AN INVESTIGATION OF THREE GREEK
MATHEMATICS TEACHERS’ CONCEPTIONS
OF THE ASSESSMENT OF PUPIL ATTAINMENT
IN MATHEMATICS
AND ITS SOCIO-POLITICAL DIMENSION

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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.
ABSTRACT

The present study is located within a broader problematic of how inequality is generated and legitimated within schools. It has as its centre of focus three Greek mathematics teachers who are seen as mediating forces between state curricular intentions and the learners. Having social justice as my primary motive for conducting this thesis research, I use the critical theoretic research paradigm as a guiding framework in order to investigate the teachers’ conceptions of the socio-political dimension of the assessment of pupil attainment in mathematics. Through an analysis of the socio-political role of educational assessment I argue that the investigated issue may be considered as a privileged window that can provide a broad perspective from which I can observe how the participants of this study are positioned with respect to the role of mathematics education in the reproduction of unequal class relations.

To obtain answers to my assessment-related research questions, through a series of interviews I examine the teachers’ theoretical positions but in addition to that I observe their classroom cultures in the formation of which they play a protagonistic role. Through the teachers’ discourses and their annotated actions, I try to uncover the ways they respond to the contradictions and the dilemmas that might be posed to them by the given educational reality, as well as the tensions they might experience whenever they perceive the incompatibility of what they espouse and what they can achieve.

Moving beyond the cognitive and psychological approaches that characterise most of research literature on teacher beliefs into the realm of ideology critique, I use Fairclough’s critical discourse analysis to depict teacher discourses as parts of social practices that are conditioned by social-historical factors and try to show what reproductive effects these discourses can have on social structures, sustaining them or contributing to their transformation.
DEDICATION

To my mother

For her self-sacrificial devotion to my well being

To the memory of my father

From whom I inherited the musical talent, to whom I owe my confidence in my mathematics ability, and who laid the foundations for the growth of my democratic sensitivities and of a critical consciousness

To my wife Alexandra

Who encouraged me to undertake this research project and provided the indispensable emotional environment through our relationship without which it would have been impossible for me to be in a creative mood

To my beloved daughter Helen

Whom I deprived of my active presence in a time very crucial for her development

To all the people who have helped me and stood by me
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Four distinguished mathematics educators whose research interests were akin to the topic I was investigating kindly offered to provide a critical analysis of a pilot study that preceded the thesis research. Peter Gates gave particularly encomiastic comments that encouraged me to conduct my thesis research with confidence. Peter Appelbaum also gave encouraging laudatory remarks and provided extensive suggestions on how to conduct my research from a critical point of view. Paul Andrews provided crucial critical remarks of methodological nature that had decisive influence on the favourable outcome of this research project. Finally, Giorgos Philippou, who is knowledgeable of the Greek education system, was also very helpful in bringing up issues of methodological nature for me to consider. I thank them all and I am grateful for their kindly offered assistance. I would also like to thank Elias Daskalakis especially for his valuable insights in our discussions on the ideological part of my analysis and interpretations.

My final thanks are addressed to the teachers who kindly accepted to participate in this study and exposed themselves to the inquisitive eyes and ears of an outsider. Without their willingness to receive me in their classrooms, something unheard of in the local educational contest, and to devote some of their precious time in order to answer my research questions this study would not have been possible.
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CHAPTER ONE

INTRODUCTION

1.1 The topic

In this thesis I explore the conceptions held by three Greek high-school mathematics teachers regarding the socio-political dimension of the assessment of pupil mathematical attainment. Greek teachers form an important part of the assessment apparatus as they enjoy considerable autonomy, insofar as, with the exception of the national examinations for entry into higher education which are administered by the state at the end of the twelfth year of secondary education, they are the sole arbiters of pupil progress in learning throughout secondary education. Consequently their conceptions of the function and role of assessment, especially as these conceptions are translated into assessment practices, have the potential to shape, to a large extent, the pupil educational landscape and experience. The elicitation of teachers’ beliefs about assessment is intended to throw some light on a particularly underresearched area within the context of Greek mathematics education, while research findings elsewhere suggest that teachers lack both a firm assessment knowledge background and confidence in their assessment practices (Hill 1997, Black & Wiliam 1998a).

The assessment of pupil progress in learning has a critical function in education. Ubiquitous throughout schooling, it is used for multiple purposes, such as informing high quality teaching and learning, certifying pupil knowledge, selecting pupils for the appropriate programmes of study, and holding teachers, educational institutions, as well as entire education systems accountable. These purposes seem to be disparate, antithetical, antagonistic and hence controversial.

When assessment is associated with examinations and grades, it is a dominant feature in the lives of pupils (Soliman 1999) and sends a powerful message as to what is valued and worth learning. In practice, summative assessment, as this kind of
assessment is usually called, defines the education system’s realised intentions and thus frequently shapes the overt part of the implemented curriculum (Soliman 1999). But most of all, summative assessment is a powerful mechanism that exerts control over the education system, with profound consequences for pupils as it affects their future educational experiences and their employment opportunities (Shohamy 2001). This is particularly the case with the assessment of pupil mathematical knowledge, inasmuch as mathematics is often used in many countries as a gate-keeper, regulating entry into further educational studies or employment (Galbraith 1993).

The use of assessment in connection with the teaching and learning process constitutes an important reconceptualisation of the term (Gipps 1995) and reflects recent developments in the theory of teaching and learning that have moved away from the behaviouristic model towards a “social-constructivist” perspective that has borrowed from cognitive, constructivist, and socio-cultural theories (Shepard 2000). In this sense, assessment has a formative character and is considered as an integral part of pedagogy. Formative assessment is seen as an ongoing communication process (National Council of Teachers of Mathematics 1995) between the teachers and the learners whose major aim is to engage teachers in making a systematic analysis and use of the available evidence to be collected from a variety of sources in order to address the pupils’ learning difficulties, weaknesses and misconceptions, as well as their strengths, and to refine their teaching approaches accordingly in order to achieve optimal learning outcomes (Gipps 1995).

1.2 The setting – The Greek education system and mathematics curriculum

Since the establishment of the Modern Greek state, curriculum development and orientation have been under the influence of a particular kind of humanism based on a blend of the Ancient Greek classical values and the Greek Christian orthodox ideals both of which, reflecting two glorious historical periods, helped to forge the national
identity of Modern Greece (Ifanti 1995, Ifanti 2007, Toumasis 1989). To this day, the
effect of this ideological influence has been reflected in the construction of overly
theoretical, elite curricula which value abstract and decontextualised knowledge and
reasoning and stress the moral and intellectual functions of education (Ifanti 2007). This
effect is particularly evident in the construction of the mathematics curriculum which is
characterised by its emphasis on abstract thinking and the theoretical aspects of
mathematics (Toumasis 1989), as well as by its considerable breadth and depth
(Hellenic Mathematical Society 2000). This ambitious uniform mathematics curriculum
persists despite important changes in the composition of the Greek pupil population in
the last three decades as a result of the massification of education.

It is argued that the Greek education system lacks the organisational structure and
perhaps, as it is suggested by Salteris (2005), the political will to address the crucial
issue of whether and to what extent a chosen specific curricular framework is successful,
i.e. whether the curricular intentions are realised in practice (Moutsios 2003). In fact,
since its establishment in 1964, the Greek Pedagogical Institute which is responsible for
the design and evaluation of school curricula has never conducted a study intended to
assess whether the curriculum standards set by the Pedagogical Institute can be
implemented and whether there can be an alignment between these standards and the
pedagogical and assessment practices (Karageorgos et al. 1999, National Council of
Education 2006).

It is widely recognised that life at the lyceum¹, especially in the last two grades, is
dominated by the national examinations for entry into higher education taken at the end
of the final year (Katsikas & Kabbadias 2000, Karageorgos et al. 1999). Unlike
multiple-choice standardised exams that are in use elsewhere, the examination in
mathematics contains theoretical problems that require a deep understanding of

¹ The general lyceum is the academic track post compulsory education and includes Grades 10-12.
mathematical theory and extensive pupil practice. The high level of difficulty of this entrance examination is allegedly dictated by the discriminatory quality that this exam must possess in view of the existing selection system based on a *numerus clausus*, in combination with an excessive social demand for higher education (Papastavridis 2000, Magoula & Psacharopoulos 1999). The demands in terms of school preparation for this highly competitive examination have been thought to be, to a large extent, incompatible with the public school’s egalitarian principles as reflected in the existence of mixed ability classes, as well as with the school’s broad spectrum of educational goals as declared by the Greek constitution (Katsikas & Kabbadias 2000) and by the official curricular aims of mathematics education (Papastavrides 2000).

As it is argued by Katsikas & Kabbadias (2002), the concurrence of these factors touched upon above, namely the existence of overburdened and cognitively demanding curricula, the school’s failure to provide individualised teaching tailored to specific pupil learning needs, the school’s inability to provide adequate preparation for meeting the demands of the national examinations for entry into higher education that are key determinants of social position, and the intense competition for educational success, largely explain the appearance and proliferation of a huge private tutoring industry consisting of “crammer” schools that function in parallel with public schools (in the afternoon and for an equal number of hours with public schools in the tested academic subjects) throughout the secondary education period. These tutorial institutions, together with the more expensive private tutoring conducted on a one-to-one basis or in small groups and provided often by the school teachers themselves, have won the trust of Greek families as the vehicles of academic success (Katsikas & Kabbadias 2002). Each year, Greek families spend in total over one billion Euros on preparatory courses for university entrance examinations, an amount exceeding that of state spending on secondary education (Psacharopoulos 2003).
Private tutoring is flourishing in Greece particularly at grades ten to twelve. The differential access to the quantity and quality of tutoring, depending upon the pupils’ family economic backgrounds, raises serious equity problems insofar as it is a factor that undermines the equality of opportunity. It has been demonstrated that tutoring maintains and exacerbates social stratification and widens the gap between urban and rural areas (Bray 2006). Private tutoring may also affect the dynamics of teaching and learning in mainstream classes (Bray 1999). Pupils who do not receive private tutoring are at a serious disadvantage in their ability to participate in classroom activities as compared to pupils who have extra-scholastic assistance. Indeed, the former pupils must deal with unfamiliar teacher questions and tasks, whilst the latter know the answers beforehand. This is due to the fact that many of the tasks usually assigned by public school teachers are taken out of the unique official textbooks distributed to the students for free. These tasks are known to the pupils who attend private tuition, insofar as tutorial lessons start before the beginning of the academic year. In my experience, pupils who receive tutoring often monopolise classroom discussions to the detriment of pupils who may be doing genuine thinking instead of reproducing already known material. When this happens, it might give a distorting picture of each pupil’s potential and may affect the teacher’s informal assessment of pupils’ knowledge. The existing disparities within the classroom may increase in cases where teachers take the pupils who receive tutoring as a norm and adopt teaching styles that permit the gaps between the pupils to widen (Bray 1999).

1.3 My motivation for conducting the study

My teaching experience as a mathematics tutor and subsequently as a mathematics teacher in various schools of different types and levels in the island of Corfu spans a period of 30 years. Throughout this period I have experienced the joy of teaching as an enculturation process by means of which young people are initiated into the
mathematics culture. On the one hand, I have felt that the Greek mathematics curriculum has given me the opportunity to reveal something of those aspects of mathematics that have been praised by mathematicians and mathematics educators alike: the power of abstraction and symbolism, linguistic precision and lack of ambiguity, systematisation of thought, transparency of mathematical argumentation, mathematical beauty, intellectual challenge, efficient language, and practical usefulness (Kline 1953, Ernest 1998). On the other hand, I have experienced the frustration of having to teach many mathematical facts, processes and tasks of increasing complexity and cognitive demand to what I have found to be markedly heterogeneous classes and in my opinion within prohibitive time constraints in terms of fully implementing the required curriculum, even by lecturing. In this pedagogical journey, I have walked alone without the help of the state in the form of any training programmes, without any evaluation by the state insofar as the state inspectorate has long been abolished, without any official informed advice insofar as the school advisor for mathematics has paid one single casual visit in 19 years. Through all this period of teaching and of associating with colleagues, I have sensed an almost universal agreement that we struggle to cover a vast and rough curricular terrain. Unlike what would be the case in big cities, most members of the Corfiot community of mathematics teachers, both public school teachers and private tutors, are personally acquainted. Since many pupils receive extra tuition from private tutors (with some of us included), the in-class activities of public school teachers, as they are perceived and interpreted by their pupils, are made public and are subject to scrutiny and criticism. What we purportedly do in class, what we omit to do, what we assign for homework, what we test, i.e. all our particular responses to the challenges associated with the implementation of the Greek mathematics curriculum, are subject to discussion and critique.
Regarding the teachers’ practices, a number of issues have been the object of my informal critical discussions with some colleagues who I have been associated with more closely over the years. The topics of these discussions which at times have turned to bitter, if incoherent and incomplete, debates have been suggested by our long teaching experience and can be described by the following questions: What is the need of using an inexhaustible source of problem books that multiply exponentially in Greece for the assignment of additional problems to those contained in the already problem-rich official textbooks? To what extend does this plethora of problems serve for consolidation purposes in each particular topic? Are they primarily assigned in anticipation to and in order to prepare for the big event, namely the national examinations for university entry that seem to pervade the educational process, ever extending their influence to lower and lower grades? What accounts for the fact that sometimes the problems assigned by the teachers to be tackled by pupils cause difficulties to experienced teachers? Are some of these tasks really addressed to the pupils or are they addressed to their tutors, in other words they are a manifestation of a relentless war between public school teachers and private tutors for prestige and economic profit? Another issue associated with the assignment of homework tasks is whether and to what extent the order of attempting these problems matters. Has this parameter been considered by the teachers? Most importantly, must the solution of these problems be preceded by the solution of some other problems? Which ones? Are the teachers aware of the negative impact on pupil self-efficacy beliefs and the ensuing learning outcomes if students are ill equipped to tackle a problem through no fault of their own? Have the teachers adequately assessed their pupils’ strengths, weaknesses and level of understanding before assigning these problems? What is the rationale for assigning these particular problems and for what objectives? Is it mostly to test conceptual understanding or, as it seems, to distinguish the “strong minds” who are able
to manipulate complicated expressions, to avoid traps set deliberately by the test constructor and to devise the right tricks in order to deal successfully with a task? What is the rationale for assigning three or four proof problems in Euclidean geometry in an advanced chapter, requiring hours of student work in one afternoon, just for mathematics? From personal experience I have grown increasingly aware of the fact that the frequency with which a problem is taught over the years is inversely proportional to its perceived difficulty. Does the previous conclusion contribute to the explanation of why some teachers have excessive homework demands? What other explanations are there? What is the effect and what are the consequences of this practice on those pupils who cannot afford tutoring and are possibly unable to solve such problems? A crucial question that emerged through my discussions was whether these problems are solved in class in such a way that the teachers give and receive the necessary feedback with a view to enhancing the learning process. In dealing with these homework tasks, to what degree are the teachers sensitive to the learning needs of those pupils who for various reasons have weak mathematical backgrounds? Moreover, to what extent does performance on the homework tasks, as it is assessed by the teachers, contribute to the pupils’ grades? Finally, how are the homework tasks assigned by the teachers and the in-class learning activities related to the teacher constructed exams?

When I decided to pursue some answers to these questions methodically, I realised that most of these questions were intimately related to the issue of the assessment of the pupils’ knowledge of mathematics both in its formative function as an indispensable tool of the teaching process and as a consequential social practice. It also became apparent that providing answers to these questions from the point of view of teachers themselves would require me to systematically explore the realm of human thinking and ideology. Doing some preliminary research I soon found out that the Greek mathematics teachers’ experiences, as well as our thoughts, beliefs and visions about mathematics
education have eluded systematic scrutiny. In fact, as we shall see in the review of literature, very few research studies have been conducted concerning secondary Greek mathematics teachers’ beliefs, despite the existence of a wide consensus among educational researchers that teachers’ cultural, ideological and personal beliefs influence significantly the way they view their role as educators (MacNab & Payne 2003, Thompson 1992).

In this study, I contribute to this scant extant literature on teachers’ beliefs in the context of Greek mathematics education by comprehensively exploring a part of the mental world of three lyceum mathematics teachers. In choosing cases studies, I tried to select cases that represented “distinct traditions within the field of mathematics education” (Gates 2000). Among pupils, Nikos had a reputation of a strict and an intimidating teacher in his overall behaviour, as well as in his grading practices both in his oral grades and in the grading of his exams. This I knew from firsthand experience as I had served in the same school with him for several years. Nikos seemed to represent the polar opposite of my position in issues of behaviour and assessment. Exploring his beliefs and conceptions was thus seen as an opportunity to venture on an intellectual journey intended to understand in depth a way of thinking that seemed distant from my own and in this way to test the power of and elucidate my own thinking. At the same time this dissimilarity of our views was a challenge that early sensitised me with regard to methodological issues that arise in such an endeavour, as I had to provide answers to what it means to study and analyse a person’s views, what kind of access to these views is available, how the validity and objectivity of the conclusions are ensured and what these terms mean.

Antonis was also a teacher I had worked with for several years in two schools. He has been involved with the direction of schools for several years and it seemed to me that he has shown a remarkable zeal for performing his bureaucratic duties. In his case, I
was interested to see how he combined the two disparate functions of school direction and the pedagogical mission at the same time, especially in view of the fact that the former is particularly energy-demanding and time-consuming. I also wanted to see what effects his higher hierarchical place in his school has had on his assessment beliefs and his pedagogy. It should be noted that according to my experience in most schools the Principals relieve themselves of their teaching duties, an option that Antonis did not choose to use.

Giorgos was well known from the meetings of the Greek mathematical society in Corfu as an advocate of rigorous and abstract mathematics in high school education. Giorgos never hid his political position and explicitly argued from a right wing conservative viewpoint. In his case I wanted to explore how his concern for the dilution of standards in the mathematics curriculum and his conservative values affected his conception of assessment and especially how he addressed the equity issue which was of primary importance for my own ideology and inevitably for the objectives of my study.

1.4 An overview of the thesis

This thesis is organised into eight chapters. Chapter One provides a brief introduction concerning the significance of pupil assessment and the teachers’ conceptions of this issue. It also gives a brief description of the Greek educational field, as well as of the Greek mathematics curriculum, delineating some of their salient features and specific characteristics. Finally, it describes some of the reasons that motivated me to conduct this inquiry, as well as the rationale for choosing the particular cases. Chapter Two constitutes the review of literature and is divided into two parts. In the first part, I explore the role and function of assessment by analysing the latter into its component parts. This first part also includes an account of the importance of teachers’ beliefs and their nature and a brief description of the broad areas that have been
explored in the literature. The second part of the chapter reviews the literature on teachers’ conceptions of assessment and assessment practices. Chapter Three deals with methodological issues and consists of three parts. I start with a description of the broad purpose of the study. Then, I develop the theoretical framework that informs the research questions. Finally, I formulate my specific research questions. In the second part, I justify the choice of the research paradigm that guides my research endeavour and give a brief account of the case study approach. In the third part, first I review the literature on the data collection methods, their advantages and limitations. Then, I describe the data collection process and how I performed the data analysis. Finally, I make a brief reference to how the case studies are structured and presented in the following chapters. Chapters Four, Five and Six are concerned with the presentation and critical analysis of the three cases studies. In Chapter Seven, first I provide a summary of the findings and their significance in light of the literature review. Then, I sketch the teachers’ ideological profiles and provide some further reflections on the teachers’ ideological standpoints. Finally, in Chapter Eight first I discuss the trustworthiness, limitations and weaknesses of the study and reflect on my personal, professional and methodological gains from this research project. Finally, I provide some suggestions for further research.
CHAPTER TWO
REVIEW OF LITERATURE

2.1 Introduction

In this chapter first I explore the role and function of assessment. The issues are discussed from two different perspectives that can briefly be characterised as the meritocratic viewpoint and a conflict theory standpoint that sees education as an institution that contributes to the reproduction of unequal class and power relations. Then, I give a brief account of how teachers’ beliefs came to be the object of systematic investigation and I provide a review of the literature on teachers’ conceptions of assessment and assessment practices. My main focus in the review of the empirical research on teachers’ assessment beliefs and practices is on research done at the secondary mathematics education level but I include some elementary education and non mathematics based research wherever it provided some theoretical ideas that I deemed useful in the conceptualisation of the present research. Finally, I describe the views of assessment that reflect the aims and mission of five ideological groups identified and analysed by Ernest (1991) in the context of British education.

2.2 Discourses on Assessment – The Role and Function of Assessment

Concerning mathematical knowledge, the National Council of Teachers of Mathematics (1995) defines assessment as the process of gathering evidence about a pupil’s knowledge of, ability to use, and disposition toward, mathematics and of making inferences from that evidence for a variety of purposes. In fact, it is the multiple purposes this process is intended to serve which is thought to constitute one of the main reasons that make assessment an area of ideological contestation and controversy (Niss 1993). In the literature, assessment, like Janus, appears with two different faces; on the one hand it is supposed to serve society and on the other it is intended to serve the pupil.
When assessment assumes the first function, it is virtually synonymous with summative testing and the assignment of grades and serves for the certification of the knowledge acquired by pupils, as well as for selection and accountability purposes. The certificatory aspect of assessment includes pupil placement, ranking, promotion and graduation. In some countries pupils are placed on a course of study that purportedly suits their abilities and interests. Grouping by ability has been a highly controversial issue in education (Slavin 1990). The most serious criticism against this practice derives from its perceived social consequences. In fact, Ireson and Hallam (1999, 2001) cite abundant evidence suggesting that low ability groups tend to include disproportionate numbers of pupils from the lower socio-economic classes. Also, despite the widely-held perception that ability grouping boosts achievement, there is evidence that it does not enhance the learning of pupils and that it can even hinder learning, particularly for pupils in the so called “lower ability” groups (Boaler et al. 2000, Zevenbergen 2005). Finally, this practice is criticised on the grounds that it is unreliable (Boaler et al. 2000), it helps to reproduce the status quo and is potentially detrimental to the goals of social justice (Zevenbergen 2005), it has an adverse impact on the self-esteem, self-concept and the attitudes towards school and schoolwork of those pupils who are placed in the lower groups, and, finally, that it contributes to anti-school attitudes and alienation from school (Ireson & Hallam 1999).

Distinguishing pupils according to their achievement by means of the grading system constitutes a near universal practice in modern school life. While the established view is that this process renders justice by rewarding effort and ability and penalising indifference and lack of effort (Avdali 1989), its critics see the constant giving of marks as creating a field of surveillance and of rigid and inescapable hierarchy (Foucault 1982). Wherever automatic promotion is not practiced, pupils are promoted to the next grade if on the basis of their overall achievement it is judged that they are ready to
pursue studies at a more advanced level. For those who fail to attain a minimum level of performance, “grade retention” occurs when pupils are held in the same grade for an additional year rather than being promoted to a higher grade along with their same age peers. This practice is thought to grant them a second opportunity to acquire the basic knowledge that is required for further studies (Brophy 2006). In the literature social promotion refers to the practice of allowing pupils who have failed to meet performance standards and academic requirements to pass on to the next grade with their peers instead of completing or satisfying the requirements (U. S Department of Education 1999). In this study it is construed as the teacher practice of giving an inflated oral mark in order to counteract the mark on the final examination so that the pupil gets an overall passing mark. Proponents of social promotion oppose grade retention on the grounds that it is inequitable, it is inefficient with respect to pupil progress, it amplifies inequalities, it is inefficient in terms of the overall results of the education system in the sense that countries that practice automatic promotion top in international assessment studies, it has a negative effect on pupil motivation, and, finally, that it stigmatises retained pupils (Cosnefroy & Rocher 2005).

Pupil graduation is translated into an academic certificate that formally attests the pupils’ successful completion of their course of studies and specifies the degree to which the curricular objectives are achieved by each particular pupil. As it is argued by Broadfoot (1996), according to the dominant social paradigm2, through the attestation of academic ability and industry, certification provides a justifiable basis for the distribution of unequally desirable social roles and is thus considered as the epitome of the meritocratic basis of contemporary society.

Assessment is also used for accountability purposes. Test-based accountability is beginning to be a widespread instrument of educational policy especially in the Anglo-

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2 The dominant social paradigm is defined as the system of beliefs, ideas and the corresponding values, which are dominant (or tend to become dominant) in a particular society at a particular moment of its history, as most consistent with the existing political, economic and social institutions (Fotopoulos 2003).
Saxon countries (Anderson 2005). Stiggins (2002) points to the existence of a strongly held view in the United States that its increasing use is justified on the grounds that school improvement requires the articulation of higher learning and achievement standards that would provide direction for schools’ pedagogical efforts and for pupils’ learning, the transformation of those expectations into rigorous assessments, and the expectation of accountability on the part of educators for pupil achievement, as reflected in test scores. According to this view, if all participants in the educational process are held accountable and all parties are suitably motivated, the pupils through good grades, the teachers through promotion and salary increase and the schools through increased allocation of resources, the result will be a raise of education standards (Heubert & Hauser 1999). Moreover, as part of the system’s accountability, pupil test results can be used to evaluate curricula in order to effect the necessary corrections and improvements that would bring an alignment between standards, curriculum, instruction and assessment (Tienken & Wilson 2001). When summative tests are used for making consequential decisions that affect the status or future of pupils, teachers or educational institutions, they are usually called high-stakes tests (Broadfoot 1996, Linn 2006, Shepard 1990).

Apart from accountability considerations, the implementation of high-stakes tests has been supported by the use of various other lines of argumentation. There is a widespread public perception, also shared by many members of the educational community, that summative assessment in the form of tests constitutes a key source of motivation for learning (Harlen & Crick 2002). To lend support to this argument, comparative test results are invoked which purportedly demonstrate an improvement of test scores during the period high-stakes testing has been introduced (Koretz et al. 1991). However, a counterargument has been projected to the effect that the increase of test
scores over time reflects the greater familiarity of teachers and pupils with the tests rather than the improvement of learning (Harlen & Crick 2002).

Test results are thought to be useful in monitoring educational progress of schools and pupils in general, and particularly the progress of demographic subgroups of pupils and the gaps in achievement of those subgroups (Linn 2006). It is also suggested that when tests are used in ways that meet relevant psychometric, legal, and educational standards, pupils’ scores provide important information which, combined with information from other sources, can support decisions that promote pupil learning and equality of opportunity (Heubert & Hauser 1999). High-stakes testing is considered by some educators as a means to press pupils to work harder and thus to learn more, and as contributing to an atmosphere of competition that drives performance upward (Baker 1992). Scoring well on the test is also deemed to lead to feelings of success, while underachieving on such tests is supposed to lead to increased effort to learn (Amrein & Berliner 2002). In addition, it is argued that high-stakes test results can be communicated to parents so that the latter are informed about their children’s progress and to administrators for the design of better teacher education programmes (Avdali 1989). Finally, some educators argue in favour of the assignment of grades on various grounds. In particular, good grades are perceived as a reward for pupils’ efforts to meet their school duties and thus they are thought to function as means of rendering justice and as a source of reinforcement (Schuman et al. 1985). Considered as a form of approbation, good marks are also thought to satisfy the pupils’ internal need for confirmation of their personal value vis-à-vis the peer group members (Avdali 1989). Finally, good grades are considered as contributing to the development of pupils’ attentiveness, perseverance and diligence (Avdali 1989).

Test and grading practices have been associated with a range of imperfections, flaws, misuses and practical difficulties. A usual criticism levelled at high-stakes testing
derives its argumentative power from the adverse effects that high-stakes tests have been found to exert on teaching practices. The assessment regimes based on large-scale examinations, especially for the Anglo-Saxon countries which favour standardised multiple-choice tests with a high degree of predictability, exert pressure on teachers to adjust their teaching so as to accommodate the specific test needs by focusing on those aspects of learning that can be easily measured (Wiliam 2001). This usually results in an impoverishment of the curriculum which is defined to a large extent by the established tradition of past exams and is restricted to the low cognitive level aspects of learning (Madaus 1988, Shepard 1990). According to Kellaghan et al. (1996), proponents of high-stakes examinations argue that it is possible to construct appropriate tests that will not compromise the richness of the curricular objectives because the teaching and preparation for such tests will result in the development of the valued abilities the test is intended to measure. However, the authors suggest that this argument seriously underestimates the ability of test preparation to corrupt the very construct the test is trying to measure, thus undermining test validity.

