ed programme. The interviews, from which we obtained some quantitative data regarding the number of hours of training and study in the H.D.Ed programme and the school quotas, were primarily intended to provide qualitative data to probe participants' thinking in more detail, going beyond even the open-ended data available from the questionnaire. Together, these tools helped to answer the research questions; that is, to explore the relationship between university and school through the H.D.Ed programme, to explore the role of the science teacher preparation programme, to explore the roles of partners, to help and support science student teachers to understand the nature of teaching science curriculum, and to explore the contradictions within and between the academic systems. These tools are also consistent with the research methodology, namely a case study that requires many sources of data and uses more than one data-collection tool. In research it is common to integrate data collection methods with each other; these tools are described in more detail in the next sections.

4.6 Methods of data collection

The following table shows the data collection procedures.

Table 4.1 Data collection procedures

No.	Tools	Procedures
1	Documentary evidence & questionnaires	Construction of questionnaires based on the documentary evidence about science student teachers and partnership programmes between universities and schools
2	Questionnaires	Pilot study for questionnaires
3	Questionnaires	Modify questionnaires to their final form
4	Questionnaires	Applying questionnaires and collection and analysis of initial data
5	Documentary evidence & questionnaires & interviews	Construction of interviews based on initial analysis of questionnaires and documentary evidence
6	Interviews	Applying interviews for collecting the data to analyse

The questionnaire was composed after considering information from the documents related to the teacher preparation programme and the research sample. This information led to the formulation of questions about the relationship between school and university in science teacher preparation and about the progress of the H.D.Ed programme. The questions were geared to obtaining answers from the participants. Free space was left in the open part of the questionnaire for participants to express their opinions, and it was expected that some of the views expressed would be discussed more deeply in the subsequent interviews in order to obtain different perspectives. The theory used in the research was one of the factors helping to shape the questionnaire questions so that all the elements of Activity Theory would be covered. This would enable the detection of interactions within and between the activity systems that share in science teacher preparation.

The following table is about the areas covered by the three tools and relates these to the research questions and to the theoretical framework (AT).

Table 4.2 Relationship between research tools and research questions

Questionnaire (structured around literature review themes/ AT elements)	Interview (structured around literature review themes/ AT elements)	Documentary evidence
Subject Q1: The main reason for the involvement of the students in science teacher preparation programme at university and practice at school is: Object Q2: What are the ways of learning to teach science from your expectations? What is the most important of these for science student teachers? Such as: The science student teacher learns from lectures at	Subject Identify the most important characteristics of a good teacher through participants' perspectives and whether the science student teachers have these characteristics. Discussion about what the science student teachers learn at the university and whether they are trained for the modern science curricula and teaching methods when he comes to school. Tools Investigate and discuss the academic sources available for science student teachers to learn more about teaching at the university. Investigate and discuss whether there are workshops at university on modern science curricula or short courses for science student teachers to understand how to deal with science curricula and, if so, what is their duration at university.	➢ University of Taibah plan for the H.D.Ed Programme ➢ University of Taibah policies and procedures for teaching practice and assessment form ➢ Statements of student names involved in the H.D.Ed programme ➢ Statements of school names involved in teaching practice

the teacher education programme. Q5: What do you think the university and school want to achieve by the programme of teacher preparation and teaching practice for science student teachers? Tools Q7: What are the essential academic sources which are available at university to help science student teachers to learn about science curricula and teaching science to pupils? Community Q10: In what ways do you feel the partnership community at university supports and assists you in learning?	Community Investigate and discuss whether the modules of the H.D.Ed programme at the university support and assist science student teachers in understanding the science curricula and how to teach them, and what kind of support is provided for them to develop their skills in the science curricula.	
Subject Q1: The main reason for the involvement of the students in science teacher preparation programme at university and practice at school	Object Investigate and discuss what the science student teachers hope to achieve from the teacher preparation programme and practice at school. Tools Investigate and discuss the academic sources available for science student teachers to learn more about teaching	

is: Object Q2: What are the ways for learning to teach science from your expectations? What is the most important of these for science student teachers? Such as 'The cooperating teacher helps science student teachers address gaps in subject knowledge in school context'. Q5: What do you think the university and school want to achieve by the programme of teacher preparation and teaching practice for science student teachers? Tools Q6: What are the essential academic sources which are available at school to help science student teachers to learn about science curricula and teaching science to pupils?	at schools. Investigate and discuss whether there are workshops at university on modern science curricula or short courses given to science student teachers to understand how to deal with science curricula and, if so, what is their duration at school? Discuss whether the school is equipped with a science lab, how often the science student teachers use it, and how many science labs there are at school. Community Investigate and discuss whether the partnership community at school supports and assists the science student teachers to learn and, if so, how. Discussion of the attitude of parents and pupils to the science student teachers, whether it causes any discipline problems, and whether it has been controlled. Rules and Object Investigate and discuss the work carried out by the student teachers at school, whether there is extra work assigned to them, and whether the existence of the student teachers reduces the workload of the main school teachers. Investigate and discuss the assignment of student teachers to waiting classes and their duration.	

Community Q9: In what ways do you feel the partnership community at school supports and assists you in learning?		
Rules Q8: Are there regulations shared between the university and school for teaching practice? Division of labour Q11: How do you see the role and responsibilities of the partnership coordinators?	Object Investigate and discuss the main problems that create differences of views between the university and school, and how they affect the science student teachers' learning. Rules Investigate and discuss any rules and regulations for organizing science students' teaching practice at school, whether they are informed of any rules, and who regulates the teaching practice. Discussion of the duration of teaching practice programme, and of how the programme is applied within the school? i.e. Is there a specific and tabulated system for this programme? Division of Labour and Object Discuss the cooperation between the university and school from your perspective. How effective is this collaboration? Investigate and discuss whether the science student teachers receive any follow-up or evaluation from the university supervisor, cooperating teacher or headmaster. Discuss whether the roles of the science student teachers and partnership community are clear and known, and whether the student teachers are expected to perform roles other than their own. If the roles are known could they summarize the roles of university supervisor, university	

	coordinator, headmaster, cooperating teacher and science student teacher?	
Subject Q3: What are the perspectives of the university and school on the relationships in science teacher preparation? Such as: the different perspectives and whether these differences cause a problem for science student teachers, and how the school teachers seethe science student teachers. Object Q4: What are the difficulties facing the science student teachers during the programme?	Subject Investigate and discuss whether the science student teachers collide with the school's reality which is different from what they have learned at the university. What are these differences? Object Investigate and discuss any difficulties facing science student teachers at the beginning of teaching practice, such as planning for science lessons and dealing with the science curriculum and the pupils; also whether the science student teachers can surmount these difficulties alone or with help, and how can this be done?	

The design of the detailed questions that implement the structure shown in 4.2 is explained in the sections that follow.

4.6.1 Questionnaires

The questionnaires are used in the conduct of educational, psychological and social research. Verma and Mallick (1999) asserted that "the questionnaire is often a vital tool in the collection of research data, and that, if it is well-constructed, it can provide data economically and in a form that lends itself perfectly to the purposes of the study"(p.117). The use of questionnaires has increased to become the most common research tool for collecting quantitative data because they can be distributed to the large samples (Assaf, 1992).

The questionnaire is a tool used to collect data from individuals or groups and includes a set of questions or statements which enable the researcher to access qualitative or quantitative information which may be used alone or with other research tools so as to reveal the aspects determined by the researcher. Babbie (1990) mentioned that the questionnaire is “a document comprising questions and other kinds of items designed to solicit suitable information to analysis” (p. 377).

Questionnaires have been used in this study because: “Such a survey could be designed as part of a case study and produce quantitative data as part of the case study evidence” (Yin, 2003, p.91).

Questions have been used with a five-point Likert scale (see Table 4.3 as an example), together with open-ended questions, to allow the researcher to learn a lot about the issues related to the research topic and answer the research questions. The open-ended questions will allow freedom of expression for the participants and should highlight specific issues which can be investigated more fully through the interviews; participants will not be restricted to answering on specific issues only. Consequently, information has been obtained from each element of Activity Theory. Peterson (2000) indicated to that: “The primary benefit of an open-end question is that its answers can provide extremely insightful information, because study participants provide answers in their own words, no researcher bias is introduced by presenting or predetermining answers” (p.33).

To ensure good questionnaire construction to cover all aspects of Activity Theory, the dimensions of the questionnaire were identified as:

‘Subject’ is science student teachers, the perceptions about a good science teacher, background that helped to shape the views of participants about science teachers, and expectations about science teaching and education science teaching.

‘Object’ is the science student teachers’ preparation through the partnership between the school and university and what it is hoped to achieve of the goals, the support from university and school to improve student teachers’ learning, and focusing on science student teachers during teaching practice at school.

‘Tools’ are academic tools available to science student teachers in both parties at the university and school that could help science student teachers in their learning about science teaching.

‘Community’ is the partnership community at the university and school which is relevant to the preparation of science student teachers.

‘Rules’ are the regulations organizing the science student teachers’ education at the university and teaching practice at school.

‘Division of labour’ is the roles and responsibilities of university supervisors, coordinators at the university, teacher collaborators, school headteachers, and science student teachers.

Table 4.3: Examples of Likert scale questions

NO.	Questions					
1	**The main reason for the involvement of the students in science teacher preparation programme at university and practice at school is:**	**SA**	**A**	**N**	**D**	**SD**
1-1	To become good science teachers.					
1-2	Because of their interest in science.					
1-3	Because teaching science is very easy.					
1-4	Because it is an enjoyable occupation.					
1-5	To find a good job with a good salary.					
1-6	Please add any other reasons not covered above.					

NO.	Questions					
2	**There are ways for learning to teach science from your expectations. The most important of these for science student teachers is:**	SA	A	N	D	SD
2-1	The science student teacher learns from lectures in the teacher education programme.					
2-2	The cooperating teacher helps science student teachers address gaps in subject knowledge in the school context.					
2-3	Please add any other reasons not covered above.					

Table 4.3 shows how area 1 of the questionnaire was designed. The Lickert scale questions help the respondents to understand what I am interested in. The open-ended part allows them to add their own ideas as I did not want to constrain their thinking. This can also be done in the interview, but having this element in the questionnaire too means that I can gather such information from a larger number of people.

Some of the questions appear to be stated as a report and not as a question. This is the result of the translation from Arabic into English. Some of the sentences such as, “The main reason for the involvement of the students in science teacher preparation programme at university and practice at school” are understood as a question in the Arabic context.

For more information about the questionnaires, see Appendix 4.1, 4.2 and 4.3.

<u>Procedures for applying the questionnaires</u>

The questionnaires were translated from English into Arabic and then applied as a pilot study to two of each category of participants; the time to complete the questionnaire was measured. The comments received from the participants about the questionnaire were addressed. It was then re-drafted, making the completion time approximately 20 minutes. In the final step, the questionnaires were distributed to the main sample, which was composed of 53 science student teachers, 11 university staff, and 27 school staff, as shown in Table 4.4.

Table 4.4: Meta-data of questionnaire participants

			University staff				School staff			
Number of questionnaires	Science student teachers		University supervisors		University coordinators		School headteachers		School teachers	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Distributed	18	75	5	6	3	3	18	40	18	40
Incoming	16	53	3	3	3	2	12	14	8	11
Actual number of completed	14	39	3	3	3	2	9	8	5	5

The sample of university staff was identified in order to provide data that represent the perspective of people from all the main roles in the team, and to compare the data. Similarly, in the school sample, categories representing all roles within the school team were chosen so that I could describe the school perspective and make the comparisons that were useful for the reader. Where the questionnaires included free answers through open questions and, therefore could be added to the analysis of qualitative data with the appropriate category.

The original population of the science student teacher was 18 males who were distributed to 18 schools, and 75 females distributed to 40 schools. The questionnaires were distributed to all the science students teachers in the cohort, to all the supervising teachers and head teachers who worked with them in the schools where they were placed for school experience and to all the science education staff in the university.

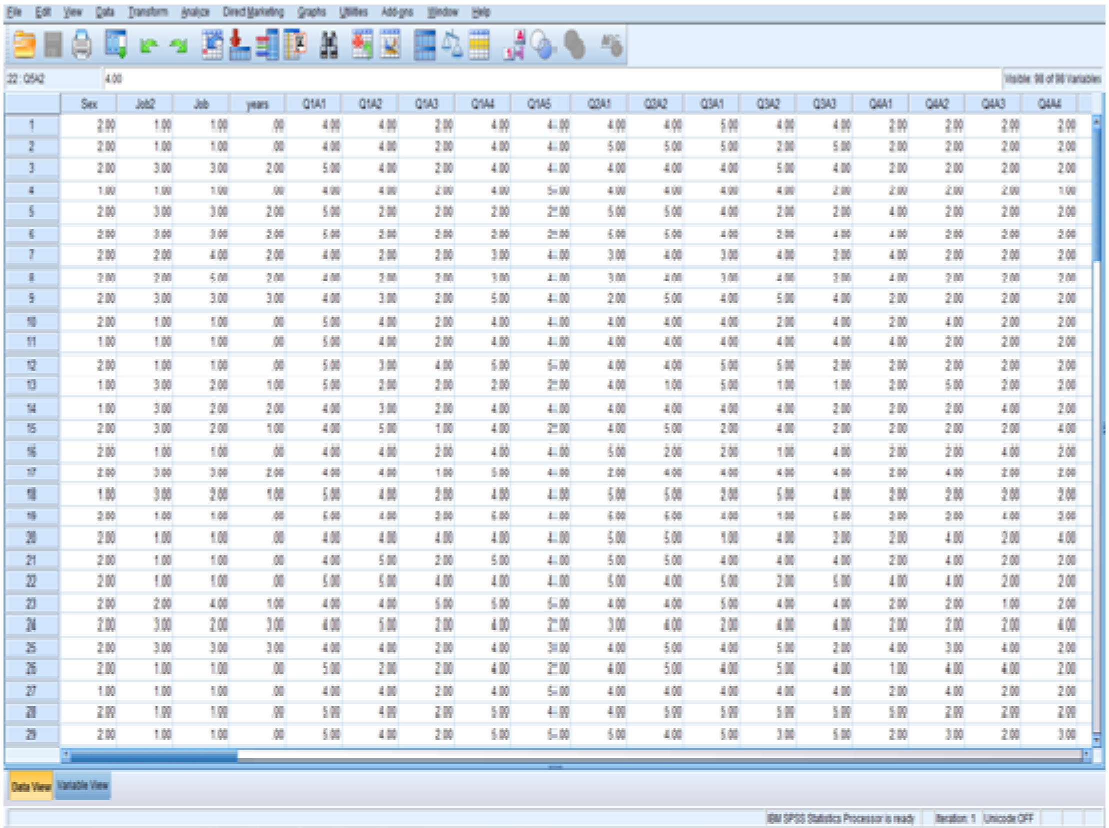
The questionnaires received from the total of original population were as follows: 16 males and 53 females of science student teachers, 3 males and 3 females of university supervisors, 3 males and 2 females of coordinators in the university. For cooperating teachers 12 males and 14 females, as well as 8 males and 11 females of the school headteachers. The completed and valid questionnaires were for science student teachers, 14 for males and 39 for females. For science supervisors at the university, 3 males, and 3 females and, the university coordinators were 3 males and 2 females. The collaborating teachers were 9 males and 8 females, and the school headteachers were 5 males and 5 females.

The completed and valid questionnaires were analyzed where these respondents demonstrated the commitment to the project by doing all that was asked of them, so I felt their responses might be a more valid reflection of what they were thinking, while incomplete questionnaires were ignored and were not used in the analysis, also the completely blank questionnaires were considered as questionnaires that were not received.

An overview of the process of quantitative data analysis

1. In the beginning, the completed questionnaires answered by the participants were collected and numbered from 1 to 91 in preparation for the introduction of data into the Statistical Package for the Social Sciences (SPSS) Software, version 21. SPSS is a powerful software package to manage and analyse quantitative data. The variables were coded to transform the data into numerical data suitable for SPSS programme; for example, codes given for the variable 'job' were (1) science student teacher, (2) university staff, (3) school staff. Codes for the variable 'gender' were (1) male and (2) female; and for the variable 'years of experience' (0) 0 years, (1) less than 10 years, (2) from 10 to 20 years, and (3) more than 20 years. The SPSS software enables one to obtain descriptive tables as well as comparison tables between variables in different groups. Bryman and Cramer (2011) indicate that: "The great advantage of using a package like SPSS is that it will enable you to score and to analyze quantitative data very quickly and in many different ways" (p.21).

Figure 4.3:An example of the quantitative data inserted to the SPSS software



2. The appropriate analytical tests were selected according to the normality of distribution of the data as identified through the skewness and kurtosis tests, and through the shapes of the histograms for each question. These revealed that most of the data followed a normal distribution, although some followed a non-normal distribution.

<u>**Distribution of data: skewness and kurtosis**</u>

Skewness and kurtosis tests were used to find out whether the responses of the participants were normally distributed, in order to decide whether a parametric or a non-parametric statistical technique was appropriate (Pallant, 2007).

Table 4.5: Descriptive statistics

Q1 Reason for the involvement of the students in science teacher preparation programme at university and practice at school participation in the science teacher preparation programme.	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q1A1To become good science teachers.	91	1.00	5.00	4.3736	.72493	-1.782	.253	5.667	.500
Q1A2 Because of their interest in science.	91	1.00	5.00	3.6593	1.03516	-.623	.253	-.582	.500
Q1A3 Because teaching science is very easy.	91	1.00	5.00	2.3956	1.16313	.735	.253	-.440	.500
Q1A4 Because it is an enjoyable occupation.	91	1.00	5.00	3.9011	.90744	-.896	.253	.669	.500
Q1A5 To find a good job with a good salary.	91	2.00	5.00	4.0220	1.01081	-.903	.253	-.202	.500

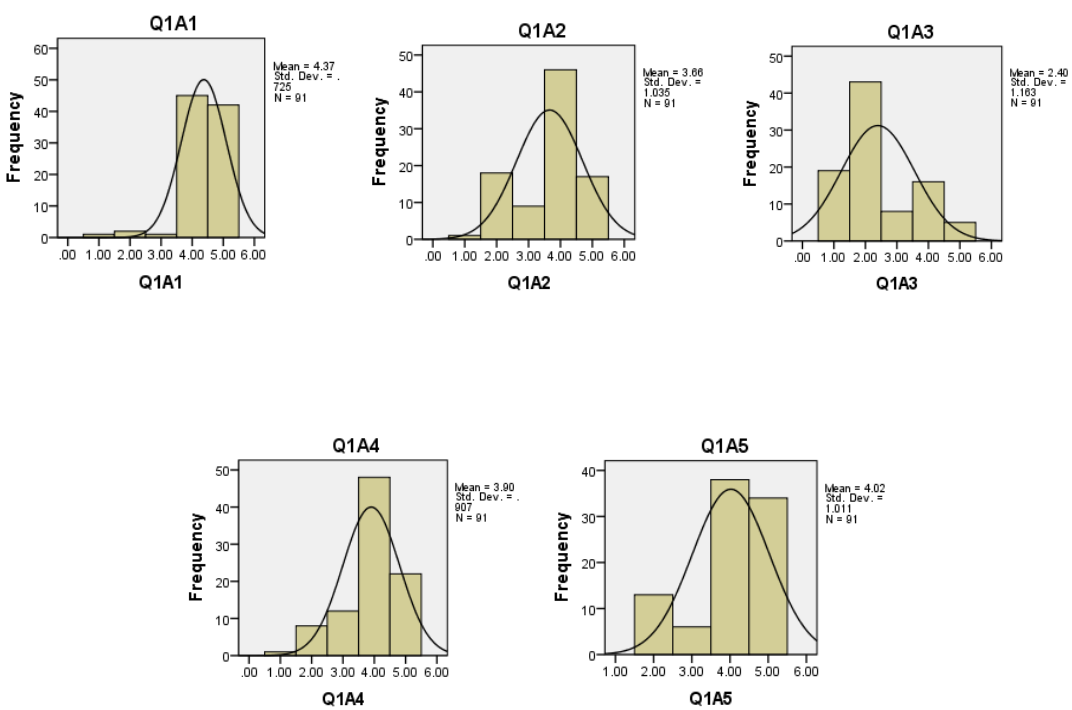
Q= Question 1,2,3,…
A= Sub question 1,2,3,…

Table 4.5 shows example of the results of the skewness and kurtosis tests on the variables all sub-questions from question one. Most values of skewness and kurtosis were close to zero suggesting that the related data approximated to a normal distribution. However, one item (Q1A1) did not have a normal distribution so it was dealt with through nonparametric tests. Tables of skewness and kurtosis for all items are shown in Appendix 5.A.

<u>Distribution of data: histograms</u>

The form of a histogram provides information on the distribution of scores on a continuous variable. Pallant (2007) confirmed that normality “can be checked by inspecting the histograms of scores on each variable” (p.124). Figure 4.4: shows examples of the shapes of histograms for all responses to the items in question one. The shapes of the histograms for all items are shown in Appendix 5.A.

Figure 4.4: The shapes of histograms for all responses to the items in question one



By looking at the histogram for each variable, it is seen that most of the actual responses lie within the bell-shaped curves). This is consistent with the indications from the skewness and kurtosis tests. These tests and the histograms together indicate that it is appropriate to treat most of the data (except Q1A1) as normally distributed.

There are statistical tests that can be used to find out whether there are statistically significant differences on a continuous dependent variable among a number of groups. The parametric versions of these tests, suitable for interval scaled data with a normal distribution, are the t-tests and one way ANOVA (Pallant, 2007). Since it has been argued (Jaccard and Wan 1996) that it is acceptable to treat data from Lickert items as interval data, and most variables in this study followed a normal distribution, a t-test was used when there were two categorical independent variables, and a one-way ANOVA when there were more than two categorical independent variables.

Non-parametric tests should be used if the data are not interval, or not normally distributed: the Mann-Whitney test, can be used to test for differences between two independent groups in place of the t-test; the Kruskal–Wallis test can be used in place of one way ANOVA to test for differences between several independent groups. (Field, 2009). These tests were used in my study where normality testing showed them to be necessary.

4.6.2 Interviews

Interviews are considered the main tool in qualitative research (Wengraf, 2001). According to Janesick (1998), interviews are a meeting between two or more people, in which information and ideas may be exchanged, interspersed with questions and responses about a particular subject, and during which meanings are constructed. Janesick distinguishes three forms of interviews: structured, semi-structured and open interviews.

The interviews constituted the main tool of data collection in this study. The interviews were held after the questionnaire data had undergone an initial analysis, and made use of the categories arising from the questionnaire. In this research, the interviews were semi-structured, with specific questions, but in which the order was changed based upon the interviewer's perspectives of what seemed most appropriate. Some changes were made to the questions, such as modification of wording, deletions, additions and explanations, depending on the interviewee. For more information about the interview questions, see Appendix (4.4).

The interviews were carried out with all categories of participants: science student teachers, university coordinators, university supervisors, headteachers and cooperating teachers. The interviews included both genders, with males and females answering all the research questions.

Interview procedures

The interview questions were translated from English into Arabic and then carried out as a pilot study on one of each category of the participants (male only); the time for the interviews was measured. Any feedback comments were addressed and the schedule was re-drafted to be appropriate for each category of the participants. The interviews took from one hour to two-and-a-half hours. The main interview sample consisted of eight science student teachers, four university supervisors, four university coordinators, four school headteachers, and six collaborator teachers. They were chosen randomly and dependent on who agreed to participate in the interview.

The composition of the main sample was composed as shown in Table 4.6.

Table 4.6: Meta-data of interview participants

NO.	Category of Interviewee	Code	Gender	Duration of the interview	Nature of the interview
1	Science student teacher	ST1	Male	1.07 Hours	Face-to-face
2	Science student teacher	ST2	Male	1.23 Hours	Face-to-face
3	Science student teacher	ST3	Male	1.10 Hours	Face-to-face
4	Science student teacher	ST4	Male	1.17 Hours	Face-to-face
5	Science student teacher	FST1	Female	1.30 Hours	Through a female mediator
6	Science student teacher	FST2	Female	1.15 Hours	Through a female mediator

7	Science student teacher	FST3	Female	1.47 Hours	Through a female mediator
8	Science student teacher	FST4	Female	2.13 Hours	Through a female mediator
9	University supervisor	US1	Male	1.24 Hours	Face-to-face
10	University supervisor	US2	Male	2.11 Hours	Face-to-face
11	University supervisor	FUS1	Female	1.22 Hours	By telephone
12	University supervisor	FUS2	Female	1.37 Hours	By telephone
13	University coordinators	UC1	Male	1.00 Hours	Face-to-face
14	University coordinators	UC2	Male	1.09 Hours	Face-to-face
15	University coordinators	FUC1	Female	1.18 Hours	By telephone
16	University coordinators	FUC2	Female	1.25 Hours	By telephone
17	Head teacher	HT1	Male	2.44 Hours	Face-to-face
18	Head teacher	HT2	Male	2.30 Hours	Face-to-face
19	Head teacher	FHT1	Female	2.37 Hours	Through a female mediator
20	Head teacher	FHT2	Female	2.19 Hours	Through a female mediator
21	Cooperating teacher	T1	Male	1.26 Hours	Face-to-face
22	Cooperating teacher	T2	Male	1.32 Hours	Face-to-face
23	Cooperating teacher	T3	Male	1.28 Hours	Face-to-face
24	Cooperating teacher	FT1	Female	1.27 Hours	Through a female mediator

25	Cooperating teacher	FT2	Female	1.11 Hours	Through a female mediator
26	Cooperating teacher	FT3	Female	1.34 Hours	Through a female mediator

Data analysis procedures

The general approach to the analysis of qualitative data is presented in this section. This includes the principles which have been used to identify codes and for organizing the major themes. These themes help to describe and discuss the findings that have emerged through the analysis stage. An example is shown of a model for the analysis software used which helped to arrange and classify codes into key themes. The codes or themes can be identified from the data through two basic methods of thematic analysis, either inductive or deductive. In the inductive approach, the codes and themes identified are strongly linked with the data themselves, and not driven by the researcher. This is reversed in the deductive approach, where the analysis more closely linked to the theoretical framework (Braun & Clarke, 2006).

The stage of transcription and data reading

To start with, the audio-recorded interviews were transcribed and organized through a programme called Max Q-Data; this prepared pieces of text from which the main codes were extracted. After that, the texts were read multiple times and at different intervals, to extract the codes using the "bottom up" inductive method. This was used at the beginning to access the participants’ existing ideas and obtain the codes in order to reflect the data freely obtained from the pieces of text. Next, the data were analyzed by the "top down" way of the deductive method. The Activity Theory adopted in this research is governed by a theoretical framework; therefore, it was necessary to organize the codes under the elements of Activity Theory to make the analysis compatible with the theory used. Braun and Clarke (2006) confirmed that "researchers cannot free themselves of their theoretical and epistemological commitments, and data are not coded in an epistemological vacuum" (p.12).

The stage of generating and aggregating the codes

After reading the data multiple times, a preliminary list of codes was generated and some ideas written and discussed until a final pattern was reached. This final pattern refers to the most basic parts of the data which are relevant and indicate the underlying meaning of the data for each theme. Braun and Clarke (2006) urged that "it is vital that you immerse yourself in the data to the extent that you are familiar with the depth and breadth of the content. Immersion usually involves 'repeated reading' of the data, and reading the data in an active way - searching for meanings, patterns and so on"(p16).

The aggregation of relevant codes under each theme was created through a preliminary list of themes that were commensurate with the research questions. After obtaining the final list of themes, they were classified to fit with the elements of Activity Theory. The data were re-read to check for internal and external compatibility, to ensure that the codes under each theme were compatible and harmonized with each other, and also that the themes were harmonious and compatible with the elements of Activity Theory, and amendments were made to the list of themes where required. Braun and Clarke (2006) advised coding the largest possible number of potential themes in the beginning, arguing that any of them could be of interest later.

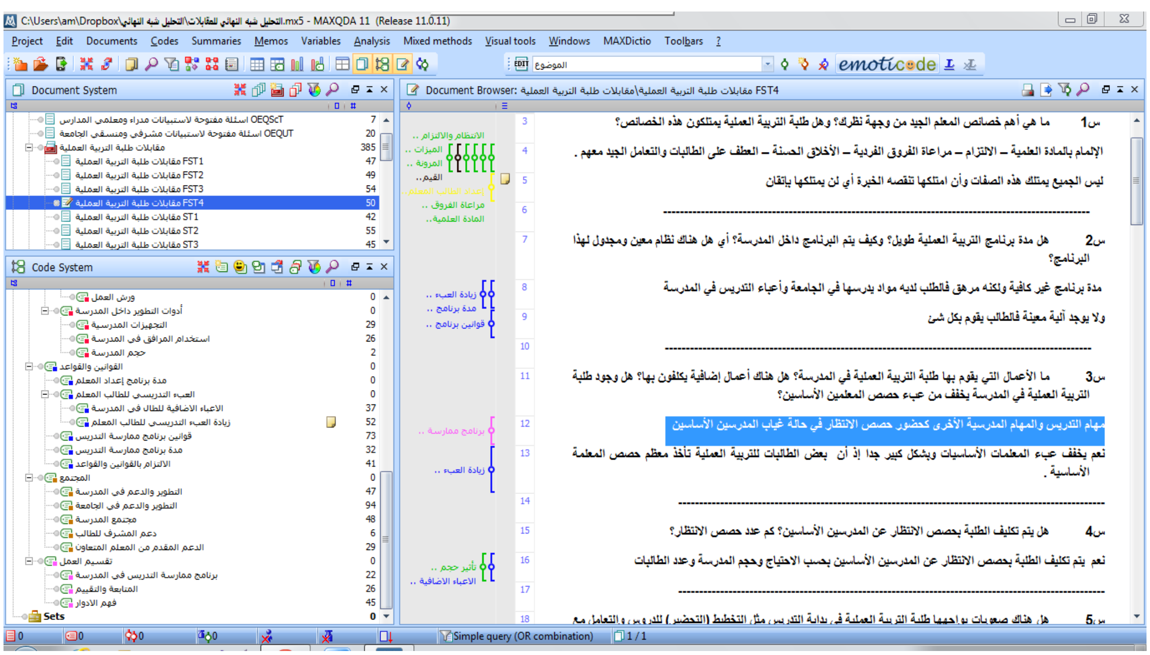
The stage of renaming and identifying the themes

The renaming of themes to reflect the codes that fell under them, and which also complied with the elements of Activity Theory, required a great effort. Supervisors were consulted here, as well as other colleagues interested in research, to ensure the trustworthiness of the thematic analysis. Braun and Clarke (2006) asserted that: "The need for re-coding from the data set is to be expected as coding is an ongoing organic process"(p.21). The final writing of the analysis included writing an accurate description of each code in terms of the compatible data, and in contrast to the contradictory data. The qualitative data collected through the interviews and open questions of the questionnaires were in Arabic, the language of the research sample, therefore the data were analysed in Arabic. This helped the researcher understand the participants' responses and helped keep their sense where it was difficult to translate literally into English. Subsequently, after ensuring that the codes and themes were appropriate, the responses were translated into English. Halai (2007) mentioned this problem in saying: "It is very common to find research participants whose first language is not English and the issue that the translation of the interview data will lose a part of the richness, meaning, and cultural flavour in translation"(p.353).

<u>The qualitative analysis software</u>

The following figure shows the way the interview texts were analysed and coded through the MAXQDA programme.

Figure 4.5: Example for coding by MAXQDA



There are many computer applications that are used as tools in the analysis of qualitative data, but Max Q-Data software (MAXQDA)was chosen for certain considerations, including that the functions listed support multiple languages. Although it does not include the Arabic language, the software enables easy dealing with Arabic text. In addition to ease of use of this programme, it incorporates many of the functions that assist in the analysis of qualitative data. Gibson and Brown (2009) confirmed that MAXQDA had become an "increasingly popular package". They stated that: "This package has much of the functionality of other programs, in terms of the coding of data, the use of written analysis through memos, the production of quantitative descriptive statistics of coding work, and the facilitation of collaborative and group analysis"(p.177).

4.6.3 Documentary evidence

Documents play a fundamental role in data collection due to their worth in providing background information and supporting the other tools. They therefore have a value in interpretive research and in the case study (Yin, 2003). Therefore, documentary evidence was used along with the previous tools. The documentary evidence consisted of the plan of the H.D.Ed programme, the policies and procedures for teaching practice and assessment at Taibah University, and the names of the students and schools involved in the H.D.Ed programme and teaching practice. The documents contributed to the construction of the questionnaires and interviews and also helped to provide qualitative and quantitative data from the schools, university and local education authority which provided a fuller background picture of the school and university context.

4.6.4 Procedures for applying the research tools

<u>The first stage</u>

The research tools were prepared after selecting the participating categories in the research sample; then the Certificate of Ethical Approval was obtained. Approval was also obtained from the Cultural Bureau at the Saudi Embassy to apply the research tools and carry out the fieldwork journey. Papers and documents were provided to facilitate being granted approval from Taibah

University and the LEA in Medinah to carry out the research in its schools and with its school staff.

The second stage

The research tools were translated into Arabic and this was followed by making contact with the participants in the research sample. This took place alongside training of the mediator, who was my wife, who had volunteered to work with me by virtue of her knowledge of the ideas of my research. She acted as mediator during the application of the research tools with the female participants, whether in the schools or university. This training took almost a week to understand the purpose of the research tools and how to apply them, as well as the rights of the participants. Participants were informed of their rights. This included their right to choose not to participate and their complete freedom to withdraw from participation. Participants' consent was obtained to transfer data from the mediator to the researcher. All aspects were discussed with participants and their queries were addressed.

The third stage

The questionnaires took two weeks to be distributed and collected by the researcher with male participants and by the female mediator with female participants, while the interviews took six to seven weeks to complete.

The fourth stage

Interviews with male participants were carried out face-to-face by the researcher. He also interviewed some of the female participants by phone after gaining their approval through the mediator. Interviews with the other female participants were carried out by the female mediator.

The fifth stage

At the end of the application of the research tools, a letter was obtained from Taiba University stating that the process of applying the research tools had been completed, and how long this had taken. They confirmed that there had been constant contact with the Curriculum and Instruction Department at all stages of the application procedure. This was very helpful as it allowed access to some of the documents, official letters and information that the researcher needed from certain sectors of the government, as well as to answer queries pertinent to the research.

<u>The sixth stage</u>

The research data was copied to a data analysis programme in preparation for the data analysis stage.

4.7 Ethical Dimensions

Ethics in research is an important issue that has to be considered carefully by researchers in all disciplines, but which is especially important in educational research as it deals with human beings. Creswell (2003) confirmed the ethical considerations that should be taken into account during the different stages of the research, including designing the questionnaire, collecting the data, data analysis and publishing of the work.

In the last few years, there have been many attempts at making lists of principles to guide researchers to avoid ethical pitfalls. One such comprehensive and useful ethical guideline was produced in 2004 by the British Education Research Association (BERA). According to BERA (2004), there are issues of informed consent, anonymity, confidentiality and the institution's permission that need to be addressed within every piece of research. Therefore, the researcher must be aware of the ethical considerations of his/her research and take the appropriate measures to implement them. Consequently, the names of the science student teachers, headteachers, collaborating teachers, university supervisors, university coordinators, and schools which were included in the study have been kept anonymous in order to protect the privacy of these institutions and the participants. The rights of the participants to withdraw from the research at any time they choose was also implemented. Therefore, all necessary measures were taken to keep the data safe from damage or loss while maintaining its confidentiality. None of the data were published for purposes other than this research. Taibah University was very cooperative and was not reluctant to have its name published, permission for which had been taken prior to obtaining approval for the application of the research tools.

BERA confirmed that participants have the right to withdraw themselves from any research that is being carried out. Participants can remove themselves at any time and informed consent should be a condition which all participants understand. They “agree to their participation without any pressure, prior to the research getting underway" (BERA, 2004).

The certificate of ethical research approval was obtained from Exeter University before applying the research tools.(See Appendix 4.5).

4.8 Difficulties facing the researcher

Difficulties may be faced by researchers during any phase of their research, but these difficulties are not insurmountable.

In this research, the following difficulties were controlled by the researcher:

1- Difficulty in obtaining a suitable sample, as potential participants were not always willing to commit the time required.

When applying the questionnaires, many potential participants apologised for not participating because they were too busy in their work and school activities. After inquiring as to why, it turned out that the schools received a large number of questionnaires on an almost daily basis, and this led to a lack of willingness of the school staff to respond. It is a fact that research in the KSA is done mainly through questionnaires.

2- Difficulty occurred due to the extension of the research to female schools. In light of the religious customs and traditions in the KSA, there is difficulty in dealing with the female community. This was been dealt with by using an intermediary with these cases, as mentioned previously.

3- Difficulty was experienced in making appointments for the interviews with academics at the university; therefore, many attempts had to be made to reschedule them. In addition, the interviews took a relatively long time for completion.

4- Most of the participants in the interviews expressed unwillingness to have their voices recorded. Therefore, the interviews were typed quickly by the researcher but this was tiring despite his proficiency in fast typing in Arabic, and it meant that the interviews took longer than scheduled. Nevertheless, this was necessary to respect the participants' right not to have their voices recorded. Obviously there was a reason for their reservations about recording their voices; perhaps they were cautious because I also work at the university. This was why the researcher was solicited through a multitude of questions about the nature of my work at the university.

5- In the fact this is self report data – what they say may not relate to what they do; what they say they think may not be what they actually think, but may be what they know is the official 'line' or the socially acceptable norm.

4.9 Summary

This chapter has presented the justification for the research design, and the procedures for the application of the research tools with the participating sample. The following chapter will present the analysis of the quantitative data which was collected by the questionnaire tool.

Chapter Five

Quantitative findings

5.1 Introduction

This chapter analyses the quantitative data collected from the questionnaires, using SPSS. It displays the results in light of the aims of the questionnaire presented in the previous chapter in two types of tables. The first type presents descriptive statistics for the items of each sub-topic under the elements of Activity Theory according to participant group. The second type presents the differences among groups on their responses to the sub-topic items according to their job, gender and years of experience. Since the numbers of questionnaires returned by some groups were small, these group differences must be regarded as suggesting *possible* differences rather that providing definitive findings about these differences. These tentative group difference findings were, however, useful when examining the qualitative data. Examples will be provided to clarify the processes of data analysis, and full tables of these examples can be found in Appendix 5.B. This chapter includes a summary of the most important of the quantitative data findings with some of the comments and justifications for these results.

5.2 Descriptive statistics and the differences among groups

In this section, the descriptive statistics tables are displayed, followed by the table of differences between the groups for each sub-topic of the Activity Theory elements.

5.2.1 Subject

There are three sub-topics under the subject topic: the reason for the involvement of the students in the science teacher preparation programme at university, the expectations of how students learn to teach science, and the science student teachers' difficulties during teaching practice. These are presented below.

5.2.1.1 Reason for the involvement of the students in the science teacher preparation programme at university

Table 5.2: Descriptive statistics for reason for the involvement of the students in the science teacher preparation programme at university according job groups

Sub-topic	Items	Job group	S.D	D	N	A	S.A	Mean	SD
Perceptions about a good teacher	Q1A1To become good science teachers.	Student teacher (ST)	0.0%	3.8%	1.9%	52.8 %	41.5 %	4.3208	.70092
		University staff (US)	0.0%	0.0%	0.0%	45.5 %	54.5 %	4.5455	.52223
		School staff (SS)	3.7%	0.0%	0.0%	44.4 %	51.9 %	4.4074	.84395
		Overall						4.3736	.72493
	Q1A2 Because of their interest in science.	ST	0.0%	17.0 %	11.3 %	52.8 %	18.9 %	3.7358	.96379
		US	0.0%	36.4 %	9.1%	36.4 %	18.2 %	3.3636	1.20605
		SS	3.7%	18.5 %	7.4%	51.9 %	18.5 %	3.6296	1.11452
		Overall						3.6593	1.03516
	Q1A3 Because teaching science is very easy.	ST	18.9 %	47.2 %	11.3 %	18.9 %	3.8%	2.4151	1.11690
		US	18.2 %	18.2 %	18.2 %	27.3 %	18.2 %	3.0909	1.44600
		SS	25.9 %	59.3 %	0.0%	11.1 %	3.7%	2.0741	1.03500
		Overall						2.3956	1.16313

	Q1A4 Because it is an enjoyable occupation.	**ST**	**0.0%**	**3.8%**	**15.1 %**	**56.6 %**	**24.5 %**	**4.0189**	**.74655**
		US	**0.0%**	**18.2 %**	**27.3 %**	**27.3 %**	**27.3 %**	**3.6364**	**1.12006**
		SS	**3.7%**	**14.8 %**	**3.7%**	**55.6 %**	**22.2 %**	**3.7778**	**1.08604**
		Overall						**3.9011**	**.90744**
	Q1A5 To find a good job with a good salary.	**ST**	**0.0%**	**9.4%**	**7.5%**	**43.4 %**	**39.6 %**	**4.1321**	**.92065**
		US	**0.0%**	**9.1%**	**0.0%**	**27.3 %**	**63.6 %**	**4.4545**	**.93420**
		SS	**0.0%**	**25.9 %**	**7.4%**	**44.4 %**	**22.2 %**	**3.6296**	**1.11452**
		Overall						**4.0220**	**1.01081**

ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

By looking Table 5.2, we find that the participants agreed that the main reason was ‘to become good science teachers’ (M=4.37, SD=0.724); this statement generated the highest agreement. This was followed by ‘to find a good job with a good salary’ (M=4.02, SD=1.01), then by ‘because it is an enjoyable occupation’ (M=3.90, SD=0.907), and ‘because of their interest in science’ (M=3.65, SD=1.03). The least agreement was with ‘because science teaching is very easy’ (M=2.39, SD=1.16).

It is, perhaps useful to note that the phrase ‘a good job with a good salary’ is a common way of describing teaching in KSA and was used in the questionnaire for that reason. There were no significant differences between the participant groups, perhaps reflecting this cultural perception of the job of teaching.

Table 5.3: Differences among groups on items related to subject

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Perceptions about a good teacher	Q1A1To become good science teachers.	.522	.690	.433	----	----	----
	Q1A2 Because of their interest in science.	.551	.078	.512	----	----	----
	Q1A3 Because teaching science is very easy.	.048*	.254	.755	US/SS	----	----
	Q1A4 Because it is an enjoyable occupation.	316	.021*	.966	----	F/ M	----
	Q1A5 To find a good job with a good salary.	.033*	.489	.051	N	----	----

Q1A1: showing the results of non-parametric tests (Mann-Whitney and Kruskal-Wallis).
* The mean difference is significant at the .05 level or less.
US/SS = The difference was between university staff and school staff: university staff had the higher score.
---- = No different among groups.
N= The difference does not appear by Bonferroni Post-Hoc Test.
F/M= The difference between females and males in favour of the females.

In general, the quantitative data analysis shows that there were two questions on the perceptions about a good teacher that showed significant differences between groups: ‘teaching science is very easy’ and ‘in order to find a good job with a good salary’. In the first case the difference existed between university staff and school staff, where are the university staff have a higher score than school staff participants. It is to be expected that there will be differences between two separate systems that work with each other. In the second case, the detailed nature of difference was not identified by a Bonferroni Post-Hoc Test.

Also, there was one significant difference at the 0.05 level between males and females in that women were more likely to join the course because they believed that science teaching would be an enjoyable occupation. It is to be expected that there would be some differences in views between males and females on some questions. Females may consider that a science teaching job in Saudi Arabia would be enjoyable for them, perhaps because it is a non-mixed career, and all the people in their schools would be female; moreover, females may have limited options in non-mixed occupations, but the males were more doubtful about this.

Nevertheless, there were no significant differences in reasons given for students participating in the science teaching course, indicating the similarity of views held by the different participants.

5.2.1.2 Expectations of how students learn to teach science

Table 5.4: Descriptive statistics for items on expectations of how students learn to teach science by job group

Sup-topic	Items	Groups	S.D	D	N	A	S.A	Mean	SD
Expectations of how students learn to teach science	Q2A1 The science student teacher learns from lectures at the teacher education programme.	Student teacher (ST)	0.0%	1.9%	7.5%	58.5%	32.1%	4.2075	.66096
		University staff (US)	0.0%	0.0%	18.2%	36.4%	45.5%	4.2727	.78625
		School staff (SS)	0.0%	7.4%	7.4%	70.4%	14.8%	3.9259	.72991
		Overall						4.1319	.70252
	Q2A2 The cooperating teacher helps science student teachers address gaps in subject knowledge in school context.	ST	1.9%	11.3%	7.5%	47.2%	32.1%	3.9623	1.01834
		US	0.0%	0.0%	0.0%	72.7%	27.3%	4.2727	.46710
		SS	3.7%	0.0%	7.4%	44.4%	44.4%	4.2593	.90267
		Overall						4.0879	.93866

ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

This question addressed respondents' expectations of ways of learning to teach science. The responses by job group are shown in Table 5.4. This shows that the participants agreed that the way of learning to teach science for science student teachers was through the lectures in the teacher education programme (M=4.13, SD=0.70), which generated the highest agreement, and, to a slightly lesser extent, from the cooperating teacher helping the student teachers to address gaps in their subject knowledge in the school context (M=4.08, SD =0.93).

Table 5.5: Differences among job groups on expectations of how students learn to teach science

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Expectations of how students learn to teach science	Q2A1 The science student teacher learns from lectures at the teacher education programme.	.186	.348	.088	----	----	----
	Q2A1 The cooperating teacher helps science student teachers address gaps in subject knowledge in school context.	.324	.748	.416	----	----	----

---- = No different among groups.

The results show no significant differences at the 0.05 level attributable to the job, gender or years of experience groups in participants' expectations of how science student teachers learn to teach science. This indicates a similarity of views held by the different groups of participants.

5.2.1.3 Science student teachers' difficulties during teaching practice

Table 5.6: Descriptive statistics on student teachers' difficulties during teaching practice by job group

Sup-topic	Items	Group	S.D	D	N	A	S.A	Mean	SD
Science student teachers difficulties during teaching practice	Q4A1 Planning for science lessons.	Student teacher (ST)	1.9%	26.4%	5.7%	37.7%	28.3%	3.6415	1.21044
		University staff (US)	0.0%	27.3%	9.1%	27.3%	36.4%	3.7273	1.27208
		School staff (SS)	0.0%	40.7%	0.0%	48.1%	11.1%	3.2963	1.13730
		Overall						3.5495	1.19502
	Q4A2 Choosing the appropriate methods for teaching science.	ST	0.0%	20.8%	3.8%	50.9%	24.5%	3.7925	1.04437
		US	0.0%	27.3%	9.1%	45.5%	18.2%	3.5455	1.12815
		SS	0.0%	29.6%	7.4%	44.4%	18.5%	3.5185	1.12217
		Overall						3.6813	1.07372
	Q4A3 Dealing with the science curriculum.	ST	1.9%	34.0%	3.8%	37.7%	22.6%	3.4528	1.23360
		US	9.1%	18.2%	27.3 %	18.2%	27.3%	3.3636	1.36182
		SS	0.0%	40.7%	0.0%	40.7%	18.5%	3.3704	1.21365
		Overall						3.4176	1.22987
	Q4A4 Acquiring teaching skills.	ST	1.9%	34.0%	1.9%	30.2%	32.1%	3.5660	1.30840
		US	0.0%	27.3%	0.0%	45.5%	27.3%	3.7273	1.19087
		SS	0.0%	37.0%	3.7%	44.4%	14.8%	3.3704	1.14852
		Overall						3.5275	1.24133
	Q4A5 How to choose appropriate practical work associated with science topics in the curriculum.	ST	1.9%	24.5%	9.4%	49.1%	15.1%	3.5094	1.08526
		US	0.0%	36.4%	0.0%	36.4%	27.3%	3.5455	1.29334
		SS	0.0%	44.4%	3.7%	40.7%	11.1%	3.1852	1.14479
		Overall						3.4176	1.12611

	Q4A6 Applying what has been learned at university from educational theories at school.	ST	0.0%	20.8%	7.5%	45.3%	26.4%	3.7736	1.06774
		US	0.0%	18.2%	0.0%	36.4%	45.5%	4.0909	1.13618
		SS	0.0%	22.2%	3.7%	44.4%	29.6%	3.8148	1.11068
		Overall						3.8242	1.08108

ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

From the overall means given in Table 5.6 on items to do with student teachers' difficulties, the highest mean was for the sixth item (M=3.82, SD=1.08), on which the participants agreed that there was difficulty in applying what had been learned at university about educational theories to school, followed by choosing appropriate methods for teaching science (M=3.68, SD=1.07), planning for science lessons (M=3.54, SD=1.19), acquiring teaching skills (M=3.52, SD=1.24) and, lastly, dealing with the science curriculum (M=3.41, SD=1.22) and choosing appropriate practical work associated with science topics (M=3.41, SD=1.12).

Table 5.7: Differences among groups on difficulties

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Science student teachers' difficulties during teaching practice	Q4A1Planning for science lessons.	.417	.954	.225	----	----	----
	Q4A2 Choosing the appropriate methods for teaching science.	.511	.012*	.470	----	M / F	----
	Q4A3 Dealing with the science curriculum.	.950	.084	.877	----		----
	Q4A4 Acquiring teaching skills.	.686	.018*	.629	----	M / F	----
	Q4A5 How to choose appropriate practical work associated with science topics in the curriculum.	.444	.002*	.566	----	M / F	----

	Q4A6 Applying what has been learned at university from educational theories at school.	**.679**	**.016***	**.186**	**----**	**M / F**	**----**

* The mean difference is significant at the .05 level or less.
---- = No difference among groups.
M/F= The difference between males and females in favour of the males.

The results showed that men were significantly more likely than women to believe that student teachers faced difficulty in choosing appropriate methods for teaching science, acquiring teaching skills, choosing appropriate practical work, and applying what had been learned in theory at university to practice at school. Although sample sizes mean that the gender differences found in this study can only be regarded as tentative indications of difference, they are consistent with aspects of Saudi society and with the findings of other studies. For example, it could be that some of the female participants had taken a week's course prior to teaching practice and this may have helped them to get a head start and gave them support. Females are also more interested in the teaching profession, as it is the most popular profession for women in Saudi Arabia. In addition to that, most of the female community in Saudi Arabia consists of teachers; therefore young women may acquire teaching skills from other females before starting their course. Furthermore, studies such as, Al-Astal and Al-Rashid, 2004; Al-Balawi 2011 have revealed that female teachers apply teaching skills better than male teachers and, are more committed to their work; they tended to implement the work that was entrusted to them accurately. This does not negate the fact that some male teachers perform their teaching duties and work elaborately.

5.2.2 Object

Under the object topic, the sub-topic of what the university and the school want to achieve through the programme of teacher preparation and teaching practice for science student teachers is presented in Table 5.8.