The Greek context of mathematics education furnishes an example where the content, comprehensiveness, unpredictability and level of difficulty of the Greek non-standardised high-school exit examinations, that are simultaneously entrance examinations for higher education, are thought to demand a significant enrichment of the curriculum (Papastavridis 2000). In fact, it has been suggested that the public school structure and the time allocated for mathematics instruction in relation to what is regarded as excessive requirements of the mathematics syllabus make it very hard for public schools to prepare pupils adequately for a demanding exam whose reliability and validity have been questioned (Kyrides 2003, Psacharopoulos & Tassoulas 2004, Kerasaridis 2006). Moreover, it is claimed that the Greek high-stakes mathematics entrance examination for higher education does not define the mathematics curriculum
but undermines the role of public schools in favour of an ever-expanding and flourishing industry of private tutoring services (Tsakloglou & Antoninis 1999, Katsikas & Kabbadias 2000, National Council of Education 2006).

High-stakes examinations have been held responsible for the increase in grade retention and dropout rates affecting pupils differentially depending upon their sex, race, ethnicity (Shriberg & Shriberg-Burke 2006) and family socioeconomic status (Clarke et al. 2000). It is also claimed that high-stakes testing is responsible for the de-motivation of low-achieving pupils whose stigmatisation lowers further their already low self-esteem and reduces the chance of future effort and success (Harlen & Crick 2002). Lastly, high-stakes tests have been found to have a negative psychological effect on many pupils, causing considerable stress and anxiety (Lynn 1999).

Another area associated with testing is the validity and reliability of tests. Several analyses of grading practices, conducted over a long time in various countries with different assessment systems, indicate that practically these concepts are fraught with problems when put into practice (Chiotakis 1999, Prahl 1999). For example, reliability is reduced by such factors as the discordance among assessors in grading the same test, the discordance of the same assessor with herself when grading the same paper after a period of time, and the extreme variety, complexity and inconsistency of pupils’ individual reactions when confronted with examinations (Guillaumin, cited in Nimier, undated). With regard to validity, studies have shown that both standardised and teacher-made tests provide too narrow a view of knowledge and skills to support the interpretations made of the results (Harlen 2004). Moreover, it is seriously contested whether assessment instruments are able to adequately capture and measure competence in selected acts of performance, especially when competence is defined as the mobilisation of an integrated totality of pupils’ mental resources (De Ketele & Gerard 2005). Finally, consequential validity has often been found to be violated in many
standardised tests by the existence of subtle racial, linguistic, class and gender biases (Froese-Germain 2001). Perrenoud (1989a) argues that success and failure in school are partly due to chance, as they are related to the composition of each class, the degree a teacher is strict or lenient in his grading, the policies of the specific school unit, and the extent to which a certain minimum number of pupils is needed in a school so that all teachers ensure their positions. Also, studies have shown that teachers may be directly influenced by the social origin of a pupil because of their own prejudices or by virtue of more or less discrete pressure on the teachers from parents with social prestige (Perrenoud 1989b).

A more radical criticism of testing and grading is provided by a sociological perspective that sees schooling as a mechanism of cultural and social reproduction operating as a series of checks and balances on the education system in order to ensure its major function of perpetuating the social, economic and political status quo (Broadfoot 1996). As Bourdieu and Passeron (1970) have argued, schools accomplish the first of these functions by rewarding the linguistic and cultural resources that are associated with society’s dominant groups. According to Bourdieu & Passeron (as described by Giroux 1983), children who acquire through their families sets of meanings, qualities of style, modes of thinking, and types of dispositions that are arbitrarily3 valued by the school environment possess a cultural capital that strongly influences their scholastic performance in a favourable way. In fact, numerous studies (Clarke et al. 2000, Katsikas & Kabbadas 2000, Kyrides 2003, Mylonas 2004) have firmly established that children coming from families with low socio-economic status have a much reduced chance of succeeding academically. Thus, it is argued that school failure should not be attributed to the lack of pupil diligence, perseverance and effort or to a low intelligence quotient as it is widely believed both by the lay public and by most

3 By the term arbitraire Bourdieu refers to the social-historical contingency of the construction of any cultural element (Webb et al. 2005).
teachers (Eurydice 1993). According to this radical sociological perspective, what happens is that pupils from “class-cultural communities socialised into communication codes that are incompatible with those that regulate the transmission of school knowledge, and not recognised by the school as legitimate, are confronted with formidable and insurmountable barriers to comprehension” (Nash 2004, p. 607). In this sense, the unequal distance that pupils of different cultural, linguistic and socio-economic backgrounds have to cover towards the acquisition of what is considered as worthwhile and useful knowledge is a factor of success for some and of failure for others (Perrenoud 1989b). It is also argued that the academic underachievement of pupils from families with low socio-economic status is intentionally exacerbated by the design of curricula that are overburdened (Perrenoud 1989b) and beyond the pupils’ cognitive capacities (Crahay 2003), which consequently in certain countries require costly extra-scholastic tuition (Katsikas & Kabbadias 2000). The proponents of the above perspective suggest that the claimed equality of opportunity is a mystification.

Once the alleged equality of opportunity is refuted, summative assessment is not seen, according to the radical perspective, as a meritocratic measure but as one of the more significant disciplinary mechanisms to have emerged (Foucault 1982). Sharing this perspective, Perrenoud (1989b) describes the classroom as a field of surveillance, where pupils are subjected to a continuous teacher evaluation that feeds a hierarchy of excellence which presupposes a necessary dipole of victors and victims. Broadfoot (1996) stressed the powerful role that assessment can play in the social creation of identity through teacher and peer labelling. Those who succeed in this competitive environment feel self-confident winners and aspire to occupy the most secure and profitable professions in society, whilst those who fail may experience shame, culpability, ridicule, reproach, and self-devaluation (Perrenoud 1989b) and will be eventually liable to settle for less desired career options.
The radical critique of the social function of assessment that was delineated above focuses its attention on how social equity is significantly and extensively undermined by the current summative assessment practices. This critique calls into question the existing social structures and systems of values and aims at social change. As it is argued by Armstrong (1999), this vision is in direct conflict with the principles underlying the marketisation of education and the increased early selection and competition between pupils and between schools.

Apart from the social role it is called to play, it has been increasingly accepted that assessment must fulfil an important pedagogical function with the first priority in its design and practice being to serve the purpose of promoting pupils’ learning (National Council of Teachers of Mathematics 1995, 2000, Gipps 1994a). In this sense, assessment forms an integral part of the teaching and learning process and refers to the set of teacher activities which serve to provide information that can be used as feedback in order to modify the teaching and learning process so as to suit the pupils’ learning needs (Black & Wiliam 1998a). When assessment has this function, it is called formative assessment and according to Black et al. (2002) it is worthy of its name only when the evidence gathered is actually used for its intended purpose. Moreover, a teacher’s feedback will not be effective unless pupils have a notion of the desired standard or goal and thus they are in the position to compare the actual with the desired performance in order to engage in the appropriate corrective action that would close the gap between the two (Gipps 1994a). Black and Wiliam (1998a, p. 7) suggest that if “formative assessment is to be productive, pupils should develop the ability of self-assessment so that they can understand the main purposes of their learning and thereby grasp what they need to do to achieve”. Peer-assessment is also thought to work in the same direction provoking discussions among pupils about different strategies and solutions that would help them to clarify their views in a setting where they can feel
safe (Lange 1999). The implementation of formative assessment requires a major shift from the learning environment typical of traditional classrooms and consequently a drastic change of roles both for the teachers and the pupils (Gipps 1994a). Black & Wiliam (1998a) suggest that an interactive process between the teacher and the pupils should promote a thoughtful and reflective dialogue focused to evoke and explore understanding and conducted in such a manner that all pupils will have an opportunity to think and to express their ideas. In this context, the role of the teacher ceases to be exclusively a presenter of content and pupils change from behaving as passive recipients of the knowledge offered to becoming active learners who take responsibility for their own learning (Black & Wiliam 2006).

In the Anglo-Saxon educational context, formative assessment forms part of a broader movement away from the psychometric measurement culture based on standardised testing (Gipps 1994a). It is at the centre of the educational reform movement advocated by National Council of Teachers of Mathematics (1995, 2000) which is trying to influence the U.S educational landscape towards a learning environment that requires a major shift from current practices. From this perspective:

1. The mathematics classroom is seen as a community and not simply as a collection of individuals;
2. Mathematical results are to be deemed credible only insofar as they are verified by means of logic and mathematical evidence and not taken for granted by virtue of the sole authority teacher;
3. Pupils are actively engaged in mathematical reasoning instead of merely memorising procedures, they are actively involved in conjecturing, inventing, and problem solving instead of mechanistically finding answers to lower level questions and, finally,
4. Pupils seek to connect mathematics, its ideas, and its applications instead of treating the subject as a body of isolated concepts and procedures


As it is suggested by the National Council of Teachers of Mathematics (1991), the creation of this learning environment requires teachers who

1. are proficient in selecting mathematical tasks to engage pupils' interests and intellect;
2. provide opportunities for pupils to deepen their understanding of the mathematics being studied and its applications;
3. orchestrate classroom discourse in ways that promote the investigation and growth of mathematical ideas;
4. use, and help pupils to use, technology and other tools to pursue mathematical investigations;
5. seek, and help pupils seek, connections to previous knowledge; and
6. develop knowledge through guiding individual, small-group, and whole-class work.

Similar views were expressed earlier in the Cockcroft Report (1982) intended to propose reforms in the context of the English mathematics curriculum and by the Greek pedagogical institute (Ministry of Education 2007). Details can be found in Appendix 1.

2.3 Teachers’ beliefs

The recent recognition of the importance of teachers’ thinking followed a long period during which the topic received little attention. Interest was revived in the 1970s when research on teaching and learning shifted from the study of teachers’ behaviours to their thinking and decision-making processes (Thompson 1992, Cooney 1999). In their review of the relevant literature, summarising and synthesising the results obtained during the period from late 1960s until 1984, Clark and Peterson (1984) came to the
conclusion that the ultimate goal of research on teachers’ thought processes was to develop a cognitive psychology of teaching that could be used by educational theorists, researchers, policy makers, curriculum designers, teacher educators, school administrators, and teachers themselves.

During the 1980s a central theme in educational research was the teachers’ sense making (Wilson & Cooney 2002). As research interest begun to shift towards the idiosyncratic construction of meaning, teachers’ beliefs and conceptions became the object of systematic inquiry (Wilson & Cooney 2002). In the last two decades there has been a proliferation of research studies on teachers’ beliefs in a range of issues and from various perspectives as it is witnessed, to cite but a few examples, by the comprehensive review conducted by Thompson (1992), by Leder et al’s (2002) book on beliefs as a hidden variable, by the Mavi workshops activities spanning a period of seven years, and by a thematically arranged rich bibliography of teacher beliefs compiled by Törner and Pehkonen (1996).

There is widespread agreement among researchers, supported by ample empirical evidence, that the teachers’ conceptions and beliefs have a strong impact on their pedagogical behaviour and consequently on the learning outcomes (Furinghetti & Pehkonen 1999, Thompson 1992, Wilson & Cooney 2002, Lloyd 2002). The understanding of teachers’ thinking and beliefs is also considered by many educators to be crucial for the implementation of effective teacher education programmes and for the success of innovative educational efforts (Chapman 2002). For these educators, teachers’ resistance to change has been considered as an impediment to curricular efforts towards revising the existing theories of teaching and learning held and practiced by teachers. Challenging the conventional view from which teaching is seen as repetition, practice, and a routinised means to some focused endpoint, and according to which mathematics learning is considered as the mastery of a fixed set of facts and
procedures, there have been reform efforts that seek to propagate the view that mathematics instruction should emphasise student engagement in investigation, sense-making, problem-solving, and theory building about important mathematical situations and concepts (Lloyd 1999). On the other hand, insofar as some reform efforts are not by necessity pedagogically beneficial but may reflect elite interests, teachers’ beliefs must not always be seen as obstacles to progress. From a critical point of view, illustrative of this case is the organised resistance of teacher unions against the increasing privatisation of education services, the introduction of business “quality control” measures into education, and the requirement that education produce the kind of minimally trained and flexible workforce that corporations require to maximise their profits (Compton & Weiner 2008, p.5). I have not seen any argument regarding this aspect of teacher resistance to change in the consulted teacher beliefs literature.

Beliefs are not considered to have an isolated existence (Pajares 1992). Rokeach (1968, quoted in Pajares 1992) introduced the notion of a belief system as a psychologically but not necessarily logically organised totality of a person’s beliefs about physical and social reality. It is argued that the nucleus of this system is composed of those beliefs that have a high degree of functional connectedness and communication with other beliefs (Pajares 1992). These central beliefs are considered stronger than those residing in the periphery and tend to resist change with greater intensity. Peterman (1991) claimed that this structure of relatively autonomous isles of beliefs may provide an explanation for any internal inconsistencies that can be found between some of a person’s beliefs.

Moving beyond the cognitive and psychological approaches but appreciating the insights these perspectives offer to the study of beliefs, Gates (2000) provided a complementary set of theoretical tools by adopting a theoretical perspective that draws from social theory. Gates’ model moves beyond beliefs into the social constitution of
the individual. According to this perspective, beliefs lose their illusory individuality, their purported idiosyncratic uniqueness as they usually have a broader and more profound dimension, “rooted in cultural norms and forms that are themselves rooted in social structure” (Gates 2006, p. 1). The latter is supposed to have “a huge influence over consciousness and ideology, setting many agendas and putting boundaries around what is considered as possible, describable or even legitimate” (Gates 2000, p. 172). Here ideology is conceptualised as a set of ideas that are related to the conflictual nature of economic and social relationships and thus to matters of power and social structure as well as to individual and social activity within the wider socio-cultural context (Gates 2000, p. 126).

Although educational researchers have agreed that teacher beliefs are important as predictors of teacher behaviour, research results are not in agreement either on the existing degree of consistency between beliefs and practice or on the nature of their relationship (Thompson 1984, 1992). Thompson (1992) suggested that teachers’ conceptions of teaching and learning mathematics are related in a complex non-causal and dialectical way to their instructional practices.

Ernest (1991) developed a broad model of a teacher’s ideology of mathematics education. Here, ideology is understood as an overall value-rich world view, combining both epistemological and moral value positions (Ernest 1991, p. 111). The primary level of the model contains the deeper elements of the ideology and consists of an epistemology and a philosophy of mathematics, a set of moral and other values, a theory of the child, a theory of society and the aims of education. The secondary level contains the derived elements pertaining to mathematics education and consists of a theory of school mathematical knowledge, the aims of mathematics education, a theory of the teaching of mathematics, a theory of resources of mathematics education, a theory of learning mathematics, a theory of the assessment of mathematics learning, a theory of
mathematics ability, and a theory of social diversity of mathematics education. Ernest (1991) used this model to provide a comprehensive description of the five major ideologies of mathematics education of distinct historical groups formed within the context of British society, namely the industrial trainers, the technological pragmatists, the old-humanists, the progressive educators and the public educators. An overview of the five educational ideologies is given in Appendix 2 (Ernest 1991).

Most research on mathematics teachers’ beliefs can be classified in relation to the following themes: teachers’ conception of mathematics, the relationship between their conception of mathematics and their teaching behaviour, their theories of mathematics teaching and learning, the relationship between their theories of mathematics teaching and learning and their teaching practices, and the issue of the development and change of teacher beliefs (Thompson 1992).

2.4 Review of research literature on teachers’ conceptions of assessment and assessment practices

As we saw earlier, the issue of educational assessment has been extensively investigated in its various aspects and from various perspectives. On the other hand, in the empirical research literature, among the themes that constitute a largely unexplored area we may include the following:

1. what teachers believe about the purpose of assessment, how they use the data they collect during the assessment process (Nisbet & Warren 2000);
2. what is the relationship between teachers’ beliefs and their assessment practices (Adams & Hsu 1998);
3. how teachers make decisions about the assessments they use (McMillan & Workman 1998); and

The empirical research concerning the teachers’ conceptions of assessment in the context of Greek secondary mathematics education is particularly scant. A personal search of the Bulletins of Greek Educational Articles published by the Greek Pedagogical Institute for the period 1992-2007 yielded three relevant studies (Ferentinos & Kassimati 2001, Barkatsas 2003, Katsamangou 2003). There is also an unpublished thesis by Barkatsas (2003) on Greek secondary mathematics teachers’ beliefs about teaching, learning and assessment and the factors that influence these beliefs, as well as an article by Barkatsas & Malone (2005) that draws on this thesis.

My investigation of the existing literature on the teachers’ conceptions of assessment and their associated practices yielded a number of themes which the various researchers focused their attention upon. These themes, elaborated upon in the next section, are: (a) the teachers’ formative assessment approaches and the rationale that supported these approaches; (b) their beliefs and practices on the relative weight that teachers attach to formative and summative assessment; (c) their beliefs about the impact of high-stakes testing; (d) their views of grading and their grading practices; (e) their views of grade retention and social promotion; and finally (e) the views of assessment described in Ernest’s model of educational ideologies.

2.4.1 Formative assessment approaches

I start with a study that has theoretical interest insofar as the authors provide empirical models of the teachers’ formative assessment approaches. Examining the assessment procedures of teachers who were preparing the teacher assessment element of the British National Assessment, Gipps, McCallum and Brown constructed a model describing the teachers’ assessment practices and linking them with their theories of
learning and with their different attitudes and approaches to criterion-referenced and to formative assessment (Gipps 1994b). Three distinct groups were distinguished. The *intuitives* rely on their memory in making and recording assessment. They do not refer to statements of attainment and consequently reject criterion referenced assessment. Also, they do not take notes and they reject systematic recorded assessment as too formal and structured an approach. They rely on their memory to make overall judgments at the end of a period or they claim that they implement continuous assessment without being able to specify this in detail. The *evidence gatherers* base their assessments on a usually rich amount of evidence. Although they do not use statements of attainment, they understand assessment in relation to criteria but insist that context and pupils’ background must occasionally be taken into account in evaluating attainment. Their idea of assessment is essentially summative but they use a variety of assessment methods and recognise the importance of observations and children’s discourses in making informal assessments. The *systematic planners* identify activities and tasks within their planned programme of teaching with specific statements of attainment in mind. They use multiple techniques for assessment such as observation, open-ended questioning, teacher/pupil discussion, running records, scrutiny of written work. They have a constructivist view of learning, they understand and operate a criterion-referenced model of assessment and use formative assessment to inform their planning on a regular and systematic basis.

There is convincing research evidence that to implement formative assessment teachers use a variety of assessment techniques, strategies, and tasks (Adams & Hsu 1998, Warren & Nisbet 1999, McMillan & Nash 2000). The most preferred means of formative assessment is teacher observation of pupils’ in-class activities such as pupils’ response to teacher questions and the quality of their involvement with assigned in-class tasks to be tackled either individually or less frequently in groups (Adams & Hsu 1998,
Warren & Nisbet 1999, Vlachou 2006). Other means that are valued are homework assignments (Adams & Hsu 1998, McMillan & Nash 2000, Braxmeyer et al. 2005, Vlachou 2006) teacher constructed tests (Brown 2003, Vlachou 2006) and, to a lesser extent, oral tests, projects (Warren & Nisbet 1999), journals (Vlachou 2006) and essays (Adams & Hsu 1998). Self assessment and peer assessment have been very rarely used even by teachers who take assessment very seriously (Black & Wiliam 1998a). Primary teachers participating in a study conducted by Vlachou (2006) confessed that they did not encourage self assessment on the grounds that elementary school pupils were not mature enough but Maclellan’s (2001) study revealed that it is not a frequent occurrence even in tertiary education. The reasons projected by teachers in Vlachou (2006) for not using alternative assessment methods were lack of time, overcrowded classrooms, inadequate informative support due to the inexistence of teacher education programmes and perceived adequacy of traditional methods.

2.4.2 Formative vs. summative assessment

Assessment theory has drawn attention to the tension between the summative and formative functions of assessment and there have been attempts to ameliorate this tension by integrating these two disparate functions of assessment (Wiliam 2000a). On the empirical level, a massive study involving 3000 junior high school French teachers (Braxmeyer et al. 2005) revealed a conception of assessment that attached much more importance to its summative certificatory function. A large proportion of teachers, however, did mention the role of assessment in understanding the nature of pupil errors and in planning the teaching process and reorganising the content taught. More than half the teachers from all disciplines favoured assessment during the learning process and around 20% favoured diagnostic assessment that takes place in the beginning of a course. Many teachers also considered it important to be informed of their pupils’ performance in other disciplines. In a study involving 19 high school American
teachers in three different states, Senk, Beckmann, and Thompson (1997) found that, despite a clear distinction in recent literature between assessment and grading, many teachers tended to equate the two. In fact, many teachers were found to assign grades to virtually every assessment task except for homework assignments. In referring to their assessment practices, these teachers meant their tests, quizzes, and other graded assignments.

Teachers studied by Vlachou (2006) expressed the opinion that the Greek mathematics curriculum, as it was perceived by teachers through their interpretation of the official texts and guides, does not allow significant teacher differentiation with respect to the content taught or of the teaching method adopted. However, despite the small degree that this was thought possible, they did use the assessment results to modify the mathematical content, the learning objectives and the time officially suggested for the teaching of each unit in order to accommodate for individual pupil needs. However, some teachers experienced a tension between the curriculum requirements and the adoption of pedagogical approaches they thought appropriate as a result of their formative assessment feedback and criticised the state standards.

As Braxmeyer et al. (2005) reported, although according to French teachers, one of the major assessment objectives is to help the pupils identify and correct their errors, the teacher assessment practices were more often centred on instrumental knowledge than on competence to perform complex tasks. Moreover, the incapacity of the majority of teachers to align their practices with their assessment objectives was found to be associated with the importance that parents attach to grades. The social pressure which was exerted on teachers seemed to legitimate and consolidate a conception of assessment that focuses on pupil certification and selection.

Focusing on the teachers’ metaphorical language, an ethnographic study carried out by Yung (2001) on the relation between teachers’ beliefs and their practices in an
assessment reform revealed three different types of approaches towards assessment in terms of the weight given to the two different functions of assessment. The Policeman metaphor referred to a teacher who, feared of being held accountable by the examination board offered little help to individual pupils, did not allow discussion and provided no feedback to pupils who made mistakes but preferred to reduce marks instead. The Driving Test Examiner metaphor referred to a teacher who supported the idea of working under pressure as a kind of training in order to prepare pupils for future working life. Finally, the Pupils’ Companion referred to a teacher who favoured interaction with pupils, seldom mentioned marks and other assessment-related issues and provided guidance to the pupils rather than disclosing the answers to the assigned tasks directly.

Finally, in two case studies investigating the teachers’ ideological positions regarding mathematics education from a critical perspective, Gates (2000) contrasted a teacher attitude antagonistic to tests based upon the rationale that they give restrictive information and reveal very little about mathematical understanding with an opposite attitude held by another teacher favourable to frequent formal and objective testing intended to prepare pupils for public examinations. The first teacher advocated teacher autonomy and the creation of a learning environment characterised by cooperation, understanding and communication between the teacher and the pupils whilst the second teacher held the view that teaching should be carried out on the basis of a limited set of learning objectives in tightly set groups and expressed his scepticism on the validity of teacher judgments of the pupils’ level of understanding. The broader aim of this study, which apart from its empirical part provided a solid theoretical framework from a critical perspective, was to elucidate how the teaching and learning of mathematics contributes to uneven social and educational outcomes and opportunity.
2.4.3 High stakes testing

A rich amount of data concerning the primary and secondary school teachers’ perceived effects of state-mandated testing programs on teaching and learning is provided by two studies (Clarke et al. 2003, Pedulla 2003) conducted by the United States National Board on Educational Testing and Public Policy. The first study was quantitative and involved a representative sample of 4200 teachers from all states, whilst the second was based on on-site interviews of 360 educators from three states, Kansas, Michigan and Massachusetts, which attach different stakes to test results.

Most teachers perceived an overall negative effect on school climate as a result of the existence of state mandated high-stakes examinations, with the psychological impact on pupils perceived to be greater at the elementary level. Similar concerns about the impact of summative assessment on pupils’ affective state were expressed by teachers interviewed by Butterfield et al. (1999), as well as by McMillan & Nash (2000). The interviewees in all three states in Clarke et al. (2003) reported too much testing, as well as more negative than positive test-related effects on pupils, e.g. test-related stress, and unfairness to special populations such as limited English proficiency pupils. Perceived positive effects noted by a minority of the interviewees included increased pupil motivation to learn and improved quality of education.

With regard to teaching, most teachers studied by Pedulla et al. (2003) believed that attaching high stakes to test results in order to raise test scores leads to instructional behaviour that is contrary to perceived good educational practice. According to the teachers in Clarke et al. (2003) the negative effects of high stakes testing are reduced instructional creativity, increased preparation for tests, a focus on breadth rather than depth of content coverage, and a curricular sequence and pace that were inappropriate for some pupils. The majority of teachers in Pedulla et al. (2003) agreed that the state testing programs influence the amount of time they devote to non-traditional methods,
such as whole-group instruction and cooperative learning. About 60% of teachers reported that their state test was compatible with their daily instructional objectives. Teachers indicated that classroom assessment tasks were similar both in content and format to those of the state test. Many teachers suggested that the stakes attached to the state-mandated tests affected the extent to which they use results for formative assessment. Finally, more elementary school teachers than high school teachers use the results for formative assessment purposes. However, about one-fifth of the interviewees in Clarke et al. (2003) noted that the results were returned too late to be useful for enhancing instruction.

Concerning the perceived impact of the state test on the curriculum, teachers in Clarke et al. (2003) reported that state test preparation affected the breadth and depth of content taught. Perceived positive effects included the removal of unneeded content, a renewed emphasis on important content, and the addition of important topics previously not taught. Perceived negative effects included a narrowing of the curriculum, an overemphasis on certain topics at the expense of others, and an overcrowded curriculum. About 10% of interviewees felt that the state test had no impact on what was taught.

Even though many teachers recognised that state testing programs reflect high academic standards, they opposed the view that the state test was an accurate measure of pupil achievement or an indicator of educational quality. Interviewees participating in Clarke et al. (2003) expressed two main concerns about the validity of the test results. The first was that frequent testing reduced pupils’ motivation to make increased effort preparing for the state tests, compromising the test’s ability to measure what was learned. The second concern was that the test results were not a valid measure for comparing schools and districts since they were affected by extra-scholastic factors. Validity concerns such as the ambiguity of certain test questions, bias due to contexts alien for certain pupils and restricted meaning of national test results compared to the
whole of pupil achievement were also raised by most of the U.K teachers interviewed by Watson (1999). These teachers, however, did not raise the same issues about their own constructed tests. On the other hand, reviewing relevant research, Brown (2003) concluded that most teachers have limited understanding of the concepts of test reliability and validity.

2.4.4 Grading

Reviewing the relevant literature, McMillan et al. (2002) contend that the investigation of teachers’ grading practices has a privileged place in the research agendas regarding teachers’ assessment beliefs and behaviour. The authors attribute this researcher preference to the consequential nature of grading and their importance in communicating pupil progress to the interested parties.