5.2.2.1 Ambitions of the university and school

Table 5.8: Descriptive statistics for the ambitions of university and school by job group

Sub-topic	Items	Group	S.D	D	N	A	S.A	Mean	SD
The ambitions	Q5A1 To obtain qualified science teachers.	Student teacher (ST)	0.0 %	0.0%	1.9%	39.6 %	58.5 %	4.566 0	.53742
		University staff (US)	0.0 %	0.0%	0.0%	27.3 %	72.7 %	4.7273	.46710
		School staff (SS)	3.7 %	0.0%	0.0%	33.3 %	63.0 %	4.5185	.84900
		Overall						4.5714	.63496
	Q5A2 To get pupils learning well in science.	ST	0.0%	3.8%	0.0%	56.6 %	39.6 %	4.3208	.67293
		US	0.0 %	0.0%	0.0%	27.3 %	72.7 %	4.7273	.46710
		SS	0.0 %	0.0%	0.0%	48.1 %	51.9 %	4.5185	.50918
		Overall						4.4286	.61721
	Q5A3 For science student teachers to be able to link theory to classroom practice.	ST	0.0%	5.7%	17.0 %	39.6 %	37.7 %	4.0943	.88283
		US	0.0%	0.0%	0.0%	45.5 %	54.5 %	4.5455	.52223
		SS	0.0%	0.0%	3.7%	51.9 %	44.4 %	4.4074	.57239
		Overall						4.2418	.77947

	Q5A4 For science student teachers to understand the goals of the curriculum.	ST	1.9 %	1.9%	13.2 %	50.9 %	32.1 %	4.0943	.83813
		US	0.0%	18.2 %	9.1%	36.4 %	36.4 %	3.9091	1.13618
		SS	0.0%	18.5 %	0.0%	44.4 %	37.0 %	4.0000	1.07417
		Overall						4.0440	.94177

ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

Table 5.8 shows the levels of agreement with the four individual items on question five. These items relate to the ambitions of the university and school in relation to the science student teachers. The means and standard deviations are shown for the sample as a whole and by job group. It shows that the participants agreed that the university and school want to achieve a supply of qualified science teachers, which generated the highest agreement (M=4.57, SD=0.63), followed by getting pupils learning well in science (M=4.42, SD=0.61), for science student teachers to be able to link theory to classroom practice (M=4.24, SD=0.77) and, with least agreement, for science student teachers to understand the goals of the curriculum (M=4.04, SD=0.94).

Table 5.9: Differences among groups on ambition items

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
The ambitions	Q5A1To obtain qualified science teachers.	.666	.988	.601	----	----	----
	Q5A2 To get pupils learning well in science.	.098	.164	.173	----	----	----
	Q5A3 For science student teachers to be able to link theory to classroom practice.	.090	.952	.111	----	----	----

	Q5.A4 For science student teachers to understand the goals of the curriculum.	**.808**	**.304**	**.059**	**----**	**----**	**----**

Q5A1&Q5A2: showing the results of non-parametric tests (Mann-Whitney and Kruskal-Wallis) ---- = No different among groups.

There were no significant differences among the groups in scores on the ambition items, as shown in Table 5.9. In general, therefore, the participants in the different job, gender and experience groups held similar views on what the programme of teacher preparation and teaching practice for science student teachers was trying to achieve.

5.2.3 Tools

There are two sub-topics under the tools topic: the essential academic tools which are available in school to help science student teachers to learn about science curricula and teaching science to pupils, and the essential academic tools which are available at the university to help science student teachers to learn about science curricula and the teaching of science to pupils. These are presented below.

5.2.3.1 Academic tools available at school

Table 5.10: Descriptive statistics for academic tools at school by job group

Sub-topic	Items	Job group	S.D	D	N	A	S.A	Mean	SD
Tools for the development of the student teachers in teaching at the schools	**Q6A1 Meetings with experienced science teachers.**	**Student teacher (ST)**	**9.4%**	**9.4%**	**1.9%**	**45.3%**	**34.0%**	**3.8491**	**1.26181**
		School staff (SS)	**0.0%**	**11.1%**	**0.0%**	**44.4%**	**44.4%**	**4.2222**	**.93370**
		Overall						**3.9750**	**1.16895**
	Q6A2 Observing science teachers teaching.	**ST**	**5.7%**	**3.8%**	**5.7%**	**62.3%**	**22.6%**	**3.9245**	**.97762**
		SS	**3.7%**	**3.7%**	**3.7%**	**48.1%**	**40.7%**	**4.1852**	**.96225**
		Overall						**4.0125**	**.97427**

	Q6A3 Teaching plans from experienced science teachers.	**ST**	**5.7%**	**11.3%**	**13.2%**	**47.2%**	**22.6%**	**3.6981**	**1.11949**
		SS	**3.7%**	**11.1%**	**3.7%**	**40.7%**	**40.7%**	**4.0370**	**1.12597**
		Overall						**3.8125**	**1.12614**
	Q6A4 Science teaching aids.	**ST**	**3.8%**	**9.4%**	**5.7%**	**47.2%**	**34.0%**	**3.9811**	**1.06501**
		SS	**0.0%**	**3.7%**	**0.0%**	**44.4%**	**51.9%**	**4.4444**	**.69798**
		Overall						**4.1375**	**.97752**
	Q6A5 Science labs.	**ST**	**3.8%**	**17.0%**	**3.8%**	**54.7%**	**20.8%**	**3.7170**	**1.09855**
		SS	**0.0%**	**7.4%**	**0.0%**	**48.1%**	**44.4%**	**4.2963**	**.82345**
		Overall						**3.9125**	**1.04571**
	Q6A6 Short courses and workshops about teaching students on the science curriculum.	**ST**	**11.3%**	**15.1%**	**15.1%**	**35.8%**	**22.6%**	**3.4340**	**1.30840**
		SS	**7.4%**	**11.1%**	**3.7%**	**33.3%**	**44.4%**	**3.9630**	**1.28547**
		Overall						**3.6125**	**1.31682**

ST= Science student teachers. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

Table 5.10 shows the levels of agreement on the essential academic resources which are available at school to help science student teachers to learn about science curricula and teaching science to pupils, by the two job groups of student teacher and school staff. It shows that the participants agreed that the essential academic resources available in the school were science teaching aids, which generated the highest agreement (M=4.13, SD=0. 97), followed by observing science teachers teaching (M=4.01, SD=0.97), meetings with experienced science teachers (M=3.97, SD=1.16), science labs (M=3.91, SD=1.04), obtaining teaching plans from experienced science teachers (M=3.81, SD=1.12) and, with least agreement, short courses and workshops about teaching students the science curriculum (M=3.61, SD=1.31).

Table 5.11: Differences among groups on tools at school (parametric tests)

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Tools for the development of the student teachers in teaching at the schools	Q6A1Meetings with experienced science teachers.	.179	.123	.528	----	----	----
	Q6A2 Observing science teachers teaching.	.130	.674	.179	----	----	----
	Q6A3 Teaching plans from experienced science teachers.	.205	.797	.091	----	----	----
	Q6A4 Science teaching aids.	.052	.720	.200	SS/ST	----	----
	Q6A5 Science labs.	.018*	.731	.059	SS/ST	----	----
	Q6A6 Short courses and workshops about teaching students in the science curriculum.	.089	.979	.100	----	----	----

Q6A2&Q6A4: showing the results of non-parametric tests (Mann-Whitney and Kruskal-Wallis).
* The mean difference is significant at the .05 level or less.
---- = No different among groups.
SS/ST = The difference between school staff and student teachers in favour of the school staff.

The results of the differences among groups according to job, gender and years of experience with regard to the topic of tools are presented in Table 5.11. The results show that there were significant differences in individual items about the importance of teaching aids and science labs between school staff and student teachers. School staff showed significantly higher agreement compared to the students. Perhaps this is due to the fact that some schools do not have laboratories for science and suffer from a lack of teaching aids. Some students thought the laboratories were inappropriate and they were unpleasantly surprised that the school was not typical or modern and that it was not what the students had expected. Academic tools offered by the school were perceived in a similar way by both male and female student teachers.

As for the differences between the experience groups there were no significant differences between individual groups on the essential academic resources which were available in schools to help science student teachers to learn about science curricula and teaching science to pupils.

5.2.3.2 Academic tools available at university

Table 5.12: Descriptive statistics for academic tools at university by job group

Sub-topic	Items	Job group	S.D	D	N	A	S.A	Mean	SD
Tools for the development of the student teachers in teaching at the university	Q7A1University Library.	Student teacher (ST)	9.4%	30.2%	13.2%	34.0%	13.2%	3.1132	1.25054
		University staff (US)	0.0%	36.4%	9.1%	36.4%	18.2%	3.3636	1.20605
		Overall						3.1562	1.23724
	Q7A2 Reflective meetings with university tutors.	ST	1.9%	20.8%	20.8%	41.5%	15.1%	3.4717	1.04888
		US	0.0%	0.0%	9.1%	63.6%	27.3%	4.1818	.60302
		Overall						3.5937	1.01916
	Q7A3 Science textbooks.	ST	1.9%	15.1%	3.8%	66.0%	13.2%	3.7358	.94362
		US	0.0%	0.0%	0.0%	36.4%	63.6%	4.6364	.50452
		Overall						3.8906	.94478
	Q7A4 Educational films for science teaching.	ST	1.9%	18.9%	15.1%	37.7%	26.4%	3.6792	1.12273
		US	0.0%	18.2%	18.2%	9.1%	54.5%	4.0000	1.26491
		Overall						3.7344	1.14424
	Q7A5 Design workshops teaching aids	ST	1.9%	28.3%	15.1%	34.0%	20.8%	3.4340	1.16865
		US	0.0%	45.5%	0.0%	18.2%	36.4%	3.4545	1.43970
		Overall						3.4375	1.20679

	Q7A6 Models analysing the content of the science curriculum.	ST	0.0%	22.6%	18.9%	47.2%	11.3%	3.4717	.97278
		US	0.0%	45.5%	0.0%	9.1%	45.5%	3.5455	1.50756
		Overall						3.4844	1.06893
	Q7A7 Visiting schools.	ST	3.8%	24.5%	20.8%	32.1%	18.9%	3.3774	1.16399
		US	18.2%	18.2%	0.0%	36.4%	27.3%	3.3636	1.56670
		Overall						3.3750	1.22798

ST= Science student teachers. US= University staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

Table 5.12 shows the levels of agreement on the essential academic resources available at the university, by the two job groups of student teacher and university staff. It is clear that the participants agreed that the essential academic resources available at the university were science textbooks, which generated the highest agreement (M=3.89, SD=0.94), followed by educational films for science teaching (M=3.73, SD=1.14), reflective meetings with university tutors (M=3.59, SD=1.01), models analysing the content of the science curriculum (M=3.48, SD=1.06), workshops for designing teaching aids (M=3.43, SD=1.20), visiting schools (M=3.37, SD=1.22) and, with least agreement, the university library (M=3.15, SD=1.23).

Table 5.13: Differences among groups on tools at university

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Tools for the development of the student teachers in teaching at the university	Q7A1 University Library.	.546	.001**	.701	----	M/ F	----
	Q7A2 Reflective meetings with university tutors.	.005*	.413	.104	US/ST	----	----
	Q7A3 Science textbooks.	.003*	.367	.010*	US/ST	----	N

	Q7A4 Educational films for science teaching.	**.402**	**.439**	**.594**	**----**	**----**	**----**
	Q7A5 Design workshops teaching aids	**.959**	**.051**	**.751**	**----**	**----**	**----**
	Q7A6 Models analysing the content of the science curriculum.	**.879**	**.026***	**.579**	**----**	**M/ F**	**----**
	Q7A7 Visiting schools.	**.973**	**.001****	**.237**	**----**	**M/ F**	**----**

** The mean difference is significant at the .001 level.
* The mean difference is significant at the .05 level or less.
---- = No different among groups.
N= The difference does not appear by Bonferroni Post-Hoc Test.
US/ST= The difference between university staff and student teachers in favour of the universitystaff.
M/F= The difference between males and females in favour of the males.

In regard to differences between job groups in perceptions of the essential academic tools which are available at the university, as shown in Table 5.13, there were significant differences on items about the reflective meetings with university tutors and the availability of science textbooks. The university staff perceived these resources as more important than the students did. This could be because students differ from university staff in terms of how to learn, or they may not find enough learning in these methods.

In regard to the difference between the responses of males and females, there were significant differences in perceptions between them on the usefulness of the university library, models analyzing the content of the science curriculum, and visiting schools, with males showed significantly higher agreement on their usefulness compared to females. Perhaps this is due to females' lack of access to the university library, or the difficulty of getting what they wanted from the university library, or in visiting schools in the female section, in addition to their obligations to their families. These significant differences between genders are not discussed in detail because of the very small numbers of participants in most of the categories.

There was a significant difference somewhere between the groups regarding the availability of science textbooks, but the Bonferroni Post-Hoc test did not identify a significant difference between any two individual groups. It may be that the

ANOVA result was accidental and does not constitute a significant difference between the groups.

5.2.4 Rules

This section relates to the sub-topics of the regulations and laws governing the teacher preparation programme at the schools, and university. Table 5.14 shows the descriptive statistics of the responses to these questions.

5.2.4.1 Regulations governing the teacher preparation programme

Table 5.14: Descriptive statistics for regulations by job group

Sub-topic	Items	Group	S.D	D	N	A	S.A	Mean	SD
Regulations and laws governing the teacher preparation programme at the university	Q8A1Always the school practice teaching is chosen based on the interests of the science student teacher.	Student teacher (ST)	34.0%	17.0%	5.7%	22.6%	20.8%	2.7925	1.60957
		University staff (US)	0.0%	36.4%	0.0%	54.5%	9.1%	3.3636	1.12006
		School staff (SS)	3.7%	7.4%	33.3%	40.7%	14.8%	3.5556	.97402
		Overall						3.0879	1.42711
	Q8A3Usually there is a coordination mechanism for the distribution of science student teachers on schools.	ST	13.2%	13.2%	17.0%	39.6%	17.0%	3.3396	1.28517
		US	0.0%	0.0%	0.0%	36.4%	63.6%	4.6364	.50452
		SS	3.7%	3.7%	29.6%	48.1%	14.8%	3.6667	.91987
		Overall						3.5934	1.18301
	Q8A4The university coordinator provides a supervisor from university for each student in the same specialization.	ST	0.0%	7.5%	9.4%	43.4%	39.6%	4.1509	.88570
		US	0.0%	0.0%	0.0%	63.6%	36.4%	4.3636	.50452
		SS	3.7%	11.1%	11.1%	40.7%	33.3%	3.8889	1.12090
		Overall						4.0989	.93160

	Q8A7Always the science student teacher is informed of reports submitted by the university supervisor.	ST	18.9%	30.2%	15.1%	24.5%	11.3%	2.7925	1.32082
		US	18.2%	27.3%	0.0%	36.4%	18.2%	3.0909	1.51357
		SS	3.7%	11.1%	29.6%	48.1%	7.4%	3.4444	.93370
		Overall						3.0220	1.26472
	Q8A9Usually the university supervisor visiting student teacher at the school sufficient number of visits to assess student.	ST	7.5%	9.4%	7.5%	49.1%	26.4%	3.7736	1.17082
		US	0.0%	18.2%	0.0%	18.2%	63.6%	4.2727	1.19087
		SS	7.4%	7.4%	7.4%	66.7%	11.1%	3.6667	1.03775
		Overall						3.8022	1.13744
	Q8A13 I think that the duration of the practice teaching programme is sufficient to develop science student teachers' skills in science teaching.	ST	5.7%	11.3%	11.3%	39.6%	32.1%	3.8113	1.17762
		US	0.0%	0.0%	0.0%	72.7%	27.3%	4.2727	.46710
		SS	7.4%	7.4%	7.4%	55.6%	22.2%	3.7778	1.12090
		Overall						3.8571	1.10123
Regulations and laws governing the teacher preparation programme at the school	Q8A2The school undertakes to provide all teaching practice requirements to be available for the science student teacher.	ST	28.3%	20.8%	13.2%	20.8%	17.0%	2.7736	1.48895
		US	0.0%	63.6%	0.0%	27.3%	9.1%	2.8182	1.16775
		SS	3.7%	11.1%	7.4%	63.0%	14.8%	3.7407	.98421
		Overall						3.0659	1.42711
	Q8A5The coordinator at school provides a collaborator teacher for each student according to specialization.	ST	7.5%	20.8%	11.3%	35.8%	24.5%	3.4906	1.28036
		US	0.0%	27.3%	18.2%	36.4%	18.2%	3.4545	1.12815
		SS	0.0%	25.9%	11.1%	51.9%	11.1%	3.4815	1.01414
		Overall						3.4835	1.17722

	Q8A6The coordinator provides an appropriate number of school teaching quotas in accordance with regulations and conditions	**ST**	**1.9%**	**9.4%**	**11.3%**	**45.3%**	**32.1%**	**3.9623**	**.99927**
		US	**0.0%**	**18.2%**	**9.1%**	**27.3%**	**45.5%**	**4.0000**	**1.18322**
		SS	**3.7%**	**11.1%**	**7.4%**	**55.6%**	**22.2%**	**3.8148**	**1.03912**
		Overall						**3.9231**	**1.02449**
	Q8A8Always the science student teacher is informed of reports submitted by the collaborator teacher.	**ST**	**15.1%**	**32.1%**	**15.1%**	**26.4%**	**11.3%**	**2.8679**	**1.28658**
		US	**36.4%**	**9.1%**	**0.0%**	**36.4%**	**18.2%**	**2.9091**	**1.70027**
		SS	**0.0%**	**18.5%**	**18.5%**	**59.3%**	**3.7%**	**3.4815**	**.84900**
		Overall						**3.0549**	**1.25045**
	Q8A10 Always the science student teacher is informed about the rules and the regulating practice teaching before starting.	**ST**	**9.4%**	**13.2%**	**9.4%**	**52.8%**	**15.1%**	**3.5094**	**1.18683**
		US	**0.0%**	**18.2%**	**0.0%**	**36.4%**	**45.5%**	**4.0909**	**1.13618**
		SS	**3.7%**	**3.7%**	**14.8%**	**66.7%**	**11.1%**	**3.7778**	**.84732**
		Overall						**3.6593**	**1.09767**
	Q8A11 Always the science student teacher is informed about school policy.	**ST**	**17.0%**	**13.2%**	**20.8%**	**37.7%**	**11.3%**	**3.1321**	**1.28658**
		US	**0.0%**	**18.2%**	**27.3%**	**9.1%**	**45.5%**	**3.8182**	**1.25045**
		SS	**0.0%**	**11.1%**	**7.4%**	**55.6%**	**25.9%**	**3.9630**	**.89792**
		Over all						**3.4615**	**1.23205**
	Q8A12 Always the science student teacher is informed about the national curriculum requirements.	**ST**	**13.2%**	**15.1%**	**22.6%**	**39.6%**	**9.4%**	**3.1698**	**1.20473**
		US	**0.0%**	**18.2%**	**0.0%**	**45.5%**	**36.4%**	**4.0000**	**1.09545**
		SS	**3.7%**	**14.8%**	**18.5%**	**44.4%**	**18.5%**	**3.5926**	**1.08342**
		Overall						**3.3956**	**1.18208**

ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

By looking Table 5.14, we find that the participants agreed that the university coordinator provided a supervisor from the university for each student in the same specialization, which generated the highest agreement (M=4.09, SD=0.93), followed by the coordinator providing an appropriate number of school teaching quotas in accordance with regulations and conditions (M=3.92, SD=1.02), that the duration of the practice teaching programme was sufficient to develop science student teachers’ skills in science teaching (M=3.85, SD=1.10), that the university supervisor usually visits student teachers at the school a sufficient number of times to assess that student (M=3.80, SD=1.13), that the science student teacher is always informed about the rules regulating practice teaching before starting (M=3.65, SD=1.09), that there is usually a coordination mechanism for the distribution of science student teachers on schools (M=3.59, SD=1.18), that the coordinator at school provides a collaborating teacher for each student according to specialization (M=3.48, SD=1.17), that the science student teacher is always informed about school policy (M=3.46, SD=1.23), that the science student teacher is always informed about the national curriculum requirements (M=3.39, SD=1.18), that the school practice teaching is always chosen based on the interests of the science student teacher (M=3.08, SD=1.42), that the school undertakes to provide all teaching practice requirements to be available for the science student teacher (M=3.06, SD=1.42), that the science student teacher is always informed of reports submitted by the collaborating teacher (M=3.05, SD=1.25) and, with least agreement, that the science student teacher is always informed of reports submitted by the university supervisor (M=3.02, SD=1.26).

Table 5.15: Differences among groups on rules

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Regulations and laws governing the teacher preparation programme at the university	Q8A1 Always the school practice teaching is chosen based on the interests of the science student teacher.	.060	.000**	.141	SS/ST	M/F	----
	Q8A3 Usually there is a coordination mechanism for the distribution of science student teachers on schools.	.003*	.487	.117	----	----	----
	Q8A4 The university coordinator provides a supervisor from university for each student in the same specialization.	.301	.437	.320	----	----	----
	Q8A7 Always the science student teacher is informed of reports submitted by the university supervisor.	.090	.000**	.172	----	M/F	----
	Q8A9 Usually the university supervisor visiting student teacher at the school sufficient number of visits to assess student.	.320	.606	.612	----	----	----
	Q8A13 I think that the duration of the practice teaching programme is sufficient to develop science student teachers' skills in science teaching.	.411	.539	.597	----	----	----

Regulations and laws governing the teacher preparation programme at the schools	**Q8A2 The school undertakes to provide all teaching practice requirements to be available for the science student teacher.**	**.009***	**.001****	**.095**	**US/ST**	**M/F**	**----**
	Q8A5 The coordinator at school provides a collaborator teacher for each student according to specialization.	**.996**	**.640**	**.780**	**----**	**----**	**----**
	Q8A6 The coordinator provides an appropriate number of school teaching quotas in accordance with regulations and conditions	**.806**	**.178**	**.630**	**----**	**----**	**----**
	Q8A8 Always the science student teacher is informed of reports submitted by the collaborator teacher.	**.106**	**.009***	**.395**	**----**	**M/F**	**----**
	Q8A10 Always the science student teacher is informed about the rules and the regulating practice teaching before starting.	**.225**	**.636**	**.207**	**----**	**----**	**----**
	Q8A11 Always the science student teacher is informed about school policy.	**.009***	**.056**	**.013***	**SS/ST**	**M/F**	**N**
	Q8A12 Always the science student teacher is informed about the national curriculum requirements.	**.060**	**.033***	**.126**	**----**	**M/F**	**----**

** The mean difference is significant at the .001 level or less
* The mean difference is significant at the .05 level or less
---- = No different among groups.
N= The difference does not appear by Bonferroni Post-Hoc Test
US/ST= The difference between university staff and student teachers in favour of the university staff.
SS/ST= The difference between school staff and student teachers in favour of the school staff.
M/F= The difference between males and females in favour of the males.

Table 5.15 shows that there were significant differences among the three job groups in responses to individual questions. There were significant differences in perception between students and school staff about the school undertaking to provide all teaching practice requirements, with school staff being more convinced that all requirements were provided than were the students. This may mean that some schools did not provide the necessary requirements, although they claimed that they did. Also, in relation to the university supervisor making sufficient visits to the student teacher there was a significant difference in perception between students and university staff, with student being less likely to believe that they received enough visits. Perhaps some of the students did not get a sufficient number of visits, or they needed more visits to help them to achieve the requirements. Lastly, there was a significant difference in perception between students and school staff over whether the science student teacher was always informed about school policy, with the school staff being more likely to maintain that this was true. Perhaps some schools did not inform students directly so they could get to know these rules through the practice work.

There were also a significant difference at the 0.05 level between the gender groups, five significant differences out of the total of thirteen items, where are the male had a higher score than female participants. Males were more likely than females to believe that their school practice teaching was chosen based on the interests of the science student teacher. This could be because more female students more than males students did not get their choice of school; perhaps also because male supervisors had private cars and thus could distribute students according to their wishes in choosing schools. On the school undertaking to provide all teaching practice requirements, the science student teacher always being informed of reports submitted by the university supervisor, the student teacher always being informed of reports submitted by the collaborating teacher, and the student teacher always being informed about the national curriculum requirements, the males showed significantly higher agreement than the females. As with all gender differences in this study, these findings are, at best, tentative. However, differences could be due to the separation of boys' schools from girls' schools and therefore depends on the gender separation policy for schools.

The years of experience did not affect participants' perceptions. There was some significant difference on the item about the science student teacher always being informed about school policy, but this was not confirmed by the Bonferroni Post-Hoc test. It may be accidental and does not constitute a significant difference between the four groups.

5.2.5 Community

Under the topic of community, there are three sub-topics: learning through the school community, learning through the university community, and learning through the relationship between school and university. Tables 5.16, 5.18 and 5.20 show the descriptive statistics for the responses to this topic.

5.2.5.1 Learning through the school community

Table 5.16: Descriptive statistics for learning through the school community by job group

Sub-topic	Items	Groups	S.D	D	N	A	S.A	Mean	SD
Learning through the school community	Q9A1School pupils usually consider science student teachers not as regular teachers and therefore they make a lot of discipline problems.	Student teacher (ST)	5.7%	17.0%	0.0%	28.3%	49.1%	3.9811	1.30812
		School staff (ss)	0.0%	11.1%	0.0%	51.9%	37.0%	4.1481	.90739
		Overall						4.0375	1.18475
	Q9A2 The number of pupils at the science student teachers' class is reasonable.	ST	13.2%	17.0%	0.0%	52.8%	17.0%	3.4340	1.32301
		SS	3.7%	25.9%	3.7%	48.1%	18.5%	3.5185	1.18874
		Overall						3.4625	1.27233
	Q9A3 Parents do not trust the capabilities of the science student teacher in the teaching of their children.	ST	1.9%	15.1%	35.8%	34.0%	13.2%	3.4151	.96942
		SS	3.7%	7.4%	11.1%	59.3%	18.5%	3.8148	.96225
		Overall						3.5500	.97954

	Q9A4 Science student teachers enjoy all the privileges provided by the school administration to the regular teachers.	**ST**	**18.9%**	**18.9%**	**11.3%**	**45.3%**	**5.7%**	**3.0000**	**1.28602**
		SS	**3.7%**	**18.5%**	**7.4%**	**63.0%**	**7.4%**	**3.5185**	**1.01414**
		Overall						**3.1750**	**1.21983**
	Q9A5 The school headteachers regard science student teachers as an unwelcome burden.	**ST**	**7.5%**	**32.1%**	**24.5%**	**26.4%**	**9.4%**	**2.9811**	**1.13494**
		SS	**7.4%**	**44.4%**	**14.8%**	**25.9%**	**7.4%**	**2.8148**	**1.14479**
		Overall						**2.9250**	**1.13377**
	Q9A6 The school assigns the science student teacher extra work that is not related to learning to teach.	**ST**	**0.0%**	**22.6%**	**9.4%**	**35.8%**	**32.1%**	**3.7736**	**1.13750**
		SS	**14.8%**	**37.0%**	**14.8%**	**25.9%**	**7.4%**	**2.7407**	**1.22765**
		Overall						**3.4250**	**1.26065**
	Q9A7 The school makes it possible for science student teachers to observe experienced teachers.	**ST**	**3.8%**	**11.3%**	**13.2%**	**52.8%**	**18.9%**	**3.7170**	**1.02615**
		SS	**3.7%**	**3.7%**	**3.7%**	**59.3%**	**29.6%**	**4.0741**	**.91676**
		Overall						**3.8375**	**.99929**
	Q9A8 The school makes it possible for science student teachers to discuss ideas about teaching with experienced teachers.	**ST**	**3.8%**	**22.6%**	**7.5%**	**41.5%**	**24.5%**	**3.6038**	**1.19839**
		SS	**0.0%**	**14.8%**	**0.0%**	**63.0%**	**22.2%**	**3.9259**	**.91676**
		Overall						**3.7125**	**1.11598**
	Q9A9 Cooperating teachers concentrate more on pupils' learning than on science student teachers' learning.	**ST**	**5.7%**	**17.0%**	**26.4%**	**37.7%**	**13.2%**	**3.3585**	**1.09359**
		SS	**0.0%**	**29.6%**	**11.1%**	**44.4%**	**14.8%**	**3.4444**	**1.08604**
		Overall						**3.3875**	**1.08492**
	Q9A10 Teachers in school feel that they can learn from student teachers.	**ST**	**9.4%**	**15.1%**	**13.2%**	**41.5%**	**20.8%**	**3.4906**	**1.24996**
		SS	**11.1%**	**25.9%**	**11.1%**	**44.4%**	**7.4%**	**3.1111**	**1.21950**
		Overall						**3.3625**	**1.24518**

	Q9A11The school teachers consider the science student teachers as a chance to reduce their teaching load.	**ST**	**0.0%**	**5.7%**	**9.4%**	**26.4%**	**58.5%**	**4.3774**	**.88201**
		SS	**7.4%**	**18.5%**	**3.7%**	**44.4%**	**25.9%**	**3.6296**	**1.27545**
		Overall						**4.1250**	**1.08354**

ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

By looking Table 5.16, we find that the participants agreed that the community at school (that is, the school teachers) considered the science student teachers as a chance to reduce their teaching load (M=4.12, SD=1.08), which generated the highest agreement, followed by school pupils usually considering science student teachers not as regular teachers and therefore making a lot of discipline problems (M=4.03, SD=1.18), the school making it possible for science student teachers to observe experienced teachers (M=3.83, SD=0.99), the school making it possible for science student teachers to discuss ideas about teaching with experienced teachers (M=3.71, SD=1.11), parents not trusting the capabilities of the science student teachers in the teaching of their children (M=3.55, SD=0.97), the number of pupils in the science student teachers' class being reasonable (M=3.46, SD=1.27), the school assigning the science student teacher extra work unrelated to learning to teach (M=3.42, SD=1.26), cooperating teachers concentrating more on pupils' learning than on science student teachers' learning (M=3.38, SD=1.08), teachers in school feeling that they can learn from student teachers (M=3.36, SD=1.24), science student teachers enjoying all the privileges provided by the school administration to the regular teachers (M=3.17, SD=1.21) and, with least agreement, the school headteachers regarding science student teachers as an unwelcome burden (M=2.92, SD=1.13).

Table 5.17: Differences among groups on items related to the school community

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Learning in through the school community	Q9A1 School pupils usually consider science student teachers not as regular teachers and therefore they make a lot of discipline problems.	.507	.563	.794	----	----	----
	Q9A2 The number of pupils at the science student teachers' class is reasonable.	.781	.862	.058	----	----	----
	Q9A3 Parents do not trust the capabilities of the science student teacher in the teaching of their children.	.084	.392	.182	----	----	----
	Q9A4 Science student teachers enjoy all the privileges provided by the school administration to the regular teachers.	.053	.120	.335	----	----	----
	Q9A5 The school headteachers regard science student teachers as an unwelcome burden.	.538	.059	.421	----	----	----
	Q9A6 The school assigns the science student teacher extra work that is not related to learning to teach.	.000**	.868	.003*	ST/SS	----	0 years/Less than 10 years 0 years/ From 10 to 20 years
	Q9A7 The school makes it possible for science student teachers to observe experienced teachers.	.132	.569	.397	----	----	----
	Q9A8 The school makes it possible for science student teachers to discuss ideas about teaching with experienced teachers.	.186	.670	.414	----	----	----

	Q9A9 Cooperating teachers concentrate more on pupils' learning than on science student teachers' learning.	**.740**	**.047***	**.704**	**----**	**M/ F**	**----**
	Q9A10 Teachers in school feel that they can learn from student teachers.	**.199**	**.029***	**.269**	**----**	**F/ M**	**----**
	Q9A11 The school teachers consider the science student teachers as a chance to reduce their teaching load.	**.009***	**.915**	**.015***	**ST/SS**	**----**	**0 years/ More than 20 years**

** The mean difference is significant at the .001 level or less.
* The mean difference is significant at the .05 level or less.
---- = No different among groups.
ST/SS= The difference between student teachers and school staff in favour of the student teachers.
M/F= The difference between males and females in favour of the males.
F/M= The difference between females and males in favour of the females.

There were significant differences between job groups on individual questions, as shown in Table 5.17. About the school assigning the science student teacher extra work that was not related to learning to teach, the student teachers showed significantly higher agreement compared to the school staff. About the school teachers considering the science student teachers as a chance to reduce their teaching load, the students again showed higher agreement than the school staff. Maybe the science student teachers were indeed given extra work that was not related to learning to teach, thereby reducing the school staff's workload. On both these items, it appears that the student teachers felt that the school was exploiting their presence as free labour.

The results also showed that males showed a significantly higher agreement compared to females that the cooperating teachers concentrated more on pupils' learning than on science student teachers' learning, Perhaps this arose because of the lack of knowledge of the roles of each party in the relationship, such as the role of the cooperating teacher. In addition, females showed a significantly higher agreement compared to males that teachers in school feel that they can learn from student teachers. This indicator of the inability of the female school teachers to communicate with the university by other means except through their female students. Also, these finding should, at best, be considered as tentative due to the small numbers of participants.

Overall, there were significant differences at the 0.05 level among the four experience groups on the individual items six and eleven. The participants with the least experience were most likely to believe that the student teachers were assigned extra work that was not related to learning to teach. Some school teachers may believe that the student teachers should be trained in every job at the school, even if these are not directly related to their teaching. These inexperienced participants were also the most likely to believe that the student teachers were used to reduce teachers' workload. This may be due to the lack of teachers within the school.

5.2.5.2 Learning through the university community

Table 5.18: Descriptive statistics for learning through the university community by job group

Sub-topic	Items	Group	S.D	D	N	A	S.A	Mean	SD
Learning through the university community	Q10A1 The number of students at the lecture hall is reasonable.	Student teacher (ST)	1.9%	9.4%	1.9%	56.6%	30.2%	4.0377	.93977
		University staff (US)	0.0%	18.2%	27.3%	27.3%	27.3%	3.6364	1.12006
		Overall						3.9687	.97539
	Q10A2 The university supervisor solves educational problems that face science student teachers during periodic meetings.	ST	3.8%	11.3%	15.1%	50.9%	18.9%	3.6981	1.03003
		US	0.0%	0.0%	9.1%	45.5%	45.5%	4.3636	.67420
		Overall						3.8125	1.00593

	Q10A3 The university supervisor regularly follows up the science student teacher to motivate them to learn.	ST	3.8%	7.5%	11.3%	56.6%	20.8%	3.8302	.97539
		US	0.0%	0.0%	18.2%	45.5%	36.4%	4.1818	.75076
		Overall						3.8906	.94478
	Q10A4 The university supervisor provides all the references needed by students.	ST	7.5%	17.0%	15.1%	39.6%	20.8%	3.4906	1.21881
		US	0.0%	0.0%	27.3%	36.4%	36.4%	4.0909	.83121
		Overall						3.5938	1.17809
	Q10A5 The student teachers study some courses at university during teaching practice.	ST	1.9%	9.4%	5.7%	52.8%	30.2%	4.0000	.96077
		US	0.0%	0.0%	0.0%	9.1%	90.9%	4.9091	.30151
		Overall						4.1563	.94648
	Q10A6 University tutors are using a variety of teaching methods in their lectures in which possible learning from it.	ST	5.7%	20.8%	11.3%	47.2%	15.1%	3.4528	1.15302
		US	0.0%	0.0%	18.2%	9.1%	72.7%	4.5455	.82020
		Overall						3.6406	1.17334
	Q10A7 University tutors help student teachers understand how to use pedagogy related to their lessons.	ST	5.7%	9.4%	9.4%	52.8%	22.6%	3.7736	1.08560
		US	0.0%	0.0%	0.0%	63.6%	36.4%	4.3636	.50452
		Overall						3.8750	1.03126
	Q10A8 University tutors helps science student teachers to link their learning at the university with learning at school through regular meetings at the university.	ST	7.5%	15.1%	11.3%	50.9%	15.1%	3.5094	1.15397
		US	0.0%	0.0%	36.4%	27.3%	36.4%	4.0000	.89443
		Overall						3.5938	1.12290

	Q10A9 The university supervisor helps student teachers understand the relationship between theory and practical teaching.	**ST**	**5.7%**	**24.5%**	**9.4%**	**43.4%**	**17.0%**	**3.4151**	**1.19990**
		US	**18.2%**	**0.0%**	**0.0%**	**36.4%**	**45.5%**	**3.9091**	**1.51357**
		Overall						**3.5000**	**1.25988**
	Q10A10 The relationship coordinator at the university directs science student teachers' where to get the learning resources.	**ST**	**3.8%**	**24.5%**	**9.4%**	**47.2%**	**15.1%**	**3.4528**	**1.13622**
		US	**18.2%**	**0.0%**	**9.1%**	**63.6%**	**9.1%**	**3.4545**	**1.29334**
		Overall						**3.4531**	**1.15373**
	Q10A11 The relationship coordinator at the university collaborates with the science student teacher to resolve educational problems at university.	**ST**	**5.7%**	**18.9%**	**13.2%**	**39.6%**	**22.6%**	**3.5472**	**1.20202**
		US	**0.0%**	**0.0%**	**0.0%**	**54.5%**	**45.5%**	**4.4545**	**.52223**
		Overall						**3.7031**	**1.16401**

ST= Science student teachers. US= University staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

By looking Table 5.18, we find that the participants agreed that the ways the community at the university supports the student teachers are that these student teachers study some courses at university during teaching practice, which generated the highest agreement (M=4.15, SD=0. 94), followed by the number of students at the lecture hall being reasonable (M=3.96, SD=0.97), that the university supervisor regularly follows up the science student teacher to motivate them to learn (M=3.89, SD=0.94), that the university tutors help student teachers understand how to use pedagogy related to their lessons (M=3.87, SD=1.03), that the university supervisor solves educational problems that face science student teachers during periodic meetings (M=3.81, SD=1.00), that the relationship coordinator at the university collaborates with the science student teacher to resolve educational problems at university (M=3.70, SD=1.16), that university tutors use a variety of teaching methods in their lectures to make learning possible (M=3.64, SD=1.17), that the university supervisor provides all the references needed by students (M=3.59, SD=1.17), that university tutors helps science student teachers to link their learning at the university with learning at school through regular meetings at the university (M=3.59, SD=1.12), that the university supervisor helps student teachers understand the relationship between theory and practical teaching (M=3.50, SD=1.25), and, with least agreement, that the relationship coordinator at the university directs science student teachers where to find learning resources (M=3.45, SD=1.15).

Table 5.19: Differences among groups on items related to the university community

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Learning through the university community	Q10A1 The number of students at the lecture hall is reasonable.	.217	.121	.469	----	----	----
	Q10A2 The university supervisor solves educational problems that face science student teachers during periodic meetings.	.045*	.465	.103	US/ ST	----	----
	Q10A3 The university supervisor regularly follows up the science student teacher to motivate them to learn.	.265	.958	.100	----	----	----
	Q10A4 The university supervisor provides all the references needed by students.	.125	.349	.050*	----	----	Less than 10 years/0 years

	Q10A5 The student teachers study some courses at university during teaching practice.	**.003***	**.751**	**.011***	**US/ ST**	**----**	**Less than 10 years/0 years**
	Q10A6 University tutors are using a variety of teaching methods in their lectures in which possible learning from it.	**.004***	**.619**	**.001****	**US/ ST**	**----**	**Less than 10 years/0 years**
	Q10A7 University tutors help student teachers understand how to use pedagogy related to their lessons.	**.084**	**.698**	**.175**	**----**	**----**	**----**
	Q10A8 University tutors helps science student teachers to link their learning at the university with learning at school through regular meetings at the university.	**.190**	**.976**	**.355**	**----**	**----**	**----**
	Q10A9 The university supervisor helps student teachers understand the relationship between theory and practical teaching.	**.240**	**.002***	**.003***	**----**	**M/F**	**Less than 10 years/0 years** **Less than 10 years/ From 10 to 20 years**
	Q10A10 The relationship coordinator at the university directs science student teachers' where to get the learning resources.	**.996**	**.079**	**.935**	**----**	**----**	**----**
	Q10A11 The relationship coordinator at the university collaborates with the science student teacher to resolve educational problems at university.	**.000****	**.296**	**.056**	**US/ ST**	**----**	**----**

** The mean difference is significant at the .001 level or less.
* The mean difference is significant at the .05 level or less.
---- = No different among groups.
US/ST= The difference between university staff and student teachers in favour of the university staff.
M/F= The difference between males and females in favour of the males.
Less than 10 years/0 years = The difference between less than 10 years and 0 years in favour of the less than 10 years.
Less than 10 years/ From 10 to 20 years= The difference between less than 10 years and from 10 to 20 years in favour of the less than 10 years.

Table 5.19 shows that there were four significant differences between university staff and student teachers, all with university staff perceiving that more support was offered. These four items related to the university supervisor solving educational problems that faced science student teachers during periodic meetings, student teachers studying some courses at university during teaching practice, the university tutors using a variety of teaching methods in their lectures to make learning possible, and the relationship coordinator at the university collaborating with the science student teacher to resolve educational problems at university. Maybe some student teachers did not get enough support to solve the problems that faced them due to the shortness of the period of teaching practice and the brevity of their regular meetings with the university supervisor. Perhaps that university teachers did not use a variety of methods to teach, due to their scientific specialties, and because they did not get training in teaching methods.

There was also a significant difference in relation to the university supervisor helping student teachers understand the relationship between theory and practical teaching, with males showed significantly higher agreement compared to females. Maybe some female students did not get sufficient support or assistance to resolve the problems facing them from their supervisor or the relationship coordinator at the university due to the greater number of female students than male students. However, this significant difference between genders is not discussed in detail because of the very small numbers of participants in most of the categories as mentioned before.

There were also, four significant differences between the experience groups. All of these differences lay between the group of less than 10 years of experience and the group of 0 years of experience, with the former scoring higher than the latter. Those with 10 years of experience were more likely to agree that the university supervisor provides all the references needed by students, that the student teachers study some courses at university during teaching practice, that the university tutors use a variety of teaching methods in their lectures, and that the university supervisor helps student teachers understand the relationship between theory and practical teaching, These differences may be due to the presence of new knowledge about teaching and lack of experience for student teachers.

5.2.5.3 Learning through the relationship between school and university communities

Table 5.20: Descriptive statistics for learning through the relationship between school and university, by job group

Sub-topic	Items	Group	S.D	D	N	A	S.A	Mean	SD
Learning through the relationship between school / university	Q3A1 The university and the school have different institutions and have different perspectives about science teaching and learning to teach science.	Student teacher (ST)	1.9%	11.3%	5.7%	39.6%	41.5%	4.0755	1.05337
		University staff (US)	0.0%	0.0%	18.2%	36.4%	45.5%	4.2727	.78625
		School staff (SS)	0.0%	22.2%	0.0%	55.6%	22.2%	3.7778	1.05003
		Overall						4.0110	1.02734
	Q3A2 School teachers consider science student teachers as regular teachers.	ST	13.2%	17.0%	11.3%	41.5%	17.0%	3.3208	1.31227
		US	0.0%	0.0%	0.0%	100.0%	0.0%	4.0000	.00000
		SS	3.7%	25.9%	0.0%	44.4%	25.9%	3.6296	1.24493
		Overall						3.4945	1.22360
	Q3A3 These differences of views between the university and the school cause a problem for science student teachers.	ST	0.0%	11.3%	11.3%	45.3%	32.1%	3.9811	.95052
		US	0.0%	18.2%	0.0%	36.4%	45.5%	4.0909	1.13618
		SS	11.1%	29.6%	3.7%	48.1%	7.4%	3.1111	1.25064
		Overall						3.7363	1.13368

ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

By looking Table 5.20, we find that participants agreed that the university and the school are different institutions and have different perspectives about science teaching and learning to teach science. This item had the highest level of agreement (M=4.01, SD=1.02), followed by the third item (These differences of views between the university and the school cause a problem for science student teachers) (M=3.73, SD=1.13) and, lastly, by the second item (School teachers consider science student teachers as regular teachers) (M=3.49, SD=1.22).

Table 5.21: Differences among groups on learning through the relationship between school and university

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
Learning through the relationship between school / university	**Q3A1** The university and the school have different institutions and have different perspectives about science teaching and learning to teach science.	.318	.896	.758	----	----	----
	Q3A2 School teachers consider science student teachers as regular teachers.	.196	.124	.401	----	----	----
	Q3A3 These differences of views between the university and the school cause a problem for science student teachers.	.002*	.855	.019*	SS/US SS/ST	----	0 years/10 to 20years

* The mean difference is significant at the .05 level or less
---- = No different among groups.
US/ST= The difference between university staff and student teachers in favour of the university staff.
0 years / From 10 to 20 years= The difference between 0 years and from 10 to 20 years in favour of the 0 years.

In general, regarding participants' perspectives on the relationship between university and school in science teachers' preparation, the results show a difference between the three job groups. Student teachers had little experience of how the school and the university staff worked together, therefore their view of this matter was not clear; perhaps part of their experience was with the school staff and the other part with the university staff. There was a significant difference of views between the university and the school staff, which could cause a problem for science student teachers. The difference of views revealed in this question is related to the problems that arise due to the different systems, of university and school. Some school staff acknowledged that there are problems for science student teachers because of this difference, while others thought that this difference did not affect the science student teachers.

Also, the results here indicate that gender had no effect on perceptions of the relationship between university and school in the trainee science teachers' placement experiences.

In addition, the perspectives about the relationship between university and school in science teachers' preparation differed somewhat by years of experience. As shown in Table 5.21, the item on differences of views between the university and the school causing a problem for science student teachers, there was a statistically significant difference between those with least experience, who found this clash to be a problem, and those with many years of experience who found it less of a problem. It is reasonable to expect a divergence in thinking between those who are inexperienced and those who have expertise. Usually, new teachers may feel problems acutely but after a few years some problems will have become normal issues.

5.2.6 Division of labour

This topic is divided into five sub-topics: the university coordinator's role, the headteacher's role, the university supervisor's role, the cooperating teacher's role, and the science student teachers' role. Table 5.22 shows the descriptive statistics of the responses to these questions.

5.2.6.1 The role and responsibilities of the relationship coordinators

Table 5.22: Descriptive statistics for roles and responsibilities by job group

Sub-topic	Items	Groups	S.D	D	N	A	S.A	Mean	SD
The university coordinator's role	Q11A1 The university coordinator's role is managing and organizes of admission to the teaching practice course.	Student teacher (ST)	1.9%	15.1%	13.2%	47.2%	22.6%	3.7358	1.04054
		University staff (US)	0.0%	0.0%	0.0%	9.1%	90.9%	4.9091	.30151
		School staff (SS)	0.0%	3.7%	18.5%	66.7%	11.1%	3.8519	.66238
		Overall						3.9121	.95042
	Q11A2 The university coordinator's role is supporting for science student teachers and coordination with school when there are problems to be solved.	ST	1.9%	15.1%	24.5%	47.2%	11.3%	3.5094	.95319
		US	0.0%	0.0%	0.0%	36.4%	63.6%	4.6364	.50452
		SS	0.0%	11.1%	7.4%	63.0%	18.5%	3.8889	.84732
		Overall						3.7582	.94682
	Q11A3 The university coordinator's role is confirmation of quality assurance of all work related to the teaching practice programme.	ST	3.8%	13.2%	18.9%	49.1%	15.1%	3.5849	1.02721
		US	0.0%	0.0%	0.0%	54.5%	45.5%	4.4545	.52223
		SS	0.0%	11.1%	11.1%	48.1%	29.6%	3.9630	.93978
		Overall						3.8022	.99129
The headteacher's role	Q11A4 The headteacher's role is receiving science student teachers and provides them an appropriate place and timetable at school.	ST	1.9%	15.1%	5.7%	52.8%	24.5%	3.8302	1.03284
		US	0.0%	0.0%	0.0%	18.2%	81.8%	4.8182	.40452
		SS	3.7%	3.7%	3.7%	55.6%	33.3%	4.1111	.93370
		Overall						4.0330	.99388

	Q11A5 The headteacher's role is introducing science student teachers to their role, duties and rights at school.	**ST**	**3.8%**	**11.3%**	**15.1%**	**47.2%**	**22.6%**	**3.7358**	**1.05886**
		US	**0.0%**	**0.0%**	**0.0%**	**45.5%**	**54.5%**	**4.5455**	**.52223**
		SS	**0.0%**	**3.7%**	**0.0%**	**70.4%**	**25.9%**	**4.1852**	**.62247**
		Overall						**3.9670**	**.93631**
	Q11A6 The headteacher's role is helping science student teachers to integrate with the school community.	**ST**	**3.8%**	**13.2%**	**9.4%**	**54.7%**	**18.9%**	**3.7170**	**1.04472**
		US	**0.0%**	**0.0%**	**18.2%**	**63.6%**	**18.2%**	**4.0000**	**.63246**
		SS	**0.0%**	**11.1%**	**3.7%**	**55.6%**	**29.6%**	**4.0370**	**.89792**
		Overall						**3.8462**	**.96521**
	Q11A7 The headteacher's role is evaluating science student teachers activities periodically at school.	**ST**	**1.9%**	**22.6%**	**13.2%**	**41.5%**	**20.8%**	**3.5660**	**1.11820**
		US	**0.0%**	**0.0%**	**18.2%**	**36.4%**	**45.5%**	**4.2727**	**.78625**
		SS	**0.0%**	**18.5%**	**7.4%**	**48.1%**	**25.9%**	**3.8148**	**1.03912**
		Overall						**3.7253**	**1.07565**
	Q11A8 The headteacher's role is solving the problems of science student teachers during teaching practice.	**ST**	**1.9%**	**9.4%**	**7.5%**	**49.1%**	**32.1%**	**4.0000**	**.98058**
		US	**0.0%**	**18.2%**	**0.0%**	**45.5%**	**36.4%**	**4.0000**	**1.09545**
		SS	**0.0%**	**7.4%**	**11.1%**	**59.3%**	**22.2%**	**3.9630**	**.80773**
		Overall						**3.9890**	**.93683**
The university supervisor's role	**Q11A9 The university supervisor's role is motivating science student teachers to carry out the required role within the teaching practice programme.**	**ST**	**1.9%**	**13.2%**	**11.3%**	**49.1%**	**24.5%**	**3.8113**	**1.02012**
		US	**0.0%**	**18.2%**	**0.0%**	**54.5%**	**27.3%**	**3.9091**	**1.04447**
		SS	**0.0%**	**11.1%**	**11.1%**	**51.9%**	**25.9%**	**3.9259**	**.91676**
		Overall						**3.8571**	**.98400**
	Q11A10 The university supervisor's role is integrating with the cooperating teacher for the development of the science student teachers.	**ST**	**3.8%**	**9.4%**	**9.4%**	**41.5%**	**35.8%**	**3.9623**	**1.09126**
		US	**0.0%**	**0.0%**	**0.0%**	**27.3%**	**72.7%**	**4.7273**	**.46710**
		SS	**0.0%**	**3.7%**	**11.1%**	**48.1%**	**37.0%**	**4.1852**	**.78628**
		Overall						**4.1209**	**.97565**

	Q11A11 The university supervisor's role is continuing assessment of the student teachers in the teaching practice programme and gives them feedback to fill the gaps in their learning and to linking theory with practice through doing weekly meetings with them.	**ST**	**1.9%**	**5.7%**	**15.1%**	**49.1%**	**28.3%**	**3.9623**	**.91908**
		US	**18.2%**	**0.0%**	**9.1%**	**9.1%**	**63.6%**	**4.0000**	**1.61245**
		SS	**3.7%**	**0.0%**	**18.5%**	**48.1%**	**29.6%**	**4.0000**	**.91987**
		Overall						**3.9780**	**1.01081**
The cooperating teacher's role	**Q11A12 The cooperating teacher's role is clear on what he/she can do and what the science student teachers expect.**	**ST**	**1.9%**	**17.0%**	**13.2%**	**41.5%**	**26.4%**	**3.7358**	**1.09458**
		US	**0.0%**	**18.2%**	**0.0%**	**27.3%**	**54.5%**	**4.1818**	**1.16775**
		SS	**0.0%**	**3.7%**	**18.5%**	**55.6%**	**22.2%**	**3.9630**	**.75862**
		Overall						**3.8571**	**1.01731**
The science student teachers' role	**Q11A13 The science student teachers' role is transferring what they have learned for the teachers at the school.**	**ST**	**5.7%**	**20.8%**	**9.4%**	**41.5%**	**22.6%**	**3.5472**	**1.21791**
		US	**0.0%**	**0.0%**	**9.1%**	**27.3%**	**63.6%**	**4.5455**	**.68755**
		SS	**7.4%**	**7.4%**	**3.7%**	**70.4%**	**11.1%**	**3.7037**	**1.03086**
		Overall						**3.7143**	**1.14781**
	Q11A14 The science student teachers' role is implementing the directives of university supervisor and collaborating teacher.	**ST**	**1.9%**	**11.3%**	**7.5%**	**50.9%**	**28.3%**	**3.9245**	**.99709**
		US	**0.0%**	**0.0%**	**0.0%**	**45.5%**	**54.5%**	**4.5455**	**.52223**
		SS	**7.4%**	**0.0%**	**3.7%**	**63.0%**	**25.9%**	**4.0000**	**1.00000**
		Overall						**4.0220**	**.96584**
	Q11A15 Usually, science student teacher carries out other roles for which he/she should not be responsible.	**ST**	**3.8%**	**9.4%**	**17.0%**	**41.5%**	**28.3%**	**3.8113**	**1.07519**
		US	**0.0%**	**27.3%**	**18.2%**	**27.3%**	**27.3%**	**3.5455**	**1.21356**
		SS	**22.2%**	**18.5%**	**25.9%**	**25.9%**	**7.4%**	**2.7778**	**1.28103**
		Overall						**3.4725**	**1.23235**

ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly disagree. D= Disagree. N= Nothing about this. A= agreed. S.A= Strongly agreed.

By looking Table 5.22, we find that the participants agreed with items in the category of the role and responsibilities of the relationship coordinators. The strongest agreement was with the item that the university supervisor’s role is integrating with the cooperating teacher for the development of the science student teachers (M=4.12, SD=0.97), followed by the head teacher’s role as receiving science student teachers and providing them an appropriate place and timetable at school (M=4.03, SD=0.99), the science student teachers' role as implementing the directives of university supervisor and collaborating teacher (M=4.02, SD=0.96), the headteacher’s role as solving the problems of science student teachers during teaching practice (M=3.98, SD=0.93), the university supervisor’s role as continuing assessment of the science student teachers in the teaching practice programme and giving them feedback to fill the gaps in their learning and to link theory with practice through doing weekly meetings with science student teachers (M=3.97, SD=1.01), the headteacher’s role as introducing science student teachers to their role, duties and rights at school (M=3.96, SD=0.93), the university coordinator's role as managing and organizing admission to the teaching practice course (M=3.91, SD=0.95), the cooperating teacher’s role as clear on what he/she can do and what the science student teachers expect (M=3.85, SD=1.01), the university supervisor’s role as motivating science student teachers to carry out the required role within the teaching practice programme (M=3.85, SD=0.98), the headteacher’s role as helping science student teachers to integrate with the school community (M=3.84, SD=0.96), the university coordinator's role as confirming quality assurance of all work related to the teaching practice programme (M=3.80, SD=0.99), the university coordinator's role as supporting science student teachers and coordinating with school when there are problems to be solved (M=3.75, SD=0.94), the headteacher’s role as evaluating science student teachers’ activities periodically at school (M=3.72, SD=1.07), the science student teachers' role as transferring what they have learned from the teachers at the school (M=3.71, SD=1.14) and, with least agreement, that the science student teacher usually carries out other roles for which he/she should not be responsible (M=3.47, SD=1.23).

Table 5.23: Differences among groups for roles and responsibilities

Sub-topic	Items	Significance level			Nature of difference		
		Job	Gender	Years of experience	Job	Gender	Years of experience
The university coordinator's role	Q11A1 The university coordinator's role is managing and organizes of admission to the teaching practice course.	.001**	.499	.120	US/ST US/SS	----	----
	Q11A2 The university coordinator's role is supporting for science student teachers and coordination with school when there are problems to be solved.	.001**	.011*	.029*	US/ST	M/ F	N
	Q11A3 The university coordinator's role is confirmation of quality assurance of all work related to the teaching practice programme.	.016*	.000**	.059	US/ST	M/ F	----
The headteacher's role	Q11A4 The headteacher's role is receiving science student teachers and provides them an appropriate place and timetable at school.	.009*	.979	.134	US/ST	----	----
	Q11A5 The headteacher's role is introducing science student teachers to their role, duties and rights at school.	.010*	.158	.042*	US/ST	----	N
	Q11A6 The headteacher's role is helping science student teachers to integrate with the school community.	.323	.081	.283	----	----	----
	Q11A7 The headteacher's role is evaluating science student teachers activities periodically at school.	.122	.203	.381	----	----	----
	Q11A8 The headteacher's role is solving the problems of science student teachers during teaching practice.	.986	.586	.427	----	----	----

The university supervisor's role	**Q11A9 The university supervisor's role is motivating science student teachers to carry out the required role within the teaching practice programme.**	**.873**	**.084**	**.676**	**----**	**----**	**----**
	Q11A10The university supervisor's role is integrating with the cooperating teacher for the development of the science student teachers.	**.054**	**.280**	**.314**	**----**	**----**	**----**
	Q11A11 The university supervisor's role is continuing assessment of the science student teachers in the teaching practice programme and gives them feedback to fill the gaps in their learning and to linking theory with practice through doing weekly meetings with science student teachers.	**.985**	**.957**	**.999**	**----**	**----**	**----**
The cooperatin	**Q11A12 The cooperating teacher's role is clear on what he/she can do and what the science student teachers expect.**	**.342**	**.279**	**.567**	**----**	**----**	**----**
The science student teachers' role	**Q11A13 The science student teachers' role is transferring what they have learned for the teachers at the school.**	**.030***	**.376**	**.445**	**US/ST**	**----**	**----**
	Q11A14 The science student teachers' role is implementing the directives of university supervisor and collaborating teacher.	**.110**	**.311**	**.642**	**----**	**----**	**----**
	Q11A15 Usually, science student teacher carries out other roles for which he/she should not be responsible.	**.001****	**.470**	**.008***	**ST/SS**	**----**	**0 years/ From 10 to 20 years**

Q11A14: showing the results of non-parametric tests (Mann-Whitney and Kruskal-Wallis).
** The mean difference is significant at the .001 level or less.
* The mean difference is significant at the .05 level or less.
---- = No different among groups.
N= The difference does not appear by Bonferroni Post-Hoc Test.
M/F= The difference between males and females in favour of the males.
US/SS = The difference between university staff and school staff in favour of the university staff.
US/ST= The difference between university staff and student teachers in favour of the university staff.
ST/SS= The difference between student teachers and school staff in favour of the student teachers.
0 years / From 10 to 20 years= The difference between 0 years and from 10 to 20 years in favour of the 0 years.

Tables 5.23 show that some of these differences were statistically significant. There were significant differences in perceptions about the university coordinator's role as managing and organizing admission to the teaching practice course between university staff and students, and between university staff and school staff; it seems that the students and school staff agreed that the university coordinators did not do their part as required. This may be due to lack of relationship between the university and schools. There were significant differences between university staff and students regarding the university coordinator's role as supporting science student teachers and coordinating with the school when there are problems to be solved, and confirming quality assurance of all work related to the teaching practice programme. Similarly, there were significant differences in perception between university staff and students concerning the head teacher's role as receiving science student teachers and providing them an appropriate place and timetable at school, and as introducing science student teachers to their role, duties and rights at school. They also had differences in perception of the science student teachers' role as transferring what they have learned from the teachers at the school. It seems that the students believed that the coordinators of the university did not do their part as required due to overlapping roles or lack of knowledge about their roles. The roles may not be clear for relationship coordinators.

Finally, there was a difference in perception between the school staff and student teachers over the latter carrying out other roles for which he/she should not be responsible. Maybe some schools believe that the student teachers are an opportunity to ease the burden on the school and the teachers. Perhaps the science student teachers did not know the roles assigned to them and see that these place burdens on them.

Overall, men and women viewed the roles and responsibilities of the university coordinators in a different way. Men were more likely than women to see the role as supporting science student teachers and coordinating with school when there are problems to be solved, and as confirming quality assurance of all work related to the teaching practice programme, It seems that the roles were not clear for women, probably because the teaching practice unit is in the men's section. Also there are larger numbers of women than men, therefore this did not allow them to understand the roles assigned to the relationship coordinators. Possibly, also, the coordination in the women's section is weak. Also, these findings between gender can only be regarded as tentative indications of difference due to the sample sizes as mentioned previously.

There were also differences by years of experience group in perceptions of the roles and responsibilities of the relationship coordinators that, the university coordinator's role is supporting science student teachers and coordinating with the school when there are problems to be solved, and that the headteacher's role is introducing science student teachers to their role, duties and rights at school; but the post hoc test did not identify these differences as existing between any two particular experience groups. Concerning the science student teacher carrying out other roles for which he/she should not be responsible, there was a significant difference between the group of 0 years and the group of 10 to 20 years. Maybe the group of 10 to 20 years were enthusiastic to provide experience for student teachers in their teaching practice; also their roles may not have been clear.

5.3 Summary

The quantitative data have been presented and discussed in this chapter through tables of descriptive statistics and differences among groups according to job, gender and years of experience for all participants and all dimensions of the questionnaires congruent with the Activity Theory categories.

The sub-topics representing the Activity Theory categories in the questionnaire are: expectations of how students learn to teach science, the perceptions about a good teacher, the difficulties during teaching practice, what the university and school want to achieve through the programme of teacher preparation and teaching practice, tools for the development of the student teachers in teaching at the university and schools, the regulations and laws governing the teacher preparation programme at the university and schools, learning through the school community, learning through the university community, learning through the relationship between school and university, and the roles and responsibilities of the relationship coordinators in supporting and assisting the science student teachers. It is clear that the questionnaire provided information on Activity Theory categories that reveal some points of support, difficulties, and contradictions inherent in the participants' views about learning of teaching for the science student teachers at the university, school, and the joint programme between them.

Chapter Six

Qualitative findings and making sense of the data

6.1 Introduction

The qualitative data were collected through semi-structured interviews and open-ended questions on the questionnaire, according to the strategy described in Chapter 4. The interviews and open-ended questions on the questionnaire were analysed qualitatively. In this section, an overview is given of all the elements of the analysis in the light of the Activity Theory elements. Activity Theory contributed, through its framework, to identifying the themes, codes and sub-codes which arose from the data. These are presented along with tables at the beginning of every Activity Theory element. The tables display the themes and sub themes and so show how the data were organized and coded; they use a small number of examples of participants' quotes to illustrate in participants' own words the kinds of ideas that were included in each theme and sub theme. Each table is followed by a detailed presentation of each element of the analysis, which draws not just on the quotes in the tables, but on the responses of all of the participants. A brief discussion of particular aspects of these findings is included, where necessary, though more extended discussion of the overall findings is reserved for the next chapter. Finally, in this chapter, a summary is given of the results of the data analysis.

Where attention is drawn to the responses of particular types of respondent (university supervisor, female headteacher etc) it should be remembered that even the total numbers of respondents in these subsamples (not just the numbers quoted in the tables) was often small. Differences and suggested explanations should therefore be read as indications of *possible* differences and possible foci for subsequent research, rather than substantive findings in their own right.

Table 6.2 Subject element of Activity Theory: perceptions of a good teacher

AT= Activity Theory; PDT = Personal development of the teacher; SFTP = The special features of teacher personality; KPA = The knowledge of pedagogical aspects; KTS = The knowledge of teaching skills; FCSC = The content knowledge of science curriculum; ST= Student teacher ; FST= Female student teacher; T= Teacher; FT= Female teacher; HT= Headteacher; FHT= Female headteacher; US= University supervisor; FUS= Female university supervisor; UC= University coordinator; FUC= Female university coordinator; OEQScT= Open ended questioner school teacher; OEQStT= Open ended questioner student teacher; OEQUT= Open ended questioner university tutor.

AT	Themes	Codes	Example
6.2. Subject	**6.2.1. Perceptions about a good teacher**	6.2.1.1. PDT	“A good teacher wants to develop himself and market himself through continuous education.” (US1)
		6.2.1.2. SFTP	6.2.1.2.1. Regularity and commitment to the laws of the education profession: “The most important moral characteristic of the good teacher is respecting the teaching profession." (FUS1) "The good teacher should [have] commitment to the school rules." (ST4)
			6.2.1.2.2. Being able to communicate and deliver information to pupils: "The good teacher listens and accepts pupils' ideas, whether wrong or right" (FST3). "The good teacher can communicate information to female pupils in different ways, developing the girls’ ideas, and absorbing information" (FT3).
			6.2.1.2.3. Flexibility in dealing with pupils: "The good teacher should have flexibility with pupils, in terms of dealing with them to achieve better communication between pupils and teacher" (FST3) "The good teacher must ascribe to attributes such as good dealing with female pupils" (FUS1).
			6.2.1.2.4. Patience "The good teacher must be patient with pupils" (T2)

			"The good teacher is characterized by educators' value such as patience" (HT2).
			6.2.1.2.5. Good moral character: "The good teacher must be characterized by good morals" (FST1). "…characterised by the educators' value (contentment, counseling, reform, justice, honesty, etc...)" (HT2).
		6.2.1.3. KPA	6.2.1.3.1. The ability to consider the age characteristics of pupils: "He must have the skills to know [pupils'] growth characteristics, the ability to study cases" (US2).
			6.2.1.3.2. The ability to consider individual differences among pupils: "A good teacher must get [into] the modern educational style and take individual differences into account" (FT1).
			6.2.1.3.3. Use of teaching aids: "A good teacher should support the educational subject by educational means which facilitate comprehending the lesson well by the student" (FST3). "A good teacher must master modern technologies in the modern curricula" (FUS2).
		6.2.1.4. KTS	Dealing with curriculum and pupils: "A good teacher should be good at dealing with the curriculum and pupils" (FUC1). Using interactive teaching methods, mental preparation and planning for teaching: "A good teacher should acquire the minimum limit of teaching skills such as using interactive teaching methods, mental preparation, and lesson planning" (FUS1). Posed by the student" (FST3). Vocal skills: "A good teacher should have vocal skills" (T1). The ability to stand in front of pupils, and diction: "A good teacher should have the ability to stand in front of the pupils and [have good] diction" (FST2).
		6.2.1.5. FCSC	"A good teacher should have the ability to understand the educational subjects well in terms of its inputs and outputs, to be able to answer any question that may possibly be posed by the student" (FST3).

6.2. Subject

6.2.1. Perceptions of a good teacher

The theme summarized in Table 6.2 was formed of five codes, some of which were made up of sub-codes. These were: the personal development of the teacher, the special features of teacher personality, the knowledge of pedagogical aspects, the knowledge of teaching skills, and the content knowledge of the science curriculum.

6.2.1.1. Personal development of the teacher

It is clear that a teacher’s commitment to his or her personal development is seen as a characteristic of a good teacher. The concept of teacher preparation is not complete without his/her self-development during teaching practice and in later stages of their career. In the sample as a whole, there was an absence of comments on development, training and creativity aspects by the female school staff, as well as by science student teachers, who did not give any perceptions about these characteristics despite their importance. This may be due to the limitations of experience and practice of the science student teachers. They did not take into account the process of self-development and, perhaps due to the fact that they were still under preparation, believed that this preparation was enough for them at the time.

The majority of views on personal development came from the university team, which focused on continuous self-development and the importance of students’ own goals for the learning process. On this topic, one of the university supervisors stated that: "A good teacher [is one] who has national goals and aspires to provide the national project, as well as wants to develop himself and market himself through continuous education" (US1). The university supervisor of female students expressed the view that a good teacher "should be familiar with new developments in the field of teaching" (FUS1). While another female supervisor added that: “A good teacher should have the desire and tendency to teach and accept directives, as well as access new developments in the teaching field" (FUS2).

While the university supervisors focused on self-development of the teachers, the headteachers focused on creativity and the processes of training. In this regard, one headteacher said that: "A good teacher should be creative and self-renewing" (HT1). The other added that a good teacher "should have the desire to train and access new developments in his specialty" (HT2). While one of the teachers thought that a good teacher "should love reading and [be] well-cultured. (T2).

This is consistent with the view that the initial teacher preparation curriculum can never be sufficient, but that teachers always need further training in-service. The quantitative data in this research show that 57.2% of the participants were looking to in-service training courses as an important academic resource to develop teachers. This may have reflected the personality of a teacher who believed that most of the workers in the school and university should undertake self-development.

6.2.1.2. The personal characteristics of a good teacher

This code was formed of six sub-codes: regularity and commitment to the laws of the education profession, learning how to communicate and deliver information to pupils, flexibility in dealing with pupils, patience, and good moral character. These in turn formed the expectations of a good teacher.

6.2.1.2.1. Regularity and commitment to the laws of the education profession

It is clear that understanding and acting in accordance with the rules, both at national and local school levels, is seen as a characteristic of a good teacher. The personal features of a good teacher come about mostly through regularity, work commitment, and being consistent in attending school classes.

There was a consensus of 50% of the students that commitment is an important feature in the characteristics of a good teacher, both commitment to attending classes or commitment to the rules of behaviour. One science student teacher asserted that the "most important characteristic for good teacher is punctuality" (ST1). While another added that the good teacher "should [have] commitment to the school rules" (ST4). Another student teacher expressed the view that: "The good teacher [is one] who can interact with school and school management" (ST3), while a female student teacher saw that the good teacher "must be punctilious towards teaching, pupils, other teachers and all aspects of the work of teaching" (FST4).

Some of the male teachers also stressed the discipline of the teacher in his work: "The good teacher is disciplined in his work" (T2); while another added that: “The good teacher is disciplined and punctual towards teaching" (T1). While the female headteacher indicated that: "The good teacher has sincerity in his work, seriousness, and punctuality" (FHT1).

The comments of the female teachers at school did not include mention of regularity or commitment. Perhaps the female teachers did not emphasize the issue of commitment and discipline as seen by the male teachers, because the female teachers may have fewer responsibilities outside of school than the males and thus are more disciplined at school. The females are not allowed to drive a car, at least not until this moment. Therefore the man, whether her father, husband or her brother usually delivers her to the places she need to visit (e.g. government departments). Thus this increases the chances of males leaving school to do some important things during the work time of these government departments. Hopwever, the female teachers might carry a bigger load in the family (e.g. childcare, care of the husband or elderly parents) within houses. The other participants, such as university supervisors and coordinators, also did not mention the issue of regularity and commitment, perhaps because at the beginning of teaching practice all science student teachers are committed to work in the school and there is no problem about this issue.

6.2.1.2.2. Being able to communicate and deliver information to pupils

It is clear that the ability to communicate and deliver information to pupils is seen as a characteristic of a good teacher. This personal feature was emphasised by most of the female participants. For example, a female student teacher stated: "The good teacher listens and accepts pupils' ideas, whether wrong or right" (FST3). Another added: “The good teacher can communicate information to his pupils easily" (T3); another female teacher said: "The good teacher can communicate information to female pupils in different ways, developing the girls' ideas, and absorbing information" (FT3). Also, one of the female headteachers emphasised: "The good female teacher should be capable of communicating information soundly to female pupils" (FHT2).

The absence of comments by the university staff on communication and delivery of information to pupils was possibly due to this issue being more important to the school staff due to their experience in teaching the pupils. Communication may also be considered as more of a critical issue for females, because there were no responses from the males (except for one teacher). It is hard to account for this difference.

6.2.1.2.3. Flexibility in dealing with pupils

The sub-code of flexibility in dealing with pupils made up one of the features of a good teacher which was quoted by most of the female students and one female supervisor, as expected of the good teacher. For example, a student teacher stated: "The good teacher must be good at dealing with pupils" (ST3). Another female student teacher said: "The good teacher should have flexibility with pupils, in terms of dealing with them to achieve better communication between pupils and teacher" (FST3); another female of science student teachers added that "A good teacher must deal sympathetically with female pupils and dealing with them in a good manner" (FST4). It's interesting that female teachers focussed on communication with female pupils and implied that there were differences between this and communication with male pupils. Most females, in my belief, like this flexibility; one of the female university supervisors, for example, stated: "The good teacher must ascribe to attributes such as good dealing with female pupils" (FUS1).

6.2.1.2.4. Patience

This quality reflects teachers' concerns about the value of education. Obviously the work of teachers requires much patience with pupils. It is clear that patience is seen as a characteristic of a good teacher. The teacher interviewees expected that: "The good teacher must be patient with pupils" (T2); "The good teacher [is one] who can be patient with pupils" (T3). One of headteachers said: "The good teacher is characterized by educators’ value such as patience" (HT2). It is an interesting point that male teachers emphasized patience with pupils while the female teachers did not; whereas the females focused on communication with female pupils. The absence of responses from the university team could be because they do not deal with pupils on a day to day basis as do the student teachers and the school staff, both of whom have to deal regularly with difficult teenagers and easily distracted young pupils.

6.2.1.2.5. Good moral character

There are also some general qualities that are expected to be possessed by the good teacher. For example, a student teacher stated: "The good teacher should be honest, to be an example for his pupils” (ST1). Another said: "The good teacher has to set a good example in the education environment" (ST4). A female student teacher added: "The good teacher must be characterized by good morals" (FST1).

Two headteachers stated that the good teacher must be "characterizing by good morals" (T2); "Her morals are good, strong personality, capable of self-control, good example for her female pupils (FT1); "balanced in his emotion" (HT1); “characterized by the educators’ value (contentment, counseling, reform, justice, honesty, etc...)" (HT2).

The absence of comments on moral aspects by the university staff is noteworthy. This shows that the experience of the school staff has a role in determining certain features which they see as having great significance by virtue of their practice in the school workplace.

6.2.1.3. The knowledge of pedagogical matters

This code was formed of three sub-codes: the ability to consider the age characteristics of pupils, the ability to consider individual differences among pupils, and use of teaching aids. These formed part of the expectations of a good teacher.

6.2.1.3.1. The ability to consider the age characteristics of pupils

One of the university supervisors expected that a good teacher must have professional aspects such as: "He must have the skills to know [pupils'] growth characteristics, the ability to study cases" (US2). Because the student teachers may practise teaching in primary, middle or secondary schools, they should know the different age characteristics of pupils at every stage.

6.2.1.3.2. The ability to consider individual differences

In terms of recognizing individual differences among pupils, six interviewees highlighted this sub-code. "A good teacher [is] expected to be knowledgeable of individual differences among pupils" (ST2), (ST4), (FST4), (FUS1). Another female student teacher added: "Knowledge of individual differences among pupils and this is above all" (FST2).

One of the female teachers linked modern educational styles with taking into account individual differences. "A good teacher must get [into] the modern educational style and take individual differences into account" (FT1).

It's interesting that most of the responses and comments about individual differences came from science student teachers. This is probably because there are some modules in the teacher preparation programme at the university that focus on growth characteristics and individual differences, and these influenced the perspectives of science student teachers about what constitutes a good teacher.

6.2.1.3.3. Use of teaching aids

It is clear that using teaching aids is seen as a characteristic of a good teacher. Some participants believed that a good teacher should use teaching aids that fit with modern science curricula. Strangely enough, all who mentioned this were female participants. Two student teachers of them said: “A good teacher should use some of the scientific and modern tools” (FST1); “A good teacher should support the educational subject by educational means which facilitate comprehending the lesson well by the student” (FST3). One of the female university supervisors confirmed the need to master modern technologies to facilitate lessons for pupils, as she said: “A good teacher must master modern technologies in the modern curriculum” (FUS2).

Through the quantitative data in this research, 75% of participants looked at science teaching aids as important tools in the processes of teaching and learning in the school, while 45% looked at the importance of teaching aids for learning at the university. Therefore, the science student teachers considered teaching aids as very important learning tools. The absence of comments from males may be due to some boys’ schools suffering from lack of teaching aids, leading to a lack of interest in this aspect of teaching.

6.2.1.4. The knowledge of teaching skills

The knowledge of teaching skills is seen as a characteristic of the good teacher. Some opinions offered by four interviewees as expectations of a good teacher focused on teaching skills. For example, one of the university coordinators mentioned that: “A good teacher should be good at dealing with the curriculum and pupils" (FUC1). But the university supervisor emphasized that: “A good teacher should acquire the minimum limit of teaching skills such as using interactive teaching methods, mental preparation, and lesson planning" (FUS1). Another teacher at the school added: “A good teacher should have vocal skills" (T1). Considering that the student teachers are new to teaching practice, one of them added that: “A good teacher should have the ability to stand in front of the pupils and [have good] diction" (FST2).

It is clear that each of the participants had some important priorities concerning the qualities that characterize a good teacher. While some emphasized the knowledge of teaching skills, others, who missed their responses on this code, may have believed that the knowledge comes through experience and long practice of teaching. Therefore we find that one of the school staff reported that vocal skills were sometimes lacking when student teachers began in the classroom, because of shyness, particularly for females, where in KSA culture it is regarded as inappropriate for women to raise their voices. Because of this, females from the university staff were usually keen on teaching vocal skills through a training course held for a week before students began teaching practice.

6.2.1.5. The content knowledge of the science curriculum

It is clear that the content knowledge of the science curriculum was seen as a characteristic of a good teacher. Ten of the participants' interviews highlighted the importance of the scientific aspect for a good teacher. Seven of them agreed that: “A good teacher should be familiar with the scientific subject as a whole" (HT1), (FST4), (FST1), (FT1), (FST2), (T2), (UC1). Some of the students added other views, for example: “A good teacher should be familiar with the science curriculum and be erudite in his specialization" (ST1); “The good teacher should have the ability to understand the educational subjects well in terms of its inputs and outputs, to be able to answer any question that may possibly be posed by the student" (FST3). The university supervisor emphasized the importance of the scientific aspect for a good teacher, such as: "He must have [at least] a minimum amount of scientific content" (US2).

Interestingly, there was an absence of perspectives from the university female staff about the content knowledge of the science curriculum. This is consistent with a particular focus on teaching skills by female university staff, while the male university staff were more focusing both on teaching skills and learning of scientific content.

Table 6.2.1 Subject elements of Activity Theory: background

AT= Activity Theory; PE= Personal experience; TT= Teachers and tutors; MC= Modern curriculum; TPP= Teacher preparation programme; At= Attitudes; ST= Student teacher ; FST= Female student teacher; T= Teacher; FT= Female teacher; HT= Headteacher; FHT= Female headteacher; US= University supervisor; FUS= Female university supervisor; UC= University coordinator; FUC= Female university coordinator; OEQScT= Open ended questioner school teacher; OEQStT= Open ended questioner student teacher; OEQUT= Open ended questioner university tutor.

AT	Themes	Codes	Example of the data
6.2. Subject	6.2.2. Background	6.2.2.1. PE	"When I went to school for teaching practice [I was] surprised that most of the school's female teachers are not trained in these modern methods or modern curricula. There is an older generation of female teachers who are not trained in the modern curricula or pedagogical skills in teaching."(FST2)
		6.2.2.2. TT	"As well, the University tutors are regarded as an example for most student teachers" (FUS2).
		6.2.2.3. MC	"I am a teacher at secondary school, but I felt weak in the professional and educational aspects, especially with the implementation of the modern curriculum, so I decided to study the educational programme to learn a lot about teaching methods and curricula."(OEQStT)
		6.2.2.4. TPP	"Completely different, what is taught at university through the educational programme is something and what is applied in schools through teachers is another thing." (FST4)
		6.2.2.5. At	"I think that teaching is a comfortable field for women, even after marriage that helps them in raising their children." (OEQStT) "I am an administrative employee at the university, but I wanted to get on the Educational Diploma programme in order to get the upgrade. I would like to complete a master's and then try to turn to university teaching." (OEQStT)

6.2.2 Background

6.2.2.1 Personal experience

Half of the interviewees highlighted the importance of personal experience in shaping their perspectives about a good teacher. For example, some of student teachers stated: “When I went to school for teaching practice [I was] surprised that most of the school's female teachers are not trained in these modern methods or modern curricula. There is an older generation of female teachers who are not trained in the modern curricula or pedagogical skills in teaching” (FST2). Also, another female student said: "Really, many of the female student teachers do not have all the characteristics of good teachers at the beginning of teaching practice, but the stages of the study made us distinguish good teachers from bad teachers. However... do the main female teachers at the school have these characteristics? As I noted, the female student teachers are characterized by energy and are more active than those female teachers at school who are only interested in the salary they get at the end of each month" (FST3).

Another student also noticed the great age of a teacher: “[The] teacher at the school is not trained in modern curricula and he is of great age and has not developed himself” (ST2).

It is clear that the science student teachers noticed some bad characteristics of teachers during their personal experience in the school and, in contrast, formed their perspectives about what the characteristics of a good teacher should be, such as self-development.

Other teachers at the school said: “They vary among themselves due to the lack of courses. Subsequently, they do not realize the modern curriculum requirements because they are non-developers of themselves, in addition to the lack of educational courses” (FT1). Another female teacher added that: "Some students have the characteristics of a good teacher and some of them do not and will not possess [these characteristics] due to [their not being] owned by the collaborating female teachers, as these are of an older generation who have not developed themselves" (FT2). While another teacher discussed the existence of the teacher cooperator at school where he argued that: "Some schools did not have a collaborating teacher and in other schools there is a collaborating teacher but not an educational teacher; also [they are] not fluent in dealing with the teaching skills" (T2).

It is clear that collaborator teachers noticed some bad characteristics of teachers through their personal experience within the school, and formed their views about the characteristics of a good teacher, which may be a reflection of the lack of teacher development programmes.

Some of the headteachers mentioned that:

> Through my experience in the administration, the situation in some schools is very bad. Not all student teachers are trained to these curricula, and even the school teachers, not all have been trained to these curricula. This is due to the lack of courses and workshops that develop teachers. There is a gap between the schools, the education authority and the universities. (FHT1)

Another of the headteachers added that:

> The student teachers come to school loaded with modules that are studying at university in the same time with teaching practicing and their educational potential is weak, relying on intercession for the choice of the school headmaster who submits his report, increasing the embarrassment of the administration. In return, the trainee does not take much advantage - where there is no serious follow up for the trainees by the university and by the educational supervision. As well, it is unfortunate that even the school teachers do not recommend this, and what is mostly thought by the school and school teachers is reducing the work load of the school teachers and their comfort. The teachers differ, some have excellent skills and some not. This may be due to the differences among them in the desire for self-education and obtaining courses outside the university on the use of modern technologies and diverse programmes such as computer use. (HT2)

It is clear that headteachers were suffering from some of the problems at the school, such as poor coordination with the university about the student teachers, or with the local education authority about the school teachers, which probably accounted for their perspectives on characteristics of a good teacher through their experiences in the school work.

According to the university supervisors and coordinators, their long experience in the university had formed their perspectives on what makes a good teacher, through the problems that faced the preparation programme:

> Unfortunately, the programme is unable to produce professionally good teachers. The programme is very old. This programme is directed to the intermediary stage. I spent a long time at the university and the teacher preparation programme has not changed for a long time. If we look at to the progress with the evolution that has occurred in education…. (FUS1)

This was also confirmed by the perspective of the university coordinator, where he said:

> As the programme coordinator of teaching practice for a long time, most of the students coming out of the teacher preparation programme are untrained in modern science curricula and modern methods of teaching and even the collaborating school teachers are mostly untrained. (UC1)

6.2.2.2 Teachers and tutors

The students' own teachers helped in the formation of perspectives as part of the background about what a good teacher is, whether at the school or the university. A female university supervisor highlighted the importance of the university tutors as examples for their students: "As well, the University tutors are regarded as an example for most student teachers" (FUS2).

There is one important negative view held by the students and that sheds light on the methods by which students learn: "The modern curricula require modern methods, but the university, through the tutors, teaches the old traditional methods" (FST2).

The responses to the open-ended questions revealed that the teacher may have an effect on his students as a good example and a distinctive style of teaching, which helps to form his/her views about what makes a good teacher:

> Since I was a child and I was in elementary school and the best teacher was the science teacher, I came to like science and this is what pushed me to come into this field. (OEQStT)

The university coordinator talked about the negative effects that the teachers reflected where he said:

> The programme needs to be restructured and developed. This programme is designed for the middle stage, but there are those who go into secondary school teaching. By virtue of that, those teaching mainly at secondary school have not had the right educational programme, therefore secondary school teachers reflect a bad image of teachers to their students. (FUC1)

All the answers came from the females (students and university staff), while the role of male teachers specifically was absent.

The teacher's personality acted, both in the university and the school, as an important factor in the formation of perspectives on what makes a good teacher, as a good role model could enable them to acquire some useful teaching skills.

6.2.2.3 Modern curricula

The issue of modern and developed curricula led to revealing some differences between the teachers, which helped to form the view about a good teacher as one who wishes to develop him/herself through knowledge of the curriculum, teaching methods and other educational aspects. The responses to the open-ended questions revealed the role of curriculum in shaping perspectives. For example: "I am a teacher at secondary school, but I felt weak in the professional and educational aspects, especially with the implementation of the modern curriculum, so I decided to study the educational programme to learn a lot about teaching methods and curricula" (OEQStT). Through the quantitative data analysis it became clear that 87% of respondents entered the programme with the aim to develop his/her professional and educational aspects, as well as 72% in order to obtain a good job. Another student reflected this perspective by stating: "The introduction of the Educational Diploma Programme is an opportunity for an upgrade and nominations at work, especially those teachers who do not possess an educational diploma. I am a teacher, but I did not get on the Educational Diploma Programme. With modern curricula I found myself needing to learn more about the curriculum and teaching methods" (OEQStT). One of the teachers discussed the importance of knowledge in the science area: "The teaching of science needs to be more knowledge-based with increased access, especially with the new curriculum, and this is why most of the teachers are turning to the Education Diploma Programme for the development of knowledge about the curriculum and teaching methods" (OEQScT). Because the questionnaire open-ended questions had already asked about the reasons for their presence in the teacher preparation programme, the interview did not pursue this in depth.

It is clear that the modern curriculum issue contributed to the creation of some perceptions about the characteristics of a good teacher, through the weakness of some teachers and students in understanding how to deal with this curriculum, and thus it became seen that a good teacher is one who is able to adapt and deal with the modern curriculum.

6.2.2.4 Teacher preparation programme

The teacher preparation programme also contributed to the formation of students' perspectives about what makes a good teacher. The students' responses were as follows:

> The student teachers do not have the characteristics of a good teacher and they will still not have them after completing the educational programme and practising teaching at school - due to the collaborating teacher not being qualified to teach educationally and not being fluent in teaching skills. What I've studied in the educational programme and what we've studied theoretically will remain how we apply it. Now I understand why some teachers at school were better than others. (ST2)

The female student teachers saw that what was taught in the university was difficult to apply in schools: "We learned from the educational diploma programme about individual differences among pupils. Unfortunately, a lot of school teachers do not pay attention to individual differences or take them into account" (FST3). Another female confirmed that: "Completely different, what is taught at university through the educational programme is something and what is applied in schools through teachers is another thing" (FST4).

It is noted that all the answers came from the student teachers, while the views of university staff and school teachers were absent on this aspect.

The student teachers may be more understanding of the requirements of a good teacher from what they learned on the teacher preparation programme and, therefore, they reflected on their experiences through the light of what they had learned on this programme to arrive at their perspectives on what made a good teacher. Only the student teachers contributed responses about this code.

6.2.2.5. Attitudes

Attitudes helped in shaping participants' perspectives about a good teacher. The interviews revealed some important negative attitudes and some positive attitudes, which will be described in detail. These responses were received from the open-ended questions. In general terms, the students' responses focused on the chance to get a job, upgrade themselves and achieve their ambitions, such as: "A chance to get a job through this programme" (OEQStT). Also a good example of an aspect existing in student responses was where a male student teacher said: "Because it is the fastest way to graduate as a teacher. I want to become a teacher in order to find a job and then I can start building my life" (OEQStT). As reported previously, the objective of getting a job occupied a significant proportion of student teachers (72%). Another one added that: "I am an administrative employee at the university, but I wanted to get on the Educational Diploma Programme in order to get the upgrade. I would like to complete a master's and then try to turn to university teaching" (OEQStT). A good example from the student responses was where a male student teacher said: "I have seen my father as a good model of a teacher, therefore I decided to study and become a science teacher like my father. Also, my brother is a teacher but not in science; his subject is mathematics" (OEQStT).

While the responses of the students focused on the lack of suitable jobs, teaching was seen as a good career for women because it is not a mixed field of work in Saudi Arabia. Some are influenced by the friends around them, such as: "I think that teaching is a comfortable field for women, even after marriage, which helps them in raising their children" (OEQStT). One of the females indicated that: "All my female friends are teachers, and I think that teaching is an appropriate field for most of the women in Saudi Arabia as a career" (OEQStT). A different female perspective was:

> To take advantage of the Educational Diploma and professional development programme for teachers. We have in the family a lot of teachers in various disciplines, but they differ in preparation level. Some of the best have a bachelor's degree and covered the Educational Diploma

> Programme; others did not get the Educational Diploma Programme or receive a bachelor's degree. But I prefer to get on the Educational Diploma Programme in order to know a lot about teaching methods. (OEQStT)

It's interesting that the female student teachers' attitudes towards entering the teacher preparation programme were centered around teaching being an appropriate field for females because the job does not have intermixing of the sexes. Here, the religious factor may be contributing to their perspectives on the teacher, while the male student teachers focused their perspectives round job security and expansion of future career choices.

Responses from teachers about students' attitudes came as follows: “Because there are no other options; students are sometimes forced to enter the programme to get a permanent job” (OEQStT). Also the need for professional preparation: "To practice the profession of teaching, the student needs a lot of information about the educational and professional aspects and formation of experience through practice teaching. Most students want to join the teaching profession, therefore after completing their study of science are turning to the Educational Diploma Programme" (OEQStT).

Responses from university supervisors about students' attitudes came as follows:

“Some students enter the programme to have more employment options available to them” (OEQUT). And some of the university staff confirmed the importance of the course in increasing the efficiency of teachers: "To raise the efficiency of the student who wishes to practice the profession of teaching and has no knowledge of teaching. This programme was found to raise the competence to become teachers"(OEQUT).

Table 6.3 Object elements of Activity Theory: preparation of student teachers

AT= Activity Theory; Amb= Ambitions; Ing= The basic ingredients for student preparation; DAO= The difficulties to achieve the goals faced by the student teacher and their ability to overcome them; ST= Student teacher ; FST= Female student teacher; T= Teacher; FT= Female teacher; HT= Headteacher; FHT= Female headteacher; US= University supervisor; FUS= Female university supervisor; UC= University coordinator; FUC= Female university coordinator; OEQScT= Open ended questioner school teacher; OEQStT= Open ended questioner student teacher; OEQUT= Open ended questioner university tutor.

AT	Theme	Codes	Examples
6.3 Object	**6.3.1. Preparation of students**	6.3.1.1 Amb	6.3.1.1.1. Students' goals of entering the teacher preparation programme "My goal from entering the programme is to be creative in teaching and learning in a practical application, but the programme should be training and educational more than being a theoretical programme- and there should be a series of seminars, courses, and good workshops." FST4 "My only hope is to get a job." FST2
			6.3.1.1.2. School goals of students' preparation during teaching practice "The goals of female student teachers' preparation in teaching practice is for them to work in teaching with more seriousness and to prepare them sufficiently for the teaching process." FHT2 "The goals of students' preparation during teaching practice is to alleviate the burden of school teachers in the school work assigned to them, and to undertake some additional work and activities." T3
			6.3.1.1.3. University goals of teacher preparation "The goal of student preparation is to provide a scientifically and educationally distinguished teacher who can make decisions in the education field." US2 "Frankly, there are great hopes and aspirations but they are a formality on paper only." UC1
		6.3.1.2. Ing	6.3.1.2.1. Divergence of perspectives between the university and school "The curricula at the school are modern and developed. Yet, the mechanism used by the university is obsolete and teaching is traditional. Interventions in the programme subjects, curriculum classification and its description is very old." ST2

			“The school gives preference to its needs rather than the needs of the student teachers' learning.” US2
			6.3.1.2.2. Harmonization between the university preparation and teaching requirements “The teaching method at schools is old. Preparing lessons is one type, and the education at university aims at realizing good teaching such as modern teaching styles, thinking and critical scientific analysis.” FUS2 “A large gap between what students learn in the university through the Educational Diploma Program of teaching methods and between the teaching of science in the modern curriculum in schools.”OEQScT
			6.3.1.2.3. Cooperation between the university and schools “There is no cooperation – the female trainee is assigned a lot of burdens by the school headmistress and has to comply with the complete school day, while the university asks the female trainees to attend lectures with no absence, sounder this lack of coordination, she becomes psychologically pressured.” FT2 “There is no joint cooperation between the university and school, even in the activities between them”UC1.
		6.3.1.3. DAO	6.3.1.3.1. Difficulties 6.3.1.3.1.1. The difficulties to achieve the goals that faced student teachers at the university: “The students also suffer from the difficulty of teaching science by virtue of their specialization in a particular branch of science, which was not comprehensive over all branches of science. For example, the school science curriculum includes biology, chemistry, physics, and other specializations, which causes difficulty for the students in the teaching curriculum.”OEQStT 6.3.1.3.1.2. The difficulties to achieve the goals that faced student teachers at the schools “Some female student teachers have difficulties in teaching assignments and dealing with modern curricula.” FHT1 “There are difficulties such as: dealing with curriculum, dealing with implementing lessons in the plan, and being required to complete the programme in a specific period only. The teacher collaborator is great age and isn't the developer of the same.” ST2
			6.3.1.3.2. The ability to overcome the difficulties to achieve the goals “Sometimes he overcomes the difficulties by himself and sometimes with the assistance of those surrounding him in the school or family community” FST4. “Certainly they cannot overcome the difficulties except with the help of supervisors and teachers.” FUC1.

6.3 Object

6.3.1. Preparation of students

This theme was formed of four codes, some of which were made up of sub-codes. These were: the ambitions; the basic ingredients for student preparation; the difficulties faced by the student and the ability to overcome them; and learning teaching skills.

6.3.1.1. Ambitions

Three sub-codes were constructed from the qualitative data analysis of the interviews and the open-ended questions of the questionnaire. These were: students' goals in entering the teacher preparation programme; school goals of students' preparation during teaching practice; and university goals of teacher preparation

6.3.1.1.1. Students' goals for the teacher preparation programme

Most of the responses of the participants were constructed from the qualitative data analysis of the interviews and the open-ended questions of the questionnaire. The focus was on the students' responses about practical training, creativity and gaining experience. For example:

> To learn more about teaching through education and training in the skills necessary for the teacher. I also hope that there will be training courses alongside the programme of study and helping us with basic conditions and to inform the school teachers there about female student teachers not completing the curriculum, and that they should not be assigned more than three waiting classes per week. Because sometimes I wanted to finish my university work at school, but I did not have any time at school because of lesson classes and waiting classes - as at the same time, we have to come to the university from 3 pm, so when can we finish the work assigned by the university and prepare daily lessons with PowerPoint presentations? (FST3)

Another female student added that "my goal from entering the programme is to be creative in teaching and learning in a practical application, but the programme should be training and educational more than being a theoretical programme - and there should be a series of seminars, courses, and good workshops" (FST4). Also one of them said that "my goals are to prepare myself as an integral teacher, familiar with the scientific subject and taking advantage of its scientific life" (FST1).

On the other hand, the goals of male students were somewhat different. “My goal from entering the programme was to be conversant with using educational technologies, but the programme has not been utilized and, to be fair, only 50% has been utilized" (ST2). Another added that "my goal for entering the programme is to graduate to the educational field as a model of a successful teacher" (ST1).

From the open questions, some of the responses are represented in the following: “My goal for entering the programme is to gain experience in how to deal with female students and interact with the atmosphere of teaching positions” (OEQStT). And another response was that “my goal on entering the programme is to improve my level of training in schools and raise the level of my students’ learning" (OEQStT).

There were some negative responses from students, some of whom were only interested in obtaining a certificate to get a job, while others believed that the programme did not meet the aspirations of students. For example: “There are no hopes or ambitions under this programme” (ST3); and this: "Obtaining the programme completion certificate" (ST4); also one of the females mentioned that “my only hope is to get a job" (FST2).

The ambitions and goals of the science student teachers differed between females and males – though again it should be remembered that the sample sizes were quite small. It is interesting that females aimed to develop themselves with skills in addition to the passion for getting a job as teacher, while the male students had some negative responses and some of them aimed merely to get a certificate of completion of the programme to get more career choices.

6.3.1.1.2. School goals for student preparation during teaching practice

“The goals of students’ preparation during teaching practice are to make good female student teachers, lack of absence, upgrading the female student teachers’ level and their contribution to school activities” (FT1). Another added that: "Teaching students well, to be good examples and disciplined in their work" (T2).

Yet another female teacher confirmed the importance of high efficiency: "Preparing the female student teachers completely and with high efficiency" (FT2). A similar view was expressed by another who said: "Undertaking the teaching work completely" (FT3). One of the teachers shared her opinion: "A student teacher who is capable of teaching with a high level of skill" (T1). In addition, from the questionnaires, responses were given like: "Applying thinking skills in teaching" (OEQScT).

There were some negative responses shown by some teachers, such as: “The goals of students’ preparation during teaching practice is to alleviate the burden of school teachers in the school work assigned to them, and to undertake some additional work and activities” (T3).

It is also interesting that the female collaborator teachers aimed to be distinguished in the preparation the female student teachers, while some male teachers aimed to prepare students teachers to be good quality teachers and others saw them as an opportunity to ease the burden in the school.

School headteachers’ responses regarding their goals for student preparation during teaching practice referred to students’ acquisition of values and educational skills in teaching. For example: “The goals of female student teachers’ preparation in teaching practice is for them to work in teaching with more seriousness and to prepare them sufficiently for the teaching process” (FHT2). Another female headteacher added: “To be punctual female student teachers and with a high level of teaching skill” (FHT1). Other headteachers added: "To prepare student teachers of high efficiency in teaching and who are familiar with fieldwork and its requirements" (HT1), and: "To give them advanced (modern) educational skills and educational values" (HT2).

It is also clear here that the female headteachers had a distinctive response in their goals for the teaching practice.

6.3.1.1.3. University goals for the teacher preparation programme

The university supervisors' ambition was to make distinguished teachers in performance within the school, who were able to make decisions in the field of education, and who had good teaching skills. For example: "The goal of student preparation is to provide a scientifically and educationally distinguished teacher who can make decisions in the education field" (US2). Another supervisor added that: "The goal of student preparation is to equip them with effective teacher skills" (US1).

The female supervisor mentioned that, "The goals of female student preparation are to develop the skills of student teachers through practice at schools and to provide a good model for them of schools" (FUS2). Another perspective was that: "The goal of female student preparation is to be able to teach well" (FUS1), while a perspective in the open questions in the questionnaire expressed that, "The ambition is for students to be able to apply active learning in schools" (OEQUT).

The partnership coordinators at the university saw that the goals of the student preparation programme were mainly concentrated on community development, by providing creative teachers for future generations, and producing teachers who were able to model teaching. For example: "Provide a good model of teachers capable of teaching and the development of a high level of skill" (FUC1). Another female coordinator added that: "We aim to have a good science teacher and creator" (FUC2). A male university coordinator made the remark: "Contribute to the development of society through the provision of good teachers for future generations" (UC2).

There was only one negative response among partnership coordinators: "Frankly, there are great hopes and aspirations but they are a formality on paper only" (UC1).

The goals of the female university staff in the teacher preparation programme differed from those of the males, where the females focused on high standards in the skills of preparation and creativity from the programme, as opposed to the male goals which focused on decision-making and effectiveness, as males had some negative perceptions about achieving goals.

6.3.2. The basic ingredients for student preparation

This code was formed of three sub-codes. These were: divergence of perspectives between the university and school, harmonization between the university preparation and teaching requirements, and cooperation between the university and schools.

6.3.2.1. Divergence of perspectives between the university and school

It is clear that there is a significant difference in views between the university and the school due to the gap between the school system and the university system. For example, the student teachers stated:

> The most prominent problems are papers, documents sent from university to school and vice versa from school to university and its effect is enormous. For example, if such papers got lost, he would be in serious problems, and he would not be the cause but the school and university. I hope the communication between the university and school will become electronic as it will be easier and more reliable. (ST1)

Another student pointed to the curriculum, where he said: "The curricula at the school are modern and developed. Yet, the mechanism used by the university is obsolete and teaching is traditional. Interventions in the programme subjects, curriculum classification and its description is very old" (ST2). Another mentioned the problem of separation: "Completely separate! The school believes that the university's outputs are bad and do not meet the purpose, and as well the university sees that the school does not meet the requirements of practising teaching" (ST3). Another added: "There are problems. The university blames the school and vice versa" (ST4). One of the females confirmed this problem when she said: "Complete separation between the school and university, and consequently duality in work and contradiction in education" (FST4). Another female mentioned further problems: "There are problems. There is not an integrated coordination between the university and the school” (FST1). In contrast, some of the female student teachers said that they did not have a problem with divergence of perspectives between the university and school. Such as: “There are no problems from my own point of view” (FST2 and FST3).

The perspectives of science student teachers on the divergence of perspectives between the university and school were similar, centering on duplication, lack of coordination, and the way existing mechanisms could hinder the achievement of the goals of teachers learning to teach. Nevertheless, some of the females did not believe that there were problems arising from this divergence of perspectives between the university and school.

Some of the cooperating teachers believed that the divergence of perspectives between the university and school was between theory and practice. For example, the cooperating teacher said: “The student teachers learn at the university how to teach and how to practice it theoretically, and the school wants the student teachers as a teacher ready to teach to meet the deficit at school” (T1); another teacher indicated that: "Timetable – throwing the burden on the school in orienting and following-up the female student teachers – burdening the trainee with many assignments" (T2). This was confirmed by another teacher: "Assigning them with waiting classes or conducting boring school tasks such as administrative work" (T3). One female teacher saw that "this lies in the number of classes given to female student teachers and the financial amount which schools claim to pay female student teachers to conduct the diverse activities to obtain marks" (FT1); other added that "duality of concepts taught to the female student teachers" (FT2); and another of them said: "Difference in planning for teaching. Contradiction between lectures at university and compliance with teaching. And not to leave before the end of the semester" (FT3).

The perspectives of the male teachers about the divergence of perspectives between the university and school focused on burdening the science student teachers at the school which could hinder their learning to teach, while the female teachers focused on duplication and contradiction in concepts such as about teaching plans.

The school headteachers believed that the difference in views between the university and the school made the student teachers come to school with academic problems, while the school wanted them to start as basic teachers. For example, one headteacher stated: “The university does not wish to assign the female student teachers with additional work at school and the school sees the opposite, because of the interest of both parties. The female student teachers should act as a school teacher and be able to work at school upon this basis” (HT1). Another headteacher stated:

> The student teachers come to school loaded with curricula and their educational potential is weak, relying on intercession for the choice of the school headteacher who submits his report, increasing the embarrassment of the administration. In return, the trainee does not gain much advantage where there is no serious follow-up of the student teachers by the university or by the educational supervisors. As well, it is unfortunate that even the school teachers do not recommend this, and what is mostly thought by the school and school teachers is reducing the quorum of school teachers and their comfort. (HT2)

But female headteachers believed that there was no differences in views between the school and the university. For example, one female headteacher said: “I do not think there are problems in points of view between university and school. As a school, we do not differ from the university” (FHT2); this was also confirmed by another female headteacher, who said: "I do not think there are problems in points of view between university and school" (FHT1).