Research has shown that in assigning grades teachers use multiple criteria that involve both achievement and non achievement factors (Brookhart 1991). I cite three indicative large scale studies that illustrate the teachers’ grading practices. The vast majority of 700 primary and secondary school teachers participating in a study conducted by McMillan & Nash (2000) showed preference to constructed-response assessments where pupils show their work, such as short answer, essay, performance assessments, demonstrations, exhibitions, portfolios. Teachers obtained grades primarily from four sources: homework, tests, quizzes and projects or papers. Tests typically did not account for more than 30% of the final grade. Apart from achievement factors, teachers counted effort, ability, and conduct to determine grades. Similar results were obtained by Philippou and Christou (1997) in a study involving 610 Cypriot and 152 Greek teachers. There was widespread agreement that class participation, performance on class work, test scores, effort put by pupil, pupil persistence and to a lesser extent homework assignments should be the major factors that contribute to the pupils’ mathematics grade.
Organising findings from his study with roughly 1500 secondary school teachers from 69 schools in Virginia and reviewing previous research, McMillan (2001) found four distinct factors that are used by teachers to determine grades, namely academic achievement, academic enablers (effort, ability, improvement and participation), use of external benchmarks (e.g. performance compared to other pupils) and use of extra credit for borderline cases where a pupil barely misses a passing mark. The use of non-achievement factors was also seen as part of a larger philosophy of teaching and learning, one that accommodates individual differences. It was mostly attributed by the author to the teachers’ desire to help the pupils, and to encourage pupil engagement, motivation and understanding. This resonates with research results obtained by Cauley and McMillan (2000) suggesting that middle school teachers who serve at schools where pupils mostly belong to families of low socio-economic status (SES) attach more importance to non-test factors in grading than do teachers at low-SES schools.

Investigating the meaning that teachers attach to grades, Brookhart (1993) found that grades seem to be used in a kind of academic token economy and function in classroom management as the reward for accomplished work. A comprehensive review of the literature on teachers’ grading practices conducted by Brookhart (1994) revealed that there is considerable variation with respect to the meaning and purpose attached to grades, as well as to the weight given by the teachers to non-achievement factors (Brookhart 1994). This result resonates with research findings by McMillan and Nash (2000) in that teachers base their grading practices on their educational philosophies and on what is best for each pupil. Similarly, in a research study conducted by Green et al. (2007) that investigated the teachers’ ethical judgments in relation to assessment, a strong majority of respondents (85%) rated the inclusion of non-achievement factors in calculating grades as ethical.
A quantitative study intended to reveal the teachers’ opinions behind their grading practices was conducted by Frary et al. (1993). Using the results of a state-wide quantitative study, the authors categorised the grading approaches of 536 secondary teachers of academic subjects randomly chosen from almost 16000 secondary teachers of all academic subjects employed in Virginia public schools. Their categorisation was derived from 27 opinion items on testing and grading. The first and smallest of the six groups obtained appeared to favour a ranking approach to measurement. The second group of teachers disagreed with the use of tests to determine the assigned grades. The third group depicted the stereotypical strict image of teachers. The fourth group advocated a flexible approach to determining passing points and was the strongest in advocating the use of extraneous factors such as effort and conduct to determine course grades. The fourth group appeared to be characterised by uncertainty and the sixth group was characterised by inconsistency in assignment of grades. Commenting on the results of this study, Brookhart (1994) stressed the need for additional research that would focus on the reasons behind teachers’ grading practices.

In 6 case studies conducted by Vlachou (2006) for her master’s dissertation, the participating Greek teachers disagreed on the role of grades. Those who agreed contended that as long as teachers treat underachieving pupils with indulgence, valuing more their effort than achievement, grading does not exacerbate school inequalities but on the contrary increases pupil motivation. They also thought that low marks should not be seen as a punitive measure but as an indicator of pupil progress that could be used both by pupils and their parents. Those teachers who disagreed with the use of grades thought that they are stressful especially for “weak” pupils. They also rejected the use of grades on the grounds that they contribute to school inequalities and proposed a descriptive assessment which sees a pupil’s performance in terms of his or her previous level of attainment. The teachers agreed on the subjective character of grading and
favoured multiple assessment methods in order to ensure objectivity. The most frequent forms of assessment used by the teachers were: the participation of pupil in daily lessons, written work during a lesson and teacher-constructed tests that were preferred to the ones contained in the official textbook. Homework was not used exclusively for diagnostic purposes by some teachers in contrast to what is officially stipulated. Although the law explicitly forbids the marking of tests and despite the fact that theoretically the teachers supported the idea that a mark does not reflect a pupil’s knowledge level, they actually marked pupil tests on the grounds that children expect grades and that grades have motivational power and give an overall indicator of the pupil’s progress in learning.

2.4.5 Grade retention

In the United States the dilemma of grade retention versus social promotion seems to divide elementary and secondary school teachers. Of the 4,200 teachers participating in the survey conducted by Pedulla et al. (2003), grade retention was supported by 1 in 4 elementary teachers, close to a third of middle school teachers, and 1 in 5 high school teachers in states where the high-stakes testing regime prevails. In Vlachou’s (2006) case studies some teachers rejected grade retention on psychological grounds, contending that socially promoted pupils will do their best in order to cover the lost ground. Those who favoured grade retention argued that, in their experience, for some pupils with particular learning difficulties the social promotion practice perpetuates and exacerbates their learning problems. A third group refrained from giving a general answer but believed that each case should be examined separately. Several teachers in McMillan & Nash’s (2000) study complained that the effect of social promotion has a watering down effect on the curriculum. A study in France revealed that half of the French pupils are made to repeat at least one year in their compulsory education period (Cosnefroy & Rocher 2005).
An attempt to provide a classification of the 135 elementary teachers’ opinions regarding grade retention was made by Tomchin & Impara (1992). The authors distinguished four different categories: The antiretentionists opposed all retentions in upper grades on the grounds that the consequences of retention rendered the practice unacceptable. The remediationists who constituted the majority thought that retention could sometimes be appropriate and beneficial. These teachers felt responsible for pupil performance and participation in their classrooms, expressed a strong sense of self-efficacy and attributed some of pupils’ difficulties to experience-deprived backgrounds. The standard-bearers believed that, regardless of their effort, pupils should be retained when they do not meet prescribed standards. Finally, the work-ethic moralists attributed pupil underachievement to home factors such as parents’ attitudes toward education or personal characteristics such as being lazy, unmotivated, or disorganized. Although these teachers admitted that retention might not be of any help to the pupil, they believed that one must make some effort to be promoted.

2.4.6 Views of assessment described in Ernest’s model of educational ideologies

Drawing on Ernest (1991), I provide a description of the views of assessment held by five different social interest groups identified in the context of British education. As it is remarked by Gates (2000, p.102), these idealised categories reflect “broad allegiances within the teaching profession”.

The industrial trainers advocate the use of examinations that test the acquisition of simple facts and skills and their correct application. These examinations are supposed to provide external standards and are also intended to ascertain that the moral obligations of schoolwork are fulfilled. Children should not be protected from failure and competition is to be encouraged as morally necessary, rewarding those who succeed through effort and intellect. Insofar as, according to this perspective, teaching is supposed to involve the transmission of knowledge as a stream of facts to be learned
and applied, discussion and cooperation are discouraged, and error making is castigated as a failure of self application, there is little room for formative assessment.

The technological pragmatists favour external tests to provide certification of attainment and skills. For the less academic, the emphasis is on the provision of records of achievement and skills profiles on a broad range of generic skills, including numeracy, literacy, communication, practical skills, problem solving, decision making, and computeracy. These skills are supposed to have utility across a range of vocational areas.

The old humanists favour external examinations based on a hierarchical view of subject matter, and at a number of levels, corresponding to mathematical ability. As any concession in terms of the degree of accessibility and level of difficulty of these exams would lead to a dilution of standards, these exams must be rather difficult in order to select, through competition, the best mathematical minds. As for formative assessment of mathematics learning, it may involve a range of methods.

The progressive educators reject high-stakes testing and external assessment on the grounds that the latter have a negative impact on the development of children who are to be protected from conflict and pain. Instead, this ideological group favours an informal criterion-based teacher assessment of positive achievements, with the avoiding of failure and the labelling of children’s work as incorrect. Formative assessment should be enacted in accordance with the role of the teacher as a facilitator of learning and a manager of the learning environment and learning resources.

Finally, through assessment the public educators intend to find the measures of competence and positive achievement in mathematics without stereotyping students by ability, or presupposing a hierarchical model of mathematics. In assessing competence, this group is sensitive to equity issues regarding gender, race, class or other social variables. Preparation for examinations and external assessment is not denied but should
be attained as a by-product of the social rationale for mathematics. A variety of forms of assessment is favoured, including profiles or records of achievement, extended projects and examinations. Assessment tasks and outcomes should be open to pupil discussion, scrutiny and negotiation where appropriate, and student choice of topic for investigation and project work. The content of assessment tasks, such as projects and examination questions, should include socially embedded mathematical issues, requiring critical thinking about the social role of mathematics. This perspective affords many opportunities for teacher formative assessment.

2.4.7 Overview of the review – Orientation of the present study

This review has revealed that a holistic view of the socio-political dimension of assessment as seen by mathematics teachers is missing in the literature. In chapter one assessment was defined as the process of gathering evidence about a pupil's knowledge of, ability to use, and disposition toward, mathematics and of making inferences from that evidence for a variety of purposes. It should be added to this definition that these purposes are socially significant and socially consequential. Hence, a teacher’s view of the socio-political dimension of assessment must be a synthesis of the teacher’s positions with respect to the whole range of social and political issues that are raised when decisions are made on the basis of assessment. The studies reviewed above have provided answers as to how different teachers and different categories of teachers view some particular assessment-related issue. But this was done within a restricted conceptual framework that did not allow the researchers to locate the teachers’ beliefs within the broader debate of two contesting perspectives regarding the socio-political significance of assessment, namely the meritocratic discourse and the theory of social reproduction. An exception to this was Gates’ (2000) study concerning the structure of the professional orientation of two teachers of mathematics from which my study drew inspiration, as well as theoretical and methodological guidance.
As far as formative assessment is concerned, the socio-political significance of the degree of its implementation has not adequately been addressed in the literature or to be more exact it has almost been ignored. On the one hand, the literature that resonates with the established values focuses on the formative assessment’s potential for improving learning outcomes, failing to adequately address the issue of the compatibility of the mathematics curriculum demands with a broad implementation of formative assessment schemes. On the other hand, analysts who argue from a social reproductive perspective have focused their critique on the social consequences of summative and high-stakes testing, tacitly assuming but not explicitly bringing forth and elaborating upon that formative assessment is by default not practicable in view of the specific curricular demands they question their legitimacy of. From the point of view of the mathematics teachers’ perspectives, this research aspires to make a small step towards covering this gap in the literature by investigating how the beliefs, priorities and goals that guide the pedagogical practices of three Greek mathematics teachers lead to instructional decisions that give rise to specific formative assessment opportunities, how the latter are evaluated by these teachers, and what significance the results of this evaluation have for them.
CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

In this chapter I start by specifying my own ideological orientation and set out the broader purpose of this project. I then argue that the theoretical framework that best informs my research is associated with the critical theoretic tradition which sees education as an institution that contributes to the reproduction of unequal class relations. Using this framework, I formulate the specific research questions that serve the broader purpose of my study. Then I justify and elaborate on my choice of the critical theoretic research paradigm delineating its basic tenets. I also set out the characteristic features of the case study approach and make a case for using this approach for my study. Finally, the main features of two basic collection tools of qualitative research, interview and observation, are reviewed and the stages I followed in order to collect and analyse the data of this inquiry are explained.

3.2 The purpose of the study

3.2.1 The broad purpose of the study

The present study is located within a broader problematic of how inequality is generated and legitimated within schools (Apple 1980). It has as its centre of focus a small sample of three Greek mathematics teachers who are seen as mediating forces between state curricular intentions and the learners. Having social justice as my primary motive for conducting this thesis research, I probe the teachers’ conceptual landscape using the issue of the socio-political significance of pupil assessment as a privileged window that can provide a broad perspective from which I can observe how the participants of this study are positioned with respect to the inequity issue in mathematics education.
To obtain answers to my research questions I examine the theoretical positions of these three teachers but also observe their classroom cultures in the formation of which they play a protagonistic role. Moreover, through their discourses and their annotated actions, I try to uncover the ways they respond to the contradictions and the dilemmas that might be posed to them by the given educational reality, as well as the tensions they might experience whenever they perceive the incompatibility of what they espouse and what they can achieve. The ultimate aim of this research is to explore

1. to what extent and in what ways, in performing their function as mathematics educators, the participants of this study adopt the hegemonic social and educational values;

2. to what extent and in what ways, acting as pedagogues, are these teachers not representative of these values, norms and beliefs but are active agents of resistance; and

3. how the participants are positioned with respect to the discourse that mathematics education undermines social equity and contributes to the reproduction of unequal social structures of power and domination.

In view of my research broad aims as delineated above I situate my inquiry within the critical theoretical paradigm.

3.2.2 Theoretical framework that informs the research questions - Schools as sites of social and cultural reproduction

Critical research has contested the ideologically dominant argument that schools are neutral institutions that provide equal opportunities for all students and promote social and economic mobility (Giroux 1980). In fact, numerous studies have demonstrated that there is a powerful correspondence between social class and educational outcomes and this suggests that an important function of schooling is its contribution to the social reproduction of unequal power relations in society (Apple 1980, Clarke et al. 2000,
Katsikas & Kabbadies 2000, Kyrides 2003, Mylonas 2004). A critical explanation of the differential scholastic student attainment shifts the emphasis from individualistic to social explanations. The former include biological determinism reflected in the ideology of the natural gift (Bourdieu 1966) and a prevailing psychologism (Valero 2002). From a critical theoretic point of view it is argued that specific curricular content, pedagogic and assessment choices make school a site of social and cultural reproduction. A separate brief analysis of these three fundamental dimensions of the school curriculum will elucidate this function of the schooling process.

With regard to curricular content, critical research views the knowledge intended to be taught at schools as historically and socially contingent insofar as this knowledge reflects the product of reconciliation among powerful groups that strive “to impose a definition of the social world which is consistent with their own interests” (Bourdieu 1979). Curricular content is regarded as contingent in another sense inasmuch as it constitutes a selective reconceptualisation of knowledge from the primary context where it was produced to the secondary pedagogical context (Apple 2002). Again, this reconceptualisation is thought to reflect the ideology, the educational aims and the interests of those who have the power to impose it as legitimate knowledge. Hence, formal education is viewed as a process of inculcation of the historically contingent culture of the dominant segments of society, which as it is argued by Bourdieu and Passeron (1970), expresses most consistently the objective material and symbolic interests of the dominant classes or groups. The authors contend that this historically contingent culture is legitimatized by the school’s acquired pedagogical authority, i.e. the historically and socially contingent power to engage in pedagogical action, misrecognised by the practitioners and the recipients to convey legitimate knowledge, and not by its intrinsic superiority over the cultures of other less powerful social groups.

4 Here I use the term culture in its broad anthropological sense.
(Bourdieu & Passeron 1970). According to Bourdieu and Passeron (1970), the key to understanding pupil academic failure is that this legitimation of the dominant culture, translated as school requirements, has differential effects on different groups of pupils depending upon their relative position with respect to the dominant culture. The authors contend that this happens because prolonged socialisation in the context of a social group produces a certain *habitus*, i.e. a durable and transposable system of perception, thinking, appreciation and action schemes which is different for different social groups. Inasmuch as education promotes the culture of the dominant segments of society, the *habitus* of the students who are socially privileged due to their family background functions as *cultural capital* that can be exchanged for academic success, whilst the *habitus* of the students who belong to the unprivileged segments of society largely predetermines their academic underachievement. Moreover, this underachievement is *misrecognised* as natural insofar as cultural capital, which is in fact socially bestowed, is misperceived as an a innate characteristic of the student. Critical research shifts the emphasis away from the established view that academic failure is related to a deficiency in the students’ mental capacities and focuses on the structural characteristics of the educational process and the unequal distribution in cultural and economic capital among pupils of different social classes.

According to Bourdieu, by treating all pupils as if they were equal vis-à-vis a culture-specific curricular content which poses differential cognitive obstacles to pupils of different cultural endowment, the education system “consecrates privilege” by transubstantiating it into merit (Jenkins 1992, p. 70). Crucial in this process is the adoption of a teacher and content centred pedagogy which is little responsive to the learning needs of those students who mostly need it. On the other hand, officially, learner centred pedagogical approaches are only rhetorically recognised when in fact they are discouraged and undermined by overburdened, test-driven curricula (Perrenoud
1989b) and the given uneven distribution in cultural capital between different groups of students in combination with the existence of overcrowded classrooms. As pedagogical efficiency with respect to the entire student population is limited by design, the differentiated educational system, i.e. the existence of the tracking, setting and streaming policies, is not intended to facilitate learning according to ability and interest, as it is officially contended, but is thought by critical researchers to primarily serve the reproduction of the hierarchical and unequal division of labour and of the unequal power relations in society (Rosenbaum 1980). To support their position, critical researchers cite abundant research findings which suggest that the academically orientated tracks and the “high-ability” groups are overrepresented by students who belong to the higher social strata, whilst vocational and professional tracks, as well as “low-ability” groups are overrepresented by pupils who originate from the less privileged social classes and groups (Ireson & Hallam 1999). On the other hand, for the same reasons analysed above, within the structural bounds of the existing distribution of power in society, neither the comprehensivised, non-differentiated secondary educational systems can adequately address the social equity problem (Hickox 1982). An illustration of this is provided in the Greek educational context, where as a result of the teachers’ social promotion policies, almost all students who enter the Greek lyceum usually graduate but a good portion of them, mostly those deprived of the required cultural and economic capital, is denied access to higher education insofar as the number of university places is limited and predetermined.

From the point of view of critical research, assessment, the third curricular dimension of major importance, primarily serves to legitimate the social and cultural reproductive function of education which is considerably biased in favour of the most powerful social classes and groups (Husen 1975). Once the unequal distribution of cultural capital among pupils of different social classes is obscured by the ideology of
inborn high intelligence or by the meritocratic claim about the existence of equality of opportunity, important and socially consequential decisions are made by means of the assessment procedures (Katsikas & Kabbadias 2000). The latter appear to fairly and objectively provide a justifiable basis for the establishment of a hierarchy of excellence that is intended to serve for the allocation of unequally desired roles in the social division of labour (Broadfoot 1996). It should be emphasised that from the point of view of critical theory this division of labour reflects the economic, political and cultural distribution of power in society and as such it does not represent the interests of the entire society. The assessment procedures used for certification purposes legitimate decisions, such as grade retention and curricular differentiation, which foster the inequality of opportunity insofar as they negatively affect students who belong to the less privileged social strata to a disproportionate degree than students of privileged social origin. This legitimation is sanctioned not only by the wider society by my most pupils themselves who often accept the school verdict as a natural consequence of fate and not as a social construction which in fact is the case. In the Greek educational context, this slow process of student attrition carried out methodically by a series of assessment-generated obstacles culminates in the high-stakes national examinations that regulate entry into higher education. With regard to these examinations, hegemonic discourses have managed to conceal the socially discriminatory function of this selection process by diverting public attention to its more technical aspects such as the existence of the same test items for the whole pupil population, the alleged objectivity of the grading process by a body of graders who do not grade the examination papers of their students but papers from different districts of the country, and chiefly by safeguarding that no test items will be given beforehand to any favoured individual pupils or to a private tutoring institution. This is mostly feared by a public opinion
distrustful of the state due to widespread phenomena of clientelism and favouritism often typical of state practices in Greece (Korovinis 2009).

Critical social theorists have debated on the role of teachers in mediating curricular intentions. The representatives of the structural tradition view the transcendence of institutional constraints in teachers’ consciousness as confined to an alert minority, while the majority is seen to be “crushed” in a more or less deterministic fashion by the systemic imperatives (Althusser 1971). On the other hand, critical researchers who belong to the neo-Marxist tradition view social institutions as characterised by contradictions which “open spaces for students and teachers to resist mechanisms of social control and domination and to create alternative cultural forms” (Margolis et al. 2001). I lean towards the structuralist viewpoint as far as the essential characteristics of the dominant social paradigm are concerned, namely those core beliefs, ideas and values that are dominant (or tend to become dominant) in a particular society at a particular moment of its history, as most consistent with the existing political, economic and social institutions (Fotopoulos 2003). However, I would see ample space for teacher resistance and variation at the individual and collective level in less cardinal aspects of the school curriculum that do not threaten the logic of the established values. In leaning towards structuralism, I make one qualification to the effect that the material structures do not determine in a law-like fashion but condition or suggest the forms human consciousness may take. In any case, this does not alter the fact that once formed and crystallised within a social formation, the core social meanings generally are not challenged, at least in the “normal phase” (Kuhn 1962) of the social paradigm (Fotopoulos 2003).

I have referred so far to what has been called as the overt curriculum. Two more important aspects of the school curriculum have been distinguished in the literature as contributing to the reproductive function of the process of formal education in their own
particular ways. The first aspect is related to the notion of *hidden curriculum* which refers to “those unstated norms, values and beliefs embedded in and transmitted to students through the underlying rules that structure the routines and social relationships in school and classroom life” (Giroux 1983, p. 47). The importance of the hidden curriculum lies in that it conveys tacit assumptions and implicit values that are more effectively transmitted than the knowledge and ideology contained in the explicit curriculum. The extent to which the values, norms and beliefs contained in the implicit curriculum are efficiently inculcated has been an object of theoretical debate. Through their empirical studies, Bowles and Gintis (1976) seem to confirm the potency of this inculcation process, while, on the other side, Giroux (1980) and Apple (1980) suggest that these values and beliefs may be actively and creatively resisted by students depending upon their cultural background.

The second aspect refers to what is *not* taught at schools implying that each particular choice of omission has an ideological directionality. Through his notion of the *null curriculum*, Eisner (1994, quoted by Flinders *et al*. 1986, p. 34) views what is silenced not simply as a “neutral void” but as something which “has important effects on the kinds of options one is able to consider, the alternatives that one can examine, and the perspectives from which one can view a situation or problems”.

### 3.2.3 The research questions

The theoretical framework described above suggests the following research questions: For the social function of assessment:

1. What are the teachers’ views of the purpose and consequences of tests and of high stakes summative testing?

2. What are the teachers’ views of the role and meaning of grades and what are their criteria for assigning grades?
3. What are the teachers’ views of the purposes and consequences of grade retention?

The first two questions examine what aspects of the issues related to promotion, curricular differentiation, graduation, selection for higher studies, pupil, teacher and school accountability appear in the teachers’ answers and how they are related with the equity issue. The third research question leads to the debate of grade retention versus social promotion. This issue is related to assessment in two senses. First, it is assessment results that grade retention is decided upon. As we have said, the major socio-political significance of school-imposed grade retention as related to the equity issue lies in the fact that it is imposed disproportionately on poor and minority students resulting in their alienation from school and a sharply increased likelihood of eventual dropout (Brophy 2006). The second sense in which it is related to assessment is that the social promotion practice has the effect of nullifying assessment results in the name of equity. Hence, the teachers’ position on this issue is intended to be used as indicative of their sensitivity towards inequality of opportunity in education.

For the pedagogical function of assessment the research questions are:

1. What are the teachers’ formative assessment practices and their underlying rationale?

2. What are the teachers’ evaluations of the degree to which they are satisfied with the picture they form of their pupils’ knowledge of mathematics and with the action they take to provide differentiated, individualised learning within their classrooms?

3. What are their reflections on the results of this evaluation?

The first question provides the background against which the teachers’ answers to the second and third question will be seen. The second question is not confined to the psychology of learning. Insofar as pupils are not equally socially endowed to address
curriculum requirements and since no compensatory programmes exist as it is the case of Greece, then the role of formative assessment assumes socio-political significance insofar as formative assessment feedback are the only means left to provide some compensation for the differential readiness of the pupils to cope with curricular demands by providing formative assessment feedback to the needier who usually come from disadvantaged social backgrounds and receiving feedback from them. The third research question is intended to examine how the conflict between the uniform curriculum requirements and the differential learning needs of the pupils is experienced, if experienced at all, and in the positive case if it is interpreted by the teachers in terms of the established values and beliefs or in a way that challenges the current logic of schooling. Also in the negative case the research objective will be to uncover some of the reasons for which the teachers do not perceive such a conflict.

Any discourse about assessment necessarily involves that which this process assesses. In our case it is the extent to which each pupil has achieved the learning objectives of the mathematics curriculum. It follows that the teachers’ views of the nature of the mathematics curriculum and of its broader social orientation and aims are a necessary ingredient of their views of the socio-political dimension of assessment as they provide the general framework within which all their statements about any assessment-related issue acquire specific meanings. From the critical theoretic perspective the crucial question that has to be answered about the curriculum is what interests, values and ideologies are embedded in the curriculum (Apple 1980). Different answers to this question give different directions to the socio-political purpose and hence to the significance assessment has as a servant of the curriculum. Hence, the last research question to be added is
1. what are the teachers’ perceptions of the orientation\(^5\) of the curriculum and how are they positioned with respect to it?

3.3 Choice of research paradigm

Disciplined inquiry is guided by a set of basic assumptions about reality (Guba 1990). The foundational basis of any research paradigm consists of the fundamental ontological, epistemological and methodological assumptions accepted within the paradigm (Guba and Lincoln 1994). In short, *ontology* is concerned with the nature of reality, *epistemology* refers to the assumptions concerning the nature and derivation of knowledge, the scope of knowledge and the reliability and validity of claims to knowledge (Carspecken 1996), and *methodology* provides a theoretical perspective that allows specific methods, instruments, and techniques to be selected to obtain knowledge of the object of investigation (Ernest 1997). In this study I follow the critical theoretic paradigm drawing on the Bourdieuan conflict theory perspective.

Bourdieu’s social ontology recognises the centrality of social relations to social analysis (Jenkins 1992). To conceptualise social reality Bourdieu uses the “critical metaphor” (DiMaggio 1979) of the “field” which is construed as a structured space of positions (Wacquant 2006). These positions are occupied either by individuals or institutions by their “present and potential situation in the structure of the distribution of species of power (or capital) whose possession commands access to the specific profits that are at stake in the field” (Wacquant 1989, p. 39). The position of a given agent within the social space is defined by the positions this agent occupies in the different relatively autonomous fields, that is, in the distribution of the powers that are active within each of them (Bourdieu 1985). According to Bourdieu (1985) the more important kinds of capital are (a) the economic capital which defines the strongest field to which

\(^{5}\) Cheung and Wong (2002) defined curriculum orientation as a collective set of beliefs about curriculum elements such as curriculum intent (aims, goals and objectives), content, teaching strategies and instructional assessment.
the other field are more or less subordinated, (b) the cultural capital, (c) the social capital, and (d) the symbolic capital, commonly called prestige, reputation, or renown. Each field is an arena of conflict through which agents and institutions seek to preserve or overturn the existing distribution of capital (Wacquant 2006). Social space which contains all fields is not a static entity insofar as fields are “historical constellations” that undergo transformations and may even “perish over time” (Wacquant 2006, p. 269).

To build a theory of subjectivity Bourdieu transcends the objectivist/subjectivist dichotomy. Objectivism is associated with the belief that social reality consists of sets of relations and forces that impose themselves upon agents, irrespective of their consciousness and will. On the other hand, subjectivism gives primacy to individual representations and is based on the assumption that “social reality is the sum total of the innumerable acts of interpretation by means of which the members of a particular community jointly construct meaningful lines” of action and interaction (Wacquant 2006, p. 267). Bourdieu contends that the objectivist and the subjectivist positions stand in a dialectical relationship. On the one hand, the objective structures of social space “form the basis for the people’s representations and constitute the structural constraints that bear upon their interactions” (Bourdieu 1985, p. 15). As it is argued by (Bourdieu 1985, p. 728)

The categories of perception of the social world are, as regards their most essential features, the product of the internalisation and incorporation of the objective structures of social space.

On the other hand, there is an idiosyncratic element in these representations owing to each individual’s trajectory in social space and the way he or she has interpreted, combined and reproduced^6^ competing discourses while engaged in social action and interaction. The transcendence of the objectivist/subjectivist dichotomy implies that social theory must not be confined to the analysis of objective structures of the various

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^6 Gates (2000, p.92) argues that insofar as reproduction allows for some variation and diversity, it should not be assimilated with replication.
fields but must also “take into consideration people’s representations of social reality in order to provide insights into the daily struggles, individual and collective, which aim to transform or to preserve these structures” (Bourdieu 1989, p. 15).

The implications of the above methodological considerations for this study are that the research participants are considered as social beings imbued by the culture, history and mental climate of their time and place. Hence, their conceptions of assessment are not seen as products of their pure subjectivities as if they lived in a social vacuum (Gates 2002). As Mannheim (1936, quoted in Gates 2002, p. 146) argued, instead of saying that the single individual thinks, it would be more appropriate to say that “he participates in thinking further what other people have thought before him”. Moreover, as Castoriadis (1987) contends, the degree of personal originality depends on the individual’s level of reflection and critical awareness, on their ability to critically examine competing discourses and to consider existing alternatives in order to shape their personal outlook and make informed decisions. As this study unfolded by covering a broad area of issues that are intimately related to the assessment of pupils’ mathematical knowledge, I sought to uncover in the teachers’ conceptions the interplay between the social and the personal and what seemed to me to be their contributions to the ongoing educational dialogue, through their alliances with and their resistance to dominant discourses.

Critical epistemology is transactional insofar as the investigator and the investigated object are assumed to be interactively linked (Guba & Lincoln 1994). Moreover, it is subjectivist in view of the following premises: (a) social thought is mediated by power relations (b) facts can never be isolated from the domain of values (Kincheloe & McLaren 1994), (c) symbolic representations are never just a matter of symbols corresponding to objective reality because social relations involving forms of power are always entailed in any representations (Carspecken 1996), and (d) people
construct their knowledge of the world on the basis of their interactions and relationships to other individuals and to the dominant forces in society (Gates 2000).

Finally, critical methodology is dialogic, establishing the epistemologically necessary interaction between the observer and each participant. In addition, critical researchers view this dialogue as dialectical in nature to the extent that this dialogue needs to uncover and potentially transform culturally and socially situated norms (Gates 2000). Criticality refers to a principled sceptical stance towards the existing political, economic and social arrangements which are supportive of the unequal distribution of power in society and thus are socially unjust. The nature of these arrangements is not always transparent insofar as they are institutionally justified by a system of beliefs, norms, values and conceptions which tend to be dominant, i.e. more or less shared or imposed by those in power, in each society at a particular moment of its history. This condition primarily works to the benefit of the dominant social groups which exercise hegemony over all the major social spheres, i.e. the social, political, economic and cultural realms (Giroux 1980). Hence, from the critical researcher’s perspective, being critical means to critique the unequal distribution of wealth, power and opportunities within societies, and to work towards the establishment of genuine democracy which guarantees the existence of the necessary conditions for all people to participate in the creation of meanings and values, and in the decisions regarding the issues that concern their collective existence (Apple 1990). This participation should not only be a formal prerogative but should be ensured by the construction of a democratic institutional framework which would educate (in the broad sense that goes beyond formal schooling) all members of society in order to be critically thinking, empowered and informed democratic citizens capable of sufficiently interrogating, reflecting and deliberating upon all the substantial social issues that are of their common concern (Fotopoulos 2003).
It follows from the above considerations that the critical research orientation requires that we locate the educational issues within a wider social context by viewing education as a social institution which is intimately tied to existing economic, social and political institutions, as well as to conflicting material and ideological interests of various social groups that strive to gain representation in the shaping of the educational process (Apple 1980). As it is argued by Cohen et al. (2003), the educational researcher who conceptualises, conducts and analyses educational research from this critical perspective primarily seeks to examine how an education system reduces or perpetuates inequality, who defines worthwhile knowledge, whose ideological interests this serves, how this reproduces societal inequalities, how power is produced and reproduced through education, whose interests are served by education and whence they derive their legitimation.

3.4 The case study approach

Case study is not a methodological choice but a choice of what is to be studied (Stake 2000). According to Ernest (2005), a case study explores the unique features of a complex particular case in all its richness, clarifying relationships and pinpointing critical processes in order to arrive at a thick description of the case that could serve as an exemplar illustrative of something more general. With respect to the investigation of my research participants’ belief systems, this passage from the singular to the universal shows the individual’s possibilities and limits within a culture (Clark 2004). The case study approach is used when the research objective is the production of a holistic understanding of a particular case (Meyer 2001), which is achieved not by controlling variables but by observing all pertinent variables and their interacting relationships (Dooley 2002). At this point it is useful to make reference to Yin’s (2003, p. 13) characterisation of the case study as “an empirical enquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between
phenomenon and context are not clearly evident” is relevant. His remark admirably captures the essential character of my specific inquiry, insofar as a teacher’s educational viewpoint is a result of a dialectical interplay between two not clearly distinguishable realities: on the one hand, of a whole world of social meanings, conventions and ideological influences with which the subject is imbued as he/she is actively engaged in everyday life situations embedded within existing social structures within and outside the educational field; on the other hand, there is an idiosyncratic dimension in the constitution of social identities owing to the specific ways individuals construct their subjectivities within a social context by interpreting their personal experiences.

Following Stake’s (1994) classification of case studies according to their purposes, the present three case studies can be qualified as *instrumental*, insofar as the particular cases, namely a small sample of the Greek mathematics teachers, are of secondary interest essentially playing a supportive role in enhancing our understanding and sharpening our insight into the broader issue of how and to what extent inequity is legitimated or resisted within the educational field. Thus, the conceptualisation of the study should be embedded in some social framework that transcends the case itself (Gates 2000). This is in line with Yin’s (2003) concept of analytic generalisability which refers to generalisations to theoretical propositions and not to populations or universes. This specific kind of generalisability is meant to be distinguished from statistic generalisation which enumerates frequencies (Yin 2003) and from the construction of predictive theories and universals which are not thought to be applicable to the social sciences (Flyvbjerg 2006).

3.5 Data collection methods

To collect my research data, I used the two basic tools that are frequently used in qualitative research, namely interviews and direct observation (Patton 2002). I start with a theoretical overview of the interview and observation methods and their limitations.
3.5.1 Interviews

The dialogic dimension of critical methodology is best served by the interview as a means to explore the participant’s feelings, thoughts and intentions which are not directly observable by the researcher (Patton 2002). Munby (1984) emphasised the appropriateness of the interview in studies involving beliefs and attitudes, arguing against traditional belief inventories that cannot encompass the contextual richness which may provide an explanation as to how beliefs may influence behaviour. From an abundance of categories cited in the literature (Cohen et al. 2003), I distinguish three approaches to collecting qualitative data through interviews. The informal conversational (or unstructured or open) interview relies entirely on the spontaneous generation of questions in the natural flow of interaction. As it is argued by Patton (2002), this approach increases the salience and relevance of questions but is less systematic and comprehensive if certain questions don’t arise “naturally”. The semi-structured interview starts with a pre-devised schedule but allows participants to raise and pursue their own issues and themes. The framing of questions for a semi-structured interview anticipates prompts that enable the interviewer to clarify topics or questions, and probes that enable the interviewer to ask respondents to extend, elaborate add to, provide detail for, clarify or qualify their response (Cohen et al. 2003). As it is argued by Kvale (1996), the lack of predetermined rules and the openness and flexibility characterising this type of data collection create an ample field of opportunity for the interviewers’ skills, knowledge and intuition in order to seek and obtain knowledge about the subject’s mental world. Finally, in the standardised open-ended interviews the exact wording and sequence of questions are determined in advance. The structured interview is useful when the researcher is aware of what she does not know and therefore is in a position to frame questions that will supply the knowledge required
(Cohen et al. 2003). In this study I have used both open and semi-structured interviews depending on specific contexts and my research purposes in these contexts.

Although the prevalent research tool by means of which dialogue can unfold is considered to be the interview (Wengraf 2001), the permissible form of this dialogue has been an object of heated debate. According to Holstein & Gubrium (1995), the advocates of the traditional method in interviewing maintain that the researcher must seek to render the subject’s perspective which is supposed to be truthfully and accurately communicable and available to the interviewer by means of an open and undistorted communication between the two parties. From this standpoint, the interviewer is presumed to be able to represent the participant's view fairly and to portray it as consistent with his or her meanings (Charmaz 1995, quoted in Silverman 2001). This entails, for purposes of validity, that the interviewers not impose their own categories for organising the world (Patton 1990) by providing any positive or negative feedback to the research participants as an active response to the specific content of their answers, thus leading them to hitherto unconsidered aspects of the issues under exploration (Fowler & Mangione 1990). On the other hand, proponents of active interviewing such as Holstein & Gubrium (1995) contend that respondents are not so much repositories of ideas as they are constructors of knowledge obtained in a collaborative process in which interviewers are actively involved. Therefore, the authors advocate that the active interviewer must deliberately “provoke responses by indicating narrative positions, resources, orientations, and precedents for the respondent to engage in addressing the research questions under consideration” (Holstein & Gubrium 1995, p. 39). The authors emphasise that the objective of this approach is not to dictate interpretation but to activate the subjects’ different aspects of their “stock of knowledge”. I used both approaches to interviewing each one in the appropriate contexts to fit my research purposes as I will explain below.
Notwithstanding its merits, the interview is not usually used as the sole source of evidence. Among the problematic features of the interview situation that restrict the scope of the interview as a data gathering instrument we can name the following: respondents may have difficulties to linguistically convey the desired meanings (especially when the research theme involves a theoretical conversation), they may present an idealised version of their thoughts and actions (Thompson 1984), or they may desire to withhold part of the relevant information. Moreover, it is impossible to bring every aspect of the encounter under rational control (Cohen et al. 2003).

3.5.2 Classroom observation

As it is argued by Hammersley (1986), classroom research has been characterised by a diversification of approach and an intensification of debate about theoretical and methodological issues. Early approaches to classroom observation were theoretically supported by behaviourist psychology and were intended to provide detailed knowledge about the organisation of classroom interaction (Edwards & Westgate 1994). Emphasis was placed on a systematic observation and recording of specific classroom events by a procedure characterised by the explicitness of purpose elaborated before data collection is conducted, the explicitness and rigour in the definition of categories as well as the criteria for classifying phenomena into these categories, and the production of quantitative data to be processed independently of a particular observer by using statistical techniques (Croll 1986). If the classroom characteristics under investigation can be coded unambiguously according to the operational rules and criteria which define the variables and categories, we speak of low-inference measures. On the contrary, high-inference measures such as rating scales involve a personal judgment on the part of the observer (Croll 1986).

The employment of systematic observation has served to provide a representative description of classrooms, to measure teaching effectiveness, to monitor teaching
approaches, to enhance in-service teacher education programmes (Croll 1986), and to investigate instructional inequities for different groups of pupils (Hilberg 2004). The range of classroom characteristics investigated includes the teachers’ and pupils’ personal traits, verbal and non-verbal interaction, the nature of learning activities, teacher management patterns, teacher professional skills, teaching aids, the affective and cognitive dimensions of classroom activities, as well as sociological issues involving the classroom as a community of practice (Wragg 1994).

The scope of systematic observation is limited to the quantifiable aspects of classroom realities and it is within its range of applicability that it exhibits its methodological strengths. On the other hand, there are dimensions of classroom life which cannot be captured by the systematic observation techniques which rely upon the outside observer’s frame of reference and interpretations (Hitchcock & Hughes 1989). The ultimate purpose of the ethnographic approach to classroom observation is to deal with these missing dimensions by providing a description, elaboration and analysis of the actors’ perspectives and understandings (Hitchcock & Hughes 1989). To achieve that aim the ethnographers are not confined exclusively to a usually prolonged observation of classroom activities but in addition they conduct interviews, distribute questionnaires and examine relevant documents. Ethnography uses a holistic framework embracing the complexity of the situation under study (Delamont & Hamilton 1986) and moves from detailed description to the identification of concepts and theories which are grounded in the data collected within the field (Pole & Morrison 2003). Ethnographic educational research has contributed to the elucidation of issues related to culture, to neighbourhood, to the backgrounds of children and staff, to class, status, ethnicity, and gender, to the minutiae of everyday interaction and to the particular contextual meanings and significance of events and activities of the school and classroom to members themselves” (Hitchcock & Hughes 1989, p. 120).

Some advocates of systematic observation have expressed their critique on qualitative approaches on the grounds that they can be subjective and unreliable (Croll
1986). Also some ethnographic observers have disputed the objectivity of the results of systematic observations and have questioned the adequacy of quantitative approaches in the sense that by focusing on the classifiable and measurable aspects of the classroom learning environment they miss out the essential and most important aspects of classrooms life (Croll 1986). On the other hand, as it has been argued by McIntyre and MacLeod (1986), the two approaches should not be seen as incompatible but as complementary strategies for explaining what happens in the classrooms. Croll (1986) refers to studies that illustrate how preliminary qualitative observation can provide researchers with procedures, definitions and hypotheses that can be used in constructing adequate research instruments for subsequent systematic observation and inversely how the outcomes of systematic observational research may furnish a starting point for a subsequent ethnographic investigation by showing statistical regularities in patterns of behaviour and interaction which may be further elucidated and explained in terms of the understandings and perspectives the participants have of them.

A psychologically and cognitively oriented ethnographic tradition based its methodology on the assumption that individuals possess meaning structures that determine much of their behaviour. Hence, according to these ethnographers, research seeks to discover what these meaning structures are, how they develop, and how they influence behaviour, in as comprehensive and objective a fashion as possible (Wilson, 1977, p. 254). Major proponents of this approach are Shavelson, Shulman and Elstein (Shavelson & Stern 1981). Apart from the observational data usually transcribed from audio or video recorded lessons, these researchers used stimulated recall interviews to elicit the teachers’ self-reports of their thoughts, judgments and decisions during the lesson (Borko et al. 2008). Representative of this tradition in mathematics education is the work of Schoenfeld (2000) which is grounded in five different areas of study: intelligent tutoring systems and artificial intelligence, “human factors” models of
tutoring, studies of tutoring and teaching, at the “planning” and script-or-schema levels, studies of teacher knowledge, and studies of beliefs, values, and goals. This cognitively oriented ethnographic approach is the one adopted in this study. Details are given in section 3.8.

3.6 Data collection process

The data collection process for this study consisted of the following phases. For each teacher, the first phase consisted of three semi-structured, approximately two hour interviews some of which were held in school and some in the participants’ houses. In the first interview, I explored each teacher’s conceptions of the nature of mathematics and their views of the Greek mathematics curriculum. In the second interview, I explored each teacher’s theory of teaching and learning. The primary purpose of these interviews was to serve for the construction of each teacher’s model. Details on this construction are given in the next section. Finally, in the third semi-structured interview, I investigated each teacher’s conceptions of testing, of the purpose and impact of high-stakes testing, as well as each teacher’s conceptions of the role and meaning of grades and their criteria for assigning grades, and finally their views of grade retention. Appendix 3 provides the interview questionnaires that guided the data collection in these interviews with the teachers. In these interviews I followed the traditional interview approach as it was defined earlier. I chose not to challenge the participants’ views in real time by presenting counter arguments or material that would stimulate a reaction on their part as it is suggested by Holstein and Gubrium (1995) in the context of an active interview. This way I wanted to discern what parameters were foregrounded by the teachers themselves in each issue and theme. Concerning the first two interviews, at a later stage, in our discussions in the context of classroom episodes, I could see how functional these parameters were in their interpretative schemes and the rationale that guided their pedagogical actions. As for the third interview, the teachers’ ideas were
discussed more actively in the critical interview the purpose of which will be explained below. At the end of each interview, I gave each teacher the transcribed interview content and asked them to read it and make any revisions in their answers that they thought necessary. Thus I gave them an opportunity to reflect on the adequacy of their answers in terms of their own conceptualisations of the issues in question. The revised material was communicated to me in follow up interviews in which the teachers answered some additional questions, whenever I thought, upon reflecting on the content of their answers of the original interview questions, that I had missed an opportunity to ask something essential.

The second phase consisted of a series of non-participant observations of ten randomly chosen lessons from each participant. The observations of these selected lessons taught by each of my three research subjects took place from 4 October 2005 to 2 November 2005 for Nikos’s lessons, from 17 February 2006 to 21 March 2006 for Antonis’ lessons and from 25 January 2006 to 15 February 2006 for Giorgos’ lessons. I obtained data from those observations by using two methods. The first one was a digital audio recorder that was placed on my desk situated in the last row of the pupil desks. The audio recorder was intended to capture the entire classroom discourse. The second method was to keep field notes in a journal. The primary purpose of the field notes was to compensate for the loss of optical information that could not be captured by the audio recorder. To this end, I took exact notes of all the mathematics content that was written on the board in my field journal making sure to distinguish what part of this content was written by a pupil and what part was contributed by the teacher. All the observed lessons were fully transcribed. The field notes also contained information as to the number of hands raised in each teacher question and the particular pupil answering each specific question. This information served as indicator of classroom participation.
To capture the teachers’ cognitions during the proactive stage of each lesson, preceding each lesson each teacher was interviewed in order to elaborate on his lesson image. Schoenfeld (2000, p.250) describes the teacher’s lesson image as “everything the teacher envisions happening in the lesson – the day’s sequence, the forms of interactions with students, what is flexible and what is not and his or her sense of how the discussion will go”. To have immediate feedback on the teachers’ thought processes during instruction, after each lesson in an open interview teachers were asked to make free comments on the incidents and processes of the particular lesson commenting on anything they thought of importance. On the same day, a stimulated-recall interview was held during which, as the teachers listened to the tape, they were asked to stop the tape and comment freely whenever they thought that they had something to say on any part of the instruction and on their thought processes at that time. At the end of the listening to the tape, as part of the postactive stage of the lesson, each teacher was asked to evaluate how the lesson went and to specify if they would do anything differently the next time they would teach the same lesson. Finally, interviews were held after the transcript of each lesson was produced and as soon as I had done a preliminary analysis of the lesson to be presented to the teacher for discussion. In addition, in each of these interviews I asked the teachers to evaluate the degree to which they were satisfied with the picture they formed of their pupils’ knowledge of mathematics and with the action they took to provide differentiated, individualised learning within their classrooms. At the end of these interviews, a final interview was held in which I asked the teachers to reflect on the significance of the results of their evaluations made in the previous interviews.

After the integration of the data derived from all planned sources, one “critical interview” for each teacher was conducted after the analytic process was completed but not yet finalised. These interviews were active in character in the sense defined earlier
and were intended to stimulate a discussion on the whole range of my interpretations of each participant’s views with the participant, to give opportunities to both parties to provide further elucidations of our positions, and to provide ground for debate on some disputed issues. For this latter objective, I had planned to have the teachers react to the inequality of opportunity discourse and to the social reproductive theory of education but the exact prompts I used were not determined in advance. Instead, I was guided by the data analysis that preceded each critical interview and the issues that had already been raised by the teachers.

3.7 Data analysis

The traditional ethnographic approach to studying a social phenomenon, usually followed by social anthropologists and social phenomenologists, would consist in entering the field with an inductive and loose design and a minimal idea of what the important research questions are (Miles & Huberman 1984). At the other end of the spectrum, there are qualitative studies that follow tight and pre-structured designs. As it is argued by Miles & Huberman (1984), the first approach is appropriate when the part of social reality studied is considered too complex, too exotic or too relative, whereas the second approach is more suitable for the study of phenomena that are more familiar to the researcher and when the researcher has a fairly good idea of what to look for. My choice was situated towards the latter end of this spectrum. My research questions explicitly defined the main dimensions that delimited my area of inquiry and bounded my collection of data. As it argued by Miles & Huberman (1984, p.28),

Focusing and bounding data collection can be seen usefully as anticipatory data reduction; it is a form of preanalysis, ruling out certain variables and relationships and attending to others.

The text under analysis came from the following sources: the initial three interviews that preceded the lessons observations, the pre-active, interactive and postactive interviews that referred to the observed lessons, the transcripts of the observed lessons, my field notes associated with the lessons observations, the interviews that discussed
my analyses of the lessons transcripts with the teachers, the interview that referred to the teachers’ evaluations of the picture they form of their pupils’ mathematical knowledge through their formative assessment practices, and the transcript of the critical interview.

Before I describe how the analytic process was carried out, a few words must be said about the problem of translating interview material from Greek to English, as well as my method of addressing this issue. To start with, the excerpts upon which the presentation and interpretation of the teachers’ views was based were selected from the source text inasmuch as they were judged to best answer the research questions worked out in the design of the study. The final selection was made after the entire text was read and listened to several times in the source language. Although, from the point of view of its translation to the target language, the selected text presented a semantic and stylistic diversity, the bulk of this text was characterised by a high degree of translatability in the sense that equivalent words, terms and expressions were readily found, ensuring that the meaning of the original was faithfully recast albeit in a new linguistic form (Neubert & Shreve 1992). As it is argued by Newmark (1991), notwithstanding the differences in frequency, usage and connotations words have in a specific language as compared to other languages, the great majority of non-cultural words have satisfactory equivalents among languages, especially if the latter reflect cultures that exhibit a large degree of similarity. This is especially true in the field of mathematics education where the countries that belong to the Western civilisation share a core of common principles and conceptualisations. Apart from the particular nature of the semantic content and style of this part of the source text that facilitated the translation task, another contributing factor to a faithful rendering of the material was the translator’s expertise in both the source and target languages as restricted to mathematics education. In this respect, I have profited from my professional experience in translating from English into Greek, insofar
I have translated three books related to mathematics education for the Katoptro publications (Vilenkin 1997, Lang 1997, Lang 1998), and I also have translated Ian Stewart’s column in the Scientific American on a regular basis for the Greek version of this magazine.

Despite the fact that the translated interview material reflected oral speech, all three teachers by and large used standard language containing few colloquialisms that would pose serious difficulties in their translation, as well as few idiomatic expressions. Where any difficulties occurred, I discussed them with two colleagues who teach English as a foreign language to Greeks and with two relatives whose mother language is English. Naturally, I used a plethora of electronic dictionaries and thesauruses available but also used the internet as a means to test my constructions whenever I was not sure of their appropriateness. Including a phrase in quotes in a search engine gives all the texts where this phrase has been used in the web and thus provides innumerable opportunities to test whether and in what frequency particular phrases have been used, as well as to see phrases in various contexts.

Returning to the textual analysis, the entire text was subdivided into two subtexts. The first subtext consisted of all the excerpts of the first three interviews that referred to the following thematic areas: the teachers’ views regarding the aims of the mathematics curriculum, the purpose and impact of tests and high stakes testing, the role and meaning of grades, and grade retention. In addition, it consisted of all those excerpts derived from the pre-active, interactive stimulated-recall, and postactive interviews in the context of the lessons observations which were thematically related to the thematic areas mentioned above. Finally, it consisted of the transcript of the critical interview.

The analysis of this first subtext consisted of the following phases. In the first analytic step I categorised the body of data according to the above predetermined thematic areas. As it is argued by Hatch (2002), this can be done by reading the data
through completely with one thematic area in mind or by assigning in each chunk of data the code that corresponds to the appropriate thematic area it is related with. I chose the latter option going through the text with all the thematic areas in mind simultaneously. The result of this process was to create new files each associated with a specific thematic area out of the start list. It should be noted that files that corresponded to different thematic areas contained some common chunks as the latter referred to more than one thematic area.

In the second step of the analytic process I worked within each of the thematic areas at a time. In each thematic area I selected those excerpts that were intended to be used in the analysis as providing answers to what I was looking for. For each excerpt I gave an accurate description, in a summary form, of what each teacher said in his own terms. This was intended to give a quick way to refer back to the original data as analysis continued. This description also provided the context out of which the excerpt had been extracted. In looking for meaning within the data from each thematic area, I had already a good idea of the patterns, relationships and themes that might be present in the data and the dimensions I sought to investigate (Hatch 2002). As it is remarked by Gates (2000, p. 262), “I was not trying to develop constructs and themes ab initio grounded in the data” but “the themes I began to be sensitised to were informed” by my review of literature and my analysis of the role of school in social reproduction both of which served as a conceptual framework for this study. This did not preclude the possibility of the generation of additional themes and categories that had an emergent nature and were pertinent for the broad purpose of the study. At this stage, I started using memos to keep a record of my thoughts, interpretations, questions, and directions for further data collection in the appropriate instances provided in the contexts of the lessons observations (Strauss & Corbin 1998).
At the third stage of the data analysis process, I looked for patterns and relationships within and across thematic areas in order to determine how the meaning conveyed by one discourse segment was related to the meaning conveyed by another discourse segment to form new patterns of meanings. In this process, I gradually constructed the *topography* of each participant’s system of beliefs that has to do with the particular arrangement of the beliefs that comprise a teacher’s viewpoint into central and more consequential beliefs with varying degrees of influencing other beliefs and the peripheral beliefs which do not affect other beliefs in a substantial way. Finally, at this stage I looked for the *logical consistency* of the text meaning which is understood in much the same way as it is used in logic but with one qualification: While in logic a contradiction is not permissible within a logical system, and its existence there undermines its truth claims, from the point of view of an ideological analysis of a text, it may reveal the lack of the participants’ critical reflective awareness, i.e. their inability to critically examine competing discourses and consider existing alternatives in order to shape an autonomous personal outlook (Castoriadis 1987). Moreover, logical inconsistency may reflect existing tensions within the participants’ consciousness due to dilemmatic situations that owe their existence to the conflictual and even contradictory nature of the social context within which the subjects are embedded. Logical inconsistencies may reveal ideological influences and in this respect they received further analytic treatment at a later stage in the analytic process.

At the final stage of the analytic process which aimed at a deeper level of analysis, the meaning of the text was approached through an interpretative process which is considered as doubly hermeneutical in the sense that the researcher interprets a pre-interpreted domain, i.e. the participants’ interpretation of a part of the social world and their place in it (Danermark *et al.* 1997). From the point of view of the critical theoretic paradigm, the salient characteristic of this interpretative process is the ideological
analysis of the texts. Here I adopted Thompson’s (1984) perspective according to which the study of ideology consists in identifying and analysing the ways in which meaning serves to establish and sustain relations of domination. This ideological analysis consisted of the following two principal phases corresponding to different ideological aspects or dimensions of the texts: the formal analysis or analysis of surface features of texts and the explanation phase.

Following Thompson (1990) and Fairclough (1989), in the first phase my aim was to focus on the formal analysis of the structural features and relations of discourse which facilitate the mobilisation of meaning. This kind of analysis proceeds by detailed line-by-line analysis of the selected textual pieces, what Strauss & Corbin (1998) in a different context called “microanalysis”, which looks at the ways in which syntactic and grammatical forms operate ideologically in discourse. Appendix 4 supplies a framework elaborated by Fairclough (1989) focusing on vocabulary and grammatical choices that was selectively used in the critical analysis of formal features of a text. Moreover, in this phase mechanisms were traced in the text through which ideology (in the critical sense mentioned above) operates. Gates (2000) contends that the detection of such mechanisms in a text may be helpful in uncovering subconscious or unintended influences and effects. Thompson (1990) distinguished the following five such modes of ideology operation, each mode with its own sub-categories (the content of each mode and sub-mode is supplied in Appendix 5).

1. Legitimation (rationalisation, universalisation, narrativisation)
2. Dissimulation (displacement, euphemisation, trope)
3. Unification (standardisation, symbolisation of unity)
4. Fragmentation (differentiation, expurgation of the other)
5. Reification (naturalisation, eternalisation, nominalisation/passivisation):
The second phase had “explanatory” nature and built on the previous phase but its main objective was to depict discourses as parts of social practices, revealing how they are conditioned by social-historical factors, and moreover to show what reproductive effects discourses can cumulatively have on those social institutions and structures, sustaining them or contributing to their transformation (Fairclough 1989). According to Fairclough (1989), when explaining a particular discourse the researcher must investigate what power relations at the situational, institutional and societal levels contribute to the shaping of discourse, what elements of the participants’ intellectual resources which are drawn upon have an ideological character and how this discourse is positioned in relation to struggles at the three aforementioned levels. At this point it should be noted that in this phase I drew on my intellectual resources the richness and adequacy of which determined the quality of this discourse identification process (Fairclough 1989). This phase also required of me to do additional reading in order to enrich my available resources and at times explore areas of which I was little acquainted with whenever I judged that it was necessitated by the data. As Thompson (1990) remarks this process involves thought on a higher level, proceeding by synthesis, by the creative construction of possible meanings, and by an interpretative explication of what is said. Moreover, he notes that the projected possible meanings by the researcher may diverge from the meanings construed by the research participants and that, in any case, the process of interpretation is considered as necessarily a risky and conflict-laden enterprise which is open to dispute.