It is interesting that the male headteachers insisted on a difference of perspectives between the university and school, which may be a result of the gap between the school system and the university system, but that the female headteachers saw things quite differently in that they did not see any difference between themselves and the university. Perhaps there was more understanding between the coordinators and supervisors of females in the university than between the males at the university and in the school.

The university supervisors believed that the differences in views between the school and the university had created a kind of Independent action. The university wanted the practice environment for the student teacher and the school wanted a student who was ready to replace the main teacher. For example: “Like the goal of teaching practice - the university places the student teachers in real experiences in which the student teachers practice all tasks, but the school sees it as an experience to alleviate the burden on the main school teachers” (US1); another supervisor saw that preference was given to schools rather than to student teachers: “The school gives preference to its needs rather than the needs of the student teachers' learning" (US2); while another said: "Lack of cooperation between the school and university, i.e. each of them works separately from the other" (US3). The same perspectives was expressed by the female supervisor: "Positioning the female trainee to fill the deficit at school and not as a student teacher who wishes to acquire experience. There is no independence of thought for the female student teachers as she has to produce two different behaviours. Surely, this affects the female student teachers' learning and her wish to apply the new scientific knowledge" (FUS1); and another confirmed that: "Positioning the female trainee to fill the deficit at school and not as a female student teacher who needs a cooperating teacher to help her” (FUS2).

The university coordinators believed that the differences in views between the school and the university had created a disconnection between the school and the university, and that what they taught at the university did not apply in school. For example: “What is taught at the universities does not apply at the schools” (UC2); other added that,: "There is no common framework between the university and the school" (UC1); and the females had the same perspective: "The university is completely separate from what is happening in schools, therefore it does not have any role in public education” (FUC1); and another mentioned that: "All work individually without any coordination - meaning the full absence of coordination in the light of these differences" (FUC2).

6.3.2.2. Harmonization between the university preparation and teaching requirements

It is clear that learning at the university was viewed as different from practising at the school; most interviewees argued that there was a gap between the university preparation programme for students and the requirements of the school and teaching. University preparation may not be perfectly compatible with the practical life of schools. For example, one student teacher (ST4) indicated that the programme was totally separated from the reality in terms of academic curricula, teaching methods, and means of use. This was also emphasised by another student (ST2): “We teach information about model things which are implemented in model schools and not in real schools”. Another student teacher (ST3) added: “During the application of theoretical study, it is found that it is completely different from practical aspects, such as the increase in student numbers at classes, exceeding 44 students.” Some cooperating teachers concurred with this view: “Certainly, he is shocked by the different reality from what he studied at university, including theories, teaching styles and preparation. But, at the end, he does what the school wants and not what he studied” (T1). Another cooperating teacher added: “In terms of the school environment, educational means, and dealing with students” (T2). Yet another confirmed: “Surely, because dealing with the female pupils at school differs from the university, and dealing with female colleagues (female teachers) is difficult for some” (FT1).

The headteachers also confirmed this perception: “The female student teachers are often shocked by the actual reality because the field work is completely different from their theoretical study at university - and it needs good knowledge of the curriculum in the actual reality” (HT1). One mentioned the difference in strategies: "Heavily in the teaching strategies and methodologies and good teaching requirements (technologies and what it includes)” (HT2); the female headteacher added that: "The field work is completely different from the theoretical information studied at university, which depends on memorisation without understanding" (FHT2).

A university supervisor indicated the actual reality: “The student teachers are shocked by the different reality. The university looks at default reality and the real reality differs from one school to another. The university is centred on theories and the importance of education, i.e. most of its study is abstract theory” (US1). Another female supervisor added: "The teaching method at schools is old. Preparing lessons is one type, and the education at university aims at realizing good teaching such as modern teaching styles, thinking and critical scientific analysis" (FUS2).

The university coordinators explained how the problems were due to the differences between the educational institutions: “Theoretical learning means that students are not trained in the modern science curriculum and modern methods” (UC2); "Definitely collide in a different reality. The school and the university are two completely different institutions and sometimes even in different systems. The system of lesson planning, for example, differs between the university and the school; the school are required to write the manual for planning lessons" (FUC2).

The responses from the open-ended questions on the questionnaire confirmed the gap between the university and the school. For example, one of the school staff mentioned that there was "a large gap between what students learn in the university through the Educational Diploma Program of teaching methods and between the teaching of science in the modern curriculum in schools” (OEQScT). Another one of the university staff also indicated the separate relationship, where said: "Separate relationship - and therefore we find, for example, that assessment of students’ educational progress contains outdated items, meaning that the supervisor must request old teaching plan cards" (OEQUT). And one of the student teachers added that: "The university should add the modern science curriculum as learning material in their curriculum, which is followed in Saudi Arabia through the teacher preparation programme" (OEQStT).

Most of the participants agreed in their views about harmonization between the university preparation and teaching requirements, and that there was already a lack of harmonization between teacher preparation programme at the university and the teaching practice at the school as a result of the separation between the two systems and a lack of cooperation between them. Therefore, the relationship between the school and the university is very weak and this may hinder the students learning the teaching profession.

6.3.2.3. Cooperation between the university and schools

It is clear that cooperation between the university and the schools is very weak and is not as effective as required. Fifteen of the twenty-six of participants mentioned that there was no cooperation between the university and the school. For example, “There is no joint cooperation between the university and school regarding education” (T1). Another female teacher added: “There may be cooperation between the university and Education Department, and not the school” (FT3). “There is no cooperation – the female trainee is assigned a lot of burdens by the school headmistress and has to comply with the complete school day, while the university asks the female trainees to attend lectures with no absence. Under this lack of coordination, she becomes psychologically pressured” (FT2).

Nevertheless, some participants came to the opposite conclusion. For example, a student teacher mentioned that: “There is cooperation between the university and the school it is very effective. The students are received when they attend the school, it gives them the opportunity to teach, and helps the university to follow up the students” (ST1). Another female student teacher added that: “The cooperation is limited to follow-up by the main school teachers in the event of [the female student teacher’s] inability to take the class due to the female student teacher having a university lecture-a sort of cooperation among them” (FST1).

A collaborating teacher confirmed that the cooperation was disorganized. For example: “There is cooperation between the university and school but in a simple and unorganized way” (T2). Another teacher added: “There is good cooperation, but between the school administration and university supervisor” (T3). One of the headteachers said: “There is cooperation. The university provides the appropriate number of female student teachers in coordination with supervisors and coordinators” (HT1).

While not all the university staff thought that there was cooperation, the partnership coordinators at the university believed that cooperation between the university and the school lay only in the university’s need for schools to accept the practice teachers, on the one hand, and the need for schools to remedy the deficit of teachers in the school. “There is no joint cooperation between the university and school, even in the activities between them” (UC1). Another female coordinator added that: “There is cooperation, but simply in helping the university supervisor to perform their work and the student teachers to apply their teaching practice in their school” (FUC1).

It seems that there is some cooperation between the university and the school, but in a disorganized way, perhaps because of the dominance of the university in the teacher preparation programme and the lack of a partnership between the school and the university. This generates some problems in achieving the goals of the teacher preparation programme.

6.3.3. The difficulties faced by the student teacher in achieving the goals and their ability to overcome them

Two codes were constructed from the qualitative data analysis of the interviews and the open-ended questions of the questionnaire. These were highlighted by all the interviewees. These were: difficulties and the ability to overcome the difficulties.

6.3.3.1. Difficulties

This code was formed from two sub-codes: The difficulties that faced student teachers at the university; and the difficulties that faced student teachers at the school.

6.3.3.1.1. The difficulties facing student teachers at the university

It is clear that there were some difficulties from the perspective of the participants. These centred round the increasing number of hours of study in the university programme during teaching practice. One student teacher said: “There is pressure through teaching subjects at 18 hours per term, the distance of the student from the university city, and potentials of school. Also the student teachers are not trained in modern curricula” (ST2). In addition, psychological pressure on students during teaching practice was cited by the other student teacher: “The curriculum is new and we know nothing about it. Plus psychological pressure by supervisor about learning the teaching” (ST3).

There were also difficulties for students through studying theoretically in the programme, which caused difficulty at the beginning of the teaching practice. For example: “There are difficulties facing the female trainees as the university teaches theoretically and there are no given lectures, workshops, or seminars concerned with the problems facing them in the field - and it does not teach the new curricula. There should be lectures taught inside the halls of the university to identify how to prepare. They still use the old preparation method, and when the female trainees practise teaching, they are shocked with this position” (FST2). Another female student teacher added: “Yes there is difficult at the beginning of teaching practice. However, after two weeks, the situation is coped with where the theoretical study is different from the practical application” (FST1). “And consequently duality in work and contradiction in education” (FST4). The teachers also said: “The difficulty of practising teaching at the beginning - like lesson preparation, teaching skills and teaching strategies, particularly in the science curriculum - and the teaching practice often differs from studying at university. The university has theoretical study only” (FT2). Another teacher added: “The student teacher is shocked with the different reality than what she studied at university, including theories, teaching styles and preparation” (T1).

This was also emphasised by the headteacher: “They face difficulties because they do not actually practise teaching in planning for teaching, teaching methodology, and all teaching skills” (HT1). The partnership coordinator stated: “There are difficulties, understanding systems at university and school, understanding the hidden curriculum at school” (US1).

One of student teachers added, through the open questions of the questionnaire, an interesting perspective where he stated:

> The students also suffer from the difficulty of teaching science by virtue of their specialization in a particular branch of science, which was not comprehensive over all branches of science. For example, the school science curriculum includes biology, chemistry, physics, and other specializations, which causes difficulty for the students in the teaching curriculum. (OEQStT)

6.3.3.1.2. The difficulties facing student teachers at the schools

It was clear that what most students found particularly difficult at the beginning of teaching practice were aspects of the school such as the pupils, curriculum, teachers and headteacher, and the difficulties in applying teaching skills. Students had fears when starting teaching practice and there was a lack of initiation for student teachers on entering the school. For example: “There are difficulties often in the method of curriculum distribution but this ends with practice through writing down preparation or illustrating a lesson or two” (ST1); "The difficulty was at the beginning of practising teaching practically and as well in terms of integration with the school staff" (ST4). This is what the university coordinator confirmed: "The student teachers suffer at the beginning from these difficulties but they decrease with practice" (UC2); and the university supervisor added: "Fright, fear and lack of self-confidence - and this is usually in the first weeks of practising teaching" (US1); the other female university supervisor also indicated that: "At the beginning of practising teaching in the first weeks, there are major problems including assigning female trainees with more than two academic curricula" (FUS2).

The school staff believed that the difficulties existed only in the first weeks of teaching practice and that they then disappeared. For example: “All tasks at the beginning are difficult.

But, with the continuity of the trainee at school, he understands how matters go practically and not theoretically as he studied at university” (T1). A headteacher added a point about adapting to the situation at the school: "The student teacher at the beginning faces difficulties. However, after one or two weeks, he starts to acclimatize and adapt to the profession, and this is frankly based on how efficient the school teacher is in the subject" (HT2).

Other difficulties were in dealing with elements of the school such as the pupils, curriculum, teachers and headteacher. For example: “There are difficulties such as: dealing with curriculum, dealing with implementing lessons in the plan, and being required to complete the programme in a specific period only. The teacher collaborator is of a great age and isn't the developer of the same” (ST2); another female student teacher expressed that: "There are female teachers who are quite old but who do not know anything about the curriculum or educational skills in teaching" (FST2); another one added that: "The difficulty is in dealing with pupils" (ST3). While one of the female student teachers said that: "I didn't face any problems except the problem of class discipline and controlling pupils, and after a short period, I controlled them with the help of the cooperating female teacher" (FST1); but another female argued that: "Some girls do not respect the female student teachers when they see them. This sometimes causes discipline problems and this depends on the female student teacher's personality. Whoever cannot control the class, she resorts to the school administration. The female pupil is threatened and disciplined and her mother is called in and informed of her disrespect to the student teacher, so this becomes a tremendous deterrent for this girl" (FST3). Another female teacher confirmed that: "Surely, because dealing with the girls at school differs from the university, and dealing with female colleagues (school teachers) is difficult to some extent" (FT1).

Some student teachers through the open questions in the questionnaire added the difficulty of dealing with the school, where one said that the "administration and the female teachers do not cooperate with the student teacher" (OEQStT); and that there is also "the difficulty of dealing with school headteacher and cooperating teachers, and also schoolgirls" (OEQStT). The university supervisor confirmed the "difficulty in dealing with school tests and dealing with the school administration" (OEQUT).

The difficulty of applying the skills of teaching at the school were also mentioned fby the school and university staff. For example: "The female headteacher mentioned that "some female student teachers have difficulties in teaching assignments and dealing with modern curricula" (FHT1); anotheradded that "there are difficulties to some extent in the planning of lessons" (T2); also the university supervisor confirmed that "there are difficulties, in addition, to managing time in the class of 45 minutes. The student teachers rely on previous planning of lessons and this may cause problems and affect the characteristics of learners" (US2). A female supervisor added other difficulties: "Certainly, there are difficulties in dealing with the curriculum. The curriculum is modern and even most of the female cooperating teachers do not deal well with it, and this is the major problem. Also, there are problems with preparation and time and class control" (FUS1). The university coordinator also mentioned some difficulties: "Most of the students have difficulties in teaching level, planning and dealing with the curriculum or pupils" (UC1); a female coordinator through extrapolation confirmed some of the difficulties: "Through supervisors' reports there are a lot of difficulties at the level of the curriculum and planning" (FUC1).

Through the open-ended questions on the questionnaires, some difficulties were reported through the perspective of students on managing time: "The difficulty is, how to apply the teaching skills through 40-45 minutes" (OEQStT); another added that: "Differences between the female teacher's basic material style with the students' style in the class room. This is a difficult challenge in the application of acquired skill" (OEQStT); while one of the teachers said: "The student teacher finds it difficult to teach the new curriculum and the implementation of the new plans in teaching, such as thinking skills" (OEQScT); but the supervisors added some perspectives on the use of laboratories: "Difficulty in conducting scientific experiments and applying them in the school due to the lack of facilities in the school" (OEQUT); as well as assessing the pupils in the laboratory: "Difficulty in evaluating students in lessons that are held in the lab" (OEQUT); and in lessons: "Difficulty in evaluating students in theoretical lessons only" (OEQUT).

6.3.3.2. The ability to overcome the difficulties

It is clear that some of these difficulties could be overcome by the student teachers themselves, but for other difficulties the student teacher needed help from the school or the university. These difficulties varied according to the individual student teacher.

The ability of student teachers to overcome some of their difficulties can be due to their own resources. For example, one student teacher mentioned that: “Some difficulties can be overcome by the student teacher alone" (ST3). Another student added: “In most cases, the student teacher helps himself by himself to overcome difficulties" (ST4). One female student teacher said that:

> The female who is sincere and likes the teaching process can overcome these difficulties by herself. I was more sincere than the main school teacher. Some female school teachers are very cooperative and this sincere cooperating female teacher helps the female trainee to plan, prepare and do worksheets. Even when there is a fairly ambitious lesson for the female trainees, the cooperating female teacher helps her in that, but some female teachers do not cooperate in these matters. (FST3)

By contrast, another student teacher said: "The student teachers cannot overcome the difficulties alone, but with the help of the cooperating school teacher" (ST2)

Some students said there were other people from outside the school and the university who could be turned to for help, such as friends or family. For example one of the female student teachers explained:

> This relies on the female trainee's personality and the extent of the cooperating female teacher's help. She cannot face difficulties alone, but with the assistance of some veteran teachers who are teaching at school or with the assistance of one of the family members in the same teaching field, through explaining the teaching method, preparation, the way of dealing with female students and implanting confidence in the female trainee. (FST2)

Yet another female student teacher added that "sometimes he overcomes the difficulties by himself and sometimes with the assistance of those surrounding him in the school or family community" (FST4).

As for the cooperating teacher and headteacher, some of them believed that the student teacher could overcome the difficulties alone, such as the teacher who said: “The student teachers can pass by themselves or with the assistance of teachers and school administration” (T3). Another teacher added: “He cannot pass without orientation and assistance, whether by one of the school members or university supervisor” (T1). And the female student teachers opined that: "According to the personality of the female student teachers. Some of them outperform the school teacher, and some of them need to be helped by the school teacher and supervisor to polish her experience by the school teacher giving her some references and by observing the classes of female teachers who teach the same subject" (FT1). Another female headteacher added that, “in some instances, the female trainees surpass this by themselves, and in some instances with the help of the schoolmistress and female cooperating teacher” (FHT1). The other cooperating teacher and headteacher confirmed that: “The female student teachers can pass with the assistance of the cooperating female teacher through direction and guidance and through their attendance at class” (FT2).The other headteacher stated: “They surpass it with the help of all those at school including cooperating teachers, and others through the attendance of watching classes and training them to use the educational device” (HT1). “The female student teachers do not overcome [the problems] by themselves, but with the help of the teachers at school who direct them, even if not from the same specialty” (FHT2).

The supervisor and the coordinators from the university believed that the student teachers could overcome the difficulties with the help of the university staff, school staff and friends. For example: “The student teachers can overcome it with the help of cooperating teacher and supervisor through weekly meetings” (US2). Someone else pointed to the weekly meetings and supervisory visits where he said: "Some female student teachers overcome these hardships with the help of the female cooperating teacher and supervisor through weekly meetings" (FUS1); another female confirmed that "they overcome the difficulties with the help of the female supervisor through visits and meetings" (FUS2); while other university coordinator addedthat "some student teachers have the ability to overcome their mistakes through the guidance of the supervisor and some do not have the ability. However, they pass the evaluation criteria" (UC1); therefore, "Often, most of them need help from all of those surrounding him. (UC2). Another said: "Certainly they cannot overcome the difficulties except with the help of supervisors and teachers" (FUC1); another female confirmed the need for support from all: "Some pass with the help of his colleagues and the cooperating teacher and supervisor by follow-up, guidance and advice, but some cannot pass these difficulties" (FUC2).

It is clear that student teachers cannot overcome the difficulties faced in the school or university on their own but only with the help of the school and the university staff working together.

Table 6.4 Tools elements of Activity Theory: tools to develop the student teacher in teaching

AT= Activity Theory; TS= Tools for the development of the student teachers in teaching at the schools; TU= Tools for the development of the student teachers in teaching at the university; ST= Student teacher; FST= Female student teacher; T= Teacher; FT= Female teacher; HT= Headteacher; FHT= Female headteacher; US= University supervisor; FUS= Female university supervisor; UC= University coordinator; FUC= Female university coordinator.

AT	Themes	Codes	Example of the data
6.4. Tools	6.4.1. Tools to develop a teacher in teaching	6.4.1.1. TS	6.4.1.1.1. School equipment “Equipped with one lab and there is a table to coordinate its usage and most users of the lab are the main school female “The school is new and it does not have a lab or learning resources room”FST1.
			6.4.1.1.2. Using the facilities at the school “There is some restriction on its usage, for fear of it being damaged”ST4. “The female science student teachers are not allowed to use all the devices. There is a restriction for the female trainees who use it”FT1.
			6.4.1.1.3. The effect of school size “If the school is small it is usually not equipped with any tools, equipment or laboratories to help the teacher in teaching, and if it is large the pupils are in very large classes and cannot be used in the laboratory”FST1.
		6.4.1.2. TU	6.4.1.2.1. Courses and workshops “Some training courses in the Education Department for the school teachers only and sometimes in other cities”FT3. “Usually, there are no training courses or workshops, but this year one course was completed in the female students section, but I did not hear about it. It lasted 5 days. Also there is a University Library and most female science student teachers do not know about the database available at the university”FUS2.
			6.4.1.2.2. The periodic meetings “ the university had a library, Curriculum Department, Educational Supervisor, Internet, and weekly feedback through meetings with supervisors to talk about what they had learned at the university and how they had applied it in the school”US1

6.4 Tools

6.4.1. Tools to develop the student teacher in teaching

Two codes were constructed under the theme of tools to develop a teacher in teaching. These were: tools for the development of the student teachers in teaching at the school and at the university. These are presented below.

6.4.1.1. Tools to develop the student teacher in teaching at the school

Science teachers usually need tools to help them in teaching, tools that will develop their learning to teach in school, such as laboratories, data display devices, and internet. Under this code, three sub-codes were constructed. These were: school equipment, using the facilities at the school, and school size. These are presented below.

6.4.1.1.1. School equipment

The majority of those who were interviewed confirmed the existence of laboratories in the schools, but some participants expressed the belief that some schools did not have labs or learning resource rooms, while not mentioning anything about the existence of other devices such as computers or projectors. For example, some science student teachers reported: “There is an equipped lab and a learning resources room” (ST1). Another interviewee stated that their school was: “Equipped with one lab and there is a table to coordinate its usage and most users of the lab are the main school female teachers” (FST4).

Another teacher agreed: “Yes, there is one laboratory only for sciences and it is used by the student and school teachers as coordinated by them” (T1). A headteacher confirmed: “Yes, there is one laboratory and a learning resources room, and we coordinate among the teachers” (HT1). One of the university supervisors said: “It is supposed to have a laboratory, but the reality sometimes differs” (US1). And another university coordinator concurred: “Not all are equipped; some schools do not have labs” (UC2). In addition, the feedback from the open-ended questions on the questionnaire suggested: “Not to take advantage of existing labs due to opposing the science class' quotas between teachers, and other means are not available" (OEQStT).

Only a small number of respondents indicated that their schools did not have labs, mostly science student teachers and their cooperating teachers. For example, some science student teachers reported:

> The schools are not equipped with a special lab. I was holding a computer and projector and moving around classes, so 10 minutes got lost of the class for preparing and installing the device. I was obliged to enter the class before the beginning of my basic class for installation and preparation as the period of one class is 45 minutes, so there was not much time for installation and explanation together. (FST3)

The other one said: "The school is new and it does not have a lab or learning resources room" (FST1). A collaborating teacher commented that: "There is no laboratory and, if any, it can be used by the female science student teachers and they can use the facilities of school" (T3). The university supervisor expressed that: "50 % of schools are bad with no laboratories" (FUS2). In addition, from the feedback from the open questions on the questionnaire there was an: "Absence of devices, materials, computers, laboratory and learning resource rooms which are necessary to teach at schools" (OEQStT).

6.4.1.1.2. Using the facilities at the school

When the participants were asked whether the school allowed science student teachers to use all the school facilities and equipment available without restrictions, the majority agreed. For example, one of science student teachers said that: "There are an equipped lab and a learning resources room which are available for female science student teachers at any time" (FST2). A collaborating teacher confirmed that: "The facilities which are available at school, it can be used by the science student teachers" (T2). Also the headteacher agreed: "There is one laboratory and the science student teachers are allowed to use it in cooperation with the laboratory technician, but not by himself, as preparing the laboratory is the responsibility of the laboratory technician and all other facilities at school are available" (HT2). A university supervisor said that: "Usually the science student teachers use all the facilities without restriction at schools" (US1).

Some negative responses were expressed by the participants that science student teachers' use of school facilities and equipment. For example, some science student teachers reported that: "The female science student teachers are not allowed [to use the equipment] and there is a reservation by the school administration" (FST1). Another science student teacher added that: "There is some restriction on its usage, for fear of it being damaged" (ST4). A collaborator teacher commented that: "The female science student teachers are not allowed to use all the devices. There is a restriction for the female trainees who use it" (FT1). A female headteacher confirmed that: "Really there are restrictions on the use of the laboratory and school facilities, for fear of damage to some instruments" (FHT1). One of university supervisors said: "Some schools are cooperative in this respect and some others are not. There are some restrictions in some instances on the female student teachers by the school" (FUS1).The university coordinators expressed that: "According to the schools, they allow students - and the schools who have custody - under the pretext of not knowing that the student teachers use it" (FUC2). In addition, the feedback given on the open questions on the questionnaire said: "The school headteachers do not let the students use school equipment for fear of their lack of interest in maintaining the equipment and their ability to deal with it properly" (OEQStT).

6.4.1.1.3. The effect of school size

An important issue prominent in participants' interviews was that of school size, which was related to the availability of equipment and tools. For example, the female science student teacher mentioned: "If the school is small it is usually not equipped with any tools, equipment or laboratories to help the teacher in teaching, and if it is large the pupils are in very large classes and cannot be used in the laboratory" (FST1). Another interviewee said: "According to school size; if it is large and if the pupil number is large and exceeding 300 pupils, there will be an average of 20 waiting classes and the female student teacher will face difficulties in implementing the lessons and using the lab, learning resource room, or a computer lab. There is no time to prepare aids" (FST2).

6.4.1.2. Tools to develop the student teacher in teaching at the university

The science student teachers need to have a variety of tools at the university to help them to learn about teaching, such as workshops, training courses, microteaching, periodic meetings, library, internet, discussion and chat programmes. These are presented below.

6.4.1.2.1. Courses and workshops

It is clear that there are deficiencies in learning tools at the university. Almost all responses confirmed the absence of workshops or training courses, even technical communication programmes, except in the university library. For example, one of the science student teachers said:

> Unfortunately, there are no workshops and usually there are no training courses, but this year one training course was held for female students for five days only for some female student teachers and not all specialties. The university library is the only tool that can help us learn more about the teaching of the science curriculum. (FST4)

An interviewed cooperating teacher, when asked about training courses and workshops, said: “One training course only at the beginning of applying the new curricula in the Education Department for 5 days and it is not repeated for students who missed it” (T1). Another cooperating teacher added that: “The training courses at the training centres are for three days or one week outside school” (FT2). And another told that: “Some training courses in the Education Department for the school teachers only and sometimes in other cities” (FT3). But the headteachers commented: “There are qualifying and activating programmes and strategies to be held for one week each semester for school teachers, but not for science student teachers” (HT2). Another added: “There are training courses by the Education Department for the school teachers, as needed, and these courses are highly rated, but there are none for the female science student teachers” (FHT1). The university supervisor expressed that: “There is no time for these workshops, but it is the university library which helps student teachers in teaching science curricula” (US2). Another university supervisor added that: “Usually, there are no training courses or workshops, but this year one course was completed in the female students section, but I did not hear about it. It lasted 5 days. Also there is a university library and most female science student teachers do not know about the database available at the university" (FUS2).

Some of the interviewed university coordinators argued that there were no any training courses or workshops, while others of them said that this year one training course had been held for female students for 5 days only (FUC1).

6.4.1.2.2. The periodic meetings

There was an interesting reference to learning about teaching tools, where one of the university supervisors (US1) mentioned that the university had a library, Curriculum Department, Educational Supervisor, Internet, and weekly feedback through meetings with supervisors to talk about what they had learned at the university and how they had applied it in the school.

It was also expected that there would be responses from the participants on other tools, such as micro-teaching, during these weekly meetings which would be important in learning to teach and in allowing students to reflect on their experiences.

Perhaps the participants did not reflect on conceptual or theoretical models (such as behaviourist versus constructivist models) as tools. This is a sign of weakness of the preparation programme and therefore needs to be reconsidered in the philosophy of the programme on which it is based.

Table 6.5 Rules governing the teacher preparation programme

AT= Activity Theory; RLU= Regulations and laws governing the teacher preparation programme at the university; RLS= Regulations and laws governing the teacher preparation programme in schools; ST= Student teacher; FST= Female student teacher; T= Teacher; FT= Female teacher; HT= Headteacher; FHT= Female headteacher; US= University supervisor; FUS= Female university supervisor; UC= University coordinator; FUC= Female university coordinator.

AT	Themes	Codes	Example data
6.5. Rules	6.5.1. Rules governing the teacher preparation programme	6.5.1.1. RLU	6.5.1.1.1. Duration of teacher preparation programme at university “Applying the programme at this time needs to be reconsidered as it is very short and it needs to add a third semester and there is an orientation to return to the integral programme”US2.
		6.5.1.2. RLS	6.5.1.2.1. The duration of the teaching practice programme “The practical part is not sufficient for the trainees. It would be better if there was a separate independent semester for practice of teaching and this semester to see how the process of teaching works at schools”ST4.
			6.5.1.2.2. The laws of teaching practice “There is nothing written about the laws of teaching practice, but discretionary standards need to be an acquired habit from previous experience of the school’s administration, differing from one school to another”HT2.
			6.5.1.2.3. The compliance with laws and regulations “The science student teachers are not informed about the laws and regulations of teaching practice, whether by university or school”ST4. “There is oral guidance from the curriculum and teaching methods department each semester. This information is written in the school letter”UC2.
			6.5.1.2.4. The academic load for science student teachers at the school and university “The female student teacher gives her classes as a cooperating teacher, in addition to waiting classes, exam supervision, non-class activities, writing tests, and working as an executive at the school. There will be a large increase according to school size; if it is large and if the student number is large and exceeding 300 students, there will be an average of 20 waiting classes a week”FST2.

6.5. Rules

6.5.1. Rules governing the teacher preparation programme

This theme was formed of two codes which were constructed from the qualitative data analysis of the interviews and the open-ended questions of the questionnaire. These were: the regulations and laws governing the teacher preparation programme at the university, and the regulations and laws governing the teacher preparation programme in the schools.

6.5.1.1. Regulations and laws governing the teacher preparation programme at the university

This code had only one sub-code, namely the duration of the teacher preparation programme at university. This is presented below.

6.5.1.1.1. Duration of teacher preparation programme at university

A variety of perspectives was expressed. Some participants expressed satisfaction at the duration of the teacher preparation programme but the problem lay in the large number of modules, but some felt that the duration of the programme was too short and constituted an inadequate preparation, while others considered that programme's duration was too long and exhausting for students. For example, one of female science student teachers said: “It is sufficient, but it is tiring for the student teachers as the trainee has subjects to study at university and teaching burdens at school” (FST4). Another student felt that the programme was very long, “Particularly as we are not free and it is regarded as tiring for students, especially after a long specialized preparation” (ST2). Another student added: “It is very long, especially in teaching practice, because the main female school teachers use this point in obliging the female students to complete the academic curriculum and reviewing as well” (ST3).

While the school staff expressed their inability to judge the whole programme, and preferred to speak only about the period of teaching practice, the university staff confirmed the short duration of the programme of teacher preparation. The university supervisor said that: “I do not think the preparation programme for teachers is of sufficient duration; it need an additional semester" (FUS1). Another confirmed that the programme was: "Very short and tiring for the female students under the duality of study and practice, especially in the second semester" (FUS2). Another university supervisor felt: "We can say short or intermediary and I suggest adding a third term, but now it is not sufficient" (US1). Another interviewed university supervisor alluded to integration of the teacher preparation programme, where he stated that: "Applying the programme at this time needs to be reconsidered as it is very short and it needs to add a third semester and there is an orientation to return to the integral programme" (US2).

The partnership coordinator commented that: "The duration of the programme is very suitable if the teaching practice is in a separate semester without the other study modules alongside" (FUC1). Another partnership coordinator also confirmed that: "The duration of the programme is short and requires that there be a third semester" (UC2).

6.5.1.2. Regulations and laws governing the teacher preparation programme in schools

This code was formed from four sub-codes. These were: the duration of the teaching practice programme, the laws governing teaching practice, the compliance with laws and regulations, and the academic load for science student teachers at the school and the university. This is presented below.

6.5.1.2.1. The duration of the teaching practice programme

In response to the question: 'Is the duration of the teaching practice programme too long?' a range of responses was obtained from participants, as listed below.

One of science student teachers said: "As for the permitted duration of the teaching practice period, I think it is perfect and appropriate" (ST1). But another student teacher felt that: "The practical part is not sufficient for the trainees. It would be better if there was a separate independent semester for practice of teaching and this semester to see how the process of teaching works at schools" (ST4).

As expressed by one student in response to the open-ended questions of the questionnaire: "The educational teacher preparation programme poses a problem for the student teachers, due to six study modules at the same time as teaching practice, and this is a big load on students" (OEQStT).

The majority of teachers and headteachers thought the period of teaching practice was very suitable. For example, one cooperating teacher stated that: "The period of teaching practice is very suitable as they solve the problem of shortage of teachers or dropping out, either because of illness or maternity care or so on, among the reasons for the lack of teachers in the school" (FT1). Another headteacher added: "One semester is enough, but the student teachers need more experience and practice at school" (FHT2). However, one of cooperating teachers suggested that:

> The teaching practice programme needs to be longer to train students to gain experience, more sense is needed to be ready to enter the teaching practice programme in order not to affect the education of pupils. Usually the student teacher is not a full-time teacher only; the university spends too much of the student teacher's time. (FT2)

All the university supervisors would put the teaching practice in the third semester, to make the duration of the teaching practice suitable by separating it into an independent semester.

The partnership coordinator mentioned: "Appropriate period of teaching practice is if the student teachers begin early training, but most student teachers begin late and some even start training two months after the beginning of the semester" (FUC2). A partnership coordinator suggested that: "The teaching practice needs to be in a separate semester and have a structured programme, which means that each week it needs to be known what is in it" (US1).

6.5.1.2.2. The laws of teaching practice

All participants agreed that there was no official guide or handbook to organize the teaching practice, but there were a lot of interesting responses on this question about the laws of teaching practice, as will be shown below as examples:

As one of student teacher interviewees said: "There are no rules and regulations as an official matter and most of them are verbal (oral instructions) for science student teachers to organize the practice of science teaching in the school" (FST2). And another commented that:

> There are no rules and regulations for science student teachers to organize the practice of science teaching in the school, except the school's letter that is sent to the school, which is taken from the university in order to enable the student teachers' application to the school, and this letter contains some instructions and laws. (ST4)

Another confirmed that: "Only orientation instructions, in addition to the school's letter, and the scholastic rules informed by the school headteacher and female supervisor at the university" (FST4).

Some cooperating teachers stated that: "There are no any regulations, and if there are any agreed upon regulations between the university supervisor and school staff, the science student teachers will be informed thereof" (T1). Another female cooperating teacher confirmed that: "There are no rules or regulations to govern science student teachers organizing their learning and teaching of science in school, but they are possibly in formed by the female cooperating teachers about the laws of teaching practice" (FT1).

Some of headteachers felt that: "There is nothing written about the laws of teaching practice, but discretionary standards need to be an acquired habit from previous experience of the school's administration, differing from one school to another" (HT2). Yet others considered that: "There are laws and regulations that can take the female trainee through their assessment during practice teaching at school" (FHT1).

Some university supervisor interviewees argued that: "There are rules and regulations for science student teachers to organize the teaching of science in school but they are not certified nor official" (US1). However, another confirmed that: "There are no rules and regulations for science student teachers to organize the teaching of science in the school as something official" (US2). Also the partnership coordinator mentioned that: "There is oral guidance from the curriculum and teaching methods department each semester" (UC2). Another coordinator said that: "If there are any laws of teaching practice they are in oral guidance only" (UC1).

6.5.1.2.3. Compliance with laws and regulations

Half of the science student teachers who answered this question reported that they were not informed about the laws and regulations to comply with. For example: “The science student teachers are not informed about the laws and regulations of teaching practice, whether by university or school” (ST4). The other half of science student teachers commented that: “We are informed about regulations since coming to school of class time tables, attendance, absence, and teaching practice period” (FST2).

The majority of cooperating teachers confirmed that if there were any laws or regulations these would be made clear to science student teachers to help them. For example, one of cooperating teachers said: “Student teachers are informed of everything that the school wanted” (FT2). Another said: “Certainly, if there were any instructions we would inform student teachers, or if there were agreed rules between the university supervisor and the school” (T1).

The headteachers reported that: “If there are rules, regulations or laws, the school is committed to notify the student teachers and is keen to help them” (FHT2). Another headteacher mentioned that: “The rules and regulations set by the school - the student teachers are informed about them with the help of the cooperating teacher and the school administration. All in school are committed to answer any queries” (HT1).

The university supervisors felt that the schools had all the information which was agreed on, and that they informed the student teachers of this information, for example: “Student teachers are not informed about the laws and regulations of teaching practice, but the information is often known” (US1). The other partnership coordinator considered that: “There is oral guidance from the curriculum and teaching methods department each semester. This information is written in the school letter” (UC2).

6.5.1.2.4. The academic load for science student teachers at the school and university

Science student teachers carry out work at the school and the university, as well as having extra work assigned to them. It is clear that the female student teachers were exposed to greater pressure from the school workload than were the male student teachers; all the female student teachers mentioned this. A range of responses were received from participants, as listed below.

One of the female student teachers said:

> The female student teacher gives her classes as a cooperating teacher, in addition to waiting classes, exam supervision, non-class activities, writing tests, and working as an executive at the school. There will be a large increase according to school size; if it is large and if the student number is large and exceeding 300 students, there will be an average of 20 waiting classes a week. (FST2)

Another female student teacher added that:

> The daily classes are the assigned work and waiting classes and there is no administrative work. But the cooperating teachers' exploitation of female student teacher is enormous, where some female student teachers take all the classes of the cooperating teacher. The waiting classes of a female student teacher usually ranges from more than four classes but, at most times, two classes, because the main school teachers refuse to cover the waiting classes so long as there are female student teachers. (FST3)

In contrast, male student teachers said: "Teaching only, and two waiting classes weekly, but there is no additional work at the school" (ST1); while another added: "The daily classes are the only assigned work, and waiting classes only - the waiting classes as needed - and it is often one class - and there is no other work" (ST4).

The female cooperating teacher confirmed that:

> The female student teacher is doing the teaching and performing some activities related to her specialty, and they usually assign her with some additional work such as administrative work, in addition waiting classes according to the need at school, which alleviates the burden of school on the female cooperating teachers. (FT3)

Another cooperating teacher indicated:

> The student teachers in the school do the teaching of the science curriculum in the limit of 8-12 classes, including two waiting classes at most in the week, supervising pupils one day weekly, and contributing to school activities. (T2)

The female headteacher indicated that:

> The female student teachers only teach, set exams, and evaluate female pupils, and they do not undertake additional work, but they are assigned waiting classes with the basic classes of the science curriculum as 12 classes weekly, i.e. the female student teacher attends the science classes and completes the remainder of the waiting classes. (FHT2)

This was confirmed by the male headteacher:

> The student teacher teaches 8 classes of the science curriculum and practises some activities with his pupils, in addition to setting exams on the subject matter which he teaches, and he is also assigned a maximum of four waiting classes. (HT2)

The female university supervisor reported that:

> The female student teachers study 18 hours weekly at the university, in addition to practising teaching at school, between 8-12 classes including waiting classes, and some school activities. The female supervisor has a role in specifying these classes with the female headteachers. It is very tiring for the female student teachers. In some instances, this does not make her mentally free to practise teaching at the school. (FUS1)

Another university supervisor noted:

> The male student teachers study 18 hours weekly including teaching practice, and it is really tiring for them. During teaching practice doing 8-12 classes, including waiting classes, is assumed, but some schools exaggerate in assigning waiting classes to the student teachers. (US2)

All partnership coordinators confirmed that the student teacher faces many burdens, especially in the second semester. The female partnership coordinator indicated that:

> The student teachers study 18 hours including teaching practice in the school and, as partnership coordinators, we emphasize to the schools not to overload the student teachers. The agreed workload is 8 teaching classes, and the waiting classes should be at maximum 4 classes, but a lot of schools ask them to cover the deficit and reduce the burden on the main school teachers. (FUC1)

Another partnership coordinator commented:

> The student teachers are studying full semester modules included Science Teaching Methods 2 in two parts (theoretical and practical), the theoretical at the university and the practical which is teaching practice at schools. This is considered stressful for students and some schools require the student teachers to ease the workload of cooperating teachers for the realization of the school's activities and administrative work. Therefore, the schools assign the quotas and waiting classes to the student teachers and some schools put pressure on student teachers by waiting classes to ease the burden on the cooperating teachers. (UC1)

The student teachers' responses to the open-ended questions of the questionnaire opined:

> The female cooperating teachers look at the student teachers as an opportunity to ease their own teaching load, as we take the full female teacher quota in the school. The cooperating teacher is very bad and the student teachers who are assigned additional work are overworked. (OEQStT)

Another from the university added:

> There is a quota agreed between the university and the schools that is 8-12 classes, but this is not applied. (OEQUT)

Table 6.6: Community theme, codes and sub-codes

AT= Activity Theory; UC= The university community; SC= The school community; ST= Student teacher; FST= Female student teacher; T= Teacher; FT= Female teacher; HT= Headteacher; FHT= Female headteacher; US= University supervisor; FUS= Female university supervisor; UC= University coordinator; FUC= Female university coordinator.

AT	Theme	Code	Example data
6.6. Community	**6.6.1. The support and development for student teachers to learn through the teacher preparation programme and teaching practice**	6.6.1.1. UC	"The university does not permanently support, and I often note much pressure by the university community, whether supervisors or others, on the female student teachers which does not take into account their situation in terms of the other subjects they study besides practising teaching, their limited financial resources and their family conditions, whether they aremarried"FT1.
		6.6.1.2. SC	"The school community supports, and although teaching practice is tiring to the school (due to the delay in the student teacher starting the teaching practice and acclimatization), it is the best evidence for support"US2.

6.6 Community

6.6.1 The support and development for student teachers to learn through the teacher preparation programme and teaching practice

This theme was formed of two codes which were constructed from the qualitative data analysis of the interviews and the open-ended questions of the questionnaire. These were: the university community, and the school community. They will be described in detail below:

6.6.1.1. The university community

It was clear that the female student teachers were more satisfied than the male student teachers with the university community and support it gave for their learning. For example, there were negative responses from male student teachers, such as "I do not know" and "It does not support [us]". One of student teachers said: “There is no support; the student teachers at the university are confused” (ST3). But the female student teachers were more positive in their responses. For example, one of female student teachers said:

> The university community supports female student teachers through motivating and encouraging them to gain experience in teaching students, how to face students, and the methods of dealing with them, through the most significant topic to be studied in the teacher preparation programme, which is mental health. (FST3)

Another female student teacher added: “The university community supports female student teachers in a very simple way through encouraging some female university supervisors, but not all” (FST4).

Two of the cooperating teachers commented:

> The university does not permanently support, and I often note much pressure by the university community, whether supervisors or others, on the female student teachers which does not take into account their situation in terms of the other subjects they study besides practising teaching, their limited financial resources and their family conditions, whether they are married. (FT1)

Another said that: “There is not complete support but they give as much help as possible from all, either from school or university” (T4).

While the rest of the cooperating teachers and headteachers did not know anything about the support provided by the university for science student teachers, the university supervisors felt that the support through the university community was partial and limited. For example, some of university supervisors indicated that: “Sometimes the university community supports science student teachers learning, according to the supervisor and all university tutors” (FUS1). Another one confirmed that: “The university community supports the science student teachers but this support to some extent is weak” (US1).

The partnership coordinators expressed the opinion that: “The educational community does not care about the student teachers, therefore the support from the university will be limited or partial” (FUC1). Another coordinator reported that: “The support is limited and there is no development through courses, workshops or joint planning between the school and the university” (UC1).

The responses on the open questions of the questionnaire included the comment that: “The university supervisor supports the science student teachers and provides instructions about the school environment which breaks the barrier of fear and facilitates integration with the school community” (OEQUT).

6.6.1.2. The school community

It is clear there was a lack of satisfaction by the male student teachers about the school community. For example, one of student teachers answered that: “There is no support for the student teachers. On the contrary, there is depression (frustration) at school with frustrating situations sometimes” (ST3). In contrast, some female student teachers thought that there was support provided by the school community “through the interaction of female student teachers with her female trainee colleagues and female teachers and mixing with the teaching community” (FST4). Another female student teacher confirmed that: “There is support from the school community, which develops and helps in acquiring skills and self- confidence through mixing with the female trainees and teachers” (FST2).

Cooperating teachers stated that there was cooperation and support to the student teachers from the school community, but not fully. For example, one of cooperating teachers said: “We try to support student teachers by developing their skills in the school community” (FT3). Another cooperating teacher mentioned that: “There is support but not as hoped in terms of orientation, planning, required assistance” (T2). Another added that: “There is support for student teachers in the school community, by encouraging them and assisting them in teaching methods and orienting them” (T3).

The headteachers expressed the belief that: “The whole school community supports the female student teachers through follow-up and helping them to overcome difficulties in practising teaching” (FUS1). Another headteacher stated that: “The school community supports and also the whole educational environment supports the female student teachers in everything” (FUS2). And another headteacher added that: “The school community supports, and although teaching practice is tiring to the school (due to the delay in the student teacher starting the teaching practice and acclimatization), it is the best evidence for support” (US2).

All supervisors at the university confirmed that support existed for students in the school community, but not as it was required. In general, they asserted that all the school community or university community or other communities sought to support students' learning. In contrast, the responses of the partnership coordinators was that there was no support in the school community for student teachers. For example, one of partnership coordinators reported that: “There is no support for student teachers - on the contrary! In some cases, the school community is frustrating, especially if it has old teachers who do not care about new technology” (UC2).

By asking the participants about the communities’ support, the issue emerged of the parents’ community. This was an accompanying community to the school community and it had its role in student teacher support. For example, one cooperating teacher mentioned that: “Some parents give negative support to the student teachers, such as requesting the school administration to change the student teacher and admit their sons to the classes in which the main school teachers teach” (T2). Another cooperating teacher added that: “The lack of confidence of the pupils in the student teachers - and this causes a lack of support due to pupils’ influence from their parents, although the student teacher may outperform the main teacher with new information about teaching” (T3).

Table 6.7 Division of labour: theme, codes and sub-codes

AT= Activity Theory; UR= The understanding of the roles; MA= Monitoring and assessment; ST= Student teacher; FST= Female student teacher; T= Teacher; FT= Female teacher; HT= Headteacher; FHT= Female headteacher; US= University supervisor; FUS= Female university supervisor; UC= University coordinator; FUC= Female university coordinator.

AT	Theme	Codes	Example data
6.7. Division of labor	**6.7.1. Role division in the partnership between university and school**	6.7.1.1. UR	"I cannot affirm that these [roles] are all obvious for all the partners in the partnership, but I can confirm that the female student teachers are undertaking roles which are not theirs at the school, while the female supervisor's role is supervision and helping the female student teachers on how to teach the subject of science and assessing them" FUS1.
		6.7.1.2. MA	"The visits were only made twice by the supervisor, but we do not know the assessment mechanism and we have not been oriented nor helped. Just the student teacher's personality is evaluated" ST4. "An evaluation was carried out of student teachers at the end of term, without the attendance of the supervisor, cooperating teacher or headteacher" ST3.

6.7. Division of labour

6.7.1. Role division in the partnership between university and school

Two codes were constructed under the theme of the role division in the partnership between university and school. These were: understanding of the roles, and monitoring and assessment. These codes are presented below.

6.7.1.1. Understanding the roles

It is clear that some of the roles were not known, and that not all were clear to the student teachers. Half of the science student teachers had the negative response that the roles were unknown to them, while the other half had a positive response. For example, one of the student teachers reported that:

> The roles are well-known and the student teacher's role is only teaching while the supervisor is responsible for field visits and assessing them, the headteacher is concerned with discipline and gives an evaluation mark, the cooperating teacher facilitates the way for the trainee to understand the method of explaining and preparing the curriculum. (ST1)

Another student teacher said that:

> Some of the roles are known, such as the role of science student teacher is just teaching and the university supervisor's role is assessment, but the role of headteacher and cooperating teacher are unknown. (ST2)

The female student teachers expressed the belief that:

> Each person knows his role and there are no other roles. The university supervisor and coordinator - attendance of the female student teachers, to evaluate her performance in explanation and informing her of weak and strong points; the headteacher - helping the female students in the discipline of female pupils and her role is motivating and encouraging the student teachers; the female cooperating teacher - helping female student teachers in any subject or lesson which she finds difficult and helping her by counselling in effective explanation styles with the pupils; and the female student teachers - training in the methods of explanation and dealing with the female pupils and teachers. (FST2)

Over half of the cooperating teachers admitted to not knowing the roles, while the others only knew the outlines of the roles. For example, one of the cooperating teachers indicated that: “The exact roles are unknown, but they are summarized in teaching, supervision, follow-up, and evaluation” (T1). Another one stated that: “We know outlines only, where the student teachers do not undertake other roles except the teaching” (T2). Another female cooperating teacher responded that: “The roles are known and the female student teachers are not performing roles other than the one specified to them, which is compliance with all that is assigned to them and teaching” (FT1).

The headteachers commented: “Not all clear. The role of all is to help female student teachers and then to be assessed at the end of teaching practice by the headteacher and university supervisor” (FHT1). Others argued:

> The role of female student teachers is to enter academic classes and complete the curriculum. The female supervisor's role is to follow-up and evaluate. The cooperating teacher's role is to provide counselling and guidance even if she does not go into the female student teachers' classes. The headteacher's role is to provide all available resources for female student teachers.(FHT2)

Another explained that: “The roles are obvious: the teaching is done by the student teachers, and conducting school activities, and to be helped by the cooperating teacher, and there is supervision and follow up by headteacher and supervisor" (HT1).On the other hand, a male headteacher denied knowledge of these roles: "Unfortunately, it is unknown and the student teachers are not assigned with anything other than their profession (education and activities)" (HT2).

The university supervisor participants revealed the belief that the roles were not clear. One of them said:

> I cannot affirm that these [roles] are all obvious for all the partners in the partnership, but I can confirm that the female student teachers are undertaking roles which are not theirs at the school, while the female supervisor's role is supervision and helping the female student teachers on how to teach the subject of science and assessing them. (FUS1)

Another female supervisor expressed the belief that:

> About 50% are obvious and some others are not clear. Some roles are mixed to the extent that I do not differentiate my role from the coordinator's role and I'm sure the all partners in the partnership are doing roles which are not for them. (FUS2)

Another university supervisor indicated that:

> The roles are given in the forms and there is a contact meeting at the beginning of each semester to explain the roles for the student teachers. (US2)

The university coordinator confirmed that the roles were unclear. For example, one of them mentioned that: “The roles are not clear, not even we know our roles exactly, we take guidance from the department and implement it, and it cannot be determined” (FUC2). Another female university coordinator added that: “There are simple roles that do not need to be explained, which are summarized as teaching - supervision - monitoring and evaluation of all” (FUC1). The other said that: “The roles are mixed and unclear. The role of the headteacher and cooperating teacher and the supervisor is the supervision and follow-up the science student teachers and the role of the student teacher is just teaching” (UC1).

6.7.1.2. Monitoring and assessment

It is clear that monitoring and assessment for science student teachers is often done by the university supervisor, apart from that there is a role for the cooperating teacher or the headteacher. For example, the female student teacher stated that: “There was a supervision by the female supervisor four times during the school term and the final assessment will be the result, while the cooperating female teacher and female headteacher did not attend any class for me and did not follow or evaluate me” (FST1). Another female student teacher confirmed that: “There is a female supervisor who evaluates the female science student teachers and attends for a complete class” (FST3). Another added that: “Only the female supervisor and cooperating female teacher made four visits for follow-up and evaluation at the same time” (FST2). On the other hand, the visits to the male student teachers were less than to the female student teachers, up to two visits or less. One of male student teachers said: “The visits were only made twice by the supervisor, but we do not know the assessment mechanism and we have not been oriented nor helped. Just the student teacher’s personality is evaluated” (ST4). And the other student teacher indicated: “An evaluation was carried out of student teachers at the end of term, without the attendance of the supervisor, cooperating teacher or headteacher” (ST3).

There were many differing perspectives held by teachers and headteachers about their role in the process of follow-up and evaluation of student teachers. For example, one of the female cooperating teachers said: “I prefer to follow up the student teachers from time to time to help them improve their performance and give them the necessary directives” (FT1). Another female cooperating teacher added: “The follow-up must be made periodically for student teachers” (FT2) while the male cooperating teacher confirmed that he did “not follow up as much as help whenever needed by the cooperating teachers” (T1). Another cooperating teacher stated that: “The follow-up occurs from time to time because there is no free time for the cooperating teachers” (T3). The other cooperating teacher mentioned that: “The follow-up for student teachers takes place from one time to another with the final evaluation” (T2).