A separate reference must be made concerning the method I used for the analysis of the observational data. This analysis was based on the lessons transcripts, the transcripts of the pre-active, interactive stimulated-recall and postactive interviews in the context of the lessons observations, the discussions with the teachers that followed my preliminary analysis of the transcripts, and the transcript of the first two interviews. All the data that
came from these sources formed the second subtext of the entire text. The observations of selected lessons from the participants of this study served three purposes. First, they were intended to investigate the teachers’ summative and formative assessment practices and the rationale behind these practices. Moreover, they were intended to have the teachers evaluate the degree to which they are satisfied with the picture they form of their pupils’ knowledge of mathematics and with the action they take to provide differentiated, individualised learning within their classrooms. Finally, an important purpose of the lessons observations was to elicit the teachers’ reflections on the results of this evaluation.

For the first step in the analysis of the lesson transcripts I drew heavily on the work of Schoenfeld (1998, 2000). Schoenfeld’s model of teaching-in-context provides a theoretical account of how and why teachers make specific moment-to-moment pedagogical decisions while they enact their lessons. Schoenfeld’s (1998) model is designed to provide a description of the ways in which the teacher’s knowledge, goals, and beliefs interact to shape the teacher’s moment-to-moment decision-making and actions (Schoenfeld 1998). To explain this particular analytic approach, I quote Schoenfeld’s (2005) description on how the interplay between the teacher's knowledge, goals, and beliefs shapes the teacher’s classroom behaviour

The basic idea is that a teacher’s decision-making can be represented by a goal-driven architecture, in which ongoing decision-making is a function of that teachers’ knowledge, goals, and beliefs. The teacher enters the classroom with a particular set of goals in mind, and some plans for achieving them. At any given time, activated goals may include short-term goals, medium-term goals, and long-term goals. Plans are chosen by the teacher on the basis of his or her beliefs and values … The teacher then sets things in motion and monitors lesson progress. If there are no untoward or unusual events, various goals are satisfied and other goals and activities take their place as planned. If something unusual does take place, then a decision is called for – the teacher will decide whether to set a new goal on the basis of what he or she believes is important at the moment. If a new high-priority goal is established, the teacher will search through his or her knowledge base for actions to meet that goal (and perhaps other high priority goals as well). This results in a change of direction, with a new top-level goal. When that goal is satisfied, there may be a return to the previously suspended goal, or a re-prioritization (Schoenfeld 2005, p. 15).
According to Schoenfeld (2000), the development of a comprehensive model of a teacher’s actions requires detailed information about:

1. the teacher’s knowledge—and how it is organized, accessed, and used;
2. the teacher’s goals (both content-related and social) and the ways they shape and are reflected in the teacher’s plans for instruction;
3. the teacher’s beliefs (about the mathematical content and the nature of mathematics; about students and learning; about teaching)
4. the teacher’s decision-making priorities—how goals, beliefs, and knowledge serve to select and shape courses of action taken by the teacher.

It should be noted that in this model there is a distinction between attributed and professed beliefs and goals. Aguirre & Speer (2000) define professed beliefs or goals as those beliefs and goals that teachers identify and articulate during the course of an interview or other discussion. These authors note that professed beliefs and goals may or may not be consistent with the observed teacher behaviour. On the other hand, the attributed beliefs and goals are identified by the researchers as implicit in and consistent with the teacher’s practice. Schoenfeld (1998) remarks that in the modelling effort professed beliefs are used as one of many sources of evidence but the teacher model contains the beliefs attributed to the teacher.

An important database from which the construction of each teacher’s model drew upon was the first two interviews that were held independently prior to the observations of selected teacher lessons. As I referred to in the previous section, those semi-structured interviews explored the teachers’ conceptions of the nature of mathematics, their views on mathematics curriculum, their views of the aims of mathematics education as reflected in the curriculum guides and the textbooks used, and their theories of teaching and learning. The discussion carried out in those interviews was outside of a particular context and moved on a theoretical level, eliciting the teachers’
standpoints regarding the issues referred to above. The second important source from which data was drawn in relation to the teachers’ knowledge base, goals and beliefs, this time within particular teaching and curricular contexts, was the teachers’ lesson image for each particular lesson which was elicited in the interview preceding each lesson observation. Additional sources used for the teacher modelling were the transcripts of each lesson and the content of the interviews that followed the lesson, namely the interactive stimulated-recall interviews and the post active interviews, and finally the transcripts of the discussions that were held with each teacher after the transcript of each lesson was produced and I had done a preliminary analysis of the lesson to be presented to the teacher.

For the analysis of each lesson, following Schoenfeld (1998), each relevant transcript was parsed into large units delineating large-scale episodes. Each of these units was potentially parsed into smaller units (corresponding to smaller-scale episodes), and so on-down to the level of relatively small linguistic units on the order of a line or two of transcript. According to Schoenfeld (1998 p. 32), one major issue for analysis is how well the episodes and sub-episodes that take place correspond to the action plans held by the teacher and what happens when this is not the case. Schoenfeld (1998) defines action plans as sets of prospective actions intended to be taken by the teacher in order to work toward the achievement of a constellation of current high priority goals. These plans are supposed to be revealed in the teacher’s lesson image. For each episode or sub-episode the analysis attempted to provide an answer as to whether it was “expected or unexpected, how (if at all) it corresponded to the teacher’s lesson image, what ‘triggered’ it, what beliefs might have shaped the way it took place, what goals the teacher's actions were intended to satisfy, what kinds of knowledge the teacher depended on in the interaction, and what brought the episode to a close” (Schoenfeld 1998 p. 35).
In short, the teacher model constructed in the first step gave (1) a description of the organisational, pedagogical and interactive routines, as well as scripts and schemata each teacher employed for dealing with content and process arrived at by the grounded theory method, and (2) an explanation of the teachers’ pedagogical actions determined by their moment-to-moment decisions as a product of their knowledge, beliefs and goals. The second step in the analytic process was to extract from this model that part which was related to assessment. Insofar as no summative assessment practices were observed except for informal observation, I focused on their formative assessment practices. For this latter part, I used Sadler’s (1989) theory of formative assessment which is based on his central notion of feedback. Thus, I categorised and analysed all verbal and written feedback that was communicated to the learners with the intention to modify their thinking or behaviour for the purpose of improving learning and described how this information was communicated to the pupils. Here I refer to a feedback system made up of the following elements: there are (a) data on the actual level of some measurable attribute; (b) data on the reference level of that attribute; (c) a mechanism for comparing the two levels, and generating information about the gap between the two levels; and finally (d) a mechanism by which the information can be used to alter the gap (Black & Wiliam 1998b). In addition, I categorised and analysed all verbal and written pupil-related feedback received by the teacher that could be used as a basis for altering instruction and evaluated if instruction was altered and how. Finally, insofar as this study is intended to investigate the relationship of assessment with equity as perceived by the teachers, I described the action taken by each teacher to provide differentiated, individualised learning within his classrooms, i.e. how each teacher responded formatively to the differential learning needs of pupils. The categorisations and descriptions referred to above were arrived at by using the grounded theory method (Straus & Corbin 1998).
The third step in the analysis of the observational data was to view the categorisations and descriptions of the previous step against the background of all the pertinent elements contained in the teacher model constructed in the first step which provided the justifications for the teachers’ pedagogical actions in terms of their knowledge, beliefs and goals. This model also contained the teachers’ own characterisations and evaluations of the feedback given and received.

The next step was to present the results of the analysis as performed in the previous phases and to ask the teachers to evaluate the formative assessment potential created by their pedagogical approaches. Finally, the last step was to ask them to reflect on the significance of the results of that evaluation. On the other hand, I refrained from making a personal evaluation of the “adequacy” of their teaching practices in providing or receiving the “necessary” formative assessment feedback or of the quality and extent of these feedback. A quantification of such parameters would be appropriate if a large scale study were conducted in the framework of a systematic observation with the objective to record and compare patterns occurring in a large population. For the purposes of this inquiry my objective was to obtain the overall evaluation by the teachers of their constructed models of the pupils’ mathematical knowledge and their justifications of their actions to be used for the broader purpose of the study, i.e. as an element of the teachers’ conceptions of the socio-political dimension of assessment. The lessons observations were additionally used for all emergent purposes in the sense that they provided contexts where emergent themes from the interviews and data analysis were illuminated by discussions based on specific contexts. The produced data from this latter process together with the teachers’ reflections on the adequacy of their constructed models of their pupils’ knowledge were integrated with the data that comprised the first subtext and were analysed as stated earlier.
Regarding the analysis of the lessons transcripts and the texts produced in the context of the observations of selected teachers’ lessons, I adopted the general rule proposed by Glaser & Strauss (1967) which consists in gathering data until each category is saturated. This means that data is gathered until (a) no new or relevant data seem to emerge regarding a category, (b) the category is well developed in terms of its properties and dimensions demonstrating variation, and (c) the relationships among categories are well established and validated (Strauss & Corbin 1998). This also determined the necessary number of lessons which in all three cases was less than the number of lessons observed. In Nikos’s case I analysed ten lessons while in the other two cases I analysed eight lessons.

During the analytic process, to enhance the credibility of my analysis, I made a limited use of peer debriefing defined by Lincoln and Guba (1985, p. 308) as “the process of exposing oneself to a disinterested peer in a manner paralleling an analytic session and for the purpose of exploring aspects of the inquiry that might otherwise remain only implicit within the inquirer’s mind”. According to the authors, peer debriefing has four purposes. First, through the process the investigator’s biases are probed, meanings explored, the basis for interpretation, clarified. Second, debriefing provides an opportunity to test working hypotheses that may be emerging in the inquirer’s mind. Third, it provides an opportunity to develop and test next steps in the emerging methodological design. Fourth, it provides an opportunity for catharsis (Lincoln and Guba 1985, p. 308). My peer debriefers were Giorgos Boukis who is currently working on his master’s degree in mathematics education and modelling and Elias Daskalakisis about whom I will say more in section 8.2.

A final issue that concerns the data analysis is associated with the criteria by means of which I selected the excerpts that illustrated each teacher’s beliefs and ideological stance and formed the basis for my interpretations. The first principle that guided the
selection of quotes was the *relevance* of each textual piece with respect to the research questions. This was the first step in the screening process that eliminated interview material containing superfluous information or information that was tangentially relevant. After completing the grouping of all excerpts obtained in this process according to the thematic categories explained earlier, in certain cases many pieces were found that referred to the same topic. In each topic, I selected the excerpts that expressed more clearly and comprehensively the teachers’ beliefs and conceptions. This resulted in a second screening phase. Special care was taken so as not to eliminate excerpts that reflected inconsistencies in the teachers’ beliefs. This was intended to prevent an unnecessarily smoothened and distorted landscape of the teachers’ thinking.

Another very significant criterion for selecting an excerpt for the final report was its importance for the construction of the model of each teacher’s ideological standpoint. This importance was a function of the text’s richness in vocabulary choices that were judged to have an ideological character, of whether the text depicted any modes of ideology operation as described above, and of whether the text as a piece of discourse mirrored power relations at the situational, institutional and societal levels. In addition, I included excerpts that were obtained in the critical section and which, except for further elucidating the teachers’ ideologies and in particular the relationships between their essential ideological ingredients, served to validate my previous interpretations. Finally, regarding the excerpts that were derived from my observational data, I selected those pieces that provided clear explanations for the teachers’ instructional routines and pedagogical choices as related to the opportunities the latter afforded for the implementation of formative assessment schemes and for providing individualised instruction and formative feedback to those pupils with weaker knowledge backgrounds. I also paid particular attention to include those excerpts derived in the context of the
teachers’ reflections on the results of their overall evaluation of the model they construct concerning each student’s knowledge that were rich in ideological ingredients.

3.8 Presentation of and rationale for choosing the case studies

In the next three chapters I present the three cases that constitute the object of this inquiry. All three chapters have the same structure starting with a few words about each participant. With the exception of the last two sections, the sections that follow the introduction of each participant provide a description of the teachers’ views in each research question separately. This description is given in their own terms with little interpretive intervention by the researcher except for a reformulation of what the teachers say. The first of the last two sections in each case study presents the results of the critical interview between each participant and the investigator. Finally, in the last section I provide a critical analysis of each teacher’s views.
CHAPTER FOUR

CASE STUDY ONE (NIKOS)

4.1 A few words about Nikos (pseudonym)

Nikos is a senior teacher with a thirty year experience mostly at technical and vocational post-compulsory education schools. Technical and vocational secondary education has been the “receptacle” of pupils with low prospects in general education and draws disproportionate numbers of pupils from families of low socio-economic status (Tsakloglou & Cholezas 2005). After the 1997 educational reform act which disallowed access of pupils who attend technical and vocational education to higher education (Arenis et al. 1998), Nikos decided to get a position at a general high school the first year this particular school came into existence.

His school is deprived of most high performing pupils who, as it is unofficially discussed among the teachers serving this school and verified by the school’s Principal, although assigned to attend this school by their place of residence, prefer to enrol at some other high school by obtaining special permission. Consequently, the school by and large harbours low performing pupils and since its inception it faces the danger of being closed down if an increase in drop-out rates reduces further the number of pupils enrolled in the school.

4.2 Nikos’ view of the mathematics curriculum

For Nikos, mathematics is “a methodology of thought” and the aim of mathematics education should be “to open up the mind”, “to learn a logical way of thinking”, and “to be able to place a problem that requires solution in the appropriate foundations” (I1.7.11.05). Nikos referred to the Greek mathematics curriculum in several places throughout the study and in different situational contexts. When asked explicitly to express his opinion on the nature of the curriculum (I1.7.11.05), he referred to the

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7 I know this from personal experience, as I have served in this school for three years.
8 For an explanation of the codes used in the references to the teachers’ texts see appendix 6.
abstractness of the content that has to be covered according to the syllabus and pointed that “it is difficult to teach abstract mathematics to senior high school pupils” because “they have not acquired the background yet in order to understand mathematical abstractions”. Then he added that the curriculum “does not fulfil its objective which is to give pupils some useful knowledge” and as a consequence pupils at best “acquire an instrumental and not a deep understanding of the subject”. At this point, Nikos qualified that “if the pupils were taught mathematics with understanding, they would have a very different attitude towards mathematics”. For all these reasons he said that he was opposed to the aims of the mathematics curriculum for the Greek lyceum. The following excerpt strongly reflects this opposition:

I don’t agree at all. Experience has shown that excepting a few who show some special preference for mathematics, the rest, that is the majority of pupils, leave school with absolutely no understanding of mathematics. The essence of mathematics that the curriculum is intended to give, no, they do not achieve that. (11.7.11.05)

In the context of the issue of grade retention (I3.22.11.05), Nikos’ criticism of the curriculum was harsher insofar as he expressed the opinion that “the way the system in general has been formed, it cripples most pupils in mathematics” because “it demands things beyond their conceptual powers”. In talking about Euclidean geometry, he spoke in the same tone asserting that “with the kind of geometry done at the lyceum, pupils don’t understand anything, the whole class. Not one, the whole class” (11.7.11.05).

Elsewhere (L3.10.10.05), Nikos criticised the curriculum for being “bits and pieces taken from curricula abroad” and focused his critique on the lack of “time available” for its implementation, as well as on the “specific learning processes taking place” both of which in his opinion preclude favourable learning outcomes. Returning to the issue of time in the final critical interview (CR.20.1.06), Nikos expressed the opinion that “as far as time for the implementation of the curriculum is concerned the teacher is defeated” and that “if the teacher tries to go ahead with five pupils who are able, the others cannot follow” and concluded that “the Greek school is a lost case”.  

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As part of his critique of education as a social institution today, Nikos described school as being a place where knowledge is “just thrown at the pupils” with no consideration of who will acquire it (I1.7.11.05). Then, he expressed his disapproval with the time constraints in teaching each specific topic and emphatically considered a pace fixed by external agents (in twelfth grade) as ethically unacceptable and detrimental to the learning process and added that “to have someone like the ministry of education monitor your pace is criminal behaviour against learning”.

In the critical interview (CR.20.1.06), Nikos reaffirmed this position and elaborated as follows:

Especially in twelfth grade the situation is desperate. In previous grades where no monitoring process exists, the teacher might save up some time by condensing certain topics in order to devote more time to other topics. But in twelfth grade I would say that the situation ranges from desperate to horrible. The pupils fall very far behind. I am in despair. I consider the pupils as sheep to be butchered. What can I say? It is hard for me to imagine such analgesia on the part of the ministry in this issue. No learning takes place in the classroom. I have not seen something more shameful.

Answering my probing question if his description was literal, Nikos said:

My words express my feelings about what is going on. It is my perception of how teaching is conducted in the third grade of lyceum. I won’t change anything I have said (CR.20.1.06).

As a result of the heavy demands of the curriculum, Nikos expressed his categorical disagreement with the way school delivers knowledge which was an indirect criticism on the current teaching practices and the kind of learning that these practices promote. The following passage reflects this disagreement:

Deep inside, if you ask them, nobody wants to go to school. Why is that? Well, because knowledge is given in such a way that resembles being pounded in the head by a hammer; and obviously no one wants to be pounded in the head by a hammer (11.7.11.05).

This statement was uttered in the context of our discussion about pupil violence in school and especially the destruction of school property. Asked to elaborate on his statement, Nikos explained that in his opinion “the pupils are bombarded with knowledge that is hard to assimilate, not only the plethora but also the kind of
knowledge” and he wondered whether “the pupils have the necessary background in order to bear this entire burden”.

In view of his appraisal of the mathematics curriculum, Nikos saw two alternatives for Greek mathematics education.

One way is to change the whole way of teaching mathematics, e.g. to be conducted by some other method or to lighten the programme. This way the teacher will have time to scrutinise the whole class in the contentious points and check everyone’s work and have the pupils assess themselves. The other way is perhaps a little crueller. You can’t pass the class, sit down and study? That’s your problem. The first is related to a scientific and pedagogical solution; the second one is a little savage. You didn’t sit down and study and consequently you flunked, what do I care? (L4.13.10.05)

Here, Nikos touched on the importance of formative assessment in enhancing the learning process and considered it as a viable alternative only under the condition that the curriculum is lightened and adequate time is given for its implementation. He also contrasted this alternative to a policy that is focused on curricular requirements and is indifferent to the learning outcomes and their possible consequences to those pupils who underachieve.

4.3 Nikos’ conception of tests and high stakes testing

Asked to appraise the character, the quality and effects of the existing system of pupil selection for higher education, Nikos answered the following:

First of all, I am for examinations. If a person wants to change educational level and go to higher education, (s)he must be selected. But these examinations must be external; otherwise they distort the school’s character. The function of school is to prepare you in general to be a member of society; knowledge should stimulate you to search further. The school’s aim is not only to prepare for examinations. This is what it’s doing now. It has been transformed into a crammer school preparing candidates for a position at the University. Its real character has long been lost, which includes its educational part, a better contact between teachers and pupils, and learning things not contained in textbooks (I3.22.11.05).

Nikos’ answer suggests that he advocates a selection system based on high-stakes examinations. On the other hand, without going into the technical details as to how it would be feasible, he wants this high-stakes testing to be disconnected from the school educational process in order to avoid the distorting effects of the former on school’s educational and formative mission.
Nikos disputed that school can adequately prepare pupils to deal successfully with the state mandated entrance examinations for study into higher education by saying that

Very few, a distinguished minority, would be able to cope with the system by studying on their own, in other words by following what the school does. The (entrance) examinations requirements transcend school knowledge. The examinations level is so different to what is covered at school (I3.22.11.05).

As he continued, Nikos discussed the social consequences of the non-alignment between curriculum standards and the assessment standards reflected in the national examinations. In this context he said:

Certainly, rich children can afford private tuition. What happens with the poor guys who cannot? One might say that the system is unjust for them. They need private lessons, but do they have the money to pay for it? One would say that the selection system works only for those who can spare the money in order to support their children’s studies (I3.22.11.05).

At this point Nikos explicitly qualified the selection system for higher education as inequitable insofar as in his opinion school alone is not adequate to prepare the candidates in order to succeed in the national examinations and thus paid extra-scholastic assistance not uniformly afforded by the pupils of different socio-economic backgrounds is needed.

Elsewhere, when he discussed the impact of teacher constructed final exams, Nikos pointed to the potential danger of ill-constructed teacher exams that may distort the teacher’s diagnostic effort and added

Look, I think the forty-minute summative exams can’t be a panacea for grading, you can’t condemn a pupil with just an exam, it is just indicative. You can’t prove much. You don’t need just one which is obligatory but three or four, otherwise it is fragmentary (I3.22.11.05).

As the following excerpt shows, however, he seemed to hold well-constructed tests in high esteem as indicators of pupil effort and knowledge:

The test shows exactly what happens when the pupil is alone, with a piece of paper containing some questions, equipped with his knowledge and nothing else, and what he has understood and what has not understood, and how adequately he is prepared because in this case the pupil comes face to face with his responsibility (I3.22.11.05).
In this excerpt Nikos also touched on the issue of pupil responsibility. In another place, he argued that testing is not the “superlative” but is “comparatively the best means to diagnose what’s going on” (I3.22.11.05) and added that he does not systematically collect information about pupil misconceptions and error patterns from his exams that could be used for formative purposes.

4.4 Nikos’ conception of the role and meaning of grades and his criteria for assigning grades

Nikos saw grades as a quantitative measure of the degree to which a pupil can “stand on a specific level of knowledge” and as an “apodictic element that the pupil has studied well and can proceed further”. Moreover, he considered grades as “some kind of reward” for pupil effort and as giving a general picture of the pupil that can be used for accountability purposes with regard to the parents. Finally, he pointed to the usefulness of grades in “ranking pupils into an order”. On the other hand, with respect to the negative aspect of grading, he referred to a possible unfairness due to the subjective nature of grading, as well as to the “notorious grade inflation”, and finally to what he called “grade hunting”, namely the phenomenon of parents choosing schools for their children on the basis of whether the teaching staff have reputedly lenient or strict grading policies (I3.22.11.05). For the assignment of the two semester grades, Nikos takes into consideration the obligatory forty-minute exam, the students’ willingness to solve homework problems on the board, and their participation in the in-class activities which is manifested by the frequency they ask or answer questions (I3.22.11.05).

4.5 Nikos’ view of grade retention and social promotion

In various contexts including the critical interview (CR.20.1.06), Nikos unreservedly supported the law for grade retention although he originally qualified this practice as “an ultimate measure, to be avoided if possible” (I3.22.11.05). Connecting
the lack of effort on the part of pupils with the favourable system for pupil promotion, the teachers’ lenient grading behaviour, and the pupils’ cheating practices, he elaborated as follows:

This way of thinking “somebody will help me, I’ll do something, I will cheat off somebody in the exam, I will get an oral grade of forty, forty five or fifty and I will be fine, I will pass” leads to the least effort mentality. Why should I study if I can pass this way? (I3.22.11.05)

Characterising this kind of behaviour on the part of pupils as “shameful”, he went on to connect pupil industriousness and diligence with the pupils’ moral obligation to themselves and their parents. He argued as follows:

I think that once the kid comes to school, sent by his parents for some purpose, it is not at all pleasing if this purpose is not realised, primarily for the kid but also for the parents who expect the kid to have some progress. So when he is doing tricks like not studying, cheating on the exam, playing truant and things like that, I think, from an ethical point of view, that he is fooling himself and all those who are connected with him (I3.22.11.05).

Then he criticised those pupils who do not make an effort although they are at risk of failing a course by saying that

Although kids know it, that they risk repeating the year if they do badly on the exam, they just make no effort to save the situation. They shrug their shoulders, they refuse to try. They don’t want to improve; they don’t want to overcome their problem (I3.22.11.05).

Nikos was particularly critical of the teachers who give inflated marks to the 12th Grade pupils, as it is shown by the following excerpt:

What impresses me is that there prevails a kind of ill-considered help, especially in twelfth grade. Some teachers say I will just give him 75°. So you get rid of the evil, you pass it to the others out in society who will have to put up with him … he will get a job, they will tell him “pick up the broom” and he will say “but I came to be a manager, I had 75 in mathematics”. I have a basic objection here, if you just stand there and you want me to help you, to give you extra credit so that you can pass the class, just because you are present, I won’t do it and do what you please. I am bad guy in grading in the sense that I don’t help children graduate. And of course they all graduate, nobody gets left back. As far as I am concerned, I am not very strict, I am not going to strangle them, but I do think that a bare minimum of requirements must be fulfilled (L5.17-10.05).

In this excerpt, Nikos labelled those pupils who in his opinion graduate undeservedly with the help of their teachers using the term “evil” as a noun. Urged to

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° He means as an oral grade to counteract a possible low grade on the final.
elaborate on this term, Nikos answered that he spoke of the pupils who are “completely ignorant and may make trouble in the classroom” and that “these pupils will never be cured of their ignorance nor do they want to do something better and hence they are something like a mischief in the school environment”. Nikos’ phrase “of course they all graduate, nobody gets left back” suggests that he is against social promotion and moreover against the law that permits pupils to be promoted if they have an overall average of 47.5, even if they are failing some subjects. Elsewhere, in the context of an incident in a lesson (L4.13.10.05) where pupils refused to volunteer to solve a homework problem on the board, he spoke of the “indifferent” behaviour of some of his pupils and thought that the measure of being promoted with the overall average rewards equally those who “show interest” and those who are “indifferent”. He elaborated as follows:

Those pupils who are used to this practice (i.e. of not working in school and getting passing marks) will repeat the same practice for the rest of their lives. These guys will be a plague on society… it is these characters that we produce, socially indifferent impostors, seeking quick and easy profit (L4.13.10.05).

This excerpt shows that, repeating the line of reasoning he developed previously, this time in a more severe manner, Nikos was very critical to the practice of rewarding and enhancing the least effort mentality which, in his opinion, has corruptive effects on the pupils’ character and consequently is supposed to constitute a threat for society.

Nikos supported the idea that it is lack of effort that is the major cause of underachievement. He elaborated as follows:

But what does “good pupils” mean? Or “this pupil is good and the others are bad”? They are bad pupils in terms of what? Brain-wise or they just don’t try? Their brains may be just fine; they are all very intelligent, no one is stupid. Simply, they have no will, they have no interest; their interest has never been stimulated during the previous educational levels. So it became a habit and they acquired the mentality “Well, let it be. We’ll have a nice time. Some teacher will be found to help us”, and things like that (I3.22.11.05).

Here, Nikos seems to downplay innate factors as a cause of underachievement at the same time where the pupils’ lack of interest in the curriculum in combination with
negative mentality towards learning fostered by lenient teacher grading practices emerge as elements of his attribution theory regarding pupil failure in mathematics.

Elsewhere however, when Nikos referred to the potential impact of the quality of teaching on the pupils’ intellectual development during the early elementary school years, he supported the primacy of genetic factors in the shaping of pupil mathematical ability by saying:

For example, there are children that say “these problems are nothing”, says the one; and another sweats out and on top of it he understands nothing. Now what can I say? It may be the teacher’s fault at the start; he may be a deterrent or a thrusting factor. It may be so. But primarily I believe it is innate (I2.14.11.05).

In another place, in the context of an imaginary dialogue with pupils with unsatisfactory participation in the in-class activities whom he would urge to overcome their passivity, Nikos supported the idea that mathematics can be understood by pupils on the grounds that it is pure logic supposedly possessed universally by all members of the humankind. He elaborated as follows:

You are big kids and you have an obligation to yourselves. Maths is not something scary; it is just a kind of logic, nothing difficult. It is something your mind can process. Just as your fellow pupil easily understands and participates, to the extent he participates, you can do the same (I2.14.11.05).

Here, insofar as Nikos did not talk of mathematics in general but referred to school mathematics, his assertion that it is “just a kind of logic” seems to be incongruous with his previous characterisations of the curriculum. In this excerpt Nikos again touched on the issue of pupil responsibility.

4.6 Nikos’ teaching practice and its underlying rationale

In nine of the ten transcribed lessons Nikos started by asking for volunteers to deal with tasks that were assigned for homework on the board. Nikos explained (L1.4.11.05) that these tasks served mostly for certification purposes, contributing to the student’s oral grade. During this process, Nikos kept no records of these pupils’ performance that could be used for systematic formative assessment feedback except for a mark that indicated a satisfactory, a moderate or unsatisfactory participation. Nikos explained that
when no volunteer appears on a specific day, he resorts to his pupil records to examine
some pupil usually with a poor participation record and on his/her refusal to be
examined the pupil is recorded as having a negative performance on that specific day
(L4.13.10.05). He qualified his policy as being both “intimidatory” and “exhortatory”
and justified it on the grounds that he is accountable to the pupils and their parents, as
well as to the state.

Nikos exhibited different kinds of behaviour in the homework tasks done on the
board by volunteers. In some tasks he made no interventions leaving the pupils to finish
up the task by writing silently on the board. His characterisation of the level of
difficulty of these tasks ranged from simple calculations like finding
the \( \lim_{x \to 1} \left( \frac{x^2 - 3}{x + 1} - \frac{x + 3}{x} \right) \) (L3.10.10.05) to relatively demanding tasks like the following
task shown in Figure 1 (L8.26.10.05).

Figure 1: Problem solved by a pupil on the board without Nikos’ intervention

Nikos explained that he follows this approach whenever he is pretty sure that the
volunteer can complete the task unaided.

In some other tasks while the pupil was working silently on the board, Nikos made
interventions:

(a) By making remarks on theory, for example when he talked about the sign of the
different trigonometric numbers in the different quadrants while the pupil tried to find
the \( \sin x \) when the \( \cos x \) was given in a specific quadrant (L1-04.10.05). Nikos
explained that this was a usual practice that was followed for purposes of review of old theory.

(b) By making corrections like when he corrected the relation $3\pi < x < \pi$ (miscopied by the pupil) into $\frac{3\pi}{2} < x < \pi$ (L1-04.10.05). He explained that he does this because he has “no time for opening a dialogue” (L1-04.10.05).

(c) By asking the class what he characterised as simple factual questions like on the priority of the operations in the expression $22 - (\frac{1}{3})^2$ (L.1-04.10.05). The rationale for this was to encourage “weak pupils” to participate (L.1-04.10.05).

(d) By making what he characterised as major interventions. This approach was also followed in non homework tasks done by volunteers. Nikos explained that he follows this pedagogical approach frequently in cognitively demanding tasks. He elaborated as follows:

In complex or difficult tasks I guide so that a specific answer is given because on the one hand there is the time parameter and on the other hand if a different answer is given than the one expected, perhaps a mistaken answer, pupils are disoriented. I do it because of my concern for the task to be done correctly and that its meaning is revealed (L8.26.10.05).

Regarding the formative assessment feedback that he gets from the volunteers at this phase of the lesson, Nikos said that he does not receive adequate feedback of his encounter with each particular volunteer inasmuch as he does not ask probing questions by means of which he could assess whether and to what extent the pupil has conceptually mastered the presented material (L3.10.10.05). He explained

The reason is that I don’t want to discourage them. If I start asking questions it is likely that they won’t know how to answer, most of them don’t. Note that the volunteers are a small minority. If I ask a question it will be an obvious one just to reinforce their self-confidence a little.

In introducing new content, Nikos followed a pedagogical approach that was a faithful implementation of his lesson image and his action plans. There were some variations of this approach according to the subject taught. In geometry, in proving the
angle bisector theorem in two of his classes, he faithfully followed the textbook’s proof shown in figure 2 below, reserving for himself the strategic problem solving decisions and retaining the full command of the proof plan.

Figure 2: Textbook’s proof of the angle bisector theorem

<table>
<thead>
<tr>
<th>An angle bisector of a triangle divides the opposite side into two segments which are proportional to the other two sides of the triangles.</th>
<th>Draw BE parallel to AD. Since AD meets AC in its extension, it will also meet its parallel, somewhere here at E. Then (&lt;A1 = &lt;B1) as alternate interior and (A2 = E). Since AD is angle bisector (&lt;A1 = &lt;A2) and therefore (&lt;B1 = &lt;E), so (AB = AE). Now from Thales’ theorem we have that and since (AB = AE) we obtain</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
</tbody>
</table>

On the other hand, he asked questions which he qualified as requiring short answers involving the reproduction of factual information and the application of theory into concrete situations, such as what is an angle bisector, of all the angles formed here by parallelism which ones are equal, since \(B1=E\) what kind of a triangle is \(ABE\) and what does this imply. There were no pupil questions. The same approach was followed in the proof of the triangle midpoint theorem and was said to be his standard approach in proving geometry theorems. In other subjects Nikos started with a brief review of the material that was pertinent to the introduction of new content and then introduced new content much the same as in geometry. Some examples are provided in Appendix 7.

The activities that took place during the practice of new content phase were characterised by Nikos as simple, short and straightforward applications of the theory treated in the introduction of new content phase. For example, the pupils were given the three sides of a triangle and were asked to compute the two segments into which a side is divided by the angle bisector of the opposite angle, a task that was an immediate application of the angle bisector theorem introduced right before this task (L8.26.10.05),
or were asked to compute \( f'(2) \) for \( f(x) = x + 3 \) and \( f'(2) \) for \( f(x) = x^2 \) (L3.10.10.05) by using the definition of the derivative which was just introduced. Most of these tasks were done by the pupils independently at their desks and some of them were then solved on the board with the participation of the pupils and the help of the teacher when it was needed. Nikos qualified this phase as having a marginal character in the overall activities of a lesson both chronologically and in terms of the formative feedback given and received on grounds that “homework tasks accountability” and the presentation of new content are more important activities and “unfortunately exhaust most of the class time” (L10.2.11.05). In fact, on average this lesson segment occupied less than five minutes per lesson. Finally, regarding the purpose of this phase he added that most pupils are “content with copying the material from the board” and that he sees it as expedient to “press them and get them out of their state of inertia even by doing a little simple effort” (L10.2.11.05).

The main source Nikos drew upon in order to receive pupil-related information that could be used as the basis for altering his pedagogical approach was the answers to the questions he addressed to his pupils during the different phases of the lesson. In the ten analysed lessons he asked seventy questions in all, seven questions on each lesson on average (see Appendix 8 for examples). Thirty four of those questions required recalling and reproducing some mathematical fact (property, rule, concept definition, formula, enunciation of a theorem), twenty four questions required of pupils to supply one or two steps in some routine procedure, six questions required making a simple computation or recalling a method, three questions required locating errors and reading off information from a figure, and three questions required some form of mathematical reasoning. Nikos explained that because of the nature of most of his questions which were characterised by him as simple factual and procedural questions and because of the fact that they were answered by a minority of pupils who usually dominated classroom discourse, almost
all questions were answered correctly and thus they did not provide fertile ground for exploring the pupils’ cognitive weaknesses (Evl.7.11.05).

Regarding the feedback given by Nikos to his pupils, most of it was corrective feedback divided into three subcategories. In the first category, the teacher provided the correct answer as a response to an erroneous answer. In the second case, the teacher let some other pupil provide the correct answer. In the third case, the teacher repeated the correct part and waited for a correction of the erroneous part by the pupil who made the error. Other feedback types observed were (a) direct answer to a pupil question with no elaboration and (b) rejection of a pupil suggestion as irrelevant to a particular solution or proof with or without justification. In the few instances where Nikos gave feedback while pupils were working independently at their desks, this feedback was short hints. Examples of all the feedback types are provided in appendix 9.

Nikos invoked the “lack of time” as a factor for not making a clinical examination of the pupil’s thinking and added that he has “no margins to deal with the pupils’ answers and investigate them in depth because there are pupils who have their hands raised and wait to be examined” (L1-4.10.05). In addition, he justified his decision not to actively engage the pupils in various modes of investigation and problem solving in “those parts of the lesson where they would have to show some initiative” on the grounds that they cannot “exploit their knowledge” insofar as “they know certain things in a fragmentary fashion” and consequently “they cannot think creatively on a task” (L1-4.10.05). Elsewhere, he said that “at best, pupils can answer simple questions” and that the problem is “inherent” (L5.17.10.05). Finally he explained why he does not engage students in a whole class dialogue by saying that “there is no adequate time available” and that “if each pupil expresses his idea, there is a possibility that the task will go astray and that it will not be solved at all” (L5.10.10.05). He added that “to participate
in a dialogue one needs to have firm knowledge” and that “the pupils can only work and solve problems mechanically”.

As an overall evaluation of the adequacy of the model he constructs concerning each student’s knowledge of mathematics which he based solely on his informal classroom observation and one forty-minute exam administered once a year, Nikos said the following:

You can’t acquire a real picture. It is just what the grades and the test reveal, in other words nonsense. I am not satisfied. I have no good picture at all. To be able to understand what a pupil can and cannot do one has to deal with him personally. You can’t be inside a pupil’s head. All you do is just to acquire a general picture of the pupil, not with many details. You know if he is interested or not, if he participates or not and perhaps for what reason if he tells you (Ev1.7.11.05).

4.7 The critical interview

Our discussion in the critical interview (CR.20.1.06) was primarily intended to test the validity of my characterisation of Nikos as a work ethic moralist. Asked whether the extensiveness of the curriculum might be responsible for people giving up, Nikos answered that the “conscientious” pupil “accepts ... the curriculum ... whether he likes it or not ... because he wants to have good grades and because he thinks that he has been sent here for work and he must be worthy of himself and have ambitions ...”. For Nikos “overcoming the dislike” is “overcoming the difficulties” in order to learn “useful knowledge”. On my question whether the behaviour of those pupils whom he did not qualify as conscientious could be seen as exhibiting some kind of resistance, Nikos answered that “it is abandonment of themselves; they have given up the effort, whatever effort they could make”. I asked Nikos whether perhaps the emphasis on effort could not be justified in view of the extremely unfavourable conditions for some pupils. Nikos answered that these pupils “give up when it’s too early, when their problem could be remedied” and that “if they made some effort in the beginning they would probably overcome their problem and gradually improve”. When I remarked that it is not central to his thought that pupils do not start from the same starting point, Nikos answered “tell
“me what can we do?” and to my further comment that effort is too important for him he added that “it’s important because nothing is done by itself. Because if you want to do something, to advance, to learn, you have to try and studying is effort ... I cannot understand how school would be without effort with pupils who did nothing ... effort is a sine qua non”. The dialogue continued as follows

I. But you don’t have enough information on why some pupil doesn’t try.
K. The pupil must make the effort anyhow. I think that he is obliged.
I. How do you respond to the argument advanced by Joshi (2001) that “Math is different from other subjects because of the sequential nature of the curriculum. If the pupil doesn't follow one lesson he is very likely not to understand the next, and within a few days the gap of ignorance will rise beyond correction”?
K. What answer can I give to that?

From all the discursive interaction with Nikos, I have gathered that he perceives underachieving pupils not as victims of the curriculum but through the prism of his work-ethic moralism.

4.8 A critical analysis of Nikos’ views

In various contexts Nikos took a critical stance towards the Greek mathematics curriculum about which originally he raised doubts as to whether it is suitable for the level of cognitive maturity of high-school pupils due to its overly theoretical character. This curriculum was later qualified by him as inordinately demanding, overburdened and hard to assimilate. Nikos’ lexical choices as reflected in his statements “knowledge just thrown at the pupils”, “knowledge is given in such a way that resembles being pounded in the head by a hammer” and “pupils are bombarded with knowledge that is hard to assimilate” constitute an explicit condemnation of the way knowledge is delivered in school. At the same time the chosen metaphors have an experiential value and seem to have been derived from a lived drama he bears witness of and shows his empathetic participation in. Nikos depicts a hostile, threatening and even “horrible” learning environment where the majority of pupils inevitably fall behind and are eventually victimised to Nikos’ “desperation”. And it is also a victimisation of the innocent as it is connoted by the “sheep” symbolism. Unable, as he sees it, to change the
course of affairs and felt “defeated” by the shortage of time in his effort to teach effectively, Nikos accuses the ministry of “analgesia” and “criminal behaviour against learning”, especially in the final grade of lyceum, and delivers his final irrevocable verdict against the Greek curriculum and its effects on pupils: “I think the way the system has become, it cripples them; it cripples them in mathematics”. For Nikos in the best case the final outcome is the acquisition of an “instrumental and not a deep understanding of the subject” and an “absolute” lack of understanding of the “essence” of mathematics, namely its “methodology of thinking”.

Reflecting on what he saw as heavy demands of the curriculum and the time constraints for its implementation, Nikos envisaged two alternatives: a lighter curriculum which would allow the teacher to implement various formative assessment schemes including self-assessment, an alternative which was characterised by Nikos as conformant to “scientific pedagogy”, and the current state of affairs which in view of the purported neglect for the individual needs of the pupils was characterised as “savage”. Nikos’ delineation of the two alternatives reflects his awareness of the pedagogical and socio-political significance of formative assessment.

Invoking the heavy demands of the curriculum and the time constraints, as well as the pupils’ cognitive gaps, Nikos explained why his pedagogical approaches give him a picture of his pupils’ knowledge of mathematics that he characterised as gross and unsatisfactory. As we saw, this picture was formed in each lesson (a) by means of an encounter with a volunteer belonging to a minority, which Nikos used primarily for summative purposes, (b) by the introduction of new content relying heavily on Nikos’ initiative, with pupils answering a few “simple factual or simple reasoning questions” and with very few questions asked by the pupils, and (c) by a marginal practicing of new content phase both in terms of the time devoted and in terms of the formative feedback given and received.
I think that the views quoted above leave little room for academic success, especially for those pupils who receive no extra-scholastic tutorial support. But where does Nikos attribute pupil underachievement? The following excerpt we have already seen provides the answer.

But what does “good pupils” mean? Or “this pupil is good and the others are bad”? They are bad pupils in terms of what? Brain-wise or they just don’t try? Their brains may be just fine; they are all very intelligent, no one is stupid. Simply, they have no will, they have no interest; their interest has never been stimulated during the previous educational levels. So it became a habit and they acquired the mentality “Well, let it be. We’ll have a nice time. Some teacher will be found to help us”, and things like that (13.22.11.05).

Here, Nikos emphatically excludes innate factors as causes of school failure, as it is suggested by his phrase “very intelligent”, and attributes underachievement to an uninteresting curriculum and the least effort mentality fostered by teachers’ lenient grading practices and the favourable law for pupil promotion which Nikos disapproves of. Elsewhere however, contrasting the learning behaviours of pupils with wide gaps in mathematical performance, he asserted that, according to him, innate mathematical ability is the chief determinant of pupil learning progress (“Now what can I say? It may be the teacher’s fault at the start; he may be a deterrent or a thrusting factor. It may be so. But primarily I believe it is innate”). It seems to me that the emphatic exclusion of the intelligence factor on the part of Nikos, in contradistinction to his claim that mathematics ability is “innate” and has a differential impact on student achievement, rather serves to emphasise and reinforce his claim about the purported lack of effort on the part of underachieving students. My opinion is, and I advance it as a speculation, that between his two beliefs, Nikos sacrifices the weaker one to the advantage of the stronger belief, which, as we had the opportunity to see, predominates in many of his explanations. The use of the superlative degree (in Greek) in Nikos’ assertion (very intelligent) seems to be psychologically and ideologically intended to overshadow or rather eliminate the intelligence factor at the same time where his conclusion about pupil indifference is presented as evident (simply, they don’t care). It should be noted at
this point that, while Nikos discusses pupil underachievement, his reference to the curriculum is quite mild as compared to his previous vehement critique.

Explaining his rationale for rejecting teacher lenient practices Nikos starts with the phrase

What impresses me is that there prevails a kind of ill-thought help, especially in twelfth grade. Some teachers say I will just give him 75 (as an oral grade to counteract a possible low grade on the final) and let him go (graduate). So you get rid of the evil, you pass it to the others out in society who will have to put up with him (L5.17-10.05).

Here, Nikos’ discourse seems to transform those pupils who are at the brink of school failure into an “evil” force. The phrase “you get rid of the evil” has not the faintest resemblance with the image of a victim of the curriculum and other factors beyond the pupil’s will as was originally depicted by Nikos. From the point of view of an ideological analysis, this phrase seems to be an instance of what Thompson (1990) called the expurgation of the other. It is the technique of constructing an enemy who is portrayed as evil, harmful or threatening and whom individuals are called upon collectively to resist or expurgate. In this particular case, Nikos urges his colleagues to act as protectors of the common good. Ideologically, the word ‘evil’ in the context used here has a conservative flavour and could be placed within the framework of Victorian values cherished by the industrial trainers, where, as Ernest (1991) points out, work and industry are identified with virtue and ease or play with evil. Nikos’ decease metaphor used in his explanation of the term “evil” when he spoke of the pupils’ incurable ignorance also fits well within this conservative framework. It is also worth pointing to the finality of his judgment in predicting the pupils’ future development when he claimed that “these pupils will never be cured of their ignorance nor do they want to do something better”. Here, the second part of this latter clause is another version of “they don’t want to improve” said in a different context which, as we have already mentioned, places the main burden of responsibility on the pupils’ shoulders.
Concerning Nikos’ position, the table 1 on the next page, based on a study conducted by Mouzakitis (2004), is illuminating. This table gives the national mathematics examinations results for the academic year 2002-2003 in the island of Corfu.

Table 1: Corfu results in the national mathematics examinations for the academic year 2002-2003 – 11th Grade

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>PASSED</th>
<th>FAILED</th>
<th>%</th>
<th>&lt;25/100</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>RURAL 1</td>
<td>13</td>
<td>38</td>
<td>74.5</td>
<td>24</td>
<td>47.1</td>
</tr>
<tr>
<td>RURAL 2</td>
<td>5</td>
<td>17</td>
<td>77.3</td>
<td>14</td>
<td>63.6</td>
</tr>
<tr>
<td>RURAL 3</td>
<td>3</td>
<td>11</td>
<td>78.6</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>RURAL 4</td>
<td>5</td>
<td>26</td>
<td>83.9</td>
<td>21</td>
<td>67.8</td>
</tr>
<tr>
<td>RURAL 5</td>
<td>11</td>
<td>25</td>
<td>69.4</td>
<td>10</td>
<td>27.8</td>
</tr>
<tr>
<td>TOWN 1</td>
<td>27</td>
<td>53</td>
<td>66.3</td>
<td>42</td>
<td>52.5</td>
</tr>
<tr>
<td>TOWN 2</td>
<td>72</td>
<td>106</td>
<td>57.9</td>
<td>49</td>
<td>26.8</td>
</tr>
<tr>
<td>TOWN 3</td>
<td>38</td>
<td>66</td>
<td>63.5</td>
<td>46</td>
<td>44.2</td>
</tr>
<tr>
<td>TOWN 4</td>
<td>21</td>
<td>33</td>
<td>61.1</td>
<td>18</td>
<td>33.3</td>
</tr>
<tr>
<td>TOWN 5</td>
<td>13</td>
<td>73</td>
<td>81.1</td>
<td>43</td>
<td>47.8</td>
</tr>
<tr>
<td>PRIVATE</td>
<td>18</td>
<td>13</td>
<td>41.9</td>
<td>6</td>
<td>19.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>235</td>
<td>461</td>
<td>66.2</td>
<td>280</td>
<td>40.2</td>
</tr>
</tbody>
</table>

Nikos severely criticised the existent promotion system in which every pupil who has an overall average of 45/100 is promoted. Thus he was unsympathetic to the idea that a person who fails mathematics be promoted to the next grade. If the law he criticised were not in force and if most teachers did not favour social promotion practices by giving inflated (oral) grades, 461 out of the total of 696 pupils in the island of Corfu, namely 66% of the pupil population, would have to be retained if they did not pass the makeup exam. In relation to the equity issue it should be noted that the failure rate is much higher in agricultural areas where the opportunity for private lessons is diminished. Also his school, although situated in the town of Corfu has the second highest failure rate in the island (81%). As I stated in the beginning, there are some historical reasons why this school harbours mostly low achieving pupils who largely belong to low social class families. On the other hand, the second lyceum and the private lyceum whose pupils are of middle and upper class origin have the best results. It should also be noted that these results are from the Greek lyceum which is the
academic track followed by approximately 70% of the Greek pupil population. In fact, the pupil average scores would be worse if the results from a third mathematics course taken by approximately 70% of the pupils had been included (there were some technical reason for not including these results). The situation is much worse in technical schools which to a very large extent harbour those pupils who underachieve in mathematics.

To return to Nikos’ critique of teacher leniency, in another place he said:

Those pupils who are used to this practice (i.e. of not working in school and getting passing marks) will repeat the same practice for the rest of their lives. These guys will be a plague on society… it is these characters that we produce, socially indifferent impostors, seeking quick and easy profit (L4.13.10.05).

Here Nikos takes a firm stand against rewarding and enhancing the least effort mentality which, in his opinion, has corruptive effects on the pupil’s character and consequently, and in his view, constitutes a threat for society. This implication is indicated by his disease metaphor (“these guys will be a plague on society”). In a broader social context, Mpourandas (2006) speaks of the “national maladies which form vicious circles, such as the least effort mentality, predatory behaviour, social indifference, corruption, individualism and corporatism”. One can miss neither the common vocabulary between Nikos’ and Mpourandas’ (2006) discourses nor the semantic affinity of their central metaphors “plague” and “malady”. However, there is one substantial difference. Mpourandas (2006) speaks of social maladies to describe social symptoms he disapproves of, which owe their existence to structural factors, and it is at that level that he might seek some desirable solution. In Nikos’ case, it is particular people who are identified with the malady and not an undesirable particular mentality that has gained wide social acceptance.

At this point, from a logical point of view, the situation may seem somewhat paradoxical. As long as Nikos is explicitly asked and thus he is theoretically engaged in the evaluation of school mathematics curriculum, he recognises its cognitively demanding character and the “devastating” effects that this has on the pupils. Inversely,
when he stares at the “devastated” pupils, he no longer invokes the curriculum or other factors but concentrates on the pupils’ least effort mentality nourished by teacher practices and the law for pupil promotion. The following excerpt provides a step towards finding the missing link.

Although kids know it, that they risk repeating the year if they do badly on the exam, they just make no effort to save the situation. They shrug their shoulders, they refuse to try. They don’t want to improve; they don’t want to overcome their problem (13.22.11.05).

Fairclough (1989) draws attention to the ideological significance of the vocabulary chosen by the text producer in the sense that the experiential values words have in a text place it within a particular ideological framework. In this case, Nikos’ lexical choices are similar to those of the industrial trainers who emphasise effort, self-help and work (Ernest 1991). In his phrase “they don’t want to improve”, Nikos places the main burden of responsibility on the pupils’ shoulders. Nikos’ position reflects views that are very typical of the work-ethic moralist position (Tomchin & Impara 1992) intended to support grade retention, as we saw in the review of the literature. According to this position, pupil underachievement is attributed chiefly to personal characteristics such as being lazy, unmotivated, or disorganized. Although work-ethic moralists admit that retention might not be of any help to the pupil, they believe that one must make some effort to be promoted. It should be noted that when it comes to the underachieving pupils, Nikos uses the (Greek) words “indifferent” and “indifference” with a strong negative ethical connotation. This interpretation was verified by Nikos himself in our final critical interview (CR.20.1.06). Actually, I think that it is usually within the context of an ideological discourse that focuses on and praises effort, work, diligence, child obedience to the arrangements set up by the elders and discipline that the terms in question might connote a morally disapproved behaviour. Within the logic of this ideological discourse, which again reflects conservative values, such “indifference”
must incur some kind of retribution which in the school context takes the form of low marks and grade retention.

Responsibility comes up again in another significant context, when Nikos described the test-taking situation.

The test shows exactly what happens when the pupil is alone, with a piece of paper containing some questions, equipped with his knowledge and nothing else, and what he has understood and what has not understood, and how adequately he is prepared because in this case the pupil comes face to face with his responsibility (I3.22.11.05).

Nikos’ description seems to depict a moment of truth where the subject’s ability is weighed in the balance. There are no distortions allowed, no assistance and no cooperative work where individual contributions merge into a collective outcome. I think that in the context of Nikos’ work-ethic moralism, responsibility should be construed in terms of accountability which, as it is argued by Eshleman (2004), “entails that the behaviour properly attributed to the agent is governed by an interpersonal normative standard of conduct that creates expectations between members of a shared community”. There are two exclusive poles highlighted in Nikos’ statement “the pupil comes face to face with his responsibility”: the demands of society and of the family on the individual pupil and the pupil’s duty to respond to these societal demands in a “praiseworthy” and not “blameworthy” fashion (Eshleman 2004). However, illuminating exclusively these poles casts a thick shadow on all other important structural factors at play. I would argue that there are crucial missing dimensions in Nikos’ discourse on responsibility. Doubtless, unless somehow it is established that the person’s judgement is impaired by factors beyond her will, it would be unreasonable from a social point of view to eliminate any considerations of responsibility for the person’s actions, in particular for the way a certain pupil addresses the scholastic requirements. But not all pupils can equally be held responsible for accomplishing the required school tasks inasmuch as not all pupils are equally (socially) equipped to address the same set of requirements. Moreover, the distribution of the share of
responsibility among pupils is not assessed at schools insofar as the school assessment regime renders most of the pupils’ biographical characteristics as irrelevant.

I think that when it comes to pupil performance, Nikos often stresses the moral dimension and the responsibility of the individual, usually at the detriment of other factors such as the heavy demands of the mathematics curriculum, the differences in cultural and pedagogical capital between pupils, and the differences in economic capital translated into a differential access to the quantity, quality and duration of private tuition services that pupils resort to, factors that are largely related to their socioeconomic status and most of them have been identified by Nikos in other contexts.

Let us now turn to Nikos’ view of high-stakes testing. Nikos supports the existing selection system based on high-stakes examinations (I am for examinations) provided that it is somehow disconnected from the educational process so as to avoid the distorting effects of a test-driven curriculum on the public school’s educational character. I would argue that Nikos’ suggestion does not give an adequate answer to the problem he wants to solve. The high social demand for higher education studies is deeply rooted in socio-historical and cultural contingencies that are connected with Greece’s historical trajectory since its national independence (Kyrides 2003, Patrinos 1997). The institutionalisation of mass education together with the high rates of economic development of the nation that permitted to a much larger number of families to invest on the education of their children has created a highly competitive academic environment (Magoula & Psacharopoulos 1999). I am of the opinion that this environment will retain this competitive character as long as access to the universities is restricted to a predetermined number that does not meet the social demands, and as long as the socio-economic structure offers limited opportunities for a decent way of living for most of those members of society who do not pursue further education.
Nikos qualifies the existing selection system for higher education as inequitable in character but this character is only visible to him in its final moment, i.e. the entrance examinations (*It’s only desperately very few who could cope with the system by studying on their own*). What the reproductive discourse views as a slow process of pupil attrition carried out scrupulously by a series of test-generated obstacles prior to their culmination in the high-stakes national university entrance examinations is chiefly seen by him exclusively as a meritocratic measure of rewards of pupil effort, diligence, intelligence and interest and of punishment in the case these virtues are lacking. This is also reflected in his view of grades exclusively as the reward for accomplished work and as a means for establishing what Perrenoud (1989a) calls a “hierarchy of excellence” (*ranking pupils into an order*). Nikos’ conception of inequity associated with the grading practices does not involve any consideration of the social justice issue but on the contrary is directed against social promotion practices, what he called the “*notorious grade inflation*”. This absence of social justice considerations is reflected in his comment “*just as your fellow pupil understands and participates ... you can do the same*”, where Nikos alludes to the equality of opportunity. However, this allusion is emphatically contradicted elsewhere, in his phrase “*One would say that the system works only for those who can spare the money in order to support their children’s studies*”.