The headteacher indicated that: “We do a final evaluation, but this does not prevent following up the female student teachers through the female cooperating teachers” (FHT1). Another female headteacher mentioned that: “The female university supervisor is responsible for following up and evaluating female student teachers and we do not follow up” (FHT2). The male headteacher commented: “I prefer to follow student teachers up from time to time” (HT1). And the other headteacher felt that: “The evaluation should be at four periods, and follow up each three weeks for student teachers” (HT2).

The university supervisors expressed the belief that the monitoring, follow-up and assessment of student teachers were very important. All university supervisors confirmed that there were at least four visits to school and weekly meetings at the university. For example, one of the university supervisors confirmed that: “The student teachers have a weekly meeting with the university supervisor and seven meetings at school as follow-up and evaluation” (US1). Also, the partnership coordinators at the university asserted that follow-up for students should not be less than eight visits to the school.

6.8 Summary

This research does not seek to generalization through these data, but to present the perspectives of the relevant participants about a specific case, namely, learning of science student teachers in the context of the University of Taibah, based on twenty-six interviews, the qualitative data generated from open questions in the questionnaires, that includes both gender and some documents to investigate in this topic. Thus offering a concise overview of the main points of the previous data results in preparation for discussion in depth in the next chapter.

It is clear regarding the perceptions of a good teacher that the teacher’s commitment to his or her personal development is seen as a characteristic of a good teacher, The concept of teacher preparation is not complete without his/her self-development during teaching practice and during his/her later career. However, due to their lack of experience and practice, the student teachers did not get into the process of self-development and, perhaps due to their under-preparation, they believed that their initial teacher education preparation was enough for them at that time. The personal features of a good teacher were also seen as important elements in the formation of a good teacher, in terms of regularity and commitment to the laws of the education profession, where understanding and acting in accordance with rules, both at national and local school level, were seen as characteristics of a good teacher. The personal characteristics of a good teacher were seen to come about mostly through regularity, commitment to the work, and being consistent in attending his/her school classes. The females also perceived, as prominent attributes of a good teacher, flexibility in dealing with pupils and using teaching aids.

There was a limited emphasis on patience as a feature of a good teacher, held by males only, particularly school staff, perhaps by virtue of their experience in working with boy pupils who may have different qualities from girl pupils. It is also interesting that the student teachers attached great importance to the ability to deal with pupils' individual differences.

The issue of modern and developed curricula led to revealing some differences between the teachers, as some held the view of a good teacher as one who wished to develop him/herself through knowledge of the curriculum, teaching methods and other educational aspects. The responses to the open-ended questions revealed the role of curriculum and attitudes in participants' perspectives about a good teacher. The interviews revealed some important negative attitudes and some positive attitudes, which will be discussed in detail in the next chapter.

Participants' responses about goals and ambitions showed differences in views between the university staff, school staff, and the science student teachers. Whilst the students' goals for entering the teacher preparation programme focussed on getting a job, the cooperating teachers' responses centred around their preparation as teachers. This included their suitable preparation to proceed with the work of a teacher in the school during the period of teaching practice; the discipline of work; and acquiring high level skills. The university staff gave similar responses. It is interesting that the female collaborator teachers aimed to be distinguished in the preparation of the female student teachers, while some male teachers had the less ambitious aim of preparing students to be good quality teachers and some even saw the student teachers in the school as an opportunity to ease their workload.

It is also interesting that female students aimed to develop and enrich themselves with skills in addition to their passion for getting a job as teacher, while the male students had some negative responses and some of them aimed merely to get a certificate of completion of the programme in order to get wider career choices.

Although it is difficult to draw firm conclusions about gender differences because of the small sample sizes (especially of teachers, headteachers and university staff), it is interesting to note that some differences did seem to be evident. This may be understandable as a consequence of the different position of males and females in Saudi society generally. It could therefore be an example that points to the importance of understanding educational research findings within the broader social context in which they were revealed.

These was also a divergence of perspectives between the university and school, on harmonization between the university preparation and teaching requirements, and on cooperation between the university and schools. The school staff believed that the difference in views between the university and the school made the student teachers come to school with academic problems, while the school wanted them to start as basic teachers. The university staff believed that the differences in views between the school and the university had led to uncoordinated action. The university wanted a good practice environment for the student teacher and the school wanted a student who was ready to replace the main teacher. This created a disconnection between the school and the university, where what they taught at the university did not apply in the school.

Most participants mentioned that there was no cooperation between the university and the school. The university staff believed that cooperation between the university and the school lay only in the university's need for schools to accept the practice teachers, while the schools only saw their need to remedy their teacher shortage; this created contradictions and difficulties for science student teachers. It is clear that there were further difficulties from the perspective of the participants that hindered achievement of the goals. These centred on the increasing number of hours of study in the university programme during teaching practice. There was pressure through teaching modules of 18 hours weekly per term, and from the distance of many students' schools from the university campus. Also the student teachers were not trained to cope with modern science curricula. On the level of the school, where most students found particular difficulty at the beginning of teaching practice were the school's elements such as the pupils, curriculum, teachers and headteacher, and the difficulties in the application of teaching skills. Students had fears when starting teaching practice and there was a lack of initiation for student teachers on entering the school.

The difficulties that faced the student teachers, as the quantitative data revealed, were that 58% of the student teachers reported that they had difficulty in planning for science lessons, 64% in choosing the appropriate methods for teaching science, 53% in dealing with the science curriculum, 57% in acquiring teaching skills, 55% in choosing appropriate practical work associated with science topics in the curriculum, and 67% reported difficulty in applying the educational theories they had learned at university in the school situation.

The science teachers usually needed tools to help them in teaching, tools that would develop their learning to teach in school, such as laboratories, data display devices, and internet.....etc. The majority of those interviewed confirmed the existence of learning tools such as laboratories, but not in all the schools. Some of the schools did not have labs or learning resource rooms, let alone other devices such as computers or projectors.

In some cases, there were laboratories and equipment to assist in the teaching, but the student teachers were prevented from using this for fear of damaging them. It is clear that there was a lack of trust in the student teachers' correct use of equipment and laboratories, especially since the student teachers came to the school for just a short period, and any damage would not affect the student teachers as much as the permanent teachers at the school.

Another issue prominent in participants' interviews was that of school size, which was related to the availability of equipment and tools. Where there were large schools in government buildings, they tended to contain laboratories which are usually well equipped with science equipment that would enable the pupils to do practical work and educational equipment, but these large schools also usually tended to have large class sizes which were difficult for the student teacher to manage in the lab. There were also a large number of other teachers wanting to use labs and therefore little chance for the student teacher. The small schools, which were often rented, had smaller class sizes but did not possess laboratories or educational equipment.

It is clear that there were deficiencies in the availability of resources at the university. Almost all responses confirmed the absence of workshops or training courses, even technical communication programmes, except in the university library. Nevertheless, a short five-day course for female students had a significant impact on helping them to start their teaching practice in schools. The university library was one of learning resources at the university but it was far from the female students' campus; this led to a lot of female students not knowing much about the existing databases at the university. Another tool helping students to learn more about teaching was the periodic meetings held by supervisors with university student teachers. It was also expected that there would be responses from the participants on other tools, such as micro-teaching, during these weekly meetings which would be important in learning to teach and in allowing students to reflect on their experiences.

In regard to the rules governing the programme of science teacher preparation, there were many opinions about whether there should be a special guide to these rules and regulations. There were also opposing opinions on another problem that surfaced, which was the duration of the programme.

With reference to the support given to student teachers from the school and university communities, it was clear that the female student teachers were somewhat satisfied, unlike the male student teachers who held a negative view. All university staff and school staff confirmed that support existed for students, but not as much as was required. In general, they asserted that the school community, university community and other communities sought to support the students' learning.

The roles of staff were not known to most of the participants, and not all were clear to the student teachers. Half of them gave the negative response that these roles were unknown to them, while the others only knew the outlines of the roles. They were clear that monitoring and assessment of science student teachers was often done by the university supervisor, and that there were separate roles for the cooperating teacher and the headteacher.

It is clear that there are many contradictions that hinder science student teachers' learning and these will be highlighted in the next chapter. These issues will be discussed in depth to help answer the research questions.

Chapter Seven

Discussion of findings

7.1 Introduction

The previous chapters presented the results of the analysis of the quantitative data extracted from the questionnaires, and also the results of the analysis of the qualitative data obtained from the open-ended questions of the questionnaires and the semi-structured interviews, in order to obtain answers to the research questions. In this chapter, I discuss the results of the data analysis. This entails discussion of the issue of science teacher pre-service preparation through the university programme, and through practice teaching in the school, and the relationship between the university and the school. This focusses on the affordances and constraints inherent in these shared systems of science teacher preparation with the aim of answering the following main research questions with their sub-questions:

1. Does the science teacher preparation programme at the university support the students in learning teaching?

Emanating from the main question, several questions arose:

(A) Is the type of programme compatible with modern trends in the education of the teacher?

(B) Are the modules of the university preparation programme compatible with the curricula applied in schools?

(C) Is the duration of the science teachers' preparation programme at the university appropriate?

2. Does the teaching practice in schools support science student teachers' learning?

Emanating from the main question, several questions arose:

(A) Do the schools provide a good environment for student science teachers' teaching practice?

(B) Is the duration of the teaching practice programme appropriate for science student teachers to learn to teach?

3. Does the relationship between the school and the university support science student teachers in learning to teach?

Emanating from the main question, several questions are as follows:

(A) What kind of partnership is the relationship between the university and the school?

(B) How can a third space be created for the relationship between the university and the school to become a partnership?

4. What are the challenges and contradictions in the teacher preparation programme?

Emanating from the main question, several questions are as follows:

(A) What are the contradictions that produce the conflicts faced by science student teachers in their learning from the teacher preparation programme at the university?

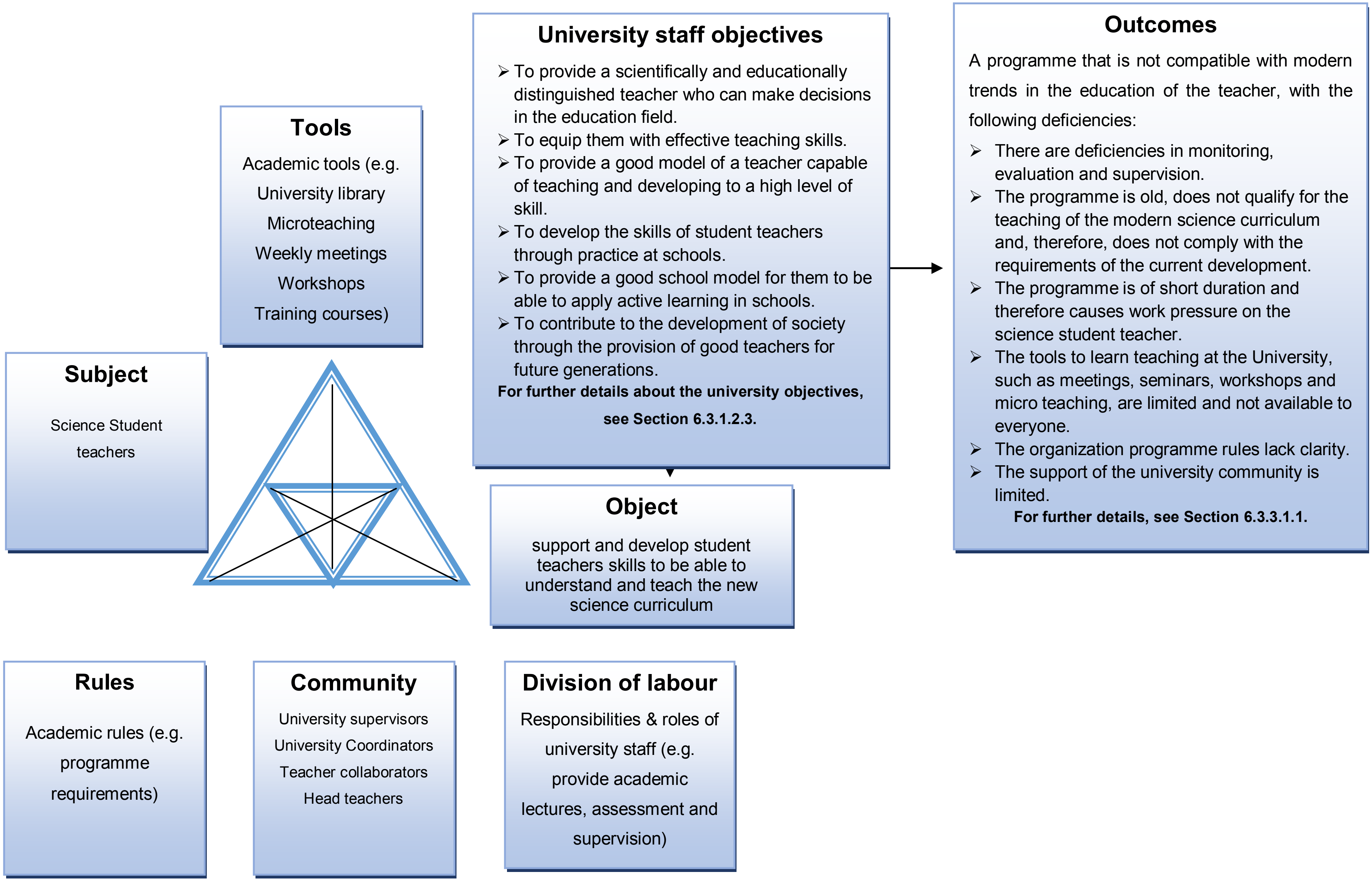
(B) What are the contradictions that produce the conflicts faced by science student teachers in their learning from the teaching practice programme in the school?

(C) What are the challenges facing the relationships for science student teachers learning to teach?

To answer these questions, the results that have emerged through the qualitative and quantitative data analysis are summarized and then discussed to reach a logical explanation, and therefore lead to suggestions for appropriate solutions.

Figure 7.1: Academic activity system of science teacher preparation at the university

(Source: Designed based on my data by the researcher for current research)



7.2 Pre-service science teacher preparation in the university context

The first research question:

1. Does the science teacher preparation programme at the university support the students in learning teaching?

From Figure 7.1 we find that there are ambitions for the preparation of science student teachers, that they will become capable of teaching science through the development of skills and from learning about teaching from the university programme. (For further details about the university objectives, see Section 6.3.1.2.3).

The results on the work of the academic activity system at the university in the preparation of student teachers, in terms of education about science teaching, as in Figure 7.1, reveal the deficiency in the support provided by the university community, the roles represented by the university team, the organization of the programme rules, the tools used to provide assistance for student teachers' learning (such as the university library, courses, meetings, lectures and teaching plans) and the supervision, follow-up and evaluation of student teachers. (For further details, see Section 6.3.3.1.1). This leads to an answer to the first research question through discussion of the sub-questions.

(A) Is the type of programme compatible with modern trends in the education of the teacher?

There were perceived deficiencies in various aspects of the process of science teacher preparation at the university that were likely to affect the professional development of the science student teachers. Some of these deficiencies were related to the implementation of the rules and the tools used. The data showed that not all the student teachers received support from the university community or had access to the learning tools within the university. Some courses were only offered to female student teachers but not every one of them received these. The quantitative data show that the item with lowest level of agreement of the participants was the item stating that the university provided workshops and short courses to help the science students teachers understand the modern science curriculum being taught in schools. In addition, not everyone received supervision or evaluation from their university supervisors and student teachers were not always informed about the regulations governing teaching practice by which the university operated. Therefore, they were not able to find out about their responsibilities towards the teaching profession or towards their school practice. There was also the issue of the university teachers who taught using traditional methods (i.e. there was a lack of courses, workshops and seminars offered to student teachers by the university). This mitigated against the students acquiring appropriate teaching skills.

Another problem was that not all students were provided with adequate support at the university or had access to the learning tools within the university. Despite the existence of the library and the internet, the data from students revealed no motivation for them to learn to use these resources more effectively. There was no programme of communication between students and teachers at the university, such as educational blogs, social media programmes or electronic learning rooms used to communication for groups or individuals, which would enable them to talk, exchange experiences and improve their teaching skills. Douglas (2012) indicated that student teachers usually feel the importance of such communication during teaching practice. However the purpose of such communication was one of the contradictions discussed by Douglas on initial teacher education (ITE). He referred to some of what was mentioned, for example: "the pre-service teachers and the mentors in school emphasised the supportive nature of ITE: ‘there’s this sort of policy of everyone’s helping everyone else and everyone’s learning from everyone else’s experience’" However, critique of another’s practice – especially of a teacher by a student teacher - was not common even though this could be an aspect of expansive learning, "where the class teacher could learn too”. In his study some student teachers felt that the focus should be on “expanding their own horizons” and saw critique of a teacher as reducing that teacher’s horizons (p.9) not as a spur to learning for all.

In my study no information was provided for student teachers on how to use the university library, although there were individual efforts by student teachers at self-learning. As mentioned by a female supervisor at the university "...Also there is a University Library and most female science student teachers do not know about the database available (whether the library catalogue or online journal resources) at the university” FUS2. Another problem was that the central library was in the campus for male students, so the female students could not enter the library at all times, as the campus buildings for female students were completely separate from the campus buildings for male students, and this led to less use of the library by female students. In regard to the difference between the responses of males and females, there were significant differences in perception between them on the usefulness of the university library. The quantitative data showed that essential academic resources provided by the university library (to help science student teachers to learn about science curricula and teaching science to pupils) were seen as less adequate by the females than the males. Therefore, as noted by Gordon (1987), the women struggle to receive what the men on campus receive. Perhaps this problem, mentioned by Gordon in 1987, has now ended in the context in which it was raised, but from my study, it still continues in the Saudi context. This is consistent with the observation by Alharbi (2014) that, in Saudi Arabia, the needs of females in education were addressed less, they were more isolated, and efforts were devoted to males only. Alharbi’s study looked at the development of the girls' educational curriculum and feedback from the community. As he mentioned, that needed a lot of work to fit with the modern world.

As a result of the lack of explicit rules and regulations upon which the programme was based, there was also a lack of knowledge of the roles of the leading participants, which became a matter of personal interpretation; therefore supervisors and students did not know what they were supposed to do, and this led to a lack of supervision or evaluation for the science student teachers. This is shown also by the results of the quantitative data where there were differences in the perceptions of the roles and responsibilities.

B) Are the modules of the university preparation programme compatible with the curricula applied in schools?

The characteristics of the curriculum in the teacher preparation programme were out of date. The curriculum was based on the earlier integrative teacher education system where study of a subject specialism went on alongside training to teach that subject , but the programme had become independent and offered a diploma after the completion of bachelor study in a particular specialty. Before 2007, teacher training was based on an integrative system, and provided training for teaching in the intermediate and secondary stages of schooling. After the establishment of the University, the students studied one of the disciplines in the Faculty of Science and then moved on to the College of Education to join the teacher preparation programme; that is, a sequential structure. The content of the curriculum did not correspond with the current preparation and requirements for the stages of teaching. For example, the educational psychology curriculum, which was within the content of the preparation programme, addressed the teenage stage but not the primary school stage. For each stage of child development, the student teacher needs knowledge of that stage before going into teaching practice.

Alarfaj (2015) argued that the 2007shift had led to a wide debate about the validity of these programmes after the transition. This is consistent with what Alaqail (2005) argued in his study, that Saudi universities did not seek to develop their curricula, therefore developments were restricted to small changes, which included the omission or addition of a topic or course. Consequently, the university curricula were not responsive to the demands of development, the needs of society or the labour market.

Another issue is that the university teachers were still using traditional methods of training to teach because of the lack of development of the actual programme, leading to the students being unable to acquire modern methods of teaching. Girvan et al. (2016) noted that university teachers would not achieve professional development if they failed to take up new ideas but clung to the practices provided by traditional methods, which were far from active learning but seen as a simple transfer of information. This was shown in the difficulty experienced by students in writing teaching plans, which did not correspond with the modern school science curriculum. This was also revealed by the quantitative findings, which showed four significant differences between university staff and student teachers, all with university staff perceiving that more support was offered. These four items related to the university supervisor solving educational problems that faced science student teachers during periodic meetings, the student teachers studying some courses at university during teaching practice, the university tutors using a variety of teaching methods in their lectures to make learning possible, and the relationship coordinator at the university collaborating with the science student teacher to resolve educational problems at the university. This is consistent with the observation made by Cuban (1992) about what is learned from the curriculum and actually happens in the classroom: "The gap between what is taught and what is learned - both intended and unintended - is large" (p. 223).

In many teacher training programmes there are opportunities for students to simulate teaching during their training and before actual teaching practice begins. This simulation would be very useful for providing feedback and guidance from university teachers and fellow students, but the programme did not contain any opportunity for simulation through micro-teaching, so the student teachers only experienced teaching practice in the actual schools. The simulation of teaching for the student in front of his/her colleagues would help to remove their fear at the start of teaching practice, which would be a first step for the teacher. This lack was in spite of the large number of hours at the university- up to 18 hours of modules each week in one semester - but all the modules were theory and lacked any practical implementation. Alsharqi (2004) indicated that the professional preparation content only contained weak contributions from educational and psychological courses to prepare students for the teaching profession, In addition there was massive theoretical content at the expense of practical content. Alsharqi attributed this to the lack of renewal or innovation in the curriculum or teaching methods. This arose from his study that included evaluating the science teacher preparation programme for the elementary stage in Saudi Arabia, according to the opinions of the supervisors and science student teachers.

(C) Is the duration of the science teachers' preparation programme at the university appropriate?

The student spends two-thirds of the teacher preparation programme at the university. From my perspective, this period is more than necessary for the theoretical part of the programme. Nevertheless, the students still experience many problems and challenges when faced with the reality of teaching, despite the contribution of the university courses. This is illustrated by the programme structure, which was distributed over two semesters, the first with some of the modules (18 hours weekly) and the second with the same hours but with other modules alongside part of the teaching practice. A more detailed discussion of this issue will be considered after the answer to the second question, under the section on common issues between the university and school (Section 7.4.1. It is addressed from two angles: through the H.D.Ed programme as a whole at the university, and through the teaching practice within the school.

Figure 7.2: Academic activity system of science teacher preparation in the schools

(Source: Designed based on my data by the researcher for current research)

School staff objectives

- To provide suitable preparation for student teachers to proceed with their work as teachers in the school during the period of teaching practice.
- To introduce the student teacher to the discipline of work.
- To allow the student teachers to acquire high level skills.
- To allow the student teachers to acquire values and educational skills in teaching.
- To support and develop student teachers' learning through the teacher preparation programme and teaching practice.

For further details about the school objectives, see Section 6.3.1.2.2.

Outcomes

As a result of weakness in the supporting environment of the schools for teaching practice:

- The cooperating teachers have some problems.
- Use of the student teachers to alleviate the cooperating teachers' burden and to cover the staffing deficit in the school.
- Difficulty in integrating the student teacher with the school staff.
- Weak cooperation with the student teacher by the school management and teacher collaborator.
- Lack of confidence in the capabilities of the student teacher in the school.
- Lack of learning assistance tools for the student teacher in teaching such as in meetings, seminars and workshops, science labs, school library, and resource learning rooms.
- Teaching practice affected by the size of the school.

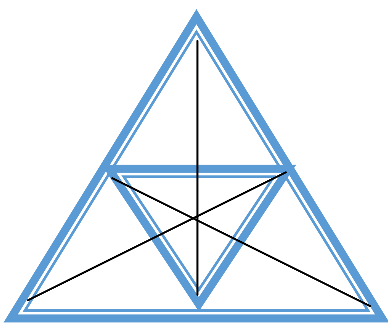
For further details, see Section 6.3.3.1.2.

Tools

Academic tools (e.g.
Science labs
School library
Resource Learning Rooms
Short Courses)

Subject

Science student teachers



Object

support and develop student teachers skills to be able to understand and teach the new science curriculum

Rules

Academic rules (e.g. Rules of teaching practice)

Community

University supervisors
Teacher collaborators
Head teachers
Parents
Pupils

Division of labour

Responsibilities & roles of school staff (e.g. teacher cooperation, headteacher's follow-up for teaching practice, guidance& counseling, assessment

7.3 Science teacher pre-service preparation in the school context

The second research question:

2. Does the teaching practice in schools support the student science teachers' learning?

Figure 7.2 shows the objectives for the preparation of the science student teacher in learning to teach science through the development of relevant skills and through learning more about teaching from school teaching practice programme, which leads to the answers to the second research question. (For further details about the school objectives, see Section 6.3.1.2.2)

The results revealed the work of the academic activity system in the context of the school through the support provided to the science student teachers by the school community, consisting of headteacher, collaborating teachers, parents and students, as well as the tools for learn teaching skills, such as the school library, science laboratories, resource rooms and teaching aids. The findings also provide data about the rules governing teaching practice, the roles of the key participants in the teaching practice programme within the school, and the aims of the science teacher pre-service preparation programme. Contradictions that created conflicts were also revealed, and these would tend to weaken the role of the school in providing full support and assistance to the student teacher for the development of teaching skills and his/her learning and understanding of the modern science curriculum.(For further details, see Section 6.3.3.1.2). This leads to the answer to the second research question through discussion of the sub-questions.

(A) Do the schools provide a good environment for student science teachers for teaching practice?

Despite the support of the school community for the student science teachers, there was a problem of lack of confidence in the student teacher on the part of the pupils and their parents, who regarded him/her being still a student in training and not really a teacher. Parents feared that their children's educational level would be compromised, thus making the student teacher lose confidence in his/her skills, resulting in difficulty in dealing with the pupils. This in turn led to psychological pressure on him/her and inhibited his/her creative ideas. Nevertheless, not all student teachers reported that this problem had happened to them and some were able to overcome these problems with the help of either the school administration, cooperating teacher or university supervisor. Williams (2014) highlighted the need to build relationships of trust and mutual respect among individuals in the learning community: "Part of managing these different perspectives is the need to negotiate potentially difficult relationships between teachers, teacher educators and, at times, student teachers" (p.325). This would help the student teachers feel equality with the rest of the teachers in the school which lead to better learning during teaching practice.

Douglas (2012) pointed out that, in initial teacher education, the teacher in the school undertakes a strong and active role in helping to guide the student teachers' ideas and provide learning opportunities for them, and if the teacher provides an excellent role model, the student teachers will be greatly helped. So we find in England that the cooperating teacher is very close to the student teacher to give support and follow-up. By contrast, some the KSA schools accepted more student teachers than the agreed number, considering them as essential to fill gaps in the school's staffing. This practice ignored the role and ability of the cooperating teacher, who bears a large part of the responsibility for helping these student teachers. Some schools lacked their own science teacher, and assigned the student teacher the full timetable for the main science teacher, who should have been replaced by the local education authority. As well, the quantitative data analysis showed that there were significant differences on the item about the school assigning the science student teacher extra work that was not related to learning to teach, where the students showed significantly higher agreement compared to the school staff. A serious issue was that the school teachers considered the science student teachers as a chance to reduce their teaching load. The problem of shortage of teachers existed in many of the new and emerging schools, sometimes because of the withdrawal of some teachers due to illness or other causes. The education system in the Kingdom of Saudi Arabia does not have cover for missing teachers, because the formal employment procedure takes a very long time, and therefore a teacher cannot be replaced during a semester, so schools often use student teachers to cover when qualified teachers are not available.

School and university buildings are essential for providing suitable environments for learning and the physical school environment has an impact on learning and teaching. Hassanain and Iftikhar (2015), through evaluation of school facilities in Saudi Arabia, have argued that the school environment and its spaces have a significant role in either enhancing or obstructing the teaching and learning process. Also, the availability of learning tools and technological instruments will enhance the learning and teaching process, as Walberg (1991) pointed out in relation to improving school science in advanced and developing countries.

There are two types of school in the Kingdom of Saudi Arabia in terms of buildings: the first type consists of schools with government buildings or government-owned buildings that have been designed as schools,; the second type consists of buildings not intended to be used as schools but rather for housing, which have been rented by the local education authority to cover the lack of existing schools. Alenazi (2013) pointed out, in his study that sought to know the impact of a school buildings in terms of safety and health in Saudi Arabia, that the education sector in the Kingdom had suffered for a long time from poor performance due to the deterioration of the quality of some of the school buildings, as well as shortage of technological tools that would improve learning and teaching. This is consistent with what Alzaydi (2010) said, that some of the administrative problems led to academic problems. Therefore, the weakness of spending on school equipment may affect learning outcomes. A challenge existed to enhance learning environments in order to have a positive influence on learning. Some student teachers liked having teaching practice in these rented schools, which are small compared to government schools, with small class-sizes, and which mostly do not have a science laboratory, and which they find to be very comfortable. Teachers and student teachers who teach in these schools use traditional methods without the use of teaching aids. However, a review by Hofstein and Lunetta (1982), of research relating to the laboratory as one of the tools for learning in science, had highlighted the important role of the school laboratory in science teaching. It indicated that the laboratory had a central, distinctive role, and provided a unique medium in science education, and that science educators had suggested that rich benefits in learning accrue from its use. Therefore the lack of laboratories in these school buildings should be considered a serious handicap in the teaching of science and the training of the science teacher, notwithstanding the fact that these schools are considered temporary until suitable government buildings are found.

On the other hand, schools with government buildings are usually equipped with a science laboratory, resource room, library and educational aids. They usually have at least two science teachers, while most of the small schools do not have a specialist science teacher to collaborate with the science student teacher. For over six years, the local education authorities have been converting some of the government school buildings into model schools supported with modern facilities including teaching aids. However, these schools, which are fully equipped and staffed, are rarely on the list of schools which receive student teachers for teaching practice, due to the lack of coordination between the university and the local education authority, and to the lack of agreement between them on the schools that should qualify for teaching practice as model educational environments. Local education authorities only consider their own interest, which is to cover the shortage of teachers. One of the university supervisors said that "the university places the student teachers in real experiences in which the student teachers practice all tasks, but the school sees it as an opportunity to alleviate the burden on the main school teachers" (US1). A female supervisor confirmed that the problem was that of: "Positioning the female trainee to fill the deficit at school and not as a female student teacher who needs a cooperating teacher to help her" (FUS2). This is due to divergence of perspectives between the university and school, the presence of many contradictions between them and the absence of full coordination, none of which work in the interest of the pre-service student teacher.

Also in the context of the newly emerging schools, we find that there is a deficit in the provision of some learning tools that would help student teachers, such as science laboratories, teaching aids, school libraries and learning resource rooms, in addition to computers and projectors in the classroom. Park et al. (2011) pointed to the importance of school buildings and their impact on the learning environment in terms of health and well-being of students and their academic achievement and behaviour, in their exploration of environment-friendly school facilities in the Korean context which were aimed at creating a pleasant educational environment. They indicated that the environment also has a significant impact on the teachers, who spend a lot of time in schools, and that school facilities should be a means to assist in the implementation of various education methods. While some large old schools have smart classrooms as well as other school equipment, if the student teacher practices in a small emerging school which lacks educational services, they would not be able to work in a typical school environment which has better facilities, so they would not be able to apply what they have learned during the teaching practice in their profession.

Furthermore, some schools limit the use of computers and educational facilities for student teachers due to fear of damage because of their lack of expertise in using these devices, or because of the limited number of such devices and absence of rules as to who can use them. According to Galton et al. (1999) in Wilson (2004), many limitations are imposed on the teaching of the science curriculum where there is unavailability of equipment, information and communication technology (ICT) and other important facilities "within a dominant didactic transmission pedagogical model of science teaching" (p.596). In addition, Alzaidi (2008) asserted that the lack of financial resources to improve school buildings and equipment in Saudi Arabia was a factor causing dissatisfaction. There was a significant difference in perception between students and school staff about the school undertaking to provide all teaching practice requirements, with school staff being more convinced that all requirements were provided than were the students. This may mean that some schools did not provide the necessary requirements and, from my experience when visiting schools as a supervisor of teaching practice, some of these are the rented schools. In addition, one of the female student teachers argued that: “If the school is small it is usually not equipped with any tools, equipment or laboratories to help the teacher in teaching and, if it is large, the pupils are in very large classes and cannot be used in the laboratory” FST1.

The application of rules and regulations about student teachers in school may be at the personal discretion of head teachers and collaborating teachers if there is no instruction manual from the university (or the partnership) for teaching practice in the schools for student teachers or new teachers which would help the school support them professionally in learning teaching skills. This results in the student teachers not knowing what they are supposed to do during the teaching practice and not knowing what the aim of it is, which leads to confusion over the role required. This is revealed in the results of the analysis which show the overlapping of roles, and that most of the school staff do not know their roles towards the student teachers, resulting in a haphazard division of labour and roles within the school. Darling-Hammond (2006) argued that "improving teaching and teacher education in the United States depends on not only strengthening individual programs but also addressing the policies needed to strengthen the teacher education enterprise as a whole. Although teacher education is only one component of what is needed to enable high-quality teaching, it is essential to the success of all the other reforms urged on schools. To advance knowledge about teaching, to spread good practice, and to enhance equity for children, thus, it is essential that teacher educators and policy makers seek strong preparation for teachers that is universally available" (p.313). Therefore, there is a need to change the school's role in teacher education in Saudi Arabia and to provide sufficient resources for this.

There is a huge challenge facing the government to develop the school environment and create model schools in terms of buildings and availability of the educational resources and laboratories that would be able to accommodate the modern science curriculum and assist in the practice of teaching and learning; this would help the science student teacher to develop professionally during teaching practice.

(B) Is the duration of the teaching practice programme appropriate for science student teachers to learn to teach?

There are different views around the period of the teaching practice programme of the participants but, on the whole, the period spent by science student teachers at the school is considered short (one third of the year in school compared to two-thirds in the university). This will be discussed in more depth in the following section under the section on common issues between the university and school.

7.4 Common issues arising in the university/school relationship

7.4.1. The duration of the teaching practice programme

Some of the participants argued that the programme was too long, others that it was too short, and yet others that it was just right. When considering these three views about the duration of the programme, the evidence suggests that it is too short and may need to include another semester.

The student teachers have a heavy a workload during teaching practice; they are studying 18 hours weekly during the second semester, including six hours of teaching practice weekly also. It is my belief that the reason for those who say that the programme is too long, mostly students, is because they may have spent a long period studying; a student will have studied for four years at least in the Faculty of Science to get a Bachelor's degree in one science discipline, then enrolled in the teacher preparation programme for one academic year to get a Diploma in Education, and therefore five years of study to become a science teacher is seen as too long a time from the perspective of some of the students.

The point of view of some participants, who believe that the programme is too short, are only looking at the duration of the Educational Diploma programme. They think that teaching practice should occupy the student teacher full-time.

When considering the British models of post-graduate teacher preparation, such as the Oxford University and Exeter University models which are both one year long, I think they have an appropriate duration, and this includes a lot of coordination. Government regulations for all such courses in England require students to spend more than two thirds of the time in the school, indicating the more practical nature of the teacher preparation programme. McNicholl and Blake (2013) were consistent with Darling-Hammond (2006) in stating that teacher education has a key role to play in improving educational systems through universities, emphasising the importance of exploring the "organisational development of teacher education; to think about the ways in which teacher education might be transformed in terms of partnership working with schools and as a form of higher education" (p.282). Therefore, this controversy, that creates tension regarding the efficiency of the programme in terms of its duration, should lead to improved coordination through the intensification of joint efforts between the university and the school to enhance the understanding of teacher education and its practical demands. It should also lead to the development of a more integrated organizational framework, which would include the roles, responsibilities and operations performed by all participants in student teacher preparation, which would involve planning within a common space based on the understandings of all parties in order to take optimal advantage of the programme.

7.4.2 Workshops and short training courses

The lack of workshops and training courses which emerged from the results of the analysis for the student teachers created an obstacle to their understanding of the modern science curriculum or to learning more about teaching.

When the modern science curriculum was first introduced, the local education authority ran several courses on it so that teachers could understand how to deal with its requirements, but these courses have not yet included new teachers. An interviewed cooperating teacher, when asked about training courses and workshops, said: “One training course only at the beginning of applying the new curricula in the Education Department for 5 days and it is not repeated for students who missed it” (T1). Another cooperating teacher added that:“Some training courses in the Education Department for the school teachers only and sometimes in other cities” (FT3); neither had the university implemented any courses on the modern curriculum, as they were not involved in compiling it and had not even seen it. One of the female headteachers added that: "Through my experience in the administration, the situation in some schools is very bad. Not all student teachers are trained to these curricula, and even the school teachers, not all have been trained to these curricula. This is due to the lack of courses and workshops that develop teachers. There is a gap between the schools, the education authority and the universities" (FHT1). The university coordinators explained how the problems were due to the differences between the educational institutions: “Theoretical learning means that students are not trained in the modern science curriculum and modern methods” (UC2). This was confirmed by a student teacher: "Unfortunately, there are no workshops and usually there are no training courses, but this year one training course was held for female students for five days, only for some female student teachers and not all specialties"(FST4). This is due to the separation of the Ministry of Education and Ministry of Higher Education, as the Ministry of Education is in charge of the management and application of the school curriculum, but this is done in isolation from the university curriculum specialists. Therefore there is a big gap in that university teachers do not know anything about the curriculum in schools. Thus there is no mutual cooperation in training courses or workshops serving the teachers and student teachers in terms of the support they require. In any case, the role of the university and the school in providing a community service is completely absent despite the urgent need for the development of science education, a service which must be provided to teachers, student teachers and parents, to educate the community on how to deal with the modern curriculum. Girvan et al. (2016) emphasised that the process of change within the individual represents professional development, that it benefits from past experience as a basis for dealing with the new and, according to Darling-Hammond and McLaughlin (2011), that this "can motivate teachers to try new practices and make desired changes to the curriculum a practical reality" (p.130). In contrast, some female student teachers thought that there was support provided by the school community “through the interaction of female student teachers with her female trainee colleagues and female teachers and mixing with the teaching community” (FST4). Thus, perhaps this contributed to the internal change for those who had received this training course on the science curriculum, which they, in turn, transferred to their colleagues in the school community. Another female added about the need for support: "Some pass with the help of his colleagues and the cooperating teacher and supervisor by follow-up, guidance and advice, but some cannot pass these difficulties" (FUC2). Also, Girvan et al. (2016) highlighted that an important factor is colleagues learning from each other within the school, which in turn leads to the development of educational practices through a collaborative approach in which there is exchange of ideas and debate about educational experiences. This is where the role of the university comes in as an external support for the school in its development. Douglas (2012) confirmed that the key element of the work of the teacher educators includes different roles and responsibilities for supervisors from the university and teachers at the school, which enhances the contribution of the school in preparing teachers.

Furthermore, the reaction of female students, who had their own special course for one week before they started teaching practice, demonstrates the need for such courses, as the results of the qualitative data analysis reported that this short course was useful in explaining how to deal with the modern science curriculum and how to plan to teach.

Figure 7.3: Academic activity system of science teacher preparation in university/school relationship

(The source: Designed based on my data by the researcher for current research)

Difficulties

- **Students say there is little support for them in school**
- **There's duality in work and contradiction in education**
- **There's different in planning for teaching on the level of school plan in teaching, and learning tools.**
- **There's contradict between lectures at university and compliance with teaching.**
- **There's different in assessment methods between school and university.**
- **Assigning them with waiting classes or conducting the tiring school programmes such as, administrative work.**

For further details about the difficulties, see Sections 6.3.3.1.1 & 6.3.3.1.2.

Outcomes

As a result of the limited common area (Third space) between the university and the school:

- **The weakness of the relationship between the university and the school through the lack of cooperation between them.**
- **Lack of coordination between the university and the school.**
- **Overlap and lack of clarity of roles in the relationship.**

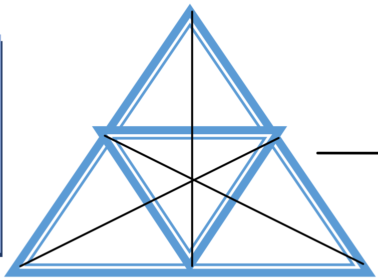
For further details, see Sections 6.3.2.1 & 6.3.2.2 & 6.3.2.3.

Tools
Academic tools (e.g. University library - Microteaching - Weekly meetings - Workshops Training courses)

Tools
Academic tools (e.g. Science labs - School library - Resource Learning Rooms - Short Courses)

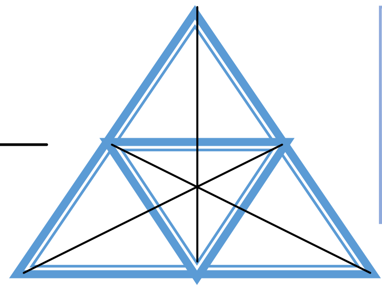
Subject

Science student teachers



Shared Objective

- Support, preparation, training, and development of the student teacher professionally, to be able to teach the modern science curriculum



Subject

Science student teachers

Rules

Academic rules (e.g. programme requirements)

Community

University supervisors
University Coordinators
Teacher collaborators
Head teachers

Division of labour

Responsibilities & roles of university staff (e.g.provide academic lectures, assessment and supervision)

Division of labour

Responsibilities & roles of school staff (e.g. teacher cooperation, Headteacher's follow-up for teaching practice, guidance& counseling, assessment

Community

University supervisors
Teacher collaborators
Head teachers
Parents
Pupils

Rules

Academic rules (e.g. Rules of teaching practice)

7.5 Science teacher pre-service preparation in the relationship between the university and the school

From Figure 7.3 we find that there are objectives for the preparation of the science student teacher, making him/her capable of teaching science through the development of his/her teaching skills and through learning more about teaching from the programme divided between the university and the school, which leads to answering the third research question and the affiliated sub-questions:

3. Does the relationship between the school and the university support science student teachers to learn teaching?

The analysis of results showed the work of the academic partnership between the university and the school. The results revealed details of the support for the student teacher in the existing relationship between the university, which runs the teacher preparation programme, and the schools, which run the location of teaching practice. They showed how these two systems work through their existing relationship to provide the tools necessary for the science student teachers to learn teaching skills, whether at the university or the school. This is a mixture of university and school tools, as well as rules and regulations governing the entire pre-service teacher preparation programme, and the roles of participants including university and school. Despite this support, there are deficiencies in many aspects of the teacher preparation as a result of the lack of full coordination between the two systems, creating a large gap between the university and school.

The local education authority (LEA) seeks to provide a good school environment for education and learning because it wants to raise the standard of the teaching force. It is clearly interested in the teachers and is committed to developing a fully qualified teaching force by allowing teachers to access in-service training and motivating them to undertake a teacher preparation programme for those who do not have educational diplomas, and to provide short courses for all teachers. Douglas (2012) emphasized the need to provide opportunities for broadening educational horizons and enhancing the possibility of new learning, and this could have happened as part of the university course and the students' experiences in schools. The analysis of the findings shows that the local education authority does not allow them access to short courses in the same way as regular teachers. At the introduction of the modern science curriculum, the LEA set up a course for main school teachers but they did not allow the student teachers, who were in the schools by then, to attend this course; and at the same time they were seeking to fill the schools' deficit of teachers through training student teachers.

Some of schools, which did not have a shortage of teaching staff, still use the student teacher as a tool to ease the workload of the regular teachers, and this view of the role of the student teacher hinders the achievement of the goal of his/her presence in the school. It is also clear from the quantitative data that there is a high level of agreement that the school teachers consider the student teachers as a chance to reduce their teaching load; this statement generated the highest agreement among all participants. On the other hand, the university wants the student teacher to be a trainee and wants the school to be responsible for the development of his/her teaching skills and to improve their experience. Consequently, these complications have made the process of pre-service teacher preparation deviate from the right track and away from its goals. Clark (1999) stated that, in the context of the relationship between university, school, and community members, the "Partnerships succeed only when participants have the same clear understanding of the collaboration's purpose and function" (p. 168), and this is clearly not happening in this case.

(A) What kind of partnership is the relationship between the university and the school?

There are big challenges for the two systems to relieve the tensions generated by the different goals. They should unite around the desired goals instead of this being lacking in their relationship. They should be motivated to create an effective partnership which is committed and balanced between the two parties.

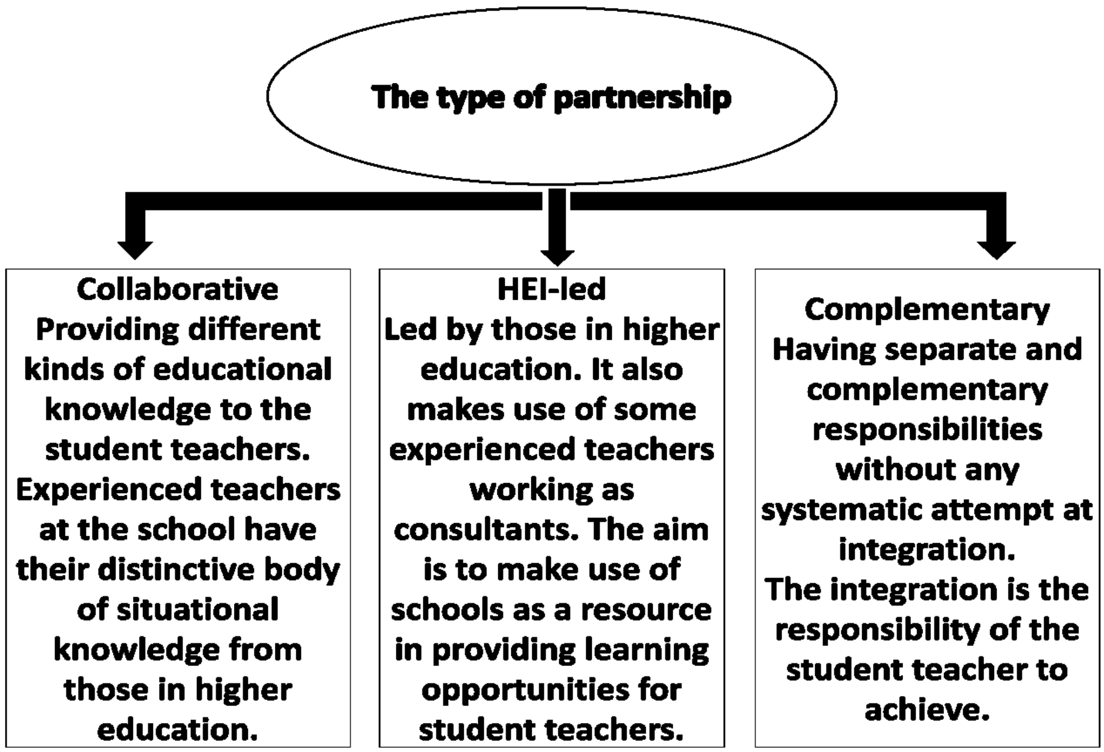
Postholm (2016) argued that learning to teach is, according to expansive learning and Vygotsky's theory, a process that begins at the social and 'external level' before it is absorbed at the individual and 'internal level'. Consequently, the focus of universities and schools should be to collaborate in the development of teaching practices that lead to better learning outcomes. They should also seek to increase the space for cooperation between the university and the school, as well as increasing the school's responsibilities in the preparation of student teachers.

Through the results of the quantitative and qualitative data analysis and the previous literature, I conclude that there is no clear partnership in the Saudi Arabian teacher preparation context. There is no formal or even cooperative partnership between the university and the school in teacher preparation, but there is only a relationship which does not incur any responsibility. This relationship cannot be elevated to the concept of partnership, but is only related to the needs of the various parties. The university needs places to train pre-service teachers so makes tentative contact with schools, and the schools welcome the student teachers, who will relieve them of some of their workload and cover the deficit of teachers in the school. A true partnership should exhibit cooperation between institutions with the aim of strengthening the effectiveness of the participants in order to achieve the objectives that have been identified. In addition, there should be a sharing of responsibility between the parties in planning, execution and assessment. Furlong et al. (2000) indicated that a partnership should involve a degree of responsibility for each party in the provision of the programme of teacher education. Partnerships often lead to continuous development as opposed to reciprocal relations which expire once you no longer need them.

Next I discuss the relationship between the university and the school through a review of partnership models to identify the type of relationships that exist. Then I use my perception of this relationship to help understand the situation in Saudi

Arabia and then give suggestions for improving it. The following figure identifies types of partnerships that may exist between the school and the university.

Figure 7.4: Types of partnership between university and school (Furlong et al, 2000; Smith et al, 2006)



According to Furlong et al. (2000) and Smith et al. (2006), there are three types of partnership model. These are described as follows:

The collaborative model

This model provides multiple forms of knowledge to the student teacher through the contribution of the university staff and the school staff. It is characterized by equal roles. This model requires regular opportunities for the university staff to visit and meet with the school staff to plan programmes and collaborative work. This approach is exemplified by the University of Oxford PGCE programme;

The HEI-based model (duplication and integration)

This model is the partnership approach based on Higher Education Institutions, and it has been described by Furlong as integration while described by Cameron-Jones and O'Hara as duplication in the relationship between university and school. This model is based on the integration of the students' training to practice in the world of school, while blurring of the boundaries between the school teacher and university tutor. The university benefits from the practical experience provided by the school teachers. The university works as consultants with a small strategy group of school staff, but with a minimum of formal responsibilities from them;

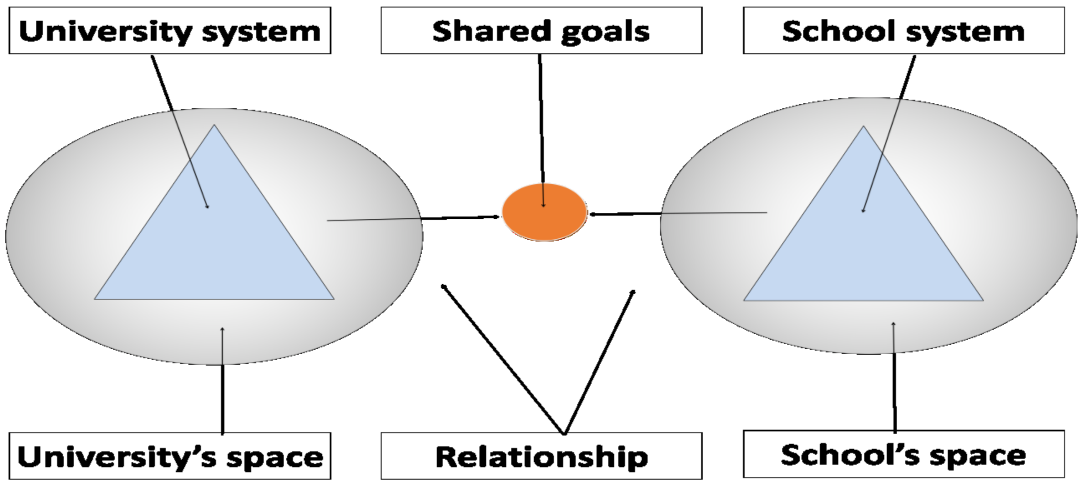
The complementary model (separatist)

The complementary model contrasts with HEI-based approach. The complementary model of partnership eliminates duplication and is characterized by the separation of the roles and responsibilities of the university staff and school staff. Integration here is the responsibility of the student teacher.