I conclude with Nikos’ insightful description of two existing alternatives in mathematics education, although the qualification of his characterisation “*crueller*” for his second alternative with the words “*perhaps*” and “*a little*” has the effect of minimising the distance between the two options:

One way is to change the whole way of teaching mathematics, e.g. to be conducted by some other method or to lighten the programme. This way the teacher will have time to scrutinise the whole class in the contentious points and check everyone’s work and have the pupils assess themselves. The other way is perhaps a little crueller. You can’t pass the class, sit down and study? That’s your problem. The first is related to a scientific and pedagogical solution; the second one is a little
savage. You didn’t sit down and study and consequently you flunked, what do I care? (L4.13.10.05)

I think that his excerpt shows that Nikos grasped the socio-political significance of formative assessment with remarkable clarity although in his ideological commitment he expressed the gloomy and “barbaric” alternative.
CHAPTER FIVE

CASE STUDY TWO (ANTONIS)

5.1 A few words about Antonis (pseudonym)

Antonis is a senior teacher who has served at all the different types of both compulsory and post-compulsory secondary education. He has also been involved in the direction of schools and has been principal and vice-principal. Except for his zeal in matters of administration, he enjoys cultivating his fields and taking care of his orchards. Currently, he serves as a principal at a Greek general lyceum.

5.2 Antonis’ view of the mathematics curriculum

Describing the purpose of the current Greek mathematics secondary school education, Antonis expressed the opinion that

The objectives set by the ministry of education aim to serve the establishment; what kind of people are needed for production. The current aim of mathematics education is to create individuals who do not think. The curricular intentions seek to make people who are effective, cooperative and who take things for granted. The system prepares and produces persons for production which means that you work for someone without raising objections, you execute orders and you are fast, you obey those who give orders without contestation and without raising any claims to any rights (I1.13.2.06).

Antonis’ discourse suggests that he subsumes the function of Greek mathematics education to the current socio-economic imperatives served by the state which dictate the production of uncritical and docile workers. For Antonis, in mathematics this purpose is achieved in two ways. Firstly, through the restriction of “free time” which if it were available could be “devoted to problem solving activities as it used to be the case with geometry” in his times, and secondly through the “standardisation of all of mathematics” (I1.13.2.06).

Linking education with the structure of the workplace, Antonis went on to provide an analogy between the importance of time in the process of production and the timed school exams:
I believe that time plays a role; one has to be effective in limited time. This is where examinations aim too: effectiveness in limited time. We could have unlimited time, ignore time as long as one reaches a certain intellectual level. Which of the two do we want? Today the aim of education is the process of production (I1.13.2.06).

As it is suggested by the following excerpt, Antonis thinks that formal education cannot be used as a vehicle of social change.

If we try to make a different society through education, will this society provide the economic base to survive or it will end up having the same rhythm again? Education cannot substantially change the economic rhythms imposed by society (I1.13.2.06).

Regarding the Greek mathematics curriculum, Antonis first referred to its theoretical character:

We do a lot of things that are perhaps unnecessary. At the level of lyceum there is a lot of stuff that has come down from the university … and it is taught at same level … I think we do things at a more theoretical depth than needed. All these things can be taught at a more practical level ensuring that pupils acquire a broad mathematics education so that they can cope with various problems when they leave school (I1.13.2.06).

This excerpt suggests that Antonis proposes a somewhat less theoretically oriented curriculum which retains the topics taught but focuses on teaching problem solving abilities related to real life situations.

5.3 Antonis’ conception of high stakes testing

Antonis was particularly articulate on the issue of pupil selection for higher education. First, he referred to the existing consensus in Greek society in favour of the current system based on state mandated national examinations:

We can’t say it is perfect, but don’t forget, in my opinion it is a system which has been widely accepted. Accepted and I believe that it tends to be just, remember that it was even accepted by the junta10. If it were not at least meritocratic and fair, we would not have made it to the university11 (I3.16.2.06).

He explained that the system is meritocratic in the sense that the pupils who have acquired the required knowledge succeed. Also, asked what he meant by “fair”, Antonis

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10 He refers to the dictatorship of the colonels in the period 1967-1974.
11 He refers to pupils about his age who gained a position in higher education although they belonged to low income families.
answered that he means that “no cheating is allowed” and that the “examination items are not known to some pupils beforehand”. He also added that fair means that equal opportunities are available to all, based only on their knowledge and skill on entering the examination and concluded:

Fair is what is widely accepted. We were examined with this system, other kids have been examined and all, no one said we should make a revolution to replace it, to change the examinations system. You hear complaints about the difficulty or the quality of the test items but no one said that we should abolish written examinations (I3.16.2.06).

Antonis’ emphasis on fairness is related to his fear of introducing subjective elements and promoting corruption. This is apparent in the following excerpt.

Would it be advisable to institute an oral examination and thus introduce subjectivity? Then the system would be vulnerable to corruption and we would have a pile of deplorable incidents nowadays. This happens now with dyslexic children who are examined orally; tremendous corruption (I3.16.2.06).

The following passage indicates that Antonis’ support of the existing system based on one exam is not without reservations.

How can it be possible to appraise someone’s knowledge by one written examination in a few hours? This way is not 100%, namely to examine by a written test and to draw a conclusion on pupils’ knowledge. Let’s take the national examinations for example. What impresses me is that at the end of each examination all the papers are assembled and are sent to Athens. How is it possible all the hard work and all the knowledge acquired by the pupils to be piled in a five-kilo box in order to be dispatched? It is likely that this is just an appraisal mechanism in order to serve some people because there are may be pupils who cannot be appraised. Could Einstein be appraised? Did his teachers understand that they had to do with Einstein? Can you appraise each one’s brain? (I3.16.2.06)

Here Antonis raised doubts as to whether one single exam can adequately assess a pupil’s knowledge and considered the appraisal of knowledge and ability as a difficult task, especially in cases of people who show creative power and whom he considers of extraordinary ability. Thus, he touched on the issue of the validity and reliability of the examination process with respect to ascertaining the mathematical knowledge, skills and potential of pupils.
Antonis qualified the existing selection system as socially reproductive by saying that

The selection system is not socially just because in this system of national examinations there enters the parents’ socio-economic status. … it is impossible for all to have the same possibilities because it is a function of money. A pupil with a wealthy family background can afford to go for private tutoring and can outperform somebody who cannot afford it. Those who succeed are teachers’ sons, sons of educated parents … that is to say the system has a reproductive function. The doctor’s son becomes a doctor; the lawyer’s son becomes a lawyer, etc. However the immigrant has insurmountable difficulties. He may have the qualifications but the very system nails him down, except for certain exceptions. There are always exceptions (I3.16.2.06).

Concerning the impact of high stakes examinations on the educational process, Antonis deplored the negative effects that the national examinations for university entrance have on the autonomy of lyceum and wanted these high-stakes examinations to be held at the individual universities after graduation from secondary education. In his opinion, currently “the lyceum has lost its mission which is the acquisition of general knowledge” and “has unfortunately become a lyceum of knowledge that fits examination purposes” (I3.16.2.06).

Moreover, he touched on the psychologically negative and at times pernicious impact that bad test results, as well as bad grades, may have on underachieving pupils in relation to their families’ expectations and demands. He elaborated as follows:

We cannot say that tests reinforce weak pupils’ morale. Far from it, it is a means to convince them to act prudently. But some pupils may study and still not make it … and this it may have a negative impact; they may lose their self-confidence … Similarly with grades. It has happened that pupils have committed suicide upon receiving bad grades. It depends on the pressure from home, how much weight a family attaches to their child’s achievement or how much they can assess their child’s capabilities (I3.16.2.06).

5.4 Antonis’ conception of the role and meaning of grades and his criteria for assigning grades

Antonis saw grades as extrinsic motivation tools. For those pupils “in the tail” grades give them a motive to “make an effort so that they are not left back” and for those who “are on top” to try and “be first”. In his opinion and according to his
experience “those in the middle relax their efforts” (I3.16.2.06). On the other hand, as we saw in the previous section, he pointed to the possibility of a pernicious impact of grades when family expectations put pressure on certain pupils. For the assignment of the two semester grades, Antonis primarily takes into consideration the pupils’ attainment on his two or three 40-minute exams. To a lesser extent he counts the “general picture” he gets of the pupils based on their participation, diligence, and attention to the lesson.

5.5 Antonis’ view of grade retention and social promotion

Regarding grade retention, Antonis clarified that he is against the measure in the 9-year compulsory education. Regarding years 10-12 he argued as follows.

In any case, I believe that pupils should be held back, at least those who are indifferent. At some point this may be of benefit to them, convince them to act prudently. Well, the teacher has no other weapon. Nothing except … you may say that by his personality the teacher can convince the pupils to sit down and study, to find ways, so that even the last pupil is improved. In my opinion at least the indifferent pupils should be held back, because pupils know … let’s be sincere: if there is no fear, pupils are not effective (I3.16.2.06).

Here, Antonis supported grade retention when it comes to pupils who are “indifferent” and characterised this policy as a correctional measure and as a means to motivate pupil effort through intimidation. He added that “we shouldn’t promote the least effort mentality which is characteristic of our society” and that “if someone doesn’t want to work, he should not to be rewarded”. In the critical interview, in my question “of those who repeat the year, how many are doctors’ children?”, Antonis answered: “Well, doctors have proved their intelligence. The farmer may not have a good brain so it is most likely for his child” (CR.16.5.06).

Finally, talking about the existent law for pupil promotion to the next grade (I3.16.2.06), Antonis said that he supported the measure and that when he spoke of the least effort mentality he just “condemned the absolute lack of effort”. He clarified that the current law is very lenient and that all a pupil has to do is “to show diligence in just
one subject” even if “he fails mathematics miserably” in order to pass the class. He also added that (a) it is this very slim minority of pupils who practically fail in all subjects that he qualified as “indifferent” and as having no will to study and that (b) only for this category he referred to the “least effort mentality” which if rewarded would have detrimental effects on the very pupils’ character. He concluded that even for this category the teachers have to make sure that their generalised underachievement is not associated with events like “death of family members, separation of parents, malady, or any other personal reasons that emerged in that particular period” in which case social promotion should be practiced.

5.6 Antonis’ teaching practice and its underlying rationale

Two different phases were observed in Antonis’ lessons that provided qualitatively different opportunities for the enactment of formative assessment: the review of old content phase and the introduction of new content phase. The practicing of new material phase, whenever it occurred, was entirely similar to the previous one.

The review of old content phase is conducted in two different ways depending on whether there are homework assignments to be reviewed on not. In the first case homework problems are solved on the board by volunteers. An excerpt illustrating Antonis’ behaviour in this part of the lesson is provided in Appendix 10. With regard to this excerpt but also referring to his general practice in this phase, Antonis explained that he plays an active part in his encounter with each volunteer by interrogating them, correcting them when necessary, suggesting how things must be written on the board, answering pupil questions on points of the solution that are not understood, asking other pupils to repeat parts of the proof and finally recapitulating the proof or the solution of the problem himself. Antonis gave the following explanation of his objectives in this phase.

In having a volunteer solve a homework problem on the board my objective is for the class to learn. What an individual pupil knows can be assessed in other occasions and in a short interval of time. Here my objective is the
consolidation and review of the content, not to assign a grade. I keep no
records of what the pupils say anyway. I form an opinion from their general
behaviour and the tests, that’s all (L1.17.2.06).

If there are no homework tasks to go over, through a serious of questions Antonis
has the pupils review what he qualified as “the major theoretical points of the previous
lesson” consisting of the “basic facts and processes treated there” and sometimes he
may even have a pupil present an entire proof previously done (L2.20.2.06). For
example, in lesson one (L1.17.2.06) he asked questions about the arithmetic mean and
weighted mean, the definition of the median of grouped distribution and the procedure
for finding it, while in lesson two (L2.20.2.06) he had a pupil prove again the theorem
that given two triangles $ABC$ and $DEF$ with $A = D$ or $A + D = 180^\circ$,

$$\frac{(ABC)}{(DEF)} = \frac{AB \cdot AC}{DE \cdot DF}.$$ 

In the latter case he justified his behaviour on the grounds that he
could not proceed to the next lesson insofar as he assessed that the class has not
mastered the previous content. He elaborated:

I have no blinkers. I do not proceed like an ox, according to my notes. Things
may evolve in a way not previously planned. You persist when you diagnose
a problem (L2.16.2.06).

Antonis’ pedagogical approach in the introduction of new content consists in
analysing the material into a series of questions which he addresses to the pupils. He
justified his approach by saying that “there should be an interaction between the pupils
and the teacher” and added that in a lesson the teacher should “give and take because if
he only lectures and does not ask questions, he may make a wrong estimate as to
whether he is understood” (I2.14.2.06). According to him, these questions are not
“predetermined” and are not the result of “thinking before the lesson” but “a teacher
who knows the lesson well is led by the material to ask the appropriate questions”
(L1.17.2.06). For Antonis the kinds of questions “depend on the level of the class”
(L8.13.3.06).
In the process of analysing each new theorem introduced in class or any new task usually done on the board into a series of steps and asking his pupils to answer the appropriate questions associated with these steps, Nikos usually does not reserve for himself the strategic problem solving decisions nor does he try to retain the full command of the proof plan. Thus, he asked “how would we construct a square inscribed in a given circle?” and did the same for an equilateral triangle. Also, when he asked how the side of an equilateral triangle in a circle is expressed in terms of the radius of the circle, he followed a pupil’s suggestion and then derived the formula using the textbook’s approach. Multiple solutions were sought by him wherever he “found the opportunity” (L6F.8.3.06). With regard to his problem solving questions, it should be noted that despite their cognitive level usually he left very little time after uttering such questions for student genuine thinking. Again, using the inscription of an equilateral triangle in a circle as an example (L4.27.2.06), in my opinion, the tutoring effect was apparent insofar as this question, as well as similar other problem solving questions, was answered almost instantly and in a spontaneous manner usually by a very small minority of pupils. Commenting on what he qualified as his “anarchic” turn-taking system, Antonis said that “it is a matter of character” and is not some “conscious pedagogical choice” (L7.9.3.06). According to him this has no negative effect on those pupils who do not dominate discourse insofar as a considerable part of the pupils in his classes in the last two grades of lyceum (where I made my observations) have already chosen a non-scientific track and hence “they have abandoned mathematics since they can be promoted with their overall average” (L7.9.3.06). Concerning a formative assessment intervention related to these pupils, Antonis said

Out of my long experience, I have come to the conclusion that they will not study no matter how you try. You won’t change anything. To motivate them and monitor their progress is utopian (L7.28.2.06).

The main source Antonis drew upon in order to receive pupil-related information that could be used as the basis for altering his pedagogical approach was the answers to
the questions he addressed to his pupils during the different phases of the lesson. In the eight analysed lessons he asked 161 questions in all, 20 questions on each lesson on average. Among those questions, 80 questions required recalling and reproducing some mathematical fact (property, rule, concept definition, formula, enunciation of a theorem, notation), 12 questions required of pupils to supply one or two steps in some routine procedure, 26 questions required the application of some property, formula or theorem, 13 questions required some form of relatively simple mathematical reasoning, 14 questions were related with pattern recognition, 5 questions asked for a recapitulation of the main points of the lesson. Most of the questions above required short answers. In addition to these questions, there were 7 questions connected with problem solving like the construction of an equilateral triangle inscribed in a give circle. Examples of his questions are provided in Appendix 11.

All feedback given by Antonis to his pupils was corrective and was categorised as follows: provision of the correct short answer by the teacher with or without explanation, brief probing into the pupil’s thinking and then providing the correct answer, asking a different pupil to provide the correct answer, providing a small hint to aid the pupil’s thinking, and cases where some other pupil interrupted the teacher probing and provided the correct answer. Examples are provided in Appendix 12.

Regarding the adequacy of the model he constructs concerning each pupil’s knowledge of mathematics, initially Antonis expressed the opinion that assessing what a pupil knows is primarily dependent on the teacher’s “smartness”. He went on

I think that the smart teacher can understand the pupil’s capabilities. It’s like having a car for many years. How can you not know its defects and capabilities? (I2.14.2.06)

Then, he used another metaphor.

It’s like planting a farm with corn or whatever. You must know what you should expect. I think it is mostly the teacher’s stupidity not to know what he has produced. This means that he is unable to assess the level of the class and of his pupils, what they have understood and what they haven’t (I2.14.2.06).
He also claimed that a “clever” teacher can appraise a pupil’s potential and knowledge in a very short time interval: He elaborated:

I’ve told you it has to do with the teacher’s intelligence. A smart teacher can understand if the pupil has mastered some knowledge or not, he can assess his intelligence only by the person’s movement, by his behaviour, without (officially) examining him. If the pupil is smart, you can see it in the way his eyes move … the experienced teacher can tell his pupil’s ability, only by a few gestures … there are teachers who can tell a pupil’s worth within a short time interval, even before the pupil writes anything. Other teachers struggle with exams and still make wrong estimates (I2.14.2.06).

However, later he pointed out that “unlike what happens in private tutoring, no detailed mapping of the pupil’s knowledge can be constructed in school because this would require individualised teaching”. In his opinion this is precluded because the implementation of the curriculum has priority (EvI.27.3.06). Here is how Antonis argued on the issue:

Well, what pace shall we impose on children? We will impose a fast pace in order to implement the curriculum, compel them to be constantly working everyday or a slow pace that usually makes them fall asleep or I’d rather say relaxes them. It depends on the pace you want to follow. Tomorrow, when they will come out in production what pace will they follow? Are they going to follow a slow pace? If they are slow they will be fired (EvI.27.3.06).

Here it is supported that a fast pace of learning keeps children more alert and prepares them to be effective and successful in the labour market. He went on:

When you remain in the same chapter because some pupils do not study or because the lesson does not come along too well… let’s say the lesson is not coming along too well, the pupils impose a slow pace on you and then what happens next? We have to cover some material and whoever wants to follow that’s fine. Some pupils don’t want to follow; there is nothing we can do for them (EvI.27.3.06).

Antonis’ words reflect the preponderance he gives to the implementation of the curriculum even if this is detrimental to the formative assessment opportunities and to the learning process. Moreover, he attributes the learning problems created by a fast pace to the lack of some pupils’ will to follow along.

Finally, expressing his inability to help pupils with more serious than average problems, as well as pupils who have no will for learning or lack intelligence, he concluded
In a class you can make some improvements but if you see someone having a problem you cannot deviate completely from the level of the class. You try to make some corrective interventions but if they are all dunces what can you correct? Or if they all don’t want to learn what can you do? In a class you have to go with the average pupil (Ev127.3.06).

The statement “if they are all dunces what can you correct” resonates with what he said elsewhere:

Well, if they are all blockheads, they will not understand no matter what method of teaching you may choose. If they are smart … even if you follow a crap-method, they will understand. The most difficult thing for the teacher is not to be understood by the smart ones; the smart ones will understand. The most difficult is to be understood by the stupid ones (I2.14.2.06).

Here, Antonis rather devalued the power of teaching in view of his emerging theory of ability as a fixed biological datum that primarily determines intellectual outcomes. As the following excerpt shows, he seemed to be categorical in his conclusion that mathematical ability is determined by hereditary factors.

There are tremendous differences! It’s not only innate but it should be in the genes. I have met pupils who were ignorant and in the course of time I discovered that their parents were also weak in maths. I believe that heredity plays a tremendous role. If the father has brains, the child will have too, as a rule. I have met a lot of pupils who can’t make it and behind this I find out that the parents are the same. Well, some people have no brains. Mathematics requires some intelligence (I2.14.2.06).

In the same interview he claimed that “a person who has no brain will still fail no matter if he has 100 teachers, the top teachers” and added that “a big percentage of those who fail do so because of inheritance factors” and supported his conclusion by saying “look who excel at the competitive examinations in Greek Mathematical Society. It is the sons of teachers” (I2.14.2.06). Asked in the critical interview whether one could invert the argument and claim that the teachers’ children have a favourable environment and the appropriate support for academic success, he replied: “I believe it is innate. If you have no brain what can you learn?” (CR.16.5.06).
5.7 The critical interview

In the critical interview (CR.16.5.06), our discussion revolved around summative assessment and formative assessment. First, Antonis touched upon the significance of assessment in any human endeavour.

Assessment exists in all aspects of social life everywhere and always. There is no society where achievement is not evaluated. In your job you will be evaluated by your boss but even being alone you will assess how you are doing.

Then he spoke of the significance of pupil ranking.

You rank the pupils into an order. It’s the analogue of what we have in society: class differences and categorisation according to the economic status. In school pupils are ranked according to their achievement. What does this hierarchisation serve? I haven’t thought about it. There must be a hierarchy according to each pupil’s knowledge for the class to function. Those at the end must try to work harder.

Asked to position himself with respect to the view that assessment and ranking should have equality of opportunity as precondition, Antonis answered: “They don’t start from the same starting point, man! This is a society of two thirds. Equality and justice hold for this part”. And he added

Education is class biased. If the parents have money they can afford sending their children for private tuition which is a sine qua non for entry to higher studies. But also during their school life, children need assistance and monitoring of their progress and most parents work. It is here where private tutoring supplements the parents’ role.

In short, Antonis considered assessment as an inescapable characteristic of social life, as well as of individual endeavour but at the same time he thought that competition to occupy a better place in the hierarchy of achievement is influenced by the pupils’ social and economic position.

Regarding formative assessment, I wanted further clarifications as to whether and to what degree Antonis is satisfied with the feedback he gives and receives from his pupils. The following dialogue illuminates Antonis’ position.

To what extent do you think that you bridge the gap between the desired and actual pupil performance on an individual basis?

I don’t think I have the time. During these last years I have made sure that I teach at the upper grades where all pupils attend private tuition. Behind me there is another person who takes care of the formative assessment work.
How about the lower grades?

I may have a pupil on the board and I see where he gets stuck. Of course this is helpful only for those pupils who come on the board. In general I do not attempt to address pupils’ individual learning needs except in cases where I cannot proceed to the next topic. If the class is unable to proceed I do more problems. That’s all I can do because I have to implement the curriculum. Besides if you deal with a pupil who does not understand on an individual basis, the other pupils will start screaming. The teacher has a class, not individuals. Even if he wants it, he must devote time which he doesn’t have.

Walking between desks and monitoring pupil progress is particularly popular in Japan. Correcting pupil homework could also provide valuable feedback both to the teacher and the pupils. What is your reaction to that?

You are given one hundred hours to teach? You will do one hundred hours. There is no need to do one hundred and fifty. The job you’ve been assigned with includes the time parameter. One shouldn’t want more time to finish a job.

In this dialogue Antonis reconfirmed in a categorical way what he claimed earlier, namely that he does not provide adequate feedback on an individual basis to his pupils. From his conclusion, we can also reconfirm his attachment to and compliance with the existing curriculum and its constraints.

Later, Antonis discourse disclosed another possible aspect of his rationale behind his formative assessment behaviour that has to do with his character.

For me it’s a matter of character. I may be a je m’en foutiste. I say what I have to say and that’s all. In matters of assessing the pupils’ knowledge I have caught myself being indifferent. I have my conscience clean, I have said it but I don’t care about the other person. Of course one has to check to find out where the pupils are, what they can understand.

Two days later he elaborated further referring to the effects of routine work in a climate of pupil relative apathy:

It’s like the driver. In the beginning he gives all his attention and his senses to his driving; he doesn’t drive mechanically. Perhaps after many years we become like the experienced driver and drive mechanically. It is an inevitable adjustment of our characters but in our case a contributing role is played by the pupils.

Antonis clarified that the school and the pupils make the teacher and that in an “experimental lyceum one would probe the pupils’ thinking in order to provide the necessary feedback associated with the pupils’ individual needs” whereas “in regular public schools these issues have been set aside for ever”. And concluded the whole
conversation by saying: “I serve the system. Don’t we all, some in full awareness and others unaware of it? Yes, I serve it but I know if something goes wrong and for what reason”.

5.8 A critical analysis of Antonis’ views

Antonis views mathematics education in connection with what he considers as the socio-economic imperatives from which the mathematics curriculum cannot escape. In his opinion this curriculum does not promote critical thinking but on the contrary it produces a docile future workforce. This is purportedly achieved by the lack of time for engaging with problem solving tasks and the ensuing standardisation of mathematics, i.e. its reduction to prescriptive rules and processes. Adhering to the aims of the mathematics curriculum as expressing historical necessity, Antonis advocated a content-centred pedagogical approach that in his original formulation bluntly disregards the pupils’ needs. This conclusion is suggested by the following excerpt

When you remain in the same chapter because some pupils do not study or because the lesson does not come along too well… let’s say the lesson is not coming along too well, the pupils impose a slow pace on you and then what happens next? We have to cover some material and whoever wants to follow that’s fine. Some pupils don’t want to follow; there is nothing we can do for them (Evl.27.3.06).

Here, pupils that are unable to follow along in the prescribed pace are described as lacking the will. The full meaning of this passage was revealed later when he described a polarised learning environment in his classes: On the one hand, the pupils who actively participate in his lessons by asking and answering questions and by correcting one another. On the other hand, a group of pupils who follow a non-scientific track and who have “abandoned mathematics” taking advantage of the existing law for social promotion by virtue of which they can pass mathematics, even if they fail it, with their overall average. According to Antonis, any effort to mobilise this latter category of pupils and monitor their progress will be futile.
Antonis conducts his teaching in two phases. In the phase of reviewing old material his main objective is to provide feedback to those pupils who could not cope with the homework tasks or receive feedback from his pupils regarding the basic theory covered in the previous lesson. In the second phase through a serious of questions and answers in a climate of informal conversation and spontaneous turn-taking he develops new theory and practices new content. Although he keeps no records of what the pupils say, Antonis expressed his satisfaction with the picture that he forms of the pupils’ capabilities in mathematics. Provided that a teacher is equipped with the necessary intelligence, an attribute that seems to pervade Antonis’ thinking, the diagnosis of the pupils’ knowledge and learning difficulties seems to him to be a natural task. To use Antonis’ initial formulations, it can be achieved as a function of the teacher’s IQ within a short time span. Let us revisit what he said earlier.

I’ve told you it has to do with the teacher’s intelligence. A smart teacher can understand if the pupil has mastered some knowledge or not, he can assess his intelligence only by the person’s movement, by his behaviour, without (officially) examining him. If the pupil is smart, you can see it in the way his eyes move … the experienced teacher can tell his pupil’s ability, only by a few gestures … there are teachers who can tell a pupil’s worth within a short time interval, even before the pupil writes anything. Other teachers struggle with exams and still make wrong estimates (I2.14.2.06).

Note that the assessment described here is not detailed but given either in terms of the good/bad dipole or in terms of “intelligence”. This underestimates the value of diagnostic tests in the teaching and learning of mathematics, such as identifying specific topic related learning difficulties, errors and misconceptions. The “car” and “farm” metaphors also testify to Antonis’ perceptions of the adequacy of his models of teachers’ knowledge. However, as I projected the content and function of formative assessment as it is conceived in the literature through my questions, Antonis became more detailed in what he practices and thinks on the issue. Thus he claimed that, concerning the feedback he gives to the pupils, he makes “some corrective interventions” that do not “deviate” from the “average” learning needs but by and large
he treats each class as a whole and not as consisting of individuals with their particular learning needs (“the teacher has a class, not individuals” and “in general I do not attempt to address pupils’ individual learning needs except in cases where I cannot proceed to the next topic”). Also he referred to the lack of time as a factor that precludes an individualised approach to adequately assessing the pupils’ learning needs. At this point he became autobiographical expressing a kind of disappointment for what life at the lyceum has become over the years. Earlier he referred to the lack of autonomy in the lyceum as a result of the pupil preparation for the national examinations and its subjugation to test imperatives that undermines its “educational mission”. Then speaking in general terms he described a teacher’s trajectory as one necessarily leading to non inquisitive mechanical behaviour and in his case he delineated his personal habitus characterised by an indifference to provide individualised help to the pupils. I think that his phrase “I have my conscience clean, I have said it but I don’t care about the other person” does some injustice to him in the sense that he does not just lecture. His teaching practice does give room for pupil participation. This practice is not irrelevant to his theory of teaching which emphasises the importance of directed free dialogue and the interaction between the teacher and the learners. It is just that this practice is beneficial to a minority who are cognitively prepared to be able to follow along or because they know the material already from their private lessons. For a good many pupils in his class, Antonis has no picture of their knowledge except for the one formed by the forty-minute exam he is obliged to give once a year. That he “doesn’t care about the other person” may also be an exaggeration but I think that it is connected with what he considers as his main duty, namely to implement the curriculum. This is shown in the following excerpt

You are given one hundred hours to teach? You will do one hundred hours. There is no need to do one hundred and fifty. The job you’ve been assigned with includes the time parameter. One shouldn’t want more time to finish a job.
In fact, Antonis does not see his task as what the Ancient Greeks would call a λειτούργημα (performance of public service), a term that still survives in the Greek vocabulary and educational thinking, but as “a job to be done”. This is in line with his disenchantment as expressed earlier (“in regular public schools these issues have been set aside for ever”). It should be noted that this passage was a response to the question as to whether he considers walking between desks as a useful practice for the provision of feedback. Focusing narrowly on the implementation of the specific curriculum, Antonis asserted that “there is no need” for additional time and “one shouldn’t want more time”. This may be true if “implementation” is construed as a recitation of the material, be it with some pupil contribution. But if we require that curriculum implementation leads to positive learning outcomes for the largest possible part of the pupils then their learning needs come to the foreground and it is these needs that determine the required time. I think that this omission to make the association between a slower pace and an opportunity for an effective formative assessment might be considered as a manifestation of the lack of teacher development programs that would acquaint teachers with the basic principles of the new rising assessment culture for learning, principles that are rhetorically recognised in the pedagogical institute’s curriculum guides but have not reached the teacher’s problematic. I would also speculate that a major reason for this omission lies in his theory of intelligence (if they are all blockheads, they will not understand no matter what method of teaching you may choose).

In fact, Antonis regards lack of intelligence as the major cause for pupil underachievement and failure. The purported pervasive influence of intelligence factors in achievement leads Antonis to the conclusion that whole social classes owe their relative position in social space as a function of the IQ of their members (“Well, doctors have proved their intelligence. The farmer may not have a good brain so it is most likely
Antonis views mind not as a dynamical, extremely complex and unfathomable entity, a view suggested by recent scientific evidence, but as a simple, one-dimensional, static reality. From this perspective, once a verdict is reached about a pupil’s purported level of intelligence, there is almost no chance of any modification. Returning to Antonis’ attribution theory regarding pupil underachievement, it should be noted that although he referred to the curriculum as consisting of material that is taught at the universities and “at the same level”, he did not regard it as a cause of pupil failure. I would speculate that this is not unrelated to his theory of mathematics ability.

Concerning the system for pupil selection for higher studies, Antonis attached great importance to the fairness and “irreproachability” criterion. One reason Antonis defends the existing selection system and emphasises public consensus seems to be related to his distrust and fear of an alternative system being introduced in a socio-political context diachronically characterised by favouritism, clientelism and generalised corruption (Korovinis 2009). On the other hand, in addition to some reservations he expressed as to whether knowledge can be appraised by a single examination, and as to its negative impact on the whole educational process, Antonis qualified the selection process as “socially unjust” insofar as in his opinion achievement in this external examination is connected with the pupils’ socio-economic, cultural and educational background. Moreover, he extended this characterisation beyond the final moment of the educational process by drawing attention to the advantages of those pupils who can receive private tuition during their school years.

Antonis explicitly characterised the function of education as socially reproductive. In his opinion, equity and meritocracy hold for the privileged “two thirds” of the population who have the necessary educational and economic capital. From this perspective, he does not favour grade retention except for some extreme cases where pupils fail all subjects without an apparent justification related to some adverse
conditions that prevented them to make an effort. Moreover, he supports the favourable law for pupil promotion that makes it very hard for pupils to repeat a grade unless they practically fail in all subjects. On the other hand, he made no reference or allusion to summative assessment as being (apart from anything else) the means to sanction school failure (Perrenoud 1989), a view conformant with the radical sociological perspective. Instead, he confined his attention to (a) the ubiquity of assessment in all human endeavours and to its social necessity and (b) the weakness of grading with respect to the negative and at time pernicious psychological impact it may have on some failing pupils. Moreover, although when prompted he rejected the idea that there exists equality of opportunity, he supported a hierarchy of excellence created by grading invoking analogous phenomena in the wider society.

Antonis’ reference to the curriculum as serving socio-economic imperatives, in combination with his comment “I serve it but I know if something doesn’t go well and for what reason” suggest that Antonis views social reality as one that “absorbs all alternatives” (Marcuse 1964). In fact, during our conversations, he refrained from expressing any vision that would be challenging and subversive to the established educational reality.
CHAPTER SIX
CASE STUDY THREE (GIORGOS)

6.1 A few words about Giorgos

Giorgos is a senior teacher with a 30 year experience in several high schools. He considers himself a hard worker and has expressed his bitterness that his devotion to his professional duty has not been met with the appropriate official recognition (L1F.26.1.06). His dissatisfaction with the luck of meritocracy in teacher professional development has contributed to his decision to consider early retirement (II.9.1.06). He spends his free time on beekeeping and on the cultivation of his fields in his country home.

6.2 Giorgos’ view of the mathematics curriculum

Giorgos sees school mathematical activity as an opportunity for the “cultivation of logic and of rational faculties” (I1.9.1.06). Speaking of the Greek mathematics curriculum for the lyceum he said the following:

First of all, I think that I agree with the objectives of the curriculum and with the level at which they are to be achieved. I would also say that I rather agree with the range and the structure of mathematics syllabus… The important thing is that there is this notion of logical sequence in the textbooks used … I think that certain parts in the textbooks must rest on even firmer theoretical foundations, although I understand that at the high school level this cannot be done in a complete manner (II.9.1.06).

This excerpt suggests that Giorgos subscribes to the aims of mathematics education as they are set by the ministry of education and agrees with the depth and breadth of mathematical content to be implemented, as well as with the structured character of the presentation, asking for even more rigorous theoretical foundations.

Although Giorgos thought that most pupils can more or less be successful in the current curriculum by virtue of their “logical capacity” which he thought to be a universal characteristic of humankind, he pointed to the fact that failure is a usual phenomenon which he attributed primarily to the teachers’ pedagogical deficiencies and
to the lack of appropriate time for implementing the appropriate pedagogical methods (I2.16.1.06). Regarding teachers he believes that “they do not follow the appropriate pedagogical principles in their daily classroom practice, certainly with some exceptions” (I2.16.1.06). Consequently he thinks that “as a result pupils do not acquire the sufficient background from their teaching” (I2.16.1.06). As far as the lack of time is concerned, he expressed the opinion that “a share of responsibility belongs to the state because the required content cannot be implemented in the time available”. To alleviate this problem, originally he proposed an increase of time devoted to the teaching of the existing syllabus from 4.5 hours to 6 hours a week (I1.9.1.06). Later, however, he spoke of lack of time as an “alibi for the meagre effectiveness that our teaching has in our classrooms” and asked for “a little more time in order to teach the mathematics” he is “obliged to teach” (L1.25.1.06).

6.3 Giorgos’ conception of high stakes testing

Giorgos sees high-stakes testing and summative testing only as a motivating and productive force. Here is how he elaborated on the issue:

If we accept the very recent estimates of psychologists and doctors that a little pressure and a little stress make a person progress and since examinations exert a little pressure and a little stress, obliging the pupil to sit down and study a little more, I would not say that examinations are a negative factor (I3.23.2.06).

Concerning the entrance examinations for higher education, Giorgos first expressed his satisfaction with their “irreproachability”. Then he referred to the quality of the test items in these external examinations.

At least for me, the test items have been instructive in the following sense: I have learned that the mathematical content we present must be very well absorbed by the pupils. I try to apply this in my teaching at all grade levels. Pupils must fully comprehend what we tell them … look, I believe that the test items have goals, they examine a very large part of the implemented mathematical content, and they are of graduated difficulty, something I approve of. I qualify them as quite appropriate (I3.23.2.06).

Here, Giorgos praised the quality of the test items which in his opinion test a representative part of the curriculum and which require a preparation that leads to a
deep level of understanding and thus enhances the pedagogical process. Regarding the issue of whether public schools can prepare their pupils for such examinations, the following dialogue ensued:

I. Do you think that public school can adequately prepare the pupils for these examinations?

G. I would say that, by and large, school cannot appropriately prepare pupils for the national examinations.

I. For what reason?

G. Because pupils are not always receptive, because they think they know the stuff already (from their tutoring lessons) and secondly because many of us undervalue our work and do not try as much as we should.

I. Otherwise it could?

G. Of course! Let me note that there are schools in Greece that lie outside the sphere of influence of tutoring institutions. If they happen to have teachers who work the right way, these schools excel in the national examinations (I3.23.2.06).

As this dialogue suggests, Giorgos thinks that public schools can adequately prepare their pupils for the national examinations, provided that the appropriate pedagogical approaches are followed by the school teachers and pupils have a receptive attitude. He located these schools in “the country towns and rural regions where the rate of success is remarkable and makes these schools to be distinguished from other regions” (I3.23.2.06). Reflecting further on the issue he said

Ah … I don’t know if I am wrong, if I speak on the basis of the existing possibilities, if it possible for a pupil to make it to the university without private tutoring lessons. I don’t know to what extend this happens in practice. Look, I spoke earlier that there are schools outside the sphere of influence of tutoring institutions whose pupils succeed. In this sense the economically feeble are not deprived of opportunities. But, you may ask, to what extent is this realised? It needs the appropriate pupils and the appropriate teachers. To what extent can this happen? I would say not always to a large extent, not always. Consequently, I would say that there exist certain inequalities because school in not organised as it should (I3.23.2.06).

As the excerpt suggests, Giorgos is unsure regarding the extent to which pupils unassisted by private tutoring can succeed in the national exams that exclusively determine their academic future. He invoked examples of successful pupils from schools situated in rural areas remote from organised tutoring institutions but did not
know the extent to which this happens. For Giorgos, if matters of school organisation are resolved and the appropriate pedagogy is employed, social equity could be ensured. Asked to explain what he meant by “appropriate pupils”, Giorgos answered

I think that to an important degree pupils have not realised what is going on in school and how much they should study and be prepared for school and examinations. I would expect and I would like students to study more, to be better prepared, to be aware of the existing difficulties and act accordingly (I3.23.2.06).

Here pupil poor performance is attributed by Giorgos to the pupils’ lack of awareness as to what the demands of academic life entail.

6.4 Giorgos’ conception of the role and meaning of grades and his criteria for assigning grades

For Giorgos “grades predispose and enlighten both pupils and their parents concerning the achievement and the capabilities of their children” (I3.23.2.06). For this reason he is against lenient practices in assigning “oral” grades insofar as such practices “disorient both parents and children” about the latter’s capabilities (I3.23.2.06). In addition he thinks that “grades give satisfaction to those who are good and mobilises those pupils who do not show the necessary interest and do not make the appropriate effort” (I3.23.2.06). In assigning oral grades, Giorgos said that he takes “seriously” into consideration the pupils’ presence in class by which he means “the attention and the diligence they show” and to a lesser extent their achievement on the forty-minute exam.

6.5 Giorgos’ view of grade retention and social promotion

Referring to grade retention, Giorgos criticised the existing law for pupil promotion to the next grade.

Today, as a result of how pupils are assessed and promoted, I think that we end up with extreme cases of pupils who not only are not improved but become worse in due course. Yet, these pupils are promoted to the next grade with practically no knowledge of mathematics. These pupils will advance,12

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12 In Greek lyceum the two oral marks given by the teacher one for each semester and based on his overall judgment of the pupil’s progress count for 50% of the pupil’s final mark, the other 50% being the pupil’s mark on the final exam constructed by all teachers in the school that teach a particular Grade.
they will graduate and they will compete for a job that requires a senior high school certificate together with others who deserve this diploma. I believe that the system of promotion should change in this respect (I3.23.2.06).

Giorgos rejected the existing lenient system of promotion, as well as the teachers’ social promotion practices on the grounds that such practices are not motivating for learning and on meritocratic grounds. It is worth noting that the old system that Giorgos favours would have a pupil repeat a year if he failed one course in a core subject during the academic year and missed a chance to get a passing grade on the make-up exam at the beginning of the following academic year. In the critical interview, responding to my remark that if the law for social promotion did not exist and teachers were not lenient in grading, 66% would have been retained, he supported the idea that “a selection process must be established from the gymnasium to the lyceum but this under the condition that technical and professional education could absorb more pupils than it does today” (I3.23.2.06).

6.6 Giorgos’ teaching practice and its underlying rationale

In all observed lessons, Giorgos followed a particularly consistent teaching pattern. Most of the time a volunteer pupil recorded the essential elements of class discourse on the board and the pupils were expected and encouraged to copy them in their notebooks. In his view this practice “facilitates the teacher’s control of the class and ensures strict discipline, with no noise or unauthorised comments tolerated at any point throughout each lesson” (L1.25.1.06). Each lesson started with a review of the basic theoretical points developed in the previous lesson which was used for formative assessment purposes. Giorgos explained that in this phase through a series of questions he has the pupils make “a brief recapitulation of the basic theoretical points of the previous lesson” and thus he assesses “to what extent pupils have understood and have assimilated the theoretical conclusions” (L1.25.1.06). Beyond that he “emphasises the crucial points that will be needed for the development of the current lesson” (L1.25.1.06). Appendix 13 provides an excerpt that illustrates and describes how this
phase is conducted. Except for the review of the major theoretical points developed in the previous lesson, all other classroom mathematical discourse is conducted in an identical way. This includes homework tasks not dealt successfully by the pupils at home, other tasks assigned in class, the development of new theory and the practice of new content. Giorgos explained that unless he is explicitly asked to solve a particular homework problem, he usually chooses to deal with problems that are not likely to be known to the pupils beforehand in order to minimise the effect of private tutoring on his teaching efforts.

For the review of tasks that have been assigned for homework, as well as for the introduction and practice of new content, Giorgos conducts each lesson in a dialogical style leading the class usually by means of an “exhaustive” (L3.30.1.06) series of questions to be answered successively by different pupils. Giorgos explained that by exhaustive he means that no two ideas should be contained in any phrase uttered by the teacher or the pupil. The following excerpt shown in figure 3 below is illustrative of his approach (L8.10.2.06).

Figure 3: Example of Giorgos’ dialogical style of teaching

For any point $P$ inside the triangle $ABC$
prove that $\frac{(PA)}{(AA)} = \frac{(BPG)}{(ABG)}$

<p>| | |</p>
<table>
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<tr>
<td>1.</td>
<td>T. Is there something essential in the relationship we want to prove?</td>
</tr>
<tr>
<td>2.</td>
<td>P1. We have a ratio of areas,</td>
</tr>
<tr>
<td>3.</td>
<td>T. Repeat what the ratio of areas is</td>
</tr>
<tr>
<td>4.</td>
<td>P1. It is $\frac{(BPG)}{(ABG)}$</td>
</tr>
<tr>
<td>5.</td>
<td>T. Yes. Are these triangles related to each other or not? Helen</td>
</tr>
<tr>
<td>6.</td>
<td>H. The share the same base.</td>
</tr>
<tr>
<td>7.</td>
<td>T. The share the same base. According to the theory we have developed the ratio of areas in this case is equal what? Maria</td>
</tr>
<tr>
<td>8.</td>
<td>M. With the ratio of the altitudes.</td>
</tr>
<tr>
<td>9.</td>
<td>T. With the ratio of the altitudes. So what should we do? Jim</td>
</tr>
</tbody>
</table>
10. J. We should draw the altitudes.
11. T. Can you come to the board and draw them?
12. J. (he draws them)
13. T. ΑΚ and ΡΘ. Correct.

For Giorgos, asking a different pupil each time helps to “increase participation and to keep pupils alert” (L1.25.1.06). Commenting on his questions on lines 1 and 5 Giorgos said that often he asks questions sufficiently general so as not to suggest the answers (I make general questions, that is, I give no clues as to what I am looking for) (L8.10.2.06). Through his questions which “problematise” pupils and “exercise their judgment”, Giorgos thinks that he can assess pupils’ “knowledge and critical faculties” (L4.1.2.06). He also said that he had learned a lot from Polya’s treatment on heuristics and added that imitating his method in-between the questions addressed to his pupils he tries to “enrich the lesson with insights that help towards a better understanding of the material and to provide remarks intended to enhance the heuristic ability of pupils when facing new tasks” (L1.25.1.06).

Giorgos said that he gives emphasis to the unfolding of the lesson through a series of steps that give the optimal path to the solution of a task and that he searches in the class each time to find the pupil who will provide the step that fits his predetermined path (L5.3.2.06). He added that he does not deal with the thinking of individual pupils when this thinking lies outside the main course of action that leads in the “optimal way” to a desired mathematical result. An illustrative example of this policy is the following task (L5.3.2.06): Find the tangent of a circle with centre K(2,3) at its point А(5,−1).

While the answers originally given by the pupils pointed to the solution obtained by using the equation \( y - b = m(x - a) \), he bypassed a number of pupils who implicitly or explicitly expressed this idea until he found a pupil who suggested that the problem be solved by using the fact that \( \overrightarrow{KM} \cdot \overrightarrow{MA} = 0 \), where \( M(x, y) \) is any point on the tangent, justifying his decision on the grounds that the latter was the “optimal solution”.

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The main source Giorgos drew upon in order to receive pupil-related information that could be used as a basis for altering his pedagogical approach was the answers to the questions he addressed to his pupils during the different phases of the lesson. In the eight analysed lessons he asked 263 questions in all, 33 questions on each lesson on average. Among those questions, 87 questions required recalling and reproducing some mathematical fact (property, rule, concept definition, formula, enunciation of a theorem, notation), 29 questions required of pupils to supply one or two steps in some routine procedure, 49 questions required the application of some property, 6 questions required reading off information from a figure or algebraic expression, 65 questions required some form of relatively simple mathematical reasoning, 2 questions were related with pattern recognition, 11 questions asked for repeating the hypothesis or part of the hypothesis of some proposition, 10 questions required the translation of verbal data into some mathematical symbolism or the inverse, and 4 questions required finding analogies. Most of the questions above required short answers. Finally, there were three problem solving questions. With regard to these questions it should be noted that they were answered in a short interval of time despite their complexity. For example, in the following problem shown in figure 4 below (L2.27.1.06)

Figure 4: Example of a problem solving question posed by Giorgos

Let $\Delta \Gamma \Delta$ be a trapezoid and $M$ be the midpoint of $AB$. Prove that $\frac{1}{2}(\Delta \Gamma \Delta) = 2(M \Gamma \Delta)$

a pupil conceived of the whole plan of drawing a perpendicular from $M$ to $\Delta \Gamma$ and $BM$, prove that $\frac{1}{2}(\Delta \Gamma \Delta) + (BM \Gamma) = \frac{1}{2}(\Delta \Gamma \Delta)$ and then deduce that $\frac{1}{2}(M \Gamma \Delta) = \frac{1}{2}(\Delta \Gamma \Delta)$ in
seven seconds. In my opinion this might have been an instance of the tutoring effect.

Examples of Giorgos’ questions are provided in Appendix 14.

All feedback given by Giorgos to his pupils was short answer corrective feedback and was supplied either by the teacher himself or by asking a different pupil or two pupils (if the first failed to give a correct answer) to provide the correct answer. Examples are provided in Appendix 15.

Giorgos explained his latter choice as follows:

The pupil remains in suspension and I address another pupil because there is not much time available. A second pupil has raised his hand to say something else. When a given answer does not satisfy me usually I expect a second and a third answer that may lead to the correct solution sooner. From a pedagogical point of view I regard this as unpleasant for the first pupil but he remains in suspension and he may be interested to check the correctness of his answer anyway.

Regarding his choice not to discuss a pupil’s irrelevant answer to one of his questions (see Appendix 16), Giorgos commented:

The pupil gave a completely unrealistic answer. Ideally, if you want to make this pupil learn you must deal with his view. Well, you cannot do that, you have to push the lesson on. One may say that this is anti-pedagogical that this pupil did not gain something. This is true. I understand that at that point clarification was needed. But one must understand my inability to cope with this thing; not personal inability but the one that obtains from the conditions of our work. I will reread the exercise so that the last pupil will understand. I can do nothing more (L.7.8.2.06).

Elsewhere, he developed similar reasoning by saying that “many pupils come to lyceum with significant gaps” and that “to fill these gaps one would have to devote considerable time, usually not at one’s disposal” (L.3.30.1.06).

Asked whether he assigns problems to be dealt individually by the pupils at their desks, a process that gives opportunities to the teacher to monitor pupil progress (approach that was not observed), Giorgos answered that although he has tried it occasionally for a brief period of time (around 5 minutes depending on the task demand) as a rule he does not use this method “because of the problem of time” (L.8F.12.2.06). Finally, regarding the pupils with weak participation in the whole class dialogue, he said that in many cases he does not only ask those pupils who raise their hands and that
“within a two month interval all pupils have understood that they have the same probability of being asked” (L3.30.1.06).

Overall, in the interview associated with his evaluation of the potential for formative assessment afforded by his teaching approach, Giorgos said that he has a “pretty good picture” of what the pupils know, at least for those pupils with “sufficient participation” (EvI.27.3.06). For the pupils with weak participation he expressed his inability to “fill the gaps” between their performance and the desired level of performance. At this point, Giorgos supported his own version of ability grouping “based on the pupils’ achievement”. For him the purpose of setting by ability is to give a chance to low achievers to “improve in every respect both in the subject matter in solving some problems that they face with the teachers’ assistance because if a pupil has certain capabilities which are not translated into good achievement there must be some negative factors at work”. Giorgos believes that “education should make sure that these negative factors are eliminated”. In his opinion those pupils situated at the lower level who can move to the level of high achievers should be “absorbed” in technical education. It should be noted that in his notion of ability grouping the different groups follow the same curriculum but the only parameter that differentiates them is the number of hours mathematics is taught presumably an increased amount in the case of lower groups. Commenting on his idea, Giorgos said that it just “passed through his mind” and that he had not worked out any details as to how it could be “technically implemented”. Asked whether he thought that this policy would change the rates of representation of the different classes in higher studies he said that “if it could be implemented in the whole of secondary education it would help decisively” (CR.16.5.06). Moreover, asked if he could give an account of why this policy has not been implemented so far he said that “what comes to my mind as an answer is that my
suggestion is not well thought of and is utopian. I cannot find any other way that explains why it is not implemented or it is not intended to be implemented”.

6.7 The critical interview

In the critical interview (CR.16.5.06) our discussion revolved around issues that are related to the socio-political dimension of assessment. First I wanted Giorgos to react to the argument that the unequal distance that pupils of different cultural, linguistic and socio-economic backgrounds have to cover towards the acquisition of what is considered as worthwhile and useful knowledge is a factor of success for some and of failure for others (Perrenoud 1989). His response was as follows:

I believe that this argument is really remarkable. It is true that those children that are better equipped, that have more cognitive capital, have more possibilities and opportunities. This is a fact. It is also true that the knowledge of a child of an urban family is richer and better that that of a child that comes from another area or class. This has direct consequences on the pupils’ achievement and it should seriously be taken into consideration but in the direction of elevating the weak and not downgrading the best ones. That language has a direct relationship with the pupils’ level of mathematics achievement is a fact. We teachers have the obligation to help the weaker pupils, to present things as clearly (but not simplistically) as possible. We can improve things but not decisively. This is an issue for the state to solve. The problem you touched upon is real but I do not think it is deliberately planned by those in power. I don’t know. Perhaps it is my temperament but I cannot imagine a brain that has planned things this way.

Here, Giorgos accepted the basic points of the theoretical perspective that challenges the equality of opportunity in education. Moreover, he urged teachers to give their best powers in order to improve the educational situation although he believed that such efforts will not be decisively effective unless there is state intervention. On the other hand, basing his argument on his personal psychology, he did not think that the state deliberately serves social reproduction.

I asked him to comment on the fact that the state has made no steps towards establishing a compensatory educational framework that would function in the direction of narrowing and ultimately eliminating the distance that separates the mathematics achievement of different groups of pupils depending on their socially inherited
intellectual equipment. He answered that the “attempts and the resulting outcomes have been negligible” and attributed this phenomenon to the “state’s weakness to solve this problem”. On the other hand, accusing the behaviour of the teacher union leaders and their consistent refusal to participate in a dialogue with the government on the grounds that it would legitimize its predetermined decisions, Giorgos went on to say:

They speak of the class character of education. Let me accept this characterisation. And I as a democrat, friendly to the people, what do I do for the people’s education? Of course I cannot teach from a different textbook but at least I should teach correctly even with the book I have in my hands … (He gives examples of topics and how they can be taught properly) … Such a spirit of teaching would unshackle teachers and pupils. That’s why I am optimist, I the simple teacher who struggles in secondary education instead of making accusations against it I try to do something substantial.

Here, he returned to the teachers’ responsibility to do their best in order to improve education, praising his personal efforts and indirectly hinting against what he qualified as a reproductive hollow discourse that is not translated into concrete pedagogical action. Asked whether he is satisfied with the results of his own pedagogical approach, Giorgos answered in the negative but held the other teachers responsible and elaborated as follows:

I do not have the opportunity to teach a group of pupils from 7th to 12th Grade to see the results. It may be selfish but I have had classes which mostly resembled a circus. In my opinion this is not education and I hold the teachers responsible for this, not the so called class character of education, teachers with a particular name and address.

After this discussion on education and social reproduction we discussed the issue of grading. Referring to the nature of grading he said: “I don’t consider grading as a class tool. Whoever believes so it’s fine with him”. Moreover, regarding the national mathematics results in the island referred to earlier on page 101, he said: “my interpretation is that regarding the non urban schools underachievement is related to the level of the local society”.

6.8 A critical analysis of Giorgos’ views

Giorgos expressed his conviction that what is important in mathematics is its logical process that consists of a series of deductive steps departing from some given
propositions. Consequently, he sees his pedagogical mission as an effort to teach this mathematical structure as an interconnected coherent whole by elucidating the logic behind its parts. Trusting logical and rational faculties as a universal human characteristic, he tries to involve his pupils in a whole class dialogue in order to implement a theoretically centred curriculum to which he gives his unreserved consent. Having a well worked-out lesson image and a predetermined plan whose implementation gives a purportedly optimal solution for each mathematical task, he follows a pedagogical approach which consists in eliciting answers in a step by step process through an exhaustive series of questions that he qualified as covering a wide spectrum of learning objectives at various levels of cognitive demand.

Giorgos thinks that his “spirit of teaching would unshackle teachers and pupils” and is critical of the general teacher practices apparently on experiential grounds insofar as no official studies have been published regarding the learning activities in the Greek secondary mathematics classroom which still remains a black box. In his opinion, under ideal organisational conditions, in a public school with teachers who exhibit the appropriate zeal for their mission and with the analogous effort made by the pupils, academic success can be ensured without the need for extra-scholastic paid assistance. To support his thesis, he invoked successful results in the national examinations by pupils who have attended public schools that lie “outside the sphere of influence of tutoring institutions”. Using this line of reasoning, he characterised the system for entry into higher education to be “socially just to a satisfactory degree” and attributed “certain inequalities” to school organisation, the teachers’ inappropriate pedagogical approaches and the inexistence of “appropriate pupils” by the latter term meaning pupils who are “receptive” in appropriating