It is clear that the relationship between the university and the school in the context of Saudi Arabia is not compatible with any of the above models, therefore it cannot be called a partnership. Figure 7.5 shows the nature of the relationship between the university and the school in the Saudi Arabian context:

Figure 7.5: The nature of the relationship between university and school in the KSA context

(The source: Designed by the researcher for current research)



The framework of the relationship between the school and university for teacher preparation in the Saudi context is the following:

- The university system in this relationship provides a teacher preparation programme.
- The university system's space in this relationship has full authority over the teacher preparation programme. The university puts through this space the rules, regulations and roles, and evaluates teachers through the university supervisor alone.
- The school system in this relationship provides professional training for in-service teachers.
- The school system's space in this relationship has full authority in the training of teachers, prepared in accordance with the school or local education authority programmes. It puts through this space the rules, regulations and roles, and evaluates teachers through the supervision department under the local education authority.
- The shared goal is to prepare science student teachers at the university and provide an opportunity for teaching practice at the school.

- The relationship between the university and the school is that the university provides new student teachers while the school only provides a place for their teaching practice.

Therefore these two systems face considerable challenges to start an organized partnership, starting with the establishment of a theoretical framework. It requires agreement on the following:

- Providing an appropriate educational environment for the preparation and development of teachers (pre-service and in-service);
- Providing learning tools through more short courses, workshops and a range of learning resources for both teachers and student teachers;
- Providing a rich communication network between the university and the school;
- Involving teachers in the research being done at the university to understand the school from a realistic perspective;
- Involving other institutions that are related with the school community to improve the learning environment.

(B) How can a third space be created for the relationship between the university and the school to become a partnership?

The separation of the two systems in teacher education creates many complications, so we find many differences and contradictions in the rules and regulations; each system establishes its regulations in isolation from the other. Student teachers suffer from the many differences, such as in preparing teaching plans and the use of instructional aids and school laboratories. Some of the participating student teachers indicated that: "The programme was totally separated from reality in terms of academic curricula, teaching methods, and means of use" (ST4); or that: “We teach information about model things which are implemented in model schools and not in real schools” (ST2); and another added: “During the application of theoretical study, it is found that it is completely different from practical aspects such as the increase in student numbers at classes, exceeding 44 students" (ST3). This consistent with Al-Liheibi's study (2008), which found that class size in Saudi Arabia was from 40 to 45 children, which is much larger than in most developed countries.

Some of the school staff confirmed that the student teachers: "are shocked by the different reality from what he studied at university, including theories, teaching styles and preparation" (T1). Some of them said that: "Surely, because dealing with the female pupils at school differs from the university, and dealing with female colleagues (school female teachers) is difficult for some" (FT1). A headteacher asserted: "The female student teachers are often shocked by the actual reality because the field work is completely different from their theoretical study at university - and it needs good knowledge of the curriculum in the actual reality" (FHT1). Other school staff noticed: "A large gap between what students learn in the university through the Educational Diploma Program of teaching methods and between the teaching of science in the modern curriculum in schools" (OEQScT); and the university staff said "The school and the university are two completely different institutions and sometimes even the systems are different. The system of lesson planning, for example, differs between the university and the school; the school are required to write the manual for planning lessons" (FUC2).

The quantitative data indicated that the majority of participants agreed that the university and the school are different institutions and have different perspectives about science teaching and learning to teach science, and these differences of views have caused problems for science student teachers. Prater and Sileo (2002) confirmed that the university and school must share a vision and a clear understanding of the goal of the partnership and about how to achieve this goal through their different roles and responsibilities. This notion of a common goal is a necessary aspect of an effective partnership, but perhaps Prater and Sileo here give insufficient attention to the inevitable contradictions that will arise as the different institutions work towards this goal. Often the response to these contradictions is to dismiss one perspective and concentrate only on the other.

However, Activity Theory highlights the creative possibilities that can arise from taking full account of these inevitable contradictions and is thus a stimulus for deeply rooted change. This issue is discussed later in this chapter.

It is known that the student studies the first part, the theoretical knowledge, at the university, then moves to the school which constitutes the second part where he/she gains experience through teaching practice in the practical field. However, in the school they find the reality is quite different from what they have learned at the university. They cannot practice what they have learned within the school for several reasons, such as the school not having a laboratory, or not providing technological devices. Furthermore, when the students are taught modern educational theories and methods in line with the modern science curriculum, but the university lecturers still use traditional methods, and the cooperating teachers at the school also use traditional teaching methods, the student teacher is not prepared appropriately for actual practice. There is a gap between theoretical knowledge and practice.

Cochran et al. (1993) indicated that the school should help student teachers to achieve integration through practice to translate what they have learned at the university into actual classroom practice. This integration occurs between the school and the university in terms of experience and theoretical knowledge when there is a partnership between them. When the school bears part of the responsibility for preparing teachers then there is communication between them to make the best of the teachers' preparation. Clark (1999) asserted that: "broad-based school-university partnerships can successfully create professional development schools that, in turn, can successfully produce the teachers needed for better schools" (p.164).

This gap between theoretical knowledge and practice may be an obstacle to the student teacher's learning processes. It is assumed that most beginner teachers need to learn more about teaching, and that this can be learned during practice, and this gives the school an important role in helping the university at this stage without incurring too much inconvenience (Grossman et al., 2009). Therefore, the unification of efforts towards the agreed education of student teachers by both parties brings a significant benefit for pre-service teacher education, towards a genuinely fruitful partnership.

In the next section I will address the fourth research question, discussing the contradictions that create many of the conflicts in the students' learning about the teaching profession.

The fourth research question:

4. What are the challenges and contradictions in the teacher preparation programme?

Activity Theory has been used to analyse the results that have emerged from the academic systems that are responsible for science teacher preparation. Activity Theory is a useful analytical tool to explore the relationships between systems and examine the interactions between them to reveal the contradictions that generate tensions between the work of the participants in the activities. According to Engeström (1987), there are four levels of inner contradictions that generate conflicts, as in the following table:

Table 7.1: The four levels of inner contradictions in activity systems (Engeström, 1987, p.221)

Contradiction Level	Description of contradiction
Level 1: Primary	The contradictions occur within each constituent component of the central activity.
Level 2: Secondary	The contradictions occur between the constituents of the central activity.
Level 3: Tertiary	The contradiction is between the objective and the motive of the dominant form of the central activity and the objective and the motive of a culturally more advanced form of the central activity.
Level 4: Quaternary	The contradictions are between the central activity and its neighbouring activities.

(A) What are the contradictions that produce the conflicts faced by science student teachers in their learning from the teacher preparation programme at the university?

(B) What are the contradictions that produce the conflicts faced by science student teachers in their learning from the teaching practice programme in the school?

This study revealed some inner contradictions in the different levels. These contradictions are shown as follows:

Level 1: Primary contradictions

Yamagata-Lynch and Haudenschild (2006) indicated that "primary contradictions occur when activity participants encounter more than one value system attached to an element within an activity that brings about conflict" (p.8). All participants share the same goal of improving teaching practice, both for the science student teachers and the teachers at school, but they do not share the same value that determines how to improve this practice. Student teachers may have to spend a full day at school and then attend classes at the university after school. Therefore they may face conflicts about the rules and the division of labour, as they prefer to practice teaching without having to attend lectures on the same day. In addition, the school teachers may face work pressure in dividing the time between their own classes and the student teachers, leading to conflict over the division of their labour. These teachers may be required to use learning tools or they all want to use these at the same time, such as laboratories and technological devices, and also to supervise student teachers to improve teaching practice, thereby assigning the teacher burdens other than teaching. Thus conflict arises here over the division of labour and using the tools.

The participants at the university share the goal of improving the preparation of the science student teachers, but the values attached to their hopes and ambitions are different. The students have different values, such as just getting through the programme and getting a job.

Level 2: Secondary contradictions

The secondary contradictions "occur when activity participants encounter a new aspect of an activity, and the process for assimilating this new aspect into their daily activity brings about conflict" (Yamagata-Lynch and Haudenschild, 2006, p.9). Therefore when teachers face the entry of student teachers at the school as a new element, the collaborator teachers face conflicts to absorb the new rules and the division of labour, as do the students teachers. Another new element is the modern science curriculum, which requires both teachers and science student teachers to put more time and effort into knowing the requirements of implementation of this curriculum in the classroom. This requires teachers at the school to access training courses and workshops to meet these requirements, which creates conflicts in the face of the tools and well as the rules. The university participants also face this new element of the modern science curriculum, which requires them to access seminars to learn more about its characteristics, despite their preoccupation with their university workload.

Level 3: Tertiary contradictions

There are conflicting positions around the inclusion of the modern science curriculum, which needs intensive training and effort to be implemented in the classroom. The teachers and student teachers are faced with overcrowded classrooms and short class times of only 45 minutes, which is not enough for the modern teaching methods that are compatible with the modern curriculum. Thus teachers become resentful of this situation imposed on them and this makes them resort to the use of traditional methods of teaching. There is therefore a contradiction in the use of tools for learning which are not compatible with modern science curricula. Also, when the science student teachers discover that what they have learned at university is not consistent with what is practised within the school, they face a conflict between their theoretical knowledge and practical teaching.

Level 4: Quaternary contradictions

The quaternary contradictions occur, as Yamagata-Lynch and Haudenschild, (2006) mentioned, "when activity participants encounter changes to their activity that result in conflicts with adjacent activities"(p.11). Conflicts arising with neighbouring activities are the need to train the existing school teachers and university supervisors in the requirements of the new curriculum. Also the need to rate the selected schools for suitability for teaching practice and to ensure the availability of all necessary learning tools for science student teachers, as it was observed during teaching practice in the rented schools that most of them did not have the basic learning requirements in place.

There also arose a conflict with another activity, that is, the community, as parents and pupils lacked trust in the science student teachers, and this undermined the students' confidence.

There was a conflict between the expectations held by the science student teachers that they would learn a lot on teaching practice and the little they learned due to their heavy workloads, and this made them feel dissatisfied. The use of student teachers to ease the workload of regular teachers revealed the contradiction in another activity, which was that of the lengthy procedure for replacing missing teachers.

Table 7.2: Levels of contradiction within the university/school system

Contradiction Level	Within the university system	Within the school system	Within the relationship
Level 1 Between	(S&O), (R&O)	(D&O), (T&O), (C&O)	(C&O), (R&O)
Level 2 Between	(S&O), (S&T)	(S&D), (S&T)	-
Level 3 Between	(S&T)	(T&O)	
Level 4 Between	-	-	(T&O), (C&O), (S&O)

S: Subject, O: Object, T: Tools, R: Rules, C: Community, D: Division of labour

(C) What are the challenges facing the relationships for science student teachers learning to teach?

Contradictions and conflicts often occur in any two separate systems working towards a single goal. Pratt et al. (2015) pointed out that tensions and contradictions inhabit learning spaces and they concentrate on things in common within and across interconnected spaces. Thus the real challenge is to seek for perfection and integration with other systems, through discovering these contradictions and finding solutions to reduce the conflicts, and this will contribute to the development of their work and to achieving their common goals. Postholm (2016) asserted that the "contradictions are the driving force for change in Activity Theory. These contradictions can be brought to light using the activity system as the unit of analysis" (p.455). As previously mentioned, the education system in Saudi Arabia consists of two separate systems: the general education system and the system of higher education. These two systems are both involved in achieving the one goal of developing professionals through pre-service teacher preparation through learning about the teaching of the modern science curriculum. By using Activity Theory, which reveals the contradictions between each of these systems and views of the professional development of the student teacher, we can represent the professional development process in the Saudi context as in the following figure:

Figure 7.7: Stages in teachers' professional development
(The source: Designed by the researcher for current research)

Figure 7.7 illustrates the professional development of teachers in the Kingdom of Saudi Arabia and how it could be achieved. The professional development of teachers will not be achieved with simply providing pre-service teachers with good quality programmes, and training courses for in-service teachers. In the absence of coordination and cooperation between the university and the school system, the results show that the education of teachers in Saudi Arabia stops at the preparation stage because the old programme needs further development and internal coordination, with more cooperative initiatives from both parties. In light of these deficiencies in teacher training, by developing training courses for in-service teachers from time to time, and providing them with information on new approaches in the field of teaching, and thereby improving their performance, this alone would still not be sufficient to overcome the deficiencies at the preparation stage if no serious work is done to develop solutions to the contradictions and conflicts described above. According to Edwards (2002), "Initial Teacher Education and Training is about inducting new members into a profession. If beginning teachers are to be endowed with the trust afforded to professionals, then the training programme must be informed by more than teachers' own historical craft-based practices and government directives" (Wilson, 2004, p. 589). Thus, training programmes should be integrated with each other through a collaborative approach between the educational and training institutions by creating and hybridizing learning spaces.

7.6 Summary

The findings have been discussed in this chapter in response to the research questions. These findings relate to the academic activity system at the university, the academic activity system at the school, and the academic activity system through the relationship between schools and universities.

It is clear that there are deficiencies in the academic activity system at the university, in that the programme is not compatible with current professional development requirements. One reason for this is that the programme is old and has not been updated or improved. Also there is great psychological pressure on the student teacher during the programme due to the coordination of programme modules, and the short time that the student teacher has to spend in the school. In addition, there is debate about the tools needed to learn to teach at the university, the rules governing the programme, and the community support. This is due to the large gap between the university and the school and the consequent blurring of the vision of teacher education between them.

This is compounded by the academic activity system at the school which suffers from deficiencies in the level of teacher collaboration with the student teacher, such as using students to alleviate the burden of their teaching. This results from the lack of clarity of roles and regulations, and the shortage of educational tools to assist in teaching. This is due to the scarcity of resources and the lack of confidence in the student teacher, as well as the poor quality of some schools which are often not qualified to be used as sites for teaching practice.

The findings have also revealed differences and problems in the perspectives on the university's relationship with the school through the joint academic activity systems. These resulted from the weakness of the relationship, the lack of coordination between the university and the school, and the overlapping and lack of clarity of roles and responsibilities in the relationship. This relationship between the university and the school was discussed in this chapter and its type identified as not reaching the level of effective partnership.

The contradictions within and between academic activity systems have been discussed. These contradictions exist in the four levels which may help to correct the existing problems in the academic activity systems in the school and university, and thus allow the development of suitable proposals and solutions to addressing these contradictions.

The next chapter will present the conclusion, recommendations and research suggestions, and the implications of this research.

Chapter Eight

Conclusion

8.1 Introduction

This chapter presents the conclusions of the research which have arisen from the data analysis discussed in the preceding chapter and which are related to all of the earlier chapters. The implications of the research for partnerships in ITE, for the school and university as sites for learning, for school staff and for university staff, for dealing with curricula, and for the theoretical perspectives used in this research are presented here. The contributions of the research include its contribution to knowledge within its context, and its contribution to theory. Recommendations arising from the research are then presented, divided into three parts: recommendations relating to the university context, recommendations relating to the school context, and recommendations relating to the university and school partnership. Some suggestions for further research are given together with their potential future contributions. Then, finally, a summary of the chapter is made.

8.2 Overview of the context and the research

Most countries strive to improve their education systems; education needs to keep pace with global economic changes in order to develop our life in society. Educational reform encompasses several aspects such as curriculum, teaching methods, teacher quality and the educational structure as a whole. Like most countries in the world, the Kingdom of Saudi Arabia (KSA) is ambitious and seeks to develop its education system and spends a lot of the state budget on education. However, the Saudi context differs from many other educational contexts in initial teacher education, because the educational philosophy in Saudi Arabia is strongly influenced by the principles of Islamic religious belief, worship, ethics, law, rules, and an integrated system of life.

This case study has focused on the H.D.Ed programme at Taibah University and has provided information about the structure of the programme, its theoretical framework, and its strengths and weaknesses. The research explored participants' perspectives on the science teacher preparation programme in the university and in the schools where students undergo training. The participants were the science student teachers, the university staff, who supervise and coordinate student teachers' learning through the H.D.Ed programme inside the university system and school staff, who supervise and coordinate student teachers' learning during teaching practice in the school system.

It has discussed previous studies and research literature that can be used by policy makers and researchers to improve the practice of teacher education. Cultural-historical activity theory was used as a theoretical framework which helped to reveal the relationship between the school and university education systems.

In 2015/2016, events occurred that were associated with the politics of the state, namely that the Ministries of Education and of Higher Education were merged and became the Ministry of Education. Many questions remain about the effectiveness of the merger. Much discussion and negotiation is required to enable the merger to achieve its goal, by facilitating decision-making and reducing the number of contradictory decisions for the development of the educational system. At present no details have been revealed about the merger and, so far, the fundamental structures appear to remain unchanged.

In the past year (2015/2016), some changes have occurred in the H.D.Ed programme. It has become a three-semester programme, as shown in Table 8.1. Some modules have changed their names, for example: Methods of Teaching Science (2) has become Teaching Practicum (2); Curriculum Foundations has become Curriculum Analysis; and Education in the K.S.A. has become The Education System. Other modules have been added, such as Teaching Practicum (2), in which students visit a school one day a week, and Introduction to Special Education and Professional Development Seminars, which have not yet published their aims or expected learning outcomes. Some modules have been discontinued, such as Foundations of General and Islamic Education, Psychological Health, and Developmental Psychology. This programme is still oriented to the intermediate and secondary stages. Because of the limited practical impact of these changes to the situation in KSA, the results of this study are still likely to be relevant.

8.3 Main Findings and their Implications

It is clear that the gap between the university and the school was very wide. This gap is evident in conceptions about the objective of student teacher education, the rules and regulations governing it, the division of labour, and the tools that exist in the various elements of the system, and it leads to problems of coordination, support and harmony within and between the academic activity systems.

8.3.1 Communication between supervisors and teachers

The problem of poor communication between university supervisors and collaborating teachers has a very significant impact which is reflected in the students' lack of knowledge their role in schools and about the support that they should expect from others and these leds to their feeling of disorientation. The implication of this finding is that a better system of communication is needed, as this could have a great impact and would enable student teachers to improve their teaching skills. This corresponds with what Douglas (2012) said, that student teachers usually feel the importance of communication during teaching practice.

8.3.2 The development of student teachers through the learning tools

Strict separation was made between males and females in education in the past in KSA, even at the level of government ministries, though these were merged later under the name of the Ministry of Education. Despite this merger, the separation in the education system continues. There is no intermixing in education, with males and females being taught in separate buildings. There are also differences in the curriculum. This study has shown that these differences have an impact on some of the learning tools for teaching. The separation of the buildings and the unequal opportunities present an obstacle to the female student teachers, for example in accessing the university library as one of the tools for learning to teach. This is consistent with the observation by Gordon (1987), in the past, that women struggle to receive what men on campus receive, and that by Alharbi (2014) in the current Saudi Arabian context that the needs of females in education have been addressed less rigorously, they have been more isolated, and efforts have been devoted mainly to males.

The science student teachers were not able to take advantage of the learning tools for teaching at the university or the school. Most students were unaware of resources such as the internet and university library (including the access that these provide to research work and publication databases). Measures are required to address this situation. Additionally, the school staff lacked confidence in the students' ability to deal with the school's educational equipment and teaching aids. These beliefs of the school staff may hinder student teachers from improving their learning. The implication is that measures should be taken to improve the training on educational technology that students receive and to ensure that school teachers are aware of this training. In these ways it may be possible to reverse the teachers' beliefs and to restore their confidence in the students' abilities.

8.3.3 Student teachers' learning in school environment

Another finding is the strong effect of the quality of school buildings on the provision of learning tools and thus on the opportunity for student teachers to learn to teach science. For example, some rented and temporary school buildings do not contain science laboratories or equipment, and sometimes there is not even a science teacher collaborator. The implication is that potential schools which apply to accept practice teachers should meet a list of criteria that would ensure that an appropriate learning environment is available for the student teacher, the teacher, and the pupils. It is important that student teachers be placed only in adequately equipped schools where there are suitably qualified teachers to support them.

8.3.4 Rules regulating the student teachers' learning for the teaching profession

Drawing on Activity Theory as an analytical tool, the extent to which rules impact on student teachers' learning for the teaching profession became apparent in the findings. The results of the research show that, as a result of the lack of explicit rules and regulations upon which to base the H.D.Ed programme, actions became a matter of personal interpretation. Lack of explicit rules and regulations led to a lack of knowledge of the roles of the participants and this led to a lack of knowledge of the division of labour. These contradictions within and between system elements could act as motivation for the improvement of initial teacher education through better organization of the roles and responsibilities.

8.3.5 Burdens that student teachers faced during learning

The education system in the Kingdom of Saudi Arabia does not have cover for absent teachers, because the formal employment procedure takes a very long time and is usually carried out at the end of the school year. Therefore a teacher cannot be replaced during a semester, so schools cover the deficit through using student teachers. Thus the student teachers face a heavy workload at both school and university during teaching practice and this had an adverse effect on their learning about teaching through the accumulation of excessive teaching loads. It is clear that they would learn more about becoming science teachers if they were given lighter timetables, and thus be more able to achieve the goals of the teaching training programme.

8.3.6 Learning acquired for student teachers from university tutors in the H.D.Ed programme

A further issue causing concern is that, despite the fact that the science curricula had been updated and developed, the university teachers were still using traditional methods of training to teach. This may be because of the lack of comprehensive development of all elements of the current programme that would ensure that the change began with the university lecturers. This led to the students not learning about modern methods of teaching during the H.D.Ed programme. Haggarty and Postlethwaite (2012) emphasized the importance of the workplace as a learning environment and therefore its great importance in supporting learning to teach; as well as the importance of role models that affect student teachers' conceptions of learning to teach. Since university tutors are one such role model, their adherence to outdated teaching styles is a significant problem.

8.3.7 The shared space between the university and the school in teacher education

The spaces that surround the academic activity systems in teacher education play a significant role in containing the tensions and contradictions. Actions can be taken to mitigate these tensions and contradictions, particularly since these spaces include many of the roles and responsibilities. Giving full effect to the notion of partnership may be a key aspect of these actions. There is a sense that each system has its "own space" in which it processes decisions, and controls the rules and responsibilities of its own area on the subject and objective that it seeks to achieve, where each system addresses the issues of teacher education from its own point of view, completely independently, and without paying attention to the other systems. (see Figure 7.5). Having their own space generates a lot of sharp contradictions at all levels, and this inhibits the relationship developing to the level of a real and effective partnership. Therefore, crossing the border between these systems could occur with the presence of a third space, from which discussions can take place to determine the roles and responsibilities which could address these contradictions. Activity Theory could also be used as an analytic tool to discuss system space, in terms of a common ‘third’ space.

8.3.8 Merging the Education Ministries

The merger of the Ministry of Education with the Ministry of Higher Education is considered a positive step in improving initial teacher education because it is important that these common systems for teacher preparation are linked through the framework of a formal partnership. For example, in the past, there were two isolated ministries, which separately managed schools and universities and the education of females was under the Presidency of Girls' Education and the education of males was under the Ministry of Knowledge. These were integrated into one Ministry of Education in 2003. This isolation produced many paradoxes from which the education system is still suffering.

8.3.9 Development of teacher preparation programme

The changes to the H.D.Ed programme that might be effective in improving initial teacher education could be made through joint planning and development with other relevant bodies (Education Development Authority, Curriculum Development Authority, Local Education Authority, and Ministry of Civil Service) and these would need to be grounded in a common perspective between the university and the school. At the moment, the three semester structure that has been introduced into ITE could create contradictions with the workforce system. One such contradiction relates to the recruitment system for teaching posts. Teaching posts are announced by the Ministry of Education and the Ministry of Civil Service after the end of the university academic year, and this means that the student teacher needs to qualify by the end of the second semester in order to be able to apply for a post. Adding a third semester would result in the student teacher having to wait a year due to the lack of coordination between the ministries concerned with recruitment to resolve this problem. They may also face a difficult designation because of their late graduation. Usually, the preference in employment is for new graduates. A result of these employment procedures is the deficit dilemma in schools; if leakage of teachers happens during the semester, schools cannot recruit new teachers so they cover the deficit with student teachers.

8.3.10 Cooperation between the school and the university to support learning

The importance of learning communities is revealed in the lack of coordination between the programme of preparation in the university setting, teaching practice in schools and the new science curricula. In addition, there are challenges facing the relationship between the school and university systems, such as the compatibility between the material students learn in the university and what they need to practise within the school.

The university should overcome the challenges faced in the development of its programmes and respond to the demands of society; it should also create professional development programmes to help teachers develop their skills leading to improved science student teacher education. Postholm (2016) indicated that the university and school should move towards expanding learning through cooperation, to enable development and to make something new in a creative process. Other challenges include the provision of learning resources and equality between males and females in access to these resources, and the development of communication processes between university staff and science student teachers.

The course held on the female campus about teaching the science curriculum, in my opinion, should be held for all student teachers at the university in the first week of teaching practice. Both university lecturers who specialize in curriculum and teaching methods, as well as supervisors in the local education authority, should integrate their work to provide this course. Not only that, but educational workshops and seminars shared between the university and the local education authority should be held so as to enhance the effectiveness of their work and reduce the gap between them. Furthermore, the university should not be restricted to the teacher preparation programme, but go further to open new horizons in terms of short courses that serve teachers in general. The university should make new inputs in the field of education through the research they undertake, and they should also develop educational projects, and the schools should benefit from this new and useful input into the education that they provide.

8.4 The vision contributions of this research

8.4.1 The vision of research

Each research stems from a particular vision. The vision in this research is not narrow. It is a broad vision that seeks to expand learning, to shed light on many issues that may to escape the narrow horizon in educational research for the future of universities. In addition it seeks to support the setting of clear goals, plans, and principles for teacher preparation programmes. The research seeks to find a model that works on contradictions and contributes to the work of activity theory to create a successful partnership and reduces the gap between the systems through creating shared dialogue point in the third space.

8.4.2 The contribution to knowledge through the context

This research has presented much information that can make a contribution to knowledge regarding the duration of the teacher preparation programme, which is probably not very different from other programmes in Saudi universities which use a one year sequential system. The results contribute to highlighting many issues, with the help of the research literature and theoretical framework, through which to determine the quality of the relationship between the university and the school, the many internal and external contradictions in academic activity systems, and the impact of the school environment and school buildings on science education and the student teachers' learning about teaching. The separation of the education ministries has been discussed, together with its effect on the weakness of cooperation between the university and the school and the centralization of decision-making on development. It has also highlighted on the differences between males and females in education and the restrictions on female education. The research summarised good models of teacher preparation programmes (e.g. Oxford & Exeter), that will contribute to develops the teacher education programmes in Saudi Arabia, if carefully re-interpreted in accordance with the context in which they will be applied.

8.4.3 The contribution to theory

The use of third generation activity theory as a theoretical framework has contributed to the exploration of the academic activity systems in science teacher education, in particular the science teacher preparation programme at the University of Taibah in the Saudi context. It has revealed important results on a number of issues in the relationship between activity systems that have an impact on science teacher education. One of the most important of these is the third space model (TSM) which provides a theoretical model which recognizes the contradictions between the systems in the partnership. This model suggests that there should be an overlap between the university and school activity systems in which there are shared goals aimed at developing the teaching skills of the student science teachers. The third space model (TSM) will contribute to expanding the framework of activity theory to show creative ideas in dealing with contradictions through appropriately sophisticated conceptualization of the niton of partnership.

8.5 Recommendations

8.5.1 Recommendations relating to the university context

It is important for development of educational programmes to be manifest in the programmes offered by the university. To this end, there should be continuous evaluation of these programmes, especially where the teacher preparation programme has been used for a long time.

In Saudi Arabia, the issue of educational development has been a focus of government attention. The well-established King Abdullah Project has been developing education for years. As Lindsay (2010) mentions, under King Abdullah, in the previous seven years, Saudi Arabia has spent generously on higher education. But this has not yet been effective in all educational institutions, including the university, because most of the universities were newly established during this period. With the growth of the curriculum in public education, the teacher’s classroom role is no longer limited to the transfer of knowledge, but a different view of the teacher’s role is needed to deal with the modern curriculums. However, the reality of the implementation of the teacher preparation programme at the university is that it is a conveyor and provider of knowledge to teachers through the old curriculum and has not yet seen the updates originally introduced into the public education system.

There should be standards applied to the programme, such as selection of students to the teaching profession, matching the curriculum in the teacher education programme with the requirements of the modern curriculum in public education, and the academic accreditation standards. As a result of my findings of the complaints some of the participants make about the great pressure they feel while they are in the programme, and from my personal experience as a an administrator in this programme for a long time, I also suggest that the evaluation and development of the programme should include a revision of the duration of the programme, description of study modules, and the criteria for selecting students for the teaching profession. A systematic list of regulations should be drawn up to organize all practices within the programme.

The university should use the expertise of other universities in the world which have advanced programmes to keep pace with developments in pre-service teacher preparation. As noted earlier, the University of Oxford Internship scheme and the University of Exeter programme are two well regarded and well documented approaches to teacher education. .

Partnerships could be set up between Saudi universities and universities in developed countries in their teacher preparation programmes. This would enable them to exchange experiences, and to adapt these programmes to the Saudi context.

Short training courses and workshops should be held on an ongoing basis for university faculty members so that there is a programme to qualify university teachers who are not educational specialists. Its aim would be to educate faculty in modern methods of teaching and educational issues. Furthermore, these programmes should not be limited to the university only, but should extend to the community, which includes teachers, parents and others who are related to learning and teaching. The Learning and Teaching in Higher Education Programme (LTHE) at the University of Exeter is a good example of what is proposed. This programme introduces university members to modern teaching methods, making it the expected style, especially for those who wish to engage in the teaching profession. Learning tools for the education of teachers should receive the attention of students and university faculty members as well as of teachers.

A specialized centre for educational consulting should be established at the university as it would be a useful facility from which to learn more about education and teaching. Libraries provide places of study for the students but they should also provide a forum for students to gain experience from each other. Modern educational technology should also play this role. For example, a closed 'chat room' programme could be established between student teachers, academic supervisors and university lecturers in curriculum and teaching methods in the Department or from the College of Education, in order to exchange experiences among the students themselves, and between students and university lecturers, as a platform from which to raise the educational issues facing them. Channels of communication between students and lecturers are important for enabling students to learn more about the requirements of the teaching profession.

I recommend establishing a mechanism and regulations which are shared between the university and school staff for the supervision and evaluation of student teachers in order to facilitate their mission to know their duties and roles, as well as to give greater transparency to the whole teacher training process.

8.5.2 Recommendations relating to the school context

The teacher at the school is in need of continuous professional development in terms of establishing a mechanism for the development and training of school teachers through short courses. Motivation to undertake such courses could be through rewards upon reaching grades of relevant training and personal development, either material or non-material, such as such as a salary increase, a reduction in workload or promotion to mentor teacher.

There are many distinguished teachers who are dedicated to developing themselves professionally; therefore they should be given the opportunity within their schools to review successful experiences. This would help teachers and students, as teachers gain experience in teaching them in schools. Work training courses or workshop in the first week of each semester would serve new teachers as well as student teachers under the supervision of the local education authority and in cooperation with universities.

A suitable title (name) should be given to trainees during their teaching practice to indicate that this person is a professional in their career, even though they are still in the training phase. Most of the student teachers suffer from the problem of pupil ill-discipline because, the pupils know that they are trainee students as well as, parents' lack of trust in the trainees and do not want their children's education to be within the fields of experimentation. Perhaps one of the misinterpretations of the trainee concept is what we have already mentioned - namely the use of student teachers as free labor. This removes the possibility that the student teacher can seen as an additional resource in the classroom, and contributes to parents' concern that the education of their children is entirely in the hands of under-prepared beginning teachers. The concept of the (trainee) is interpreted in different ways by some people in Saudi society. This title (name) would give them confidence in front of pupils and parents of pupils; perhaps the name of 'visitor teacher' or 'assistant teacher' would give them more self-confidence in front of the school community. Support for trainee teachers could also be improved through awareness sessions for parents at the beginning of each semester to emphasize their role in the follow-up of their children, and the importance of supporting new teachers and student teachers.

The issue of the shortage of appropriate school buildings is an important one, and finding solutions to these should be a priority for the local education authority and government departments. Closing inappropriate school buildings is not the solution in light of overcrowding of pupils, but the solution could be to create an alternative system, perhaps a two-shift system, where some of the students attend in the morning and others in the evening, with the shifting of students changing every half term. This would be a temporary solution to cover the deficit of schools, and it would also reduce the expenditure on inappropriate buildings, from which the funds saved could be used for the establishment of modern and appropriate school buildings.

The problem of the shortage of teachers in schools is another important issue which should be discussed by researchers and decision-makers. Emergency solutions could be put in place, such as a temporary or part-time employment system for a limited period, using the competencies of retired and distinguished teachers. This would be preferable to using the student teachers who come in to the schools as beginning teachers and have to cope with the burdens placed upon them by both parties (school and university).

8.5.3 Recommendations relating to the university and school partnership

Working together would help lead to an effective partnership between the university and the schools. As noted in the discussion of partnership as a 'third space' a truly effective partnership must be much more than a well managed administrative arrangement; it must be a place of equal dialogue that gives opportunities for contradictions between the school and university systems to be addressed without existing power relationships allowing one system to impose its own priorities and processes on the other.

A mechanism could be put in place to initiate strengthening the third space, such as a monthly meeting and yearly conference, particularly to raise issues relating to education between university and schools. The role of the teaching staff in the College of Education should not be ignored, as they are familiar with much educational research and educational theory. They should be able to let schools know about relevant research in education, from which could be extracted solutions to educational and teaching problems and curriculum issues. This could help find effective solutions to the contradictions in the education of the teacher.

Both the university tutors and the school teachers should be involved in choosing the learning tools and equipment and even suitable school buildings; this would enhance the partnership between the school and the university, and would help the student teacher get the benefit of these agreed-upon tools to enhance the process of their professional development. Furthermore, both university and school should be involved in the development of regulations regarding teaching practice; such an agreed scheme would enhance the student teachers' status and the professional development of their teaching skills, as well as increasing their opportunities to learn more about teaching.

There should be assessment of teaching practice by all participants, namely student teachers, teacher collaborators, school administrators, academic supervisors, parents and pupils. Questionnaires could be administered to elicit suggestions to benefit professional development.

The university and the school should work jointly to develop a series of short courses, seminars and continuous workshops to deliver professional development to the teacher. These should be diverse, covering the needs of each teacher, and provide varied opportunities for teachers and student teachers to choose what they need to study to develop pedagogic skills. In addition, electronic communication channels should be utilized to ensure the convenient delivery of these courses.

The idea of establishing a sophisticated school model that meets all aspirations for the standards of teaching and learning could be adopted under the supervision of education colleges at universities. This cooperation with the local education authority would provide the opportunity to explore the problems of education in the schools, and to find appropriate solutions to these problems and how to apply them realistically within schools.

Standards should be established through the existing partnership in regard to appropriate school buildings and educational environment that would help the professional growth of the student teacher through an annual assessment of each school. It should student teachers only be sent to the best schools and therefore, these schools should be classified as high rank. This classification would depend on the collaborating teachers' ability to help the student teachers, as well as on the suitability and readiness of school buildings, including modern learning tools, utilities, supplements to help education, the size of the school and the number of students per class. In addition, these standards should take into account whether schools have programmes with a role in serving the community through the establishment of courses, seminars and workshops.

The school should be fully staffed when the student teachers arrive, and the staff recruitment process should be altered to allow new staff to join the school before the end of the school year.

Most university tutors, who are not in the College of Education, have not studied educational courses or teaching methods, and have a purely scientific specialization and their goal is the transfer of scientific knowledge and expertise to future generations. However, to teach and learn in ways that are modern and exciting, it is necessary to have knowledge of learner characteristics to help them with their teaching, such as knowledge of individual differences, but most of those who teach at the university have not been given these educational sessions. Therefore the students acquire the wrong teaching practices from their university tutors, because the latter rely on traditional methods such as lectures, and do not use modern methods of active and interactive teaching. After four years of study at the College of Science, in which the student acquires inappropriate methods and styles of teaching, this becomes a pattern in the life of a student and it is difficult to modify this during the one-year teacher preparation programme. Therefore, programmes and mechanisms for professional development of the university tutors should be provided.

8.6 Suggestions for further research

In light of what has been revealed from the results of this study, some research proposals can be suggested for the professional preparation and development of teachers through partnership in professional development programmes that can be explored through educational research.

Few research studies on teacher professional preparation and development in the Saudi Arabian context have used an interpretative methodology, and questionnaires have been the most common tool in Saudi Research. Interpretative methodology can provide a helpful approach to gain a deeper investigation of the issues of teacher professional preparation and development and it is commensurate with interviews and other tools, as it is rich in perspectives, it explores problems, and investigates in a focused way.

This research has addressed the partnership between the university and the school, and not many studies in Saudi Arabia have discussed such partnerships between academic activity systems. Research could be undertaken to examine partnerships that exist with other educational systems such as teacher preparation at Oxford University or the University of Exeter in the UK. These would be systems in different contexts, but comparison could also be made between different universities' systems in Saudi Arabia in their teacher preparation. Other partnerships could be examined, such as the partnership between school or university and the community.

Further research applications could use Activity Theory in initial teacher education, because it can give a rich analysis of the relationships within or between systems, as well as analyzing the spaces for each system through the use of the Third Space Model. This could be a model to explore more of the inherent contradictions in the school/university partnership.

Further research applications on the third space between the educational systems' activities could look at accommodating the contradictions within and between different systems and developing strategies of adaptation and managing the dilemmas that need to be dealt with.

Research could lead to plans to keep education up-to-date in terms of the future needs of teachers, the capabilities that they will need and the new technologies they will have to be competent with. This research should address quality standards in teacher preparation and the drawing up of a list of standards that meet the contemporary requirements of the development made in the curriculum.

Research could be undertaken to evaluate the content of the modules of the H.D.Ed programme at the university, which the researcher knows has not been changed for a long time. The modules could be examined for their suitability for all stages of public education and with regard to the relative balance between the amount of scientific content and the attention given to the application of educational experiences within the universities and schools.

Further research could be carried out on new teachers which could investigate their developmental needs, and which could involve the teachers in the schools in the research through the mediation of the university researchers. This could provide realistic action research for investigation of issues in the field of learning and teaching practice.

The study suggests the need for further research into the school buildings and learning tools contained in them, as well as the formation of model schools, comparing the model to the models of education in advanced countries in this field, which could help teachers and science educators to provide a suitable environment for teaching practice.

8.7 Potential future contributions

I have acquired many teaching and research skills through study in the United Kingdom. Exeter University is one of the universities of excellence in research, therefore I have acquired many research skills. I have also acquired knowledge of the distinctive programmes which are offered both in the study phase of the PhD and the PGCE programme in Exeter University, as discussed in the literature review section both with the Oxford scheme. Therefore, I could use the knowledge gained in the future to develop the H.D.Ed programme in the Saudi context.

The use of interpretive methodology and qualitative research have provided me with experience with this approach to research so that I could draw attention to the use of qualitative methods in the Saudi context, so as to address some other educational issues.

The results of this research, which has provided me with a huge amount of knowledge about important issues in the education of the teacher, could form a nucleus for further research in the future. The idea of the third space could be used to create successful and effective partnerships, and this has given me a great desire to develop the third space model (TSM) to expand the unit of analysis in activity theory to include systems' spaces, which could benefit the users of activity theory in the future to analyse different activity systems.

The changes that occurred in 2015 in terms of the merger of the Ministries of Education and Higher Education, as well as a slight change in the H.D.Ed programme, have opened up new prospects for exploring these developments, and this could act as a motivation for further research to monitor the impact of these changes.

8.8 Summary

This research aimed to contribute to the development of science teacher education by way of exploring perspectives on the science teacher preparation programme at Taibah University in the KSA. There has been a lack of investigation of this programme after the merger of teachers' colleges with colleges of education in 2010, when the establishment of Taiba University was announced. Thus it may be considered as developing and emerging university, despite the fact that the College of Education was established well before the founding of the University. Through the review of relevant literature earlier in this thesis, it has been possible to compare the development of teacher learning in other international contexts with that in the Saudi context.

Activity theory played a useful role in the exploration of the existing partnership between the university and the school. Furthermore, the investigation of this relationship through interpretive methodology for this case study resulted in the provision of quantitative and qualitative findings which highlighted the weakness of the relationship between university and school and the gap between them. It was therefore able to identify some of the internal and external contradictions among the academic activity systems in science teacher education.

The TSM also contributed to the importance of the idea of the third space and how it can have a role in accommodating these contradictions by crossing borders and theorizing the possibility of extending education to prepare the science teacher. The TSM may be the starting point for a comprehensive conceptual framework for dialogue, control, and treatment the contradictions, bridging gaps, and creating partnerships that are effective and successful.

In the end, I have highlighted the implications of this research and then put forward some recommendations and suggestions for further research that can contribute to the development of the process of science teacher preparation in the Saudi context, and which show me, as a researcher, the way forward in completing what the limits of this research did not allow me to complete.

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Appendices

Appendix 4.1: Science Student Teachers’ Questionnaire

Dear Participant,

Thank you very much for your participation in responding to this questionnaire which is one of the tools of collecting data for the current study. This study aims at exploring participant perspectives of how the university, the school, and the school-university partnership work to support science student teachers learning and teach science curriculums. The questionnaire consists of several sections. Each section discusses the factors which may affect science student teachers' learning and practice and how science student teachers learn to teach. In each section there is a number of questions (e.g. 1-1,1-2,......) which should be answered carefully.

Please put a tick (√) in the box which represents your response to the item. The abbreviations used refer to the following:

SA = strongly agree.

A = agree.

N = no opinion about it.

D = disagree.

SD = strongly disagree.

There is also a box below each section. This is space for you to give your own perspective on this aspect which is not mentioned above. We are particularly interested in the things you put in these boxes as the ways that these expand upon the examples we have given in the 'tick box sections' are really important. All information given by you will be kept confidential and will be used only for educational research purposes.

Kind Regards,
Sami Binjumah
PhD student, School of Education, University of Exeter.

Science Student Teachers' Questionnaire

Demographic information				
Gender		Male		Female

NO.	Questions	SA	A	N	D	SD
1	**The main Reason for the involvement of the students in science teacher preparation programme at university and practice at school is:**	SA	A	N	D	SD
1-1	To become good science teachers.					
1-2	Because of their interest in science.					
1-3	Because teaching science is very easy.					
1-4	Because it is an enjoyable occupation.					
1-5	To find a good job with a good salary.					
1-6	Please add any other reasons not covered above.					
NO.	Questions					
2	**There are ways for learning to teach science from your expectations. The most important of these for science student teachers is:**	SA	A	N	D	SD
2-1	The science student teacher learns from lectures in the teacher education programme.					
2-2	The cooperating teacher helps science student teachers address gaps in subject knowledge in the school context.					
2-3	Please add any other reasons not covered above.					
NO.	Questions					
3	**Your perspective about the university and school and the relationship between them in science teachers' preparation.**	SA	A	N	D	SD
3-1	The university and the school are different institutions and have different perspectives about science teaching and about learning to teach science.					
3-2	School teachers consider science student teachers as regular teachers.					
3-3	The different views between the university and the school cause a problem for science student teachers.					
3-4	Please add any other reasons not covered above.					
NO.	Questions					
4	**During teaching practice do you think the science student teacher has difficulty with:**	SA	A	N	D	SD

4-1	Planning for science lessons.					
4-2	Choosing the appropriate methods for teaching science.					
4-3	Dealing with the science curriculum.					
4-4	Acquiring teaching skills.					
4-5	How to choose appropriate scientific experiments associated with science topics in the curriculum.					
4-6	Applying the educational theories learned at university to practice in the school.					
4-7	Please add any other reasons not covered above.					
NO.	**Questions**					
5	**What do you think the university and school want to achieve by the programme of teacher preparation and teaching practice for science student teachers?**	**SA**	**A**	**N**	**D**	**SD**
5-1	To obtain qualified science teachers.					
5-2	To get pupils learning well in science.					
5-3	For science student teachers to be able to link theory to classroom practice.					
5-4	For science student teachers to understand the goals of the curriculum.					
5-5	Please add any other reasons not covered above.					
NO.	**Questions**					
6	**The important academic resources available inthe school to help science student teachers learn about the science curriculum and teaching science to pupils are:**	**SA**	**A**	**N**	**D**	**SD**
6-1	Meetings with experienced science teachers.					
6-2	Observing science teachers teaching.					
6-3	Science teaching plans made by experienced science teachers.					
6-4	Science teaching aids.					
6-5	Science labs.					
6-6	Short courses and workshops about teaching the science curriculum.					
6-7	Please add any other reasons not covered above.					

NO.	Questions					
7	**The essential academic resources available at the university to help science student teachers to learn about the science curriculum and teaching science to pupils are:**	**SA**	**A**	**N**	**D**	**SD**
7-1	University library.					
7-2	Reflective meetings with university tutors.					
7-3	Science textbooks.					
7-4	Educational films for science teaching.					
7-5	Workshops for designing teaching aids.					
7-6	Models analyzing the content of the science curriculum.					
7-7	Visiting schools.					
7-8	Please add any other reasons not covered above.					

NO.	Questions					
8	**The regulations shared between the university and school for teaching practice say:**	**SA**	**A**	**N**	**D**	**SD**
8-1	The school for practice teaching is always chosen based on the desire of the science student teacher.					
8-2	The school undertakes to provide all teaching practice requirements to be available for the science student teacher.					
8-3	There is usually a coordination mechanism for the distribution of science student teachers between schools.					
8-4	The university coordinator provides a supervisor from the university for each student in the same specialization.					
8-5	The coordinator at school provides a collaborator teacher for each student according to specialization.					
8-6	The coordinator provides an appropriate number of school teaching quotas in accordance with regulations and conditions.					
8-7	The science student teacher is always informed of reports submitted by the university supervisor.					
8-8	The science student teacher is always informed of reports submitted by the collaborator teacher.					
8-9	The university supervisor usually makes a sufficient number of visits to the student teacher at the school to assess the student.					
8-10	The science student teacher is always informed about the rules and regulations on practice teaching before starting.					
8-11	The science student teacher is always informed about school policy.					

8-12	The science student teacher is always informed about the national curriculum requirements.					
8-13	I think that the duration of the practice teaching programme is sufficient to develop science student teachers' skills in science teaching.					
8-14	Please add any other reasons not covered above.					
NO.	**Questions**					
9	**In what ways do you feel the partnership community at school supports and assists you in learning?**	**SA**	**A**	**N**	**D**	**SD**
9-1	School pupils usually consider science student teachers not to be regular teachers and therefore they make a lot of discipline problems.					
9-2	The number of pupils in the science student teachers' classes is reasonable.					
9-3	Parents do not trust the capabilities of the science student teacher in the teaching of their children.					
9-4	Science student teachers enjoy all the privileges provided by the school administration to the regular teachers.					
9-5	The school headteachers regard science student teachers as an unwelcome burden.					
9-6	The school assigns the science student teacher extra work that is not related to learning to teach.					
9-7	The school makes it possible for science student teachers to observe experienced teachers.					
9-8	The school makes it possible for science student teachers to discuss ideas about teaching with experienced teachers.					
9-9	Cooperating teachers concentrate more on pupils' learning than on science student teachers' learning.					
9-10	Teachers in school feel that they can learn from student teachers.					
9-11	The school teachers consider the science student teachers as a chance to reduce their teaching load.					
9-12	Please add any other reasons not covered above.					
NO.	**Questions**					
10	**In what ways do you feel the partnership community at university supports and assists you in learning?**	**SA**	**A**	**N**	**D**	**SD**
10-1	The number of students in the lecture hall is reasonable.					

10-2	The university supervisor solves educational problems that face science student teachers during periodic meetings.					
10-3	The university supervisor regularly follows up the science student teachers to motivate them to learn.					
10-4	The university supervisor provides all the references needed by students.					
10-5	The student teachers study some modules at the university that help them during the period of teaching practice.					
10-6	University tutors use a variety of teaching methods in their lectures which make it possible to learn these methods.					
10-7	University tutors help science student teachers understand how to use pedagogy related to their lessons.					
10-8	University tutors help science student teachers to link their learning at the university with learning at school through regular meetings at the university.					
10-9	The university supervisor helps student teachers understand the relationship between theory and practical teaching.					
10-10	The partnership coordinator at the university directs science student teachers towardsavailable learning resources.					
10-11	The partnership coordinator at the university collaborates with the science student teacher to resolve educational problems at university.					
10-12	Please add any other reasons not covered above.					
NO.	Questions					
11	**How do you see the role and responsibilities of the partnership coordinators?**	SA	A	N	D	SD
11-1	The university coordinator's role is managing and organizing admission to the teaching practice course.					
11-2	The university coordinator's role is supportingthe science student teachers and coordinating with the school when there are problems to be solved.					
11-3	The university coordinator's role is quality assurance of all work related to the teaching practice programme.					
11-4	The headteacher’s role is receiving science student teachers and providing them an appropriate place and timetable at school.					
11-5	The headteacher’s role is introducing science student teachers to their role, duties and rights at school.					
11-6	The headteacher’s role is helping science student teachers to integrate with the school community.					

11-7	The headteacher’s role is periodically evaluating science student teachers’ activities at school.					
11-8	The university supervisor’s role is motivating science student teachers to carry out their required role within the teaching practice programme.					
11-9	The university supervisor’s role is integrating with the cooperating teacher for the development of the science student teachers’ skills.					
11-10	The university supervisor’s role is continuing assessment of the science student teachers in the teaching practice programme, giving them feedback to fill the gaps in their learning.					
11-11	The university supervisor’s role is linking theory with practice through weekly meetings with science student teachers.					
11-12	The cooperating teacher’s role is making science student teachers aware of what they should do to enhance their learning in school.					
11-13	The science student teachers' role is transferring what they have learned for the teachers at the school.					
11-14	The science student teachers' role is implementing thedirectives of university supervisor and collaborating teacher.					
11-15	Usually, science student teachers carry out other roles for which they should not be responsible.					
11-16	Please add any other reasons not covered above.					

Appendix 4.2: School Headteacher and Cooperating Teachers' Questionnaire

Dear Participant,

Thank you very much for your participation in responding to this questionnaire which is one of the tools for collecting data for the current study. This study aims at exploring participant perspectives of how the university, the school, and the school-university partnership work to support science student teachers' learning to teach he science curriculum. The questionnaire consists of several sections. Each section discusses the factors which may affect science student teachers' learning and practice and how science student teachers learn to teach. In each section there is a number of questions (e.g. 1-1,1-2,......) which should be answered carefully.

Please put a tick (√) in the box which represents your response to the item. The abbreviations used refer to the following:

SA = strongly agree.

A = agree.

N = no opinion about it.

D = disagree.

SD = strongly disagree.

There is also a box below each section. This is space for you to give your own perspective on this aspect which is not covered or mentioned above. We are particularly interested in the things you put in these boxes as the ways that these expand upon the examples we have given in the 'tick box sections' are really important. All information given by you will be kept confidential and will be used only for educational research purposes.

Kind Regards,
Sami Binjumah
PhD student, School of Education, University of Exeter.

School Headteacher and Cooperating Teacher Questionnaire

Demographic information						
Gender		Male			Female	
Job		Head teacher			Cooperating teacher	
Years of experience		Less than 10 years		10-20 years		More than 20 years

NO.	Questions					
1	**The main reason for the existence of the students in the science teacher preparation programme at the university and practice school is:**	**SA**	**A**	**N**	**D**	**SD**
1-1	To become good science teachers.					
1-2	Because of their interest in science.					
1-3	Because teaching science is very easy.					
1-4	Because it is an enjoyable occupation.					
1-5	To find a good job with a good salary.					
1-6	Please add any other reasons not covered above.					

NO.	Questions					
2	**There are ways for learning to teach science from your expectations. The most important of these for science student teachers is:**	**SA**	**A**	**N**	**D**	**SD**
2-1	The science student teacher learns from lectures in the teacher education programme.					
2-2	The cooperating teacher helps science student teachers address gaps in subject knowledge in the school context.					
2-3	Please add any other reasons not covered above.					

NO.	Questions					
3	**Your perspective on the university and school and the relationship between them in science teachers' preparation.**	**SA**	**A**	**N**	**D**	**SD**
3-1	The university and the school are different institutions and have different perspectives on science teaching and learning to teach science.					

3-2	School teachers consider science student teachers as regular teachers.					
3-3	The different views between the university and the school cause a problem for science student teachers.					
3-4	Please add any other reasons not covered above.					
NO.	**Questions**					
4	**During teaching practice do you think the science student teacher has difficulty with:**	**SA**	**A**	**N**	**D**	**SD**
4-1	Planning science lessons.					
4-2	Choosing the appropriate methods for teaching science.					
4-3	Dealing with the science curriculum.					
4-4	Acquiring teaching skills.					
4-5	How to choose appropriate scientific experiments associated with topics in the curriculum.					
4-6	Applying the educational theories learned at the university to practice atthe school.					
4-7	Please add any other reasons not covered above.					
NO.	**Questions**					
5	**What do you think the university and school want to achieve by the programme of teacher preparation and teaching practice for science student teachers?**	**SA**	**A**	**N**	**D**	**SD**
5-1	To obtain qualified science teachers.					
5-2	To get pupils learning well in science.					
5-3	For science student teachers to be able to link theory to classroom practice.					
5-4	For science student teachers to understand the goals of the curriculum.					
5-5	Please add any other reasons not covered above.					
NO.	**Questions**					
6	**The important academic resources available in the school to help science student teachers to learn about the science curriculum and teaching science to pupils are:**	**SA**	**A**	**N**	**D**	**SD**
6-1	Meetings with experienced science teachers.					
6-2	Observing science teachers teaching.					

6-3	Science teaching plans made by experienced science teachers.					
6-4	Science teaching aids.					
6-5	Science labs.					
6-6	Short courses and workshops about teaching the science curriculum.					
6-7	Please add any other reasons not covered above.					
NO.	**Questions**	**SA**	**A**	**N**	**D**	**SD**
7	**The regulations shared between the university and school for teaching practice say:**					
7-1	The school for practice teaching is always chosen based on the desire of the science student teacher.					
7-2	The school undertakes to provide all teaching practice requirements to be available for the science student teacher.					
7-3	There is usually a coordination mechanism for the distribution of science student teachers on schools.					
7-4	The university coordinator provides a supervisor from university for each student in the same specialization.					
7-5	The coordinator at school provides a collaborator teacher for each student according to specialization.					
7-6	The coordinator provides an appropriate number of school teaching quotas in accordance with regulations and conditions					
7-7	The science student teacher is always informed of reports submitted by the university supervisor.					
7-8	The science student teacher is always informed of reports submitted by the collaborator teacher.					
7-9	The university supervisor usually makes a sufficient number of visits to the student teacher at the school to assess the student.					
7-10	The science student teacher is always informed about the rules and regulations on practice teaching before starting.					
7-11	The science student teacher is always informed about school policy.					
7-12	The science student teacher is always informed about the national curriculum requirements.					
7-13	I think that the duration of the practice teaching programme is sufficient to develop science student teachers' skills in science teaching.					
7-14	Please add any other reasons not covered above.					

NO.	Questions					
8	**In what ways do you feel the partnership community at school supports and assists the science student teachers' learning?**	SA	A	N	D	SD
8-1	School pupils usually consider science student teachers not as regular teachers and therefore they make a lot of discipline problems.					
8-2	The number of pupils in the science student teachers' classes is reasonable.					
8-3	Parents do not trust the capabilities of the science student teachers in the teaching of their children.					
8-4	Science student teachers enjoy all the privileges provided by the school administration to the regular teachers.					
8-5	The school headteachers regard science student teachers as an unwelcome burden.					
8-6	The school assigns the science student teacher extra work that is not related to learning to teach.					
8-7	The school makes it possible for science student teachers to observe experienced teachers.					
8-8	The school makes it possible for science student teachers to discuss ideas about teaching with experienced teachers.					
8-9	Cooperating teachers concentrate more on pupils' learning than on science student teachers' learning.					
8-10	Teachers in school feel that they can learn from student teachers.					
8-11	The school teachers consider the science student teachers as a chance to reduce their teaching load.					
8-12	Please add any other reasons not covered above.					

NO.	Questions					
9	**How do you see the role and responsibilities of the partnership coordinators?**	SA	A	N	D	SD
9-1	The university coordinator's role is managing and organizing admission to the teaching practice course.					
9-2	The university coordinator's role is supporting science student teachers and coordinating with the school when there are problems to be solved.					
9-3	The university coordinator's role is quality assurance of all work related to the teaching practice programme.					
9-4	The headteacher's role is receiving science student teachers and providing them an appropriate place and timetable at school.					

9-5	The headteacher's role is introducing science student teachers to their role, duties and rights at school.					
9-6	The headteacher's role is helping science student teachers to integrate with the school community.					
9-7	The headteacher's role is evaluating science student teachers' activities periodically at school.					
9-8	The university supervisor's role is motivating science student teachers to carry out the required role within the teaching practice programme.					
9-9	The university supervisor's role is integrating with the cooperating teacher for the development of the science student teachers' skills.					
9-10	The university supervisor's role is continuing assessment of the science student teachers in the teaching practice programme, giving them feedback to fill the gaps in their learning.					
9-11	The university supervisor's role is linking theory with practice through weekly meetings with science student teachers.					
9-12	The cooperating teacher's role makes science student teachers aware of what they should do to enhance their learning in school.					
9-13	The science student teachers' role is transferring what they have learned for the teachers at the school.					
9-14	The science student teachers' role is implementing the directives of university supervisor and collaborating teacher.					
9-15	Usually, science student teacher carries out other roles for which he/she should not be responsible.					
9-16	Please add any other reasons not covered above.					

Appendix 4.3: University Supervisor and Coordinator Questionnaire

Dear Participant,

Thank you very much for your participation in responding to this questionnaire which is one of the tools of collecting data for the current study. This study aims at exploring participant perspectives of how the university, the school, and the school-university partnership work to support science student teachers learning and teach science curriculums. The questionnaire consists of several sections. Each section discusses the factors which may affect science student teachers' learning and practice and how science student teachers learn to teach. In each section there is a number of questions (e.g. 1-1,1-2,......) which should be answered carefully.

Please put a tick (√) in the box which represents your response to the item. The abbreviations used refer to the following:

SA = strongly agree.

A = agree.

N = no opinion about it.

D = disagree.

SD = strongly disagree.

There is also a box below each section. This is space for you to give your own perspective on this aspect of section which is not covered or mentioned above. We are particularly interested in the things you put in these boxes as the ways that these expand upon the examples we have given in the 'tick box sections' are really important. All information given by you will be kept confidential and will be used only for educational research purposes.

Kind Regards,
Sami Binjumah
PhD student, School of Education, University of Exeter.

University Supervisor and Coordinator Questionnaire

Demographic information						
Gender		Male				Female
Job		Head teacher				Cooperating teacher
Years of experience		Less than 10 years		10-20 years		More than 20 years

NO.	Questions					
1	**The main reason for the existence of the students in science teacher preparation programme at university and practice at school is:**	SA	A	N	D	SD
1-1	To become good science teachers.					
1-2	Because of their interest in science.					
1-3	Because teaching science is very easy.					
1-4	Because it is an enjoyable occupation.					
1-5	To find a good job with a good salary.					
1-6	Please add any other reasons not covered above.					

NO.	Questions					
2	**There are ways for learning to teach science from your expectations. The most important of these for science student teachers is:**	SA	A	N	D	SD
2-1	The science student teacher learns from lectures in the teacher education programme.					
2-2	The cooperating teacher helps science student teachers address gaps in subject knowledge in the school context.					
2-3	Please add any other reasons not covered above.					

NO.	Questions					
3	**Your perspective about the university and school and the relationship between them in science teachers' preparation.**	SA	A	N	D	SD
3-1	The university and the school are different institutions and have different perspectives about science teaching and about learning to teach science.					
3-2	School teachers consider science student teachers as regular teachers.					

3-3	The different views between the university and the school cause a problem for science student teachers.					
3-4	Please add any other reasons not covered above.					
NO.	**Questions**					
4	**During teaching practice do you think the science student teacher has difficulty with:**	**SA**	**A**	**N**	**D**	**SD**
4-1	Planning science lessons.					
4-2	Choosing the appropriate methods for teaching science.					
4-3	Dealing with the science curriculum.					
4-4	Acquiring teaching skills.					
4-5	How to choose appropriate scientific experiments associated with topics in the curriculum.					
4-6	Applying the educational theories learned at university to practice in the school.					
4-7	Please add any other reasons not covered above.					
NO.	**Questions**					
5	**What do you think the university and school want to achieve by the programme of teacher preparation and teaching practice for science student teachers?**	**SA**	**A**	**N**	**D**	**SD**
5-1	To obtain qualified science teachers.					
5-2	To get pupils learning well in science.					
5-3	For science student teachers to be able to link theory to classroom practice.					
5-4	For science student teachers to understand the goals of the curriculum.					
5-5	Please add any other reasons not covered above.					
NO.	**Questions**					
6	**The essential academic resources available at university to help science student teachers to learn about science curricula and teaching science to pupils are:**	**SA**	**A**	**N**	**D**	**SD**
6-1	University library.					
6-2	Reflective meetings with university tutors.					
6-3	Science text books.					

6-4	Educational films for science teaching.					
6-5	Workshops for designing teaching aids.					
6-6	Models analyzing the content of the science curriculum.					
6-7	Visiting schools.					
6-8	Please add any other reasons not covered above.					

NO.	**Questions**					
7	**The regulations shared between the university and school for teaching practice say:**	**SA**	**A**	**N**	**D**	**SD**
7-1	The school for practice teaching is always chosen based on the desire of the science student teacher.					
7-2	The school undertakes to provide all teaching practice requirements to be available for the science student teacher.					
7-3	There is usually a coordination mechanism for the distribution of science student teachers between schools.					
7-4	The university coordinator provides a supervisor from the university for each student in the same specialization.					
7-5	The coordinator at school provides a collaborator teacher for each student according to specialization.					
7-6	The coordinator provides an appropriate number of school teaching quotas in accordance with regulations and conditions.					
7-7	The science student teacher is always informed of reports submitted by the university supervisor.					
7-8	The science student teacher is always informed of reports submitted by the collaborator teacher.					
7-9	The university supervisor usually makes a sufficient number of visits to the student teacher at the school to assess the student.					
7-10	The science student teacher is always informed about the rules and regulations on practice teaching before starting.					
7-11	The science student teacher is always informed about school policy.					
7-12	The science student teacher is always informed about the national curriculum requirements.					
7-13	I think that the duration of the practice teaching programme is sufficient to develop science student teachers’ skills in science teaching.					
7-14	Please add any other reasons not covered above.					

NO.	Questions					
8	**In what ways do you feel the partnership community at the university supports and assists the student teacher in learning?**	**SA**	**A**	**N**	**D**	**SD**
8-1	The number of students at the lecture hall is reasonable.					
8-2	The university supervisor solves educational problems that face science student teachers during periodic meetings.					
8-3	The university supervisor regularly follows up science student teachers to motivate them to learn.					
8-4	The university supervisor provides all the references needed by students.					
8-5	The student teachers study some modules at the university that help them during the period of teaching practice					
8-6	University tutors use a variety of teaching methods in their lectures which make it possible for their students to learn these methods.					
8-7	University tutors help science student teachers understand how to use pedagogy related to their lessons.					
8-8	University tutors help science student teachers to link their learning at the university with learning at school through regular meetings at the university					
8-9	The university supervisor helps student teachers understand the relationship between theory and practical teaching.					
8-10	The partnership coordinator at the university directs science student teachers towards available learning resources.					
8-11	The partnership coordinator at the university collaborates with the science student teacher to resolve educational problems at university.					
8-12	Please add any other reasons not covered above.					

NO.	Questions					
9	**How do you see the role and responsibilities of the partnership coordinators?**	**SA**	**A**	**N**	**D**	**SD**
9-1	The university coordinator's role is managing and organizing admission to the teaching practice course.					
9-2	The university coordinator's role is supporting science student teachers and coordinating with the school when there are problems to be solved.					
9-3	The university coordinator's role is quality assurance of all work related to the teaching practice programme.					
9-4	The headteacher’s role is receiving science student teachers and providing them an appropriate place and timetable at school.					

9-5	The headteacher's role is introducing science student teachers to their role, duties and rights at school.					
9-6	The headteacher's role is helping science student teachers to integrate with the school community.					
9-7	The headteacher's role is evaluating science student teachers' activities periodically at school.					
9-8	The university supervisor's role is motivating science student teachers to carry out their required role within the teaching practice programme.					
9-9	The university supervisor's role is integrating with the cooperating teacher for the development of science student teachers' skills.					
9-10	The university supervisor's role is continuing assessment of the science student teachers in the teaching practice programme,giving them feedback to fill the gaps in their learning.					
9-11	The university supervisor's role is linking theory with practice through weekly meetings with science student teachers.					
9-12	The cooperating teacher's role makes science student teachers aware of what they should do to enhance their learning in school.					
9-13	The science student teachers' role is transferring what they have learned for the teachers at the school.					
9-14	The science student teachers' role is implementing the directives of university supervisor and collaborating teacher.					
9-15	Usually, science student teachers carry out other roles for which they should not be responsible.					
9-16	Please add any other reasons not covered above.					

Appendix 4.4: The main axes of interview questions for the participants

No.	Interview Questions
Q1	What are the most important characteristics of a good teacher from your perspective? Do science student teachers possess these characteristics?
Notes	
Q2	Does the teaching practice programme have an appropriate duration? How is the programme applied within the school? i.e. Is there a specific and tabulated system for this programme?
Notes	
Q3	Is there an official guide for teaching practice?
Notes	
Q4	Is the teacher preparation programme (H.D.Ed) capable of producing good professional teachers? To any stage directs its deliverables? How so?
Notes	
Q5	Are schools selected based on the science student teachers'wishes? Do you think that the choice of school helps science student teachers learn?
Notes	
Q6	How many modules are students allowed to study at the university alongside practising teaching? Do you think it's stressful for the student teachers?
Notes	
Q7	What tasks are carried out in the school by the science student teachers? Are extra tasks assigned to them? Are science student teachers in the school an opportunity to reduce school teachers'workload?
Notes	
Q8	What is focused on more by cooperating teachers:is it on teaching pupils or on teaching the science student teachers how to teach?
Notes	
Q9	Are the science student teachers assigned waiting classes? If so, how many?
Notes	
Q10	What are the difficulties facing science student teachers at the beginning of teaching?planning for science lessons?dealing with the science curriculum?dealing with the students?
Notes	
Q11	Can the science student teachers overcomethese difficulties alone or with help? From who?and how can this be done?

Notes	
Q12	Do the science student teachers collide with the school's reality which is different from what they have learned at the university? How large is this difference?
Notes	
Q13	What do science student teachers learn in the H.D.EdProgramme at the university or in teaching practice at school?
Notes	
Q14	Are science student teachers trained in the modern science curriculum and teaching methods during their school teaching practice?
Notes	
Q15	Are there workshops at the university on the modern science curriculum?
Notes	
Q16	Are short courses given for science student teachers to understand how to deal with the modern science curriculum? What are the durations of these at university or school?
Notes	
Q17	Are short courses given for school teachers to understand how to deal with the modern science curriculum?
Notes	
Q18	Do the subjects studied in the H.D.EdProgramme at the university assist science student teachers to understand the modern science curriculum and to cope with teaching practice at the school?
Notes	
Q19	What kind of support is provided for science student teachers to develop their skills in the science curriculum? at the university?atthe school?
Notes	
Q20	What does the (University - School - Student) hope to achieve from the education of science student teachers?
Notes	
Q21	Is there cooperation between the university and school from your perspective? How effective is this collaboration?
Notes	
Q22	Do you participate in selecting and constructing the science curriculum?
Notes	

Q23	What are the main problems that create differences of views between the university and school? And how do they affect the science student teachers?
Notes	
Q24	Is the school equipped with a science lab? Do the science student teachers use it regularly? How many science labs are there at the school?
Notes	
Q25	Does the school allow science student teachers to use all school facilities and equipment without restriction?
Notes	
Q26	What resources are available for science student teachers to learn more about teaching at the university/school?
Notes	
Q27	Are there rules and regulations for the science teachers who organise science teaching practice at school?
Notes	
Q28	Are science student teachers informed of the rules and regulations of teaching practice? If yes, from who?
Notes	
Q29	Does the partnership community support and assist the science student teachers to learn? If yes, how?
Notes	
Q30	Do the science student teachers receive any follow-up or evaluation from the university supervisor, cooperating teacher or headteacher?
Notes	
Q31	Does the attitude of parents and pupils at school affect the science student teachers at school? Does it cause any problems with discipline and has it been controlled or not?
Notes	
Q32	Are the roles of the science student teachers and partnership community clear and known? Are the science student teachers performing roles other than their own?
Notes	
Q33	If theyare known to you, can you summarize the roles of university supervisor, university coordinator, headteacher, cooperating teacher and science student teacher?
Notes	

Appendix 5.A: Distribution of data

Distribution of data: skewness and kurtosis

Skewness and kurtosis tests were used to find out whether the responses of the participants were normally distributed, in order to decide whether a parametric or a non-parametric statistical technique was appropriate (Pallant, 2007).

Distribution of data: histograms

The shape of a histogram provides information about the distribution of scores on a continuous variable. Pallant(2007) confirmed that normality "can be checked by inspecting the histograms of scores on each variable" (p.124).

Overview on data distribution (skewness, kurtosis and histograms)

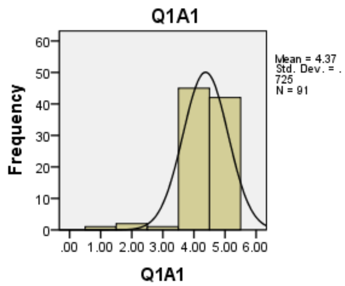
The following results shows the skewness and kurtosis tests and the histograms of the scores on the questionnaire items. Most of the values of skewness and kurtosis are less than 1.96 ($|S| < 1.96$ & $|K| < 1.96$ when alpha=5%) for each item, suggesting that most responses were close to a normal distribution; also in terms of the bell-shape of the histograms. These items have been dealt with through parametric tests (t-test and one way ANOVA). Those items which did not have a normal distribution (Q1A1, Q5A1, Q5A2, Q6A2, Q6A4, Q11A14) were dealt with through non-parametric tests (Mann-Whitney and Kruskal-Wallis).

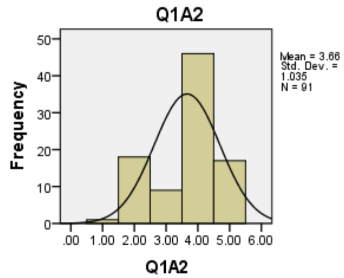
Q1: Distribution of data: skewness and kurtosis

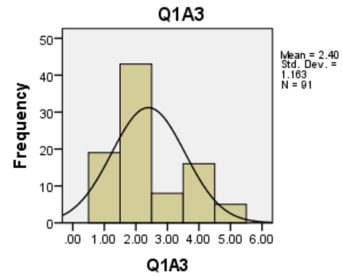
Q1 The Reasons for students' participation in the science teacher preparation program.	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q1A1To become good science teachers.	91	1.00	5.00	4.3736	.72493	-1.782	.253	5.667	.500
Q1A2 Because of their interest in science.	91	1.00	5.00	3.6593	1.03516	-.623	.253	-.582	.500
Q1A3 Because teaching science is very easy.	91	1.00	5.00	2.3956	1.16313	.735	.253	-.440	.500
Q1A4 Because it is an enjoyable occupation.	91	1.00	5.00	3.9011	.90744	-.896	.253	.669	.500
Q1A5 To find a good job with a good salary.	91	2.00	5.00	4.0220	1.01081	-.903	.253	-.202	.500

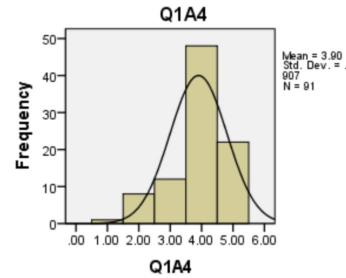
Q= Question 1,2,3,…
A= Sub question 1,2,3,…

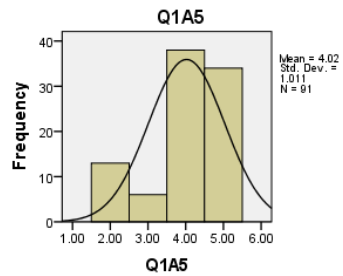
Q1: Distribution of data: histograms









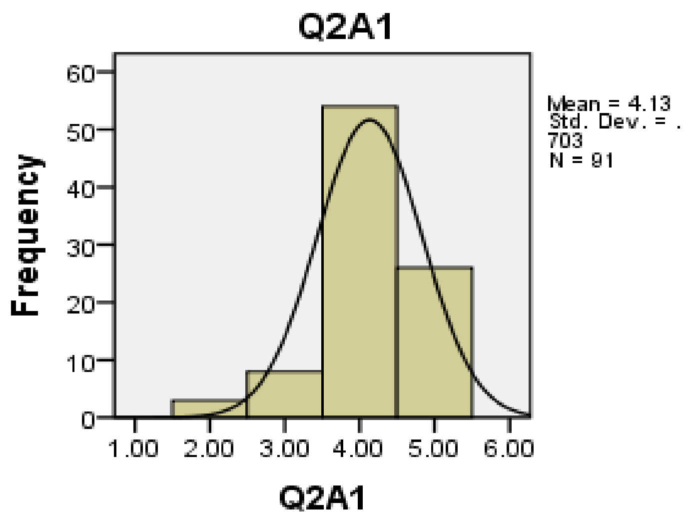


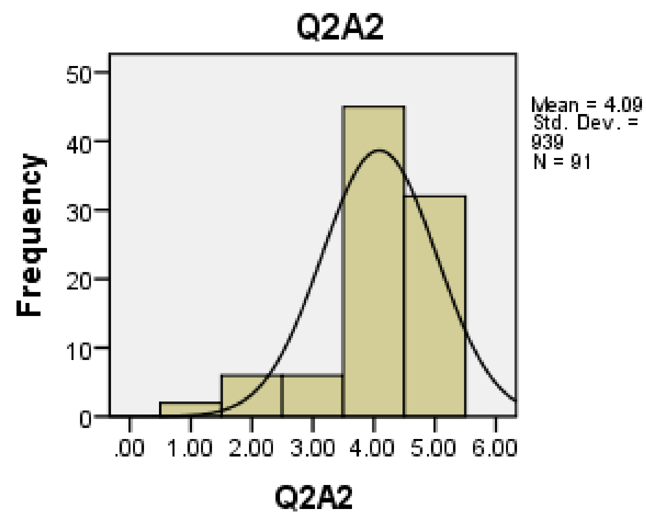
Q2: Distribution of data: skewness and kurtosis

Q2 Expectations of how students learn to teach science	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q2A1 The science student teacher learns from lectures at the teacher education programme.	**91**	**2.00**	**5.00**	**4.1319**	**.70252**	**-.779**	**.253**	**1.280**	**.500**
Q2A2 The cooperating teacher helps science student teachers address gaps in subject knowledge in school context.	**91**	**1.00**	**5.00**	**4.0879**	**.93866**	**-1.332**	**.253**	**1.892**	**.500**

Q= Question 1,2,3,…
A= Sub question 1,2,3,…

Q2: Distribution of data: histograms



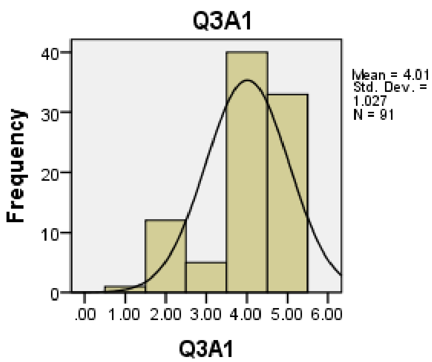


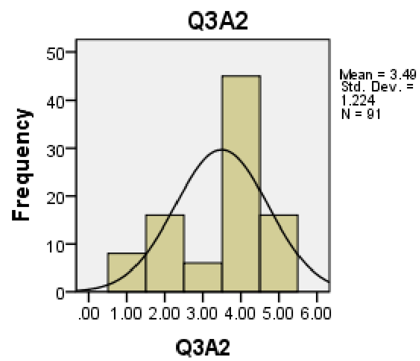
Q3: Distribution of data: skewness and kurtosis

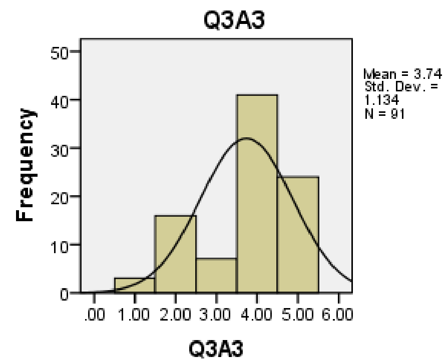
Q3 Perspectives on the relationship between university and school in science teacher preparation	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q3A1 The university and the school have different institutions and have different perspectives about science teaching and learning to teach science.	**91**	**1.00**	**5.00**	**4.0110**	**1.02734**	**-1.028**	**.253**	**.259**	**.500**
Q3A2 School teachers consider science student teachers as regular teachers.	**91**	**1.00**	**5.00**	**3.4945**	**1.22360**	**-.731**	**.253**	**-.585**	**.500**
Q3A3 These differences of views between the university and the school cause a problem for science student teachers.	**91**	**1.00**	**5.00**	**3.7363**	**1.13368**	**-.770**	**.253**	**-.392**	**.500**

Q= Question 1,2,3,…
A= Sub question 1,2,3,…

Q3: Distribution of data: histograms





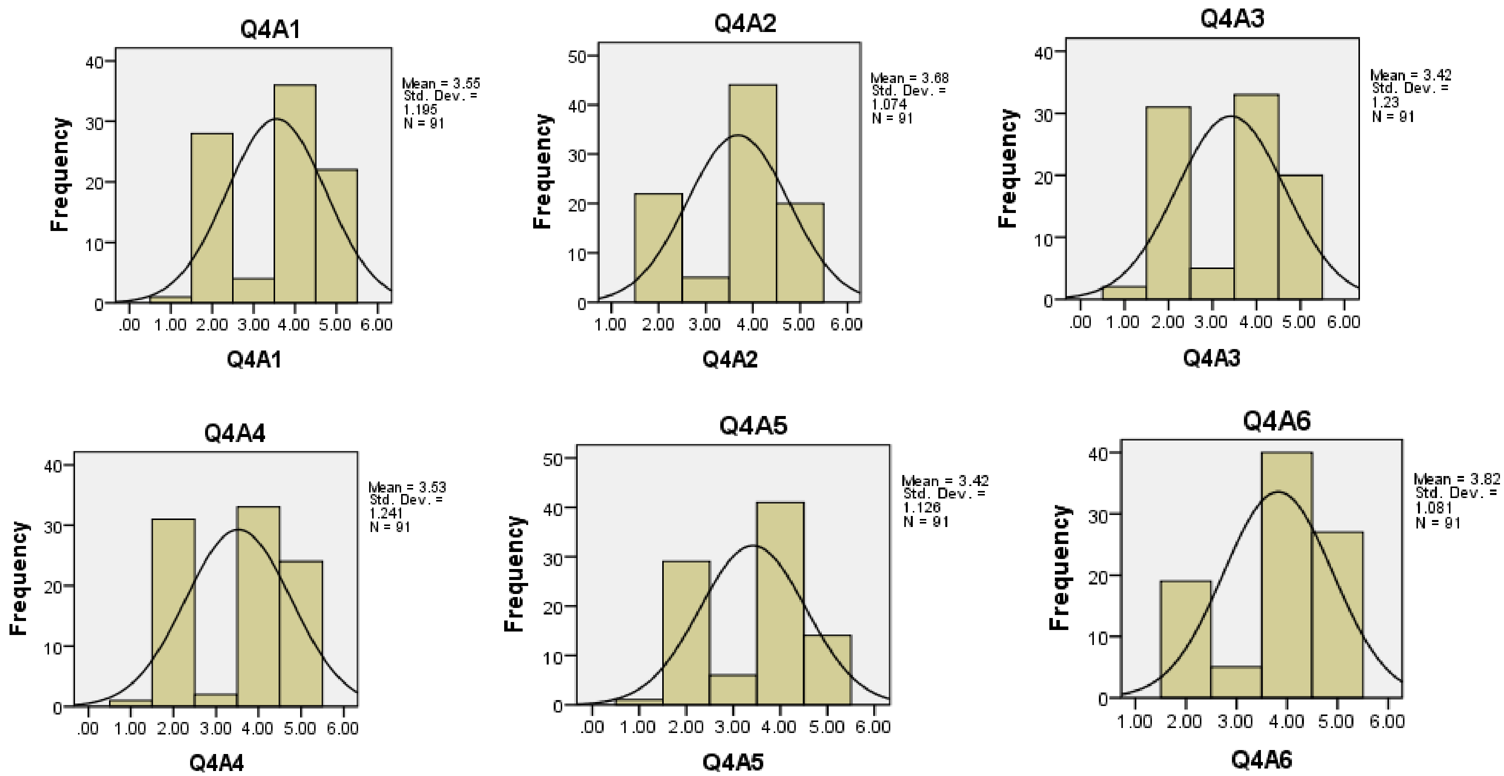


Q4: Distribution of data: skewness and kurtosis

Q4 Science student teachers' difficulties during teaching practice	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q4A1 Planning for science lessons.	91	1.00	5.00	3.5495	1.19502	-.339	.253	-1.339	.500
Q4A2 Choosing the appropriate methods for teaching science.	91	2.00	5.00	3.6813	1.07372	-.540	.253	-.978	.500
Q4A3 Dealing with the science curriculum.	91	1.00	5.00	3.4176	1.22987	-.190	.253	-1.427	.500
Q4A4 Acquiring teaching skills.	91	1.00	5.00	3.5275	1.24133	-.278	.253	-1.481	.500
Q4A5 How to choose appropriate practical work associated with science topics in the curriculum.	80	1.00	5.00	3.4176	1.12611	-.267	.253	-1.301	.500
Q4A6 Applying what has been learned at university from educational theories at school.	64	2.00	5.00	3.8242	1.08108	-.666	.253	-.804	.500

Q= Question 1,2,3,…
A= Sub question 1,2,3,…

Q4: Distribution of data: histograms

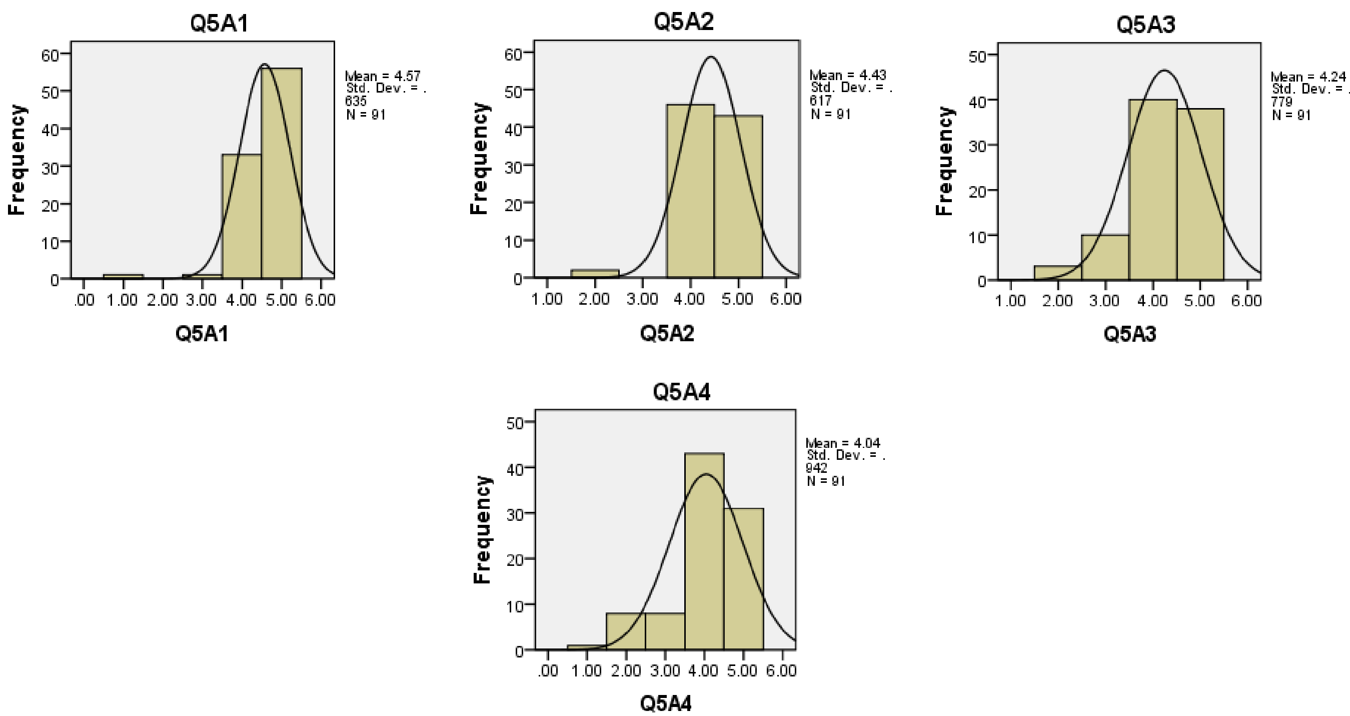


Q5: Distribution of data: skewness and kurtosis

Q5 What the university and school want to achieve through the programme of teacher preparation and teaching practice for science student teachers	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q5A1 To obtain qualified science teachers.	**91**	**1.00**	**5.00**	**4.5714**	**.63496**	**-2.271**	**.253**	**9.626**	**.500**
Q5A2 To get pupils learning well in science.	**91**	**2.00**	**5.00**	**4.4286**	**.61721**	**-1.171**	**.253**	**3.093**	**.500**
Q5A3 For science student teachers to be able to link theory to classroom practice.	**91**	**2.00**	**5.00**	**4.2418**	**.77947**	**-.886**	**.253**	**.509**	**.500**
Q5A4 For science student teachers to understand the goals of the curriculum.	**91**	**1.00**	**5.00**	**4.0440**	**.94177**	**-1.068**	**.253**	**.836**	**.500**

Q= Question 1,2,3,…
A= Sub question 1,2,3,…

Q5: Distribution of data: histograms

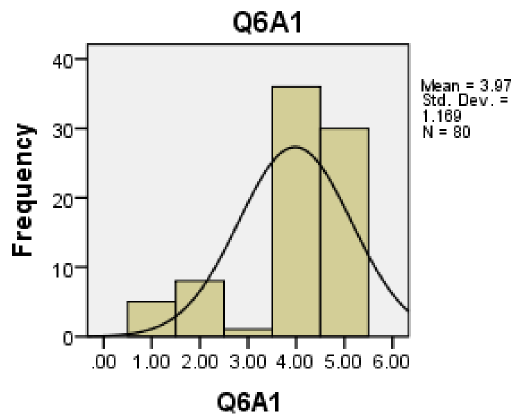


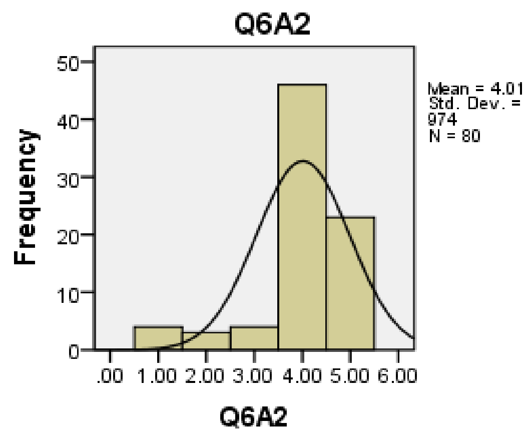
Q6: Distribution of data: skewness and kurtosis

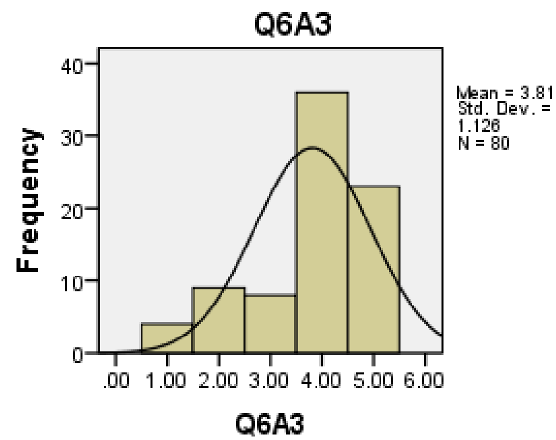
Q6 The essential academic resources which are available at school to help science student teachers to learn about science curricula and teaching science to pupils.	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q6A1 Meetings with experienced science teachers.	80	1.00	5.00	3.9750	1.16895	-1.316	.269	.886	.532
Q6A2 Observing science teachers teaching.	80	1.00	5.00	4.0125	.97427	-1.626	.269	3.017	.532
Q6A3 Teaching plans from experienced science teachers.	80	1.00	5.00	3.8125	1.12614	-.983	.269	.251	.532
Q6A4 Science teaching aids.	80	1.00	5.00	4.1375	.97752	-1.450	.269	1.995	.532
Q6A5 Science labs.	80	1.00	5.00	3.9125	1.04571	-1.116	.269	.590	.532
Q6A6 Short courses and workshops about teaching students in the science curriculum.	80	1.00	5.00	3.6125	1.31682	-.711	.269	-.674	.532

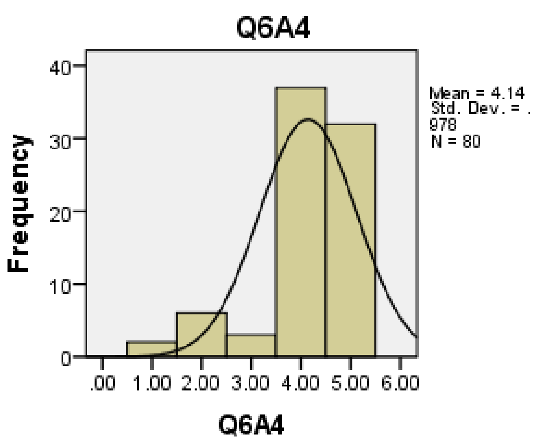
Q= Question 1,2,3,…
A= Sub question 1,2,3,…

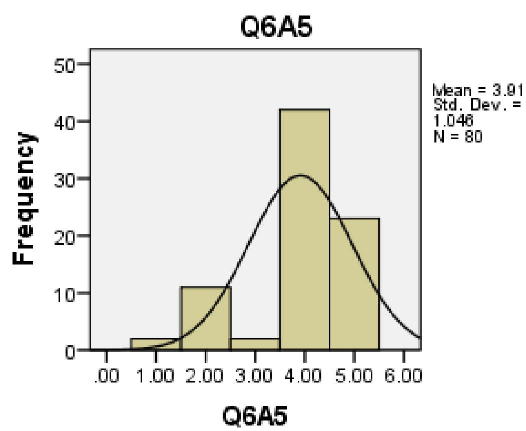
Q6: Distribution of data: histograms

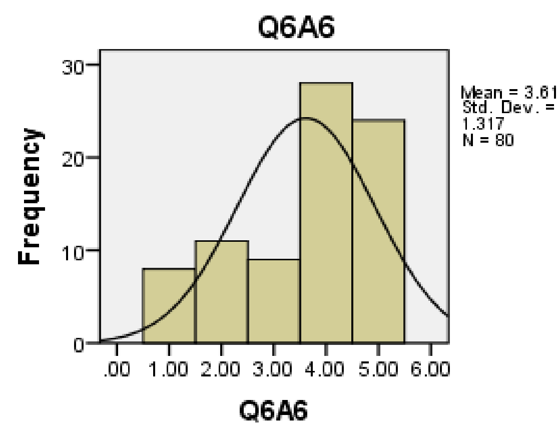










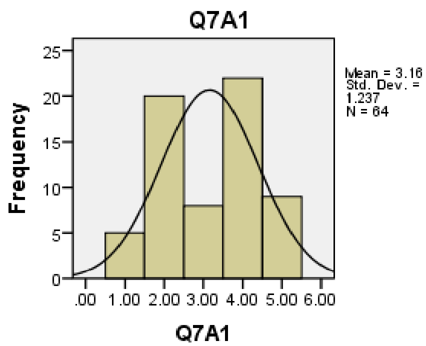


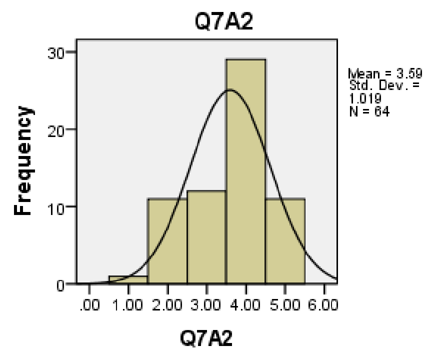
Q7: Distribution of data: skewness and kurtosis

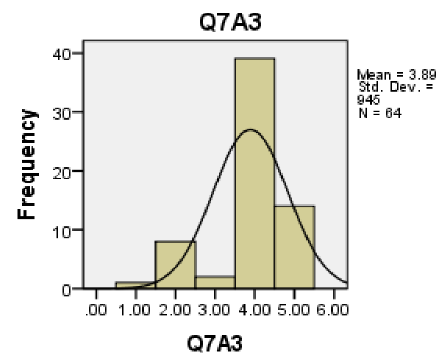
Q7 The essential academic resources available at the university to help science student teachers learn about science curricula and teaching science to pupils	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q7A1University Library.	**64**	**1.00**	**5.00**	**3.1563**	**1.23724**	**-.099**	**.299**	**-1.219**	**.590**
Q7A2Reflective meetings with university tutors.	**64**	**1.00**	**5.00**	**3.5938**	**1.01916**	**-.495**	**.299**	**-.534**	**.590**
Q7A3Science textbooks.	**64**	**1.00**	**5.00**	**3.8906**	**.94478**	**-1.175**	**.299**	**1.114**	**.590**
Q7A4Educational films for science teaching.	**64**	**1.00**	**5.00**	**3.7344**	**1.14424**	**-.504**	**.299**	**-.920**	**.590**
Q7A5 Design workshops teaching aids	**64**	**1.00**	**5.00**	**3.4375**	**1.20679**	**-.128**	**.299**	**-1.400**	**.590**
Q7A6 Models analyzing the content of the science curriculum.	**64**	**2.00**	**5.00**	**3.4844**	**1.06893**	**-.200**	**.299**	**-1.236**	**.590**
Q7A7 Visiting schools.	**64**	**1.00**	**5.00**	**3.3750**	**1.22798**	**-.285**	**.299**	**-1.037**	**.590**

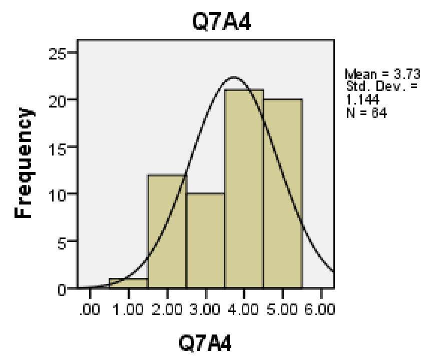
Q= Question 1,2,3,…
A= Sub question 1,2,3,…

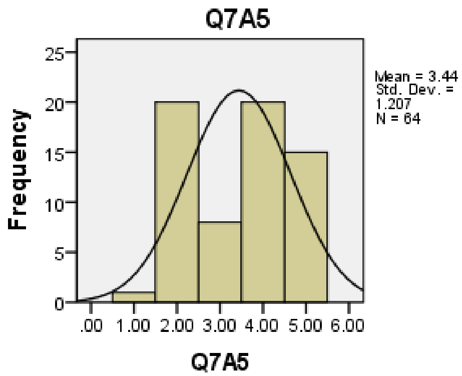
Q7: Distribution of data: histograms










Q7A5
Frequency
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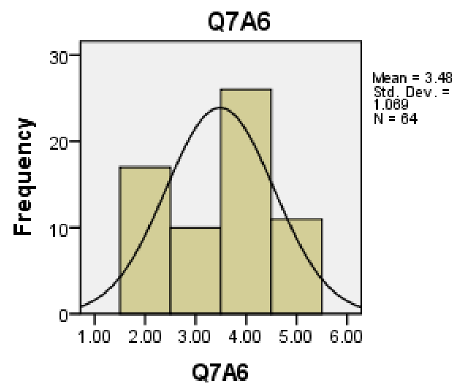
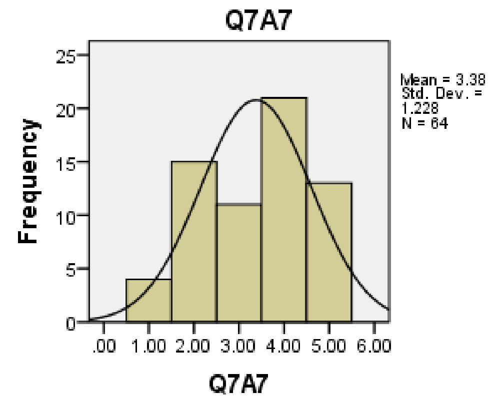
Std. Dev. = 1.207
N = 64
Q7A5


Q7A6
Frequency
Mean = 3.48
Std. Dev. = 1.069
N = 64
Q7A6


Q7A7
Frequency
Mean = 3.38
Std. Dev. = 1.228
N = 64
Q7A7

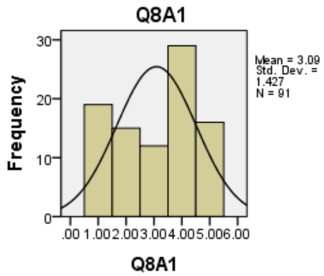
Q8: Distribution of data: skewness and kurtosis

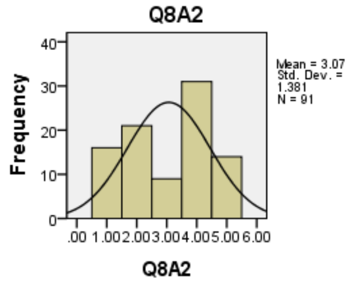
Q8 Regulations shared between the university and school for teaching practice	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q8A1 Always the school practice teaching is chosen based on the interests of the science student teacher.	**91**	**1.00**	**5.00**	**3.0879**	**1.42711**	**-.228**	**.253**	**-1.339**	**.500**
Q8A2 The school undertakes to provide all teaching practice requirements to be available for the science student teacher.	**91**	**1.00**	**5.00**	**3.0659**	**1.38084**	**-.172**	**.253**	**-1.345**	**.500**
Q8A3 Usually there is a coordination mechanism for the distribution of science student teachers on schools.	**91**	**1.00**	**5.00**	**3.5934**	**1.18301**	**-.805**	**.253**	**-.102**	**.500**
Q8A4 The university coordinator provides a supervisor from university for each student in the same specialization.	**91**	**1.00**	**5.00**	**4.0989**	**.93160**	**-1.128**	**.253**	**1.031**	**.500**
Q8A5 The coordinator at school provides a collaborator teacher for each student according to specialization.	**91**	**1.00**	**5.00**	**3.4835**	**1.17722**	**-.440**	**.253**	**-.924**	**.500**
Q8A6 The coordinator provides an appropriate number of school teaching quotas in accordance with regulations and conditions	**91**	**1.00**	**5.00**	**3.9231**	**1.02449**	**-.984**	**.253**	**.423**	**.500**
Q8A7 Always the science student teacher is informed of reports submitted by the university supervisor.	**91**	**1.00**	**5.00**	**3.0220**	**1.26472**	**-.143**	**.253**	**-1.144**	**.500**
Q8A8 Always the science student teacher is informed of reports submitted by the collaborator teacher.	**91**	**1.00**	**5.00**	**3.0549**	**1.25045**	**-.210**	**.253**	**-1.167**	**.500**

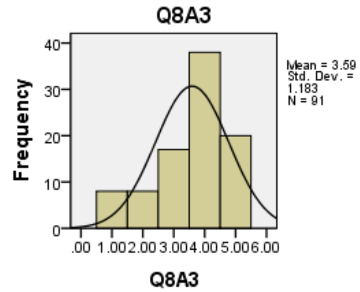
Q8A9 Usually the university supervisor visiting student teacher at the school sufficient number of visits to assess student.	**91**	**1.00**	**5.00**	**3.8022**	**1.13744**	**-1.129**	**.253**	**.565**	**.500**
Q8A10 Always the science student teacher is informed about the rules and the regulating practice teaching before starting.	**91**	**1.00**	**5.00**	**3.6593**	**1.09767**	**-1.036**	**.253**	**.415**	**.500**
Q8A11 Always the science student teacher is informed about school policy.	**91**	**1.00**	**5.00**	**3.4615**	**1.23205**	**-.620**	**.253**	**-.578**	**.500**
Q8A12 Always the science student teacher is informed about the national curriculum requirements.	**91**	**1.00**	**5.00**	**3.3956**	**1.18208**	**-.570**	**.253**	**-.579**	**.500**
Q8A13 I think that the duration of the practice teaching programme is sufficient to develop science student teachers' skills in science teaching.	**91**	**1.00**	**5.00**	**3.8571**	**1.10123**	**-1.140**	**.253**	**.750**	**.500**

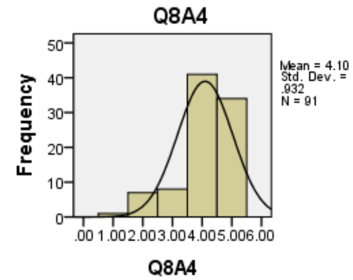
Q= Question 1,2,3,…
A= Sub question 1,2,3,…

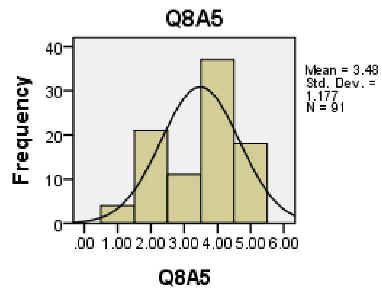
Q8: Distribution of data: histograms

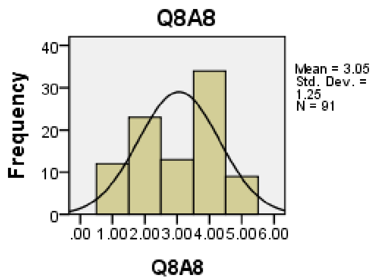











Q8A8
Frequency
Q8A8
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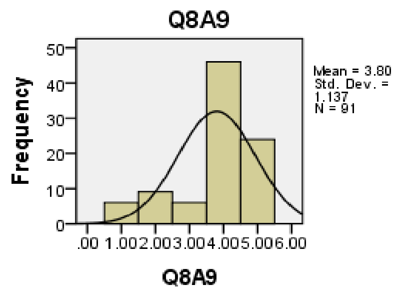
Std. Dev. = 1.25
N = 91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Frequency
Q8A9
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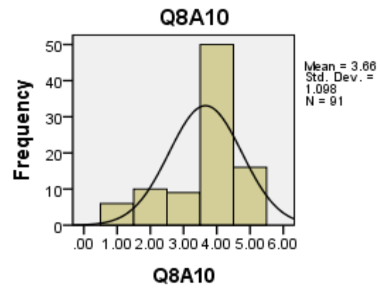
Std. Dev. = 1.137
N = 91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Frequency
Q8A10
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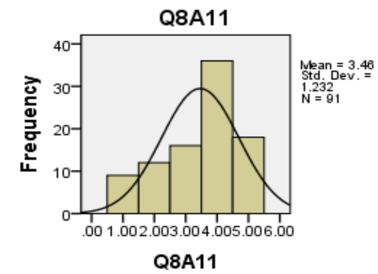
Std. Dev. = 1.098
N = 91


Q8A11
Frequency
Q8A11
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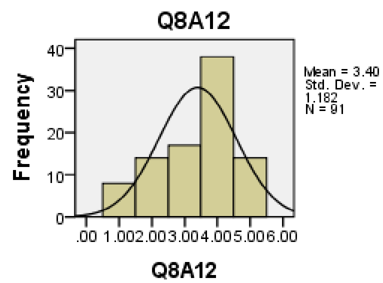
Std. Dev. = 1.232
N = 91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Frequency
Q8A12
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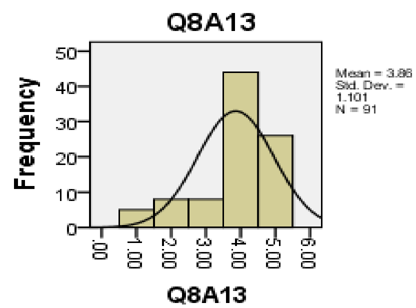
Std. Dev. = 1.182
N = 91


Q8A13
Frequency
Q8A13
Mean = 3.86
Std. Dev. = 1.101
N = 91

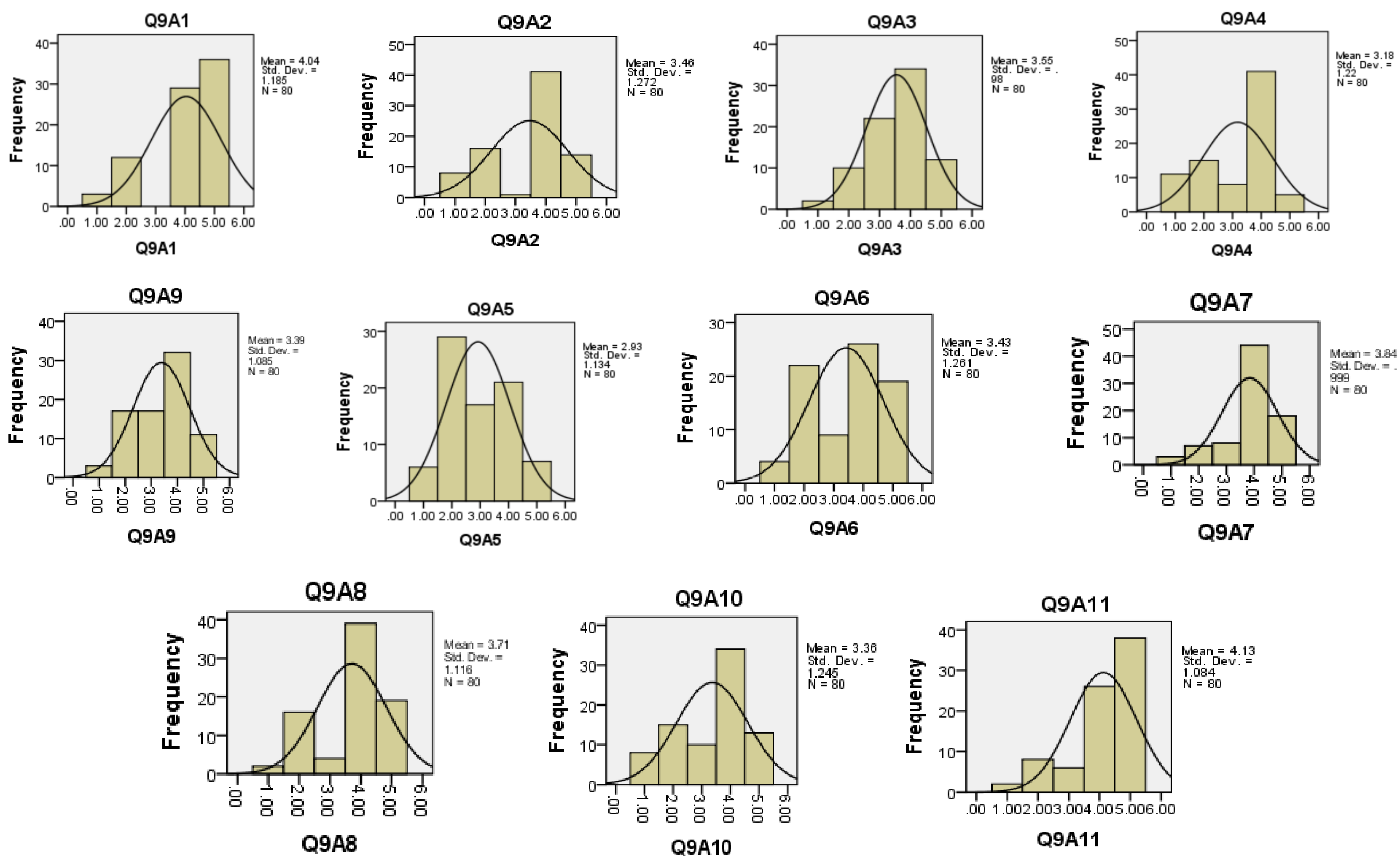
Q9: Distribution of data: skewness and kurtosis

Q9 How the partnership community at school supports and assists the science student teacher	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q9A1 School pupils usually consider science student teachers not as regular teachers and therefore they make a lot of discipline problems.	80	1.00	5.00	4.0375	1.18475	-1.198	.269	.301	.532
Q9A2 The number of pupils at the science student teachers' class is reasonable.	80	1.00	5.00	3.4625	1.27233	-.708	.269	-.777	.532
Q9A3 Parents do not trust the capabilities of the science student teacher in the teaching of their children.	80	1.00	5.00	3.5500	.97954	-.475	.269	-.169	.532
Q9A4 Science student teachers enjoy all the privileges provided by the school administration to the regular teachers.	80	1.00	5.00	3.1750	1.21983	-.602	.269	-.963	.532
Q9A5 The school headteachers regard science student teachers as an unwelcome burden.	80	1.00	5.00	2.9250	1.13377	.204	.269	-.957	.532
Q9A6The school assigns the science student teacher extra work that is not related to learning to teach.	80	1.00	5.00	3.4250	1.26065	-.274	.269	-1.230	.532
Q9A7 The school makes it possible for science student teachers to observe experienced teachers.	80	1.00	4.85	3.8375	.99929	-1.148	.269	1.144	.532
Q9A8 The school makes it possible for science student teachers to discuss ideas about teaching with experienced	80	1.00	5.00	3.7125	1.11598	-.750	.269	-.481	.532

teachers.									
Q9A9 Cooperating teachers concentrate more on pupils' learning than on science student teachers' learning.	**80**	**1.00**	**5.00**	**3.3875**	**1.08492**	**-.343**	**.269**	**-.754**	**.532**
Q9A10 Teachers in school feel that they can learn from student teachers.	**80**	**1.00**	**5.00**	**3.3625**	**1.24518**	**-.525**	**.269**	**-.844**	**.532**
Q9A11 The school teachers consider the science student teachers as a chance to reduce their teaching load.	**80**	**1.00**	**5.00**	**4.1250**	**1.08354**	**-1.234**	**.269**	**.705**	**.532**

Q= Question 1,2,3,…
A= Sub question 1,2,3,…

Q8: Distribution of data: histograms



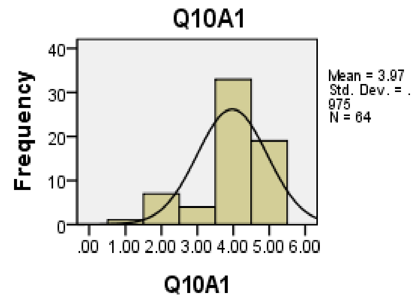
Q10: Distribution of data: skewness and kurtosis

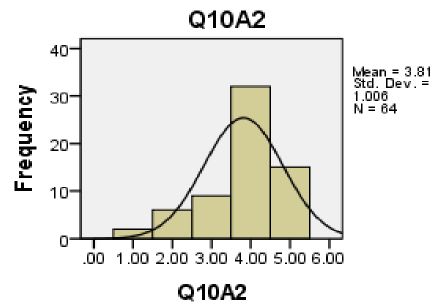
Q10 How the partnership community at university supports and assists the science student teacher	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q10A1 The number of students at the lecture hall is reasonable.	64	1.00	5.00	3.9688	.97539	-1.101	.299	.861	.590
Q10A2 The university supervisor solves educational problems that face science student teachers during periodic meetings.	64	1.00	5.00	3.8125	1.00593	-.961	.299	.666	.590
Q10A3 The university supervisor regularly follows up the science student teacher to motivate them to learn.	64	1.00	5.00	3.8906	.94478	-1.175	.299	1.640	.590
Q10A4 The university supervisor provides all the references needed by students.	64	1.00	5.00	3.5938	1.17809	-.653	.299	-.431	.590
Q10A5 The student teachers study some courses at university during teaching practice.	64	1.00	5.00	4.1563	.94648	-1.366	.299	1.766	.590
Q10A6 University tutors are using a variety of teaching methods in their lectures in which possible learning from it.	64	1.00	5.00	3.6406	1.17334	-.654	.299	-.551	.590
Q10A7 University tutors help student teachers understand how to use pedagogy related to their lessons.	64	1.00	5.00	3.8750	1.03126	-1.266	.299	1.411	.590
Q10A8 University tutors helps science student teachers to link their learning at the university with learning at school	64	1.00	5.00	3.5938	1.12290	-.797	.299	-.055	.590

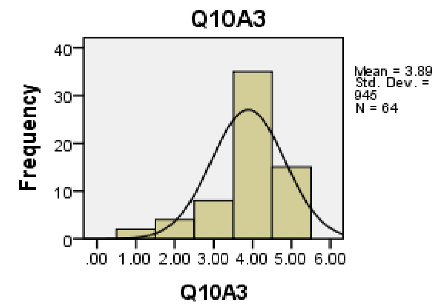
through regular meetings at the university.									
Q10A9 The university supervisor helps student teachers understand the relationship between theory and practical teaching.	**64**	**1.00**	**5.00**	**3.5000**	**1.25988**	**-.590**	**.299**	**-.834**	**.590**
Q10A10 The partnership coordinator at the university directs science student teachers' where to get the learning resources.	**64**	**1.00**	**5.00**	**3.4531**	**1.15373**	**-.650**	**.299**	**-.611**	**.590**
Q10A11 The partnership coordinator at the university collaborates with the science student teacher to resolve educational problems at university.	**64**	**1.00**	**5.00**	**3.7031**	**1.16401**	**-.762**	**.299**	**-.349**	**.590**

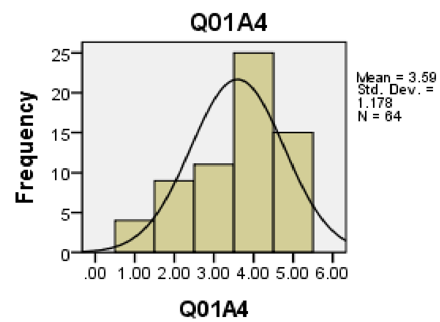
Q= Question 1,2,3,…
A= Sub question 1,2,3,…

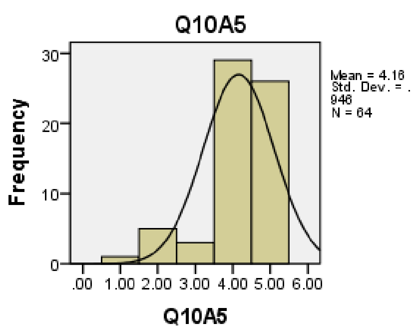
Q10: Distribution of data: histograms

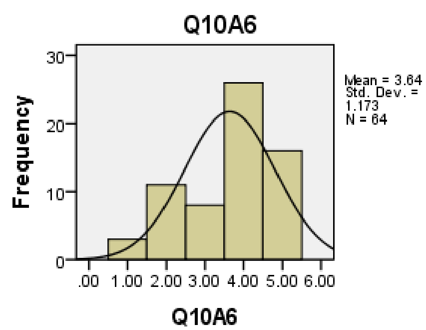


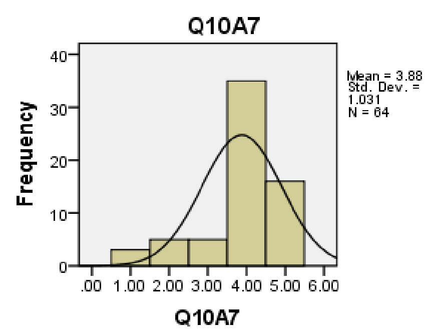


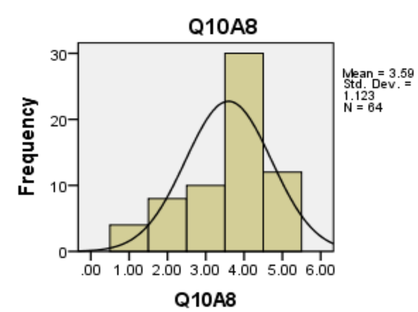












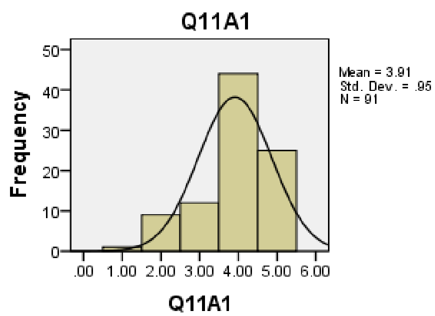
Q11: Distribution of data: skewness and kurtosis

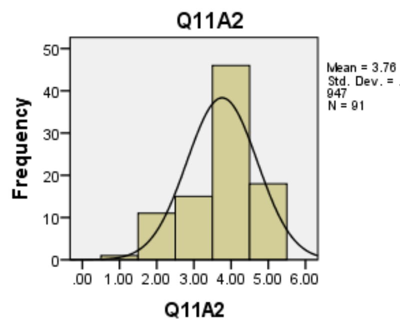
Q11 The role and responsibilities of the partnership coordinators	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Q11A1 The university coordinator's role is managing and organizes of admission to the teaching practice course.	91	1.00	5.00	3.9121	.95042	-.854	.253	.326	.500
Q11A2 The university coordinator's role is supporting for science student teachers and coordination with school when there are problems to be solved.	91	1.00	5.00	3.7582	.94682	-.699	.253	.015	.500
Q11A3 The university coordinator's role is confirmation of quality assurance of all work related to the teaching practice programme.	91	1.00	5.00	3.8022	.99129	-.849	.253	.310	.500
Q11A4 Theheadteacher's role is receiving science student teachers and provides them an appropriate place and timetable at school.	91	1.00	5.00	4.0330	.99388	-1.247	.253	1.214	.500
Q11A5 Theheadteacher's role is introducing science student teachers to their role, duties and rights at school.	91	1.00	5.00	3.9670	.93631	-1.179	.253	1.460	.500
Q11A6 Theheadteacher's role is helping science student teachers to integrate with the school community.	91	1.00	5.00	3.8462	.96521	-1.048	.253	.825	.500
Q11A7 Theheadteacher's role is evaluating science student teachers activities periodically at school.	91	1.00	5.00	3.7253	1.07565	-.578	.253	-.709	.500
Q11A8 Theheadteacher's role is solving the problems of science student teachers during teaching practice.	91	1.00	5.00	3.9890	.93683	-1.056	.253	.838	.500
Q11A9 The university supervisor's role is motivating science student teachers to carry out the required role within the teaching	91	1.00	5.00	3.8571	.98400	-.851	.253	.109	.500

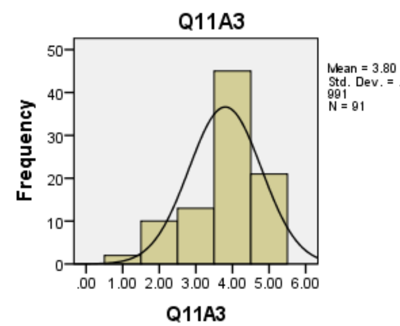
practice programme.									
Q11A10 The university supervisor's role is integrating with the cooperating teacher for the development of the science student teachers.	**91**	**1.00**	**5.00**	**4.1209**	**.97565**	**-1.275**	**.253**	**1.431**	**.500**
Q11A11 The university supervisor's role is continuing assessment of the science student teachers in the teaching practice programme and gives them feedback to fill the gaps in their learning and to linking theory with practice through doing weekly meetings with science student teachers.	**91**	**1.00**	**5.00**	**3.9780**	**1.01081**	**-1.209**	**.253**	**1.517**	**.500**
Q11A12 The cooperating teacher's role is clear on what he/she can do and what the science student teachers expect.	**91**	**1.00**	**5.00**	**3.8571**	**1.01731**	**-.743**	**.253**	**-.217**	**.500**
Q11A13 The science student teachers' role is transfering what they have learned for the teachers at the school.	**91**	**1.00**	**5.00**	**3.7143**	**1.14781**	**-.903**	**.253**	**-.051**	**.500**
Q11A14 The science student teachers' role is implementing the directives of university supervisor and collaborating teacher.	**91**	**1.00**	**5.00**	**4.0220**	**.96584**	**-1.406**	**.253**	**2.105**	**.500**
Q11A15 Usually, science student teacher carries out other roles for which he/she should not be responsible.	**91**	**1.00**	**5.00**	**3.4725**	**1.23235**	**-.536**	**.253**	**-.670**	**.500**

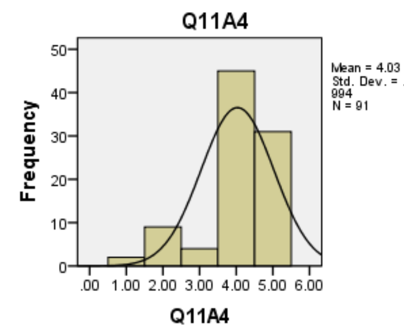
Q= Question 1,2,3,…
A= Sub question 1,2,3,…

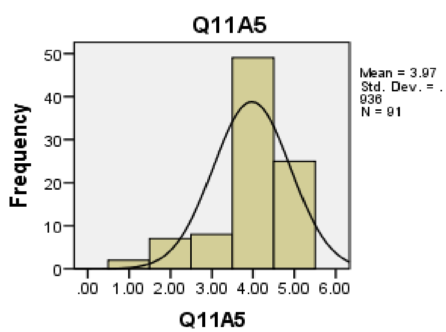
Q11: Distribution of data: histograms

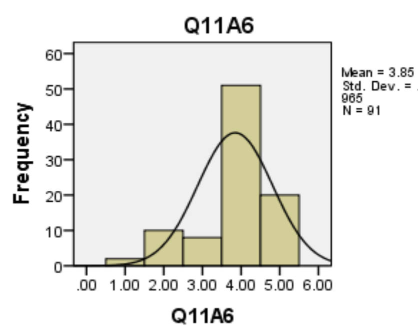


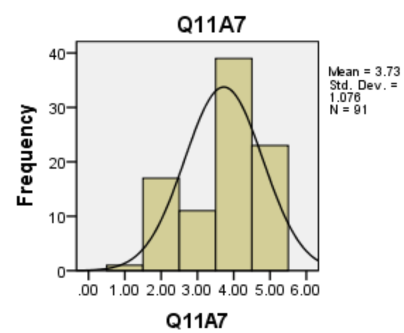


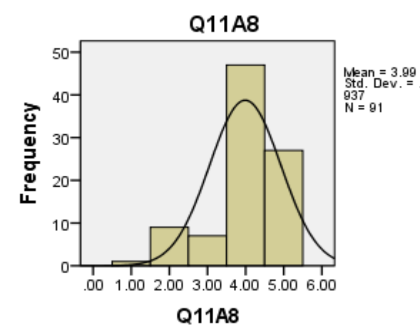


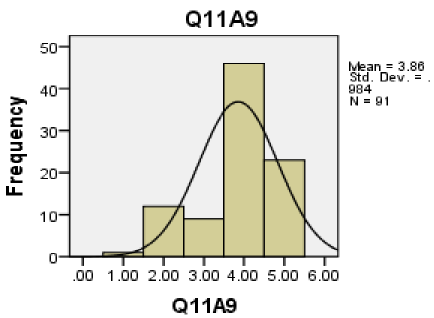


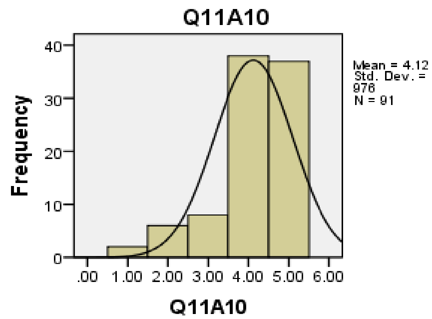


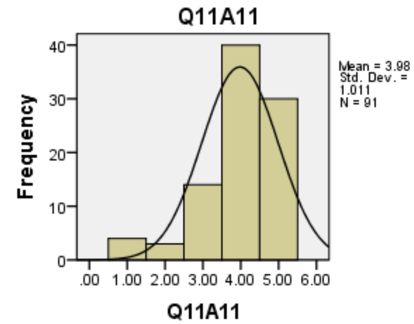


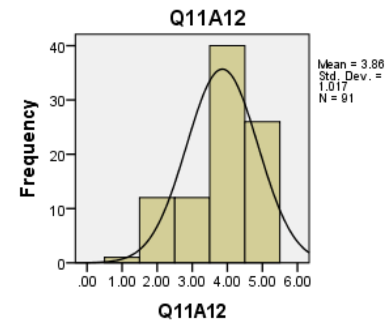


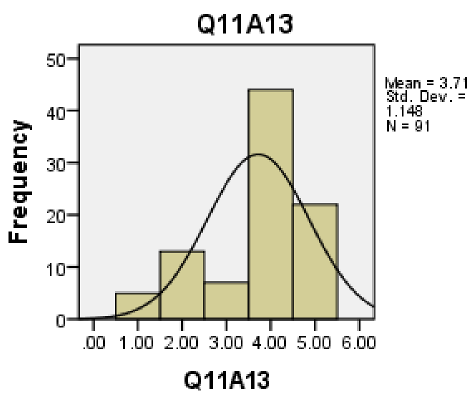


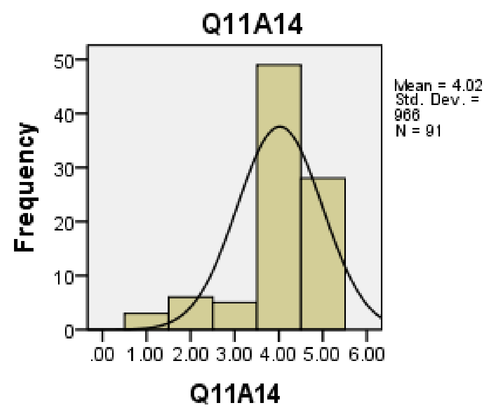

Q11A9
Frequency
Mean = 3.86
Std. Dev. = .984
N = 91
Q11A9

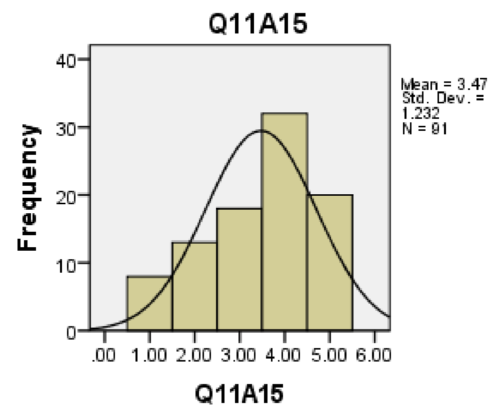

Q11A10
Frequency
Mean = 4.12
Std. Dev. = .976
N = 91
Q11A10


Q11A11
Frequency
Mean = 3.98
Std. Dev. = 1.011
N = 91
Q11A11


Q11A12
Frequency
Mean = 3.86
Std. Dev. = 1.017
N = 91
Q11A12


Q11A13
Frequency
Mean = 3.71
Std. Dev. = 1.148
N = 91
Q11A13


Q11A14
Frequency
Mean = 4.02
Std. Dev. = .966
N = 91
Q11A14


Q11A15
Frequency
Mean = 3.47
Std. Dev. = 1.232
N = 91
Q11A15

Appendix 5.B: Exploring differences between groups

There are statistical tests that can be used to find out whether there are statistically significant differences on a continuous dependent variable among a number of groups. The parametric versions of these tests, suitable for interval scaled data with a normal distribution, are the t-tests and one way ANOVA (Pallant, 2007). Therefore, when the variables followed a normal distribution, a t-test was used when there were two values of the categoric independent variable, matched by Mann-Whitney which is the non-parametric test when the data were not normally distributed. A one-way ANOVA was used when there were more than two values of the categoric independent variable, matched by Kruskal-Wallisas the non-parametric test when the data were not normally distributed.

5.2 Descriptive statistics and the differences among groups

In this section the descriptive statistics tables are displayed, followed by the table of differences between the groups for each sub-topic of the Activity Theory subject.

5.2.1 Subject

There are three sub-topics under the subject topic: the reasons for students' participation in the science teacher preparation programme, the expectations of how students learn to teach science, and the science student teachers' difficulties during teaching practice. These are presented below.

5.2.1.1 Reasons for students' participation in the science teacher preparation programme, question one(Q.1)

Table 5.2.1: Descriptive statistics for reasons for students' participation in the science teacher preparation programme according job groups

Items	Groups	S.D	D	N	A	S.A	Mean	S.D
Q1A1 To become good science teachers.	ST	0.0%	3.8%	1.9%	52.8%	41.5%	4.3208	.70092
	US	0.0%	0.0%	0.0%	45.5%	54.5%	4.5455	.52223
	SS	3.7%	0.0%	0.0%	44.4%	51.9%	4.4074	.84395
	Over all						4.3736	.72493
Q1A2 Because of their interest in science.	ST	0.0%	17.0%	11.3%	52.8%	18.9%	3.7358	.96379
	US	0.0%	36.4%	9.1%	36.4%	18.2%	3.3636	1.20605
	SS	3.7%	18.5%	7.4%	51.9%	18.5%	3.6296	1.11452
	Over all						3.6593	1.03516
Q1A3 Because teaching science is very easy.	ST	18.9%	47.2%	11.3%	18.9%	3.8%	2.4151	1.11690
	US	18.2%	18.2%	18.2%	27.3%	18.2%	3.0909	1.44600
	SS	25.9%	59.3%	0.0%	11.1%	3.7%	2.0741	1.03500
	Over all						2.3956	1.16313
Q1A4 Because it is an enjoyable occupation.	ST	0.0%	3.8%	15.1%	56.6%	24.5%	4.0189	.74655
	US	0.0%	18.2%	27.3%	27.3%	27.3%	3.6364	1.12006
	SS	3.7%	14.8%	3.7%	55.6%	22.2%	3.7778	1.08604
	Over all						3.9011	.90744
Q1A5 To find a good job with a good salary.	ST	0.0%	9.4%	7.5%	43.4%	39.6%	4.1321	.92065
	US	0.0%	9.1%	0.0%	27.3%	63.6%	4.4545	.93420
	SS	0.0%	25.9%	7.4%	44.4%	22.2%	3.6296	1.11452
	Over all						4.0220	1.01081

Key to codes:
ST= Science student teachers. US= University staff. SS= School staff.
S.D= Strongly d

By looking Table 5.2.1, we find that almost all the participants either strongly agreed or agreed that the main reason was ‘to become good science teachers’ (M=4.37, SD=0.724); this statement generated the highest agreement. This was followed by ‘to find a good job with a good salary’ (M=4.02, SD=1.01), then by ‘because it is an enjoyable occupation’ (M=3.90, SD=0.907), and ‘because of their interest in science’ (M=3.65, SD=1.03). The least agreement was with ‘because science teaching is very easy’ (M=2.39, SD=1.16).

5.2.1.2 Reasons for students’ participation in science teacher preparation programme by job groups

Examination of the data showed that (Q1A1) is non-normallydistributed;therefore, the Kruskal Wallis test, which is a non-parametric test, was used;this corresponds tothe one-way ANOVA parametric test fornormallydistributed data. Analysis of Variancewas used to compare these three independent groups: students (ST) vs. university staff (US) vs. school staff (SS).Table 5.2.2.a shows the results of the Kruskal Wallis test, while Table 5.2.2.b shows the results of the one way ANOVA.

Table 5.2.2.a: Kruskal Wallis (non-parametric test) byjob group

	Groups	N	Mean	Std. Deviation	Chi-Square	df	Sig.
Q1A1	Student	53	4.3208	.70092	1.300	2	.522
	University staff	11	4.5455	.52223			
	School staff	27	4.4074	.84395			
	Total	91	4.3736	.72493			

Table 5.2.2.b: One way ANOVA (parametric test) byjob group

		Sum of Squares	df	Mean Square	F	Sig.
Q1A2	Between Groups	1.296	2	.648	.599	.551
	Within Groups	95.144	88	1.081		
	Total	96.440	90			
Q1A3	Between Groups	8.129	2	4.065	3.148	.048
	Within Groups	113.629	88	1.291		
	Total	121.758	90			
Q1A4	Between Groups	1.917	2	.958	1.168	.316
	Within Groups	72.193	88	.820		
	Total	74.110	90			
Q1A5	Between Groups	6.857	2	3.429	3.545	.033
	Within Groups	85.099	88	.967		
	Total	91.956	90			

Table 5.2.3: Bonferroni Post-Hoc test by job group

(I) Moderated	(I) Moderated	(J) Moderated	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Q1A3	Student	University staff	-.67581	.37649	.228	-1.5947	.2431
		School staff	.34102	.26868	.623	-.3147	.9968
	University staff	Student	.67581	.37649	.228	-.2431	1.5947
		School staff	1.01684*	.40646	.043	.0248	2.0088
	School staff	Student	-.34102	.26868	.623	-.9968	.3147
		University staff	-1.01684*	.40646	.043	-2.0088	-.0248
Q1A5	Student	University staff	-.32247	.32582	.975	-1.1177	.4727
		School staff	.50245	.23251	.100	-.0650	1.0699
	University staff	Student	.32247	.32582	.975	-.4727	1.1177
		School staff	.82492	.35175	.064	-.0336	1.6834
	School staff	Student	-.50245	.23251	.100	-1.0699	.0650
		University staff	-.82492	.35175	.064	-1.6834	.0336

* The mean difference is significant at the .05 level.

Table 5.2.4: The differences among job groups

	Groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Q1A3	Student	53	2.4151	1.11690	.15342	2.1072	2.7229	1.00	5.00
	University staff	11	3.0909	1.44600	.43598	2.1195	4.0623	1.00	5.00
	School staff	27	2.0741	1.03500	.19919	1.6646	2.4835	1.00	5.00
	Total	91	2.3956	1.16313	.12193	2.1534	2.6378	1.00	5.00
Q1A5	Student	53	4.1321	.92065	.12646	3.8783	4.3858	2.00	5.00
	University staff	11	4.4545	.93420	.28167	3.8269	5.0821	2.00	5.00
	School staff	27	3.6296	1.11452	.21449	3.1887	4.0705	2.00	5.00
	Total	91	4.0220	1.01081	.10596	3.8115	4.2325	2.00	5.00

In general, and by looking at both tables 5.2.2a and 5.2.2b, some items show significant differences at the 0.05 level between groups. One example is the third question (Q1A3;'teaching science is very easy') where [f (2,88)=3.14, p=0.048] in Table 5.2.2b. Table 5.2.4 shows that the university staff generated the highest agreement (M=3.09, SD=1.44) followed by students (M=2.41, SD=1.11) and the least agreement by the school staff (M=2.07, SD=1.03). By looking at Table 5.2.3, which shows the results of using the Bonferroni Post-Hoc Test for multiple comparisons, it was evident that there was a significant difference between university staff and school staff (p=0.048), though not between these groups and the students.

The fifth question (Q1A5), which is 'to find a good job with a good salary', also yielded a statistically significant difference between groups [f (2, 88) =3.54, p=0.033] in Table 5.2.2b. Table 5.2.4 shows that the university staff (M=4.45, SD=0.934) generated the highest agreement followed by students (M=4.13, SD=0.920) and least by the school staff (M=3.62, SD=1.11). However, the differences between three groups were no longer statistically significant on the Bonferroni Post-Hoc test for multiple comparisons (Table 5.2.3).

5.2.3 Reasons for students' participation in science teacher preparation programme by gender groups

Table 5.2.5a:Mann-Whitney test (non-parametric test)by gender

Q1A1	Gender group	male	N	34	Mean Rank	47.26	Sum of Ranks	1607.00
		female		57		45.25		2579.00
		Total		91				
	Mean		4.3736					
	Std. Deviation		.72493					
	Mann-Whitney U		926.000					
	Wilcoxon W		2579.000					
	Z		-.399					
	Asymp. Sig. (2-tailed)		.690					

Table 5.2.5b:Levene's test & T-test(parametric test)by gender

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q1A2	Equal variances assumed	3.057	.084	-1.783	89	.078	-.39525	.22164	-.83565	.04515
	Equal variances not assumed			-1.726	62.652	.089	-.39525	.22897	-.85286	.06235
Q1A3	Equal variances assumed	6.689	.011	1.224	89	.224	.30753	.25135	-.19189	.80696
	Equal variances not assumed			1.153	57.390	.254	.30753	.26678	-.22661	.84168
Q1A4	Equal variances assumed	2.254	.137	-2.359	89	.021	-.45253	.19183	-.83369	-.07137
	Equal variances not assumed			-2.252	59.924	.028	-.45253	.20091	-.85441	-.05064
Q1A5	Equal variances assumed	.153	.697	.695	89	.489	.15273	.21967	-.28374	.58921
	Equal variances not assumed			.689	67.453	.493	.15273	.22178	-.28989	.59536

* The mean difference is significant at the .05 level or less.

Table 5.2.6: Descriptive statistics for question one by gender

	Moderated	N	Mean	Std. Deviation	Std. Error
Q1A4	male	34	3.6176	.98518	.16896
	female	57	4.0702	.82071	.10871

There were significant differences between gender groups on thefourth (Q1A4) part of question one, as shown in Tables 5.2.5a Mann-Whitney test (non-parametric test) for Q1A1 and 5.2.5b T-test (parametric test).On Q1A4, that science teaching is an enjoyable occupation, Table 5.2.6 indicates that males hada lower average score (M=3.61, SD=0.98) than females (M=4.07, SD=0.82). To test for the significance of this difference, Levene's test for equality of variance (F=2.25, p=0.13) showed that both groups have equal variances, and the results of the t-test showed that the difference was statistically significant [t (89)=-2.35, p=0.021]. Thus female respondents were more likely to see science teaching as an enjoyable occupation compared to male respondents.

5.2.4 Reasons for students' participation in science teacher preparation programmeby years of experience

Table 5.2.7.a: Kruskal Wallis (non-parametric test) byyears of experience groups

	Groups	N	Mean	Std. Deviation	Chi-Square	df	Sig.
Q1A1	0 years	53	4.3208	.70092	2.745	3	.433
	Less than 10 years	16	4.5455	.52223			
	From 10 to 20 years	16	4.3333	.51640			
	More than 20 years	6	4.4074	.84395			
	Total	91	4.3736	.72493			

Table 5.2.7b: One Way ANOVA (parametric test) by years of experience groups

		Sum of Squares	df	Mean Square	F	Sig.
Q1A2	Between Groups	1.304	3	.435	.398	.755
	Within Groups	95.135	87	1.094		
	Total	96.440	90			
Q1A3	Between Groups	.369	3	.123	.088	.966
	Within Groups	121.389	87	1.395		
	Total	121.758	90			
Q1A4	Between Groups	6.295	3	2.098	2.692	.051
	Within Groups	67.814	87	.779		
	Total	74.110	90			
Q1A5	Between Groups	3.610	3	1.203	1.185	.320
	Within Groups	88.346	87	1.015		
	Total	91.956	90			

The results shown in Tables 5.2.7a Kruskal-Wallis (non-parametric test) for Q1A1 and 5.2.7b one way ANOVA (parametric test) for the other parts ofquestion one, were used to compare these four independent groups: 0 years, less than 10 years, from 10 to 20 years, and more than 20 years of experience. Theyshow that there were no significant differences in reasons given for students participating in the science teaching programme by years of experience.

5.2.2.1 Expectations of how students learn to teach science (Q.2)

Table 5.3.1: Descriptive statistics for question two (Q2) by job group

Items	Groups	S.D	D	N	A	S.A	Mean	Std.D
Q2A1 The science student teacher learns from lectures at the teacher education programme.	ST	0.0%	1.9%	7.5%	58.5%	32.1%	4.2075	.66096
	US	0.0%	0.0%	18.2%	36.4%	45.5%	4.2727	.78625
	SS	0.0%	7.4%	7.4%	70.4%	14.8%	3.9259	.72991
	Overall						4.1319	.70252
Q2A2 The cooperating teacher helps science student teachers address gaps in subject knowledge in school context.	ST	1.9 %	11.3%	7.5%	47.2%	32.1%	3.9623	1.01834
	US	0.0 %	0.0%	0.0%	72.7%	27.3%	4.2727	.46710
	SS	3.7 %	0.0%	7.4%	44.4%	44.4%	4.2593	.90267
	Overall						4.0879	.93866

Question two addressed respondents' expectations of ways of learning to teach science. The responses by job group are shown in Table 5.3.1. This shows that almost all the participants either strongly agreed or agreed that the most important way of learning to teach science for science student teachers was from lectures in the teacher education programme (M=4.13, SD=0. 70), which generated the highest agreement, and to a slightly lesser extent from the cooperating teacher helping the student teachers to address gaps in their subject knowledge in the school context (M=4.08, SD=0.93).

5.2.2.2Differences in expectations of how students learn to teach science by job group

Table 5.3.2: One way ANOVA by job group

		Sum of Squares	df	Mean Square	F	Sig.
Q2A1	Between Groups	1.667	2	.833	1.716	.186
	Within Groups	42.751	88	.486		
	Total	44.418	90			
Q2A2	Between Groups	2.005	2	1.003	1.141	.324
	Within Groups	77.292	88	.878		
	Total	79.297	90			

The data in this question followed a normal distribution therefore, one way ANOVA was used to compare the three job groups: students, university staff and school staff.

Looking at Table 5.3.2 the results show no significant differences at the 0.05 level between the three job groups in general, as a subtopic of respondents' expectations of the ways for learning to teach science for science student teachers. This indicates a similarity of views held by the different roles of participants.

5.2.2.3Differences in expectations of how students learn to teach science by gender

Table 5.3.3:T-test(parametric test)by gender

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q2A1	Equal variances assumed	.892	.348	1.401	89	.165	.21207	.15142	-.08880	.51295
	Equal variances not assumed			1.555	88.325	.123	.21207	.13637	-.05891	.48306
Q2A2	Equal variances assumed	.104	.748	.925	89	.357	.18834	.20356	-.21614	.59281
	Equal variances not assumed			.963	78.300	.338	.18834	.19551	-.20086	.57754

There were no significant differences between gender groups on either question, as shown by the results of the t-test in Table 5.3.3, which was used as a parametric test. In general, the males and females held similar expectations of how science student teachers learn to teach science.

5.2.2.4 Differences in expectations of how students learn to teach science byyears of experience groups

Table 5.3.4: One Way ANOVAby years of experience groups

		Sum of Squares	df	Mean Square	F	Sig.
Q2A1	Between Groups	3.201	3	1.067	2.252	.088
	Within Groups	41.217	87	.474		
	Total	44.418	90			
Q2A2	Between Groups	2.539	3	.846	.959	.416
	Within Groups	76.758	87	.882		
	Total	79.297	90			

The results, shown in Table 5.3.4,of one way ANOVA (parametric test) for both questions, which was used to compare these four independent groups of experience, show that there were no significant differences by years of experience in expectations of how student teachers learn to teach science.

5.2.3.1 Science student teachers' difficulties during teaching practice(Q.4)

Table 5.4.1: Descriptive statistics for question four by job

Items	Groups	S.D	D	N	A	S.A	Mean	Std.D
Q4A1 Planning for science lessons.	ST	1.9%	26.4%	5.7%	37.7%	28.3%	3.6415	1.21044
	US	0.0%	27.3%	9.1%	27.3%	36.4%	3.7273	1.27208
	SS	0.0%	40.7%	0.0%	48.1%	11.1%	3.2963	1.13730
	Overall						3.5495	1.19502
Q4A2 Choosing the appropriate methods for teaching science.	ST	0.0%	20.8%	3.8%	50.9%	24.5%	3.7925	1.04437
	US	0.0%	27.3%	9.1%	45.5%	18.2%	3.5455	1.12815
	SS	0.0%	29.6%	7.4%	44.4%	18.5%	3.5185	1.12217
	Overall						3.6813	1.07372
Q4A3 Dealing with the science curriculum.	ST	1.9%	34.0%	3.8%	37.7%	22.6%	3.4528	1.23360
	US	9.1%	18.2%	27.3%	18.2%	27.3%	3.3636	1.36182
	SS	0.0%	40.7%	0.0%	40.7%	18.5%	3.3704	1.21365
	Overall						3.4176	1.22987
Q4A4 Acquiring teaching skills.	ST	1.9%	34.0%	1.9%	30.2%	32.1%	3.5660	1.30840
	US	0.0%	27.3%	0.0%	45.5%	27.3%	3.7273	1.19087
	SS	0.0%	37.0%	3.7%	44.4%	14.8%	3.3704	1.14852
	Overall						3.5275	1.24133
Q4A5 How to choose appropriate practical work associated with science topics in the curriculum.	ST	1.9%	24.5%	9.4%	49.1%	15.1%	3.5094	1.08526
	US	0.0%	36.4%	0.0%	36.4%	27.3%	3.5455	1.29334
	SS	0.0%	44.4%	3.7%	40.7%	11.1%	3.1852	1.14479
	Overall						3.4176	1.12611
Q4A6 Applying what has been learned at university from educational theories at school.	ST	0.0%	20.8%	7.5%	45.3%	26.4%	3.7736	1.06774
	US	0.0%	18.2%	0.0%	36.4%	45.5%	4.0909	1.13618
	SS	0.0%	22.2%	3.7%	44.4%	29.6%	3.8148	1.11068
	Overall						3.8242	1.08108

From the overall means given in Table 5.5 on items to do with student teachers' difficulties, the highest mean was for the sixth item (M=3.82, SD=1.08), on which most participants either strongly agreed or agreed that the difficulty was in applying what had been learned at university about educational theories to school, followed by choosing appropriate methods for teaching science (M=3.68, SD=1.07), planning for science lessons (M=3.54, SD=1.19), acquiring teaching skills (M=3.52, SD=1.24) and, lastly, dealing with the science curriculum (M=3.41, SD=1.22) and choosing appropriate practical work associated with science topics (M=3.41, SD=1.12).

5.2.3.2 Differences in science student teachers' difficulties during teaching practice by job

Table 5.4.2: One way ANOVA (parametric test) byjob

		Sum of Squares	df	Mean Square	F	Sig.
Q4A1	Between Groups	2.527	2	1.264	.883	.417
	Within Groups	126.000	88	1.432		
	Total	128.527	90			
Q4A2	Between Groups	1.573	2	.787	.677	.511
	Within Groups	102.185	88	1.161		
	Total	103.758	90			
Q4A3	Between Groups	.158	2	.079	.051	.950
	Within Groups	135.974	88	1.545		
	Total	136.132	90			
Q4A4	Between Groups	1.184	2	.592	.379	.686
	Within Groups	137.497	88	1.562		
	Total	138.681	90			
Q4A5	Between Groups	2.085	2	1.043	.819	.444
	Within Groups	112.047	88	1.273		
	Total	114.132	90			
Q4A6	Between Groups	.921	2	.460	.389	.679
	Within Groups	104.266	88	1.185		
	Total	105.187	90			

The results, revealed in Table 5.5.2 through using one way ANOVA (parametric test) for all questions, show that there were no significant differences at the 0.05 level between the groups. Thus the roles of the participants, whether student teacher, university staff or school staff, did not make a difference to the way they perceived the sources of student teachers' difficulties.

5.2.3.3 Differences in science student teachers' difficulties during teaching practice bygender

Table 5.4.3: T-test (parametric test) by gender

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Q4A1	Equal variances assumed	1.030	.313	.057	89	.954	.01496	.26040	-.50244	.53237
	Equal variances not assumed			.059	74.567	.953	.01496	.25448	-.49204	.52196
Q4A2	Equal variances assumed	8.136	.005	2.454	89	.016	.55573	.22643	.10581	1.00565
	Equal variances not assumed			2.558	78.529	.012	.55573	.21723	.12330	.98816
Q4A3	Equal variances assumed	2.006	.160	1.747	89	.084	.46027	.26352	-.06334	.98387
	Equal variances not assumed			1.774	73.000	.080	.46027	.25938	-.05667	.97721
Q4A4	Equal variances assumed	11.160	.001	2.337	89	.022	.61352	.26256	.09182	1.13522
	Equal variances not assumed			2.416	76.826	.018	.61352	.25393	.10787	1.11917
Q4A5	Equal variances assumed	20.578	.000	2.969	89	.004	.69505	.23407	.22996	1.16013
	Equal			3.221	85.771	.002	.69505	.21577	.26609	1.12400

	variances not assumed									
Q4A6	Equal variances assumed	2.707	.103	2.468	89	.016	.56244	.22791	.10959	1.01528
	Equal variances not assumed			2.548	76.509	.013	.56244	.22074	.12284	1.00203

* The mean difference is significant at the .05 level or less.

Table 5.4.4: Descriptive statistics for questions by gender

	Group	N	Mean	Std. Deviation	Std. Error
Q4A2	male	34	4.0294	.93696	.16069
	female	57	3.4737	1.10365	.14618
Q4A4	male	34	3.9118	1.11104	.19054
	female	57	3.2982	1.26724	.16785
Q4A5	male	34	3.8529	.85749	.14706
	female	57	3.1579	1.19208	.15789
Q4A6	male	34	4.1765	.96830	.16606
	female	57	3.6140	1.09796	.14543

The results in Table 5.4.3 showed significant differences by gender in the second (Q4A2), fourth (Q4A4), fifth (Q4A4), and sixth (Q4A6) questions. On the second item, that the science student teacher faces difficulty with choosing appropriate methods for teaching science, Table 5.4.4 shows that males showed higher agreement (M=4.02, SD=0.93) compared to females (M=3.47, SD=1.10). Levene's test for equality of variance (F=8.13, p=0.005) showed that the groups did not have equal variances, and the results of the t-test showed that the difference between the genders was significant [t(78.52)=2.55, p=0.012].

On the fourth question, that the science student teacher faces difficulty acquiring teaching skills, males again showed higher agreement (M=3.91, SD=1.11) than females (M=3.29, SD=1.26). Levene’s test for equality of variance (F=1.11, p=0.01) reflected that the groups did not have equal variance and the results of the t-test showed a significant difference [t(76.82)=2.41, p=0.018].

On the fifth question, concerningthe students’ difficulty in choosing appropriate practical work, Table 5.4.4 again reveals that the males showed higher agreement (M=3.85, SD=0.85) than the females (M=3.15, SD=1.19). Levene’s test for equality of variance (F=20.5, p=0.00) showed that the groups did not have equal variance, and the results of the t-test showed that the difference between the means was significant [t(85.77)=3.22, p=0.02].

In the sixth question, on student teachers’ difficulty applying what had been learned at in theory at university to practice at school, male respondents showed higher agreement (M=4.17, SD=0.96) than female respondents (M=3.61, SD=1.09). Levene’s test for equality of variance (F=2.70, p=0.10) reflected that both groups had equal variance but the results of the t-test showed a significant difference between the means [t(89)=2.46, p=0.016].

5.2.3.3 Differences in science student teachers' difficulties during teaching practice byyears of experience groups

Table 5.4.5: One way ANOVA (parametric test) byyears of experience groups

		Sum of Squares	df	Mean Square	F	Sig.
Q4A1	Between Groups	6.255	3	2.085	1.484	.225
	Within Groups	122.272	87	1.405		
	Total	128.527	90			
Q4A2	Between Groups	2.958	3	.986	.851	.470
	Within Groups	100.800	87	1.159		
	Total	103.758	90			
Q4A3	Between Groups	1.062	3	.354	.228	.877
	Within Groups	135.070	87	1.553		
	Total	136.132	90			
Q4A4	Between Groups	2.725	3	.908	.581	.629
	Within Groups	135.956	87	1.563		
	Total	138.681	90			
Q4A5	Between Groups	2.616	3	.872	.680	.566
	Within Groups	111.516	87	1.282		
	Total	114.132	90			
Q4A6	Between Groups	5.633	3	1.878	1.641	.186
	Within Groups	99.554	87	1.144		
	Total	105.187	90			

The results in Table 5.4.5 show that there were no significant differences at the 0.05 level between the four groups using one way ANOVA (parametric test) for all questions. These results show that years of experience did not make a difference to the perceived difficulties faced by science student teachers.

Appendix 4.5: Certificate of ethical research approval

STUDENT HIGHER-LEVEL RESEARCH
DISSERTATION/THESIS

UNIVERSITY OF EXETER

Graduate School of Education

Certificate of ethical research approval

DISSERTATION/THESIS

To activate this certificate you need to first sign it yourself, and then have it signed by your supervisor and finally by the Chair of the School's Ethics Committee.

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<u>READ THIS FORM CAREFULLY</u> AND THEN COMPLETE IT ON YOUR COMPUTER (the form will expand to contain the text you enter). **DO <u>NOT</u> COMPLETE BY HAND**

Your name: Sami Binjumah

Your student no: 570036972

Return address for this certificate: 104 Gloucester Rd, EXETER, EX4 2EB

Degree/Programme of Study : Doctorate in Educational, Science Teaching Methods

Project Supervisor(s): Nigel Skinner and Keith Postlethwaite

Your email address: smsb201@ex.ac.uk and arrsam@gmail.com

Tel: 07540588332

I hereby certify that I will abide by the details given overleaf and that I undertake in my dissertation / thesis (delete whichever is inappropriate) **to respect the dignity and privacy of those participating in this research.**

I confirm that if my research should change radically, I will complete a further form.

Signed: **Sami Binjumah** **date: 31/01/2013**

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Chair of the School's Ethics Committee
updated: April 2011

only be accessed by the researcher with their username and password. Electronic information will also be stored on a secure system, within a locked building with recognised virus protection. It will be destroyed when it is no longer required (Upon completion of the research completely).

Give details of any exceptional factors, which may raise ethical issues (e.g. potential political or ideological conflicts which may pose danger or harm to participants):
There is no any exceptional factors, which may raise ethical issues.

This form should now be printed out, *signed by you on the first page and sent to your supervisor to sign. Your supervisor will forward this document to the School's* ***Research Support Office*** *for the Chair of the School's Ethics Committee to countersign. A unique approval reference will be added and this certificate will be returned to you to be included at the back of your dissertation/thesis.*

N.B. You should not start the fieldwork part of the project until you have the signature of your supervisor

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This project has been approved for the period: 3/4/13 **until:** 1/6/13

By (above mentioned supervisor's signature): .... **date:** 3/4/13

N.B. ***To Supervisor:*** *Please ensure that ethical issues are addressed annually in your report and if any changes in the research occur a further form is completed.*

GSE unique approval reference: D/12/13/16

Signed: .... **date:** ....
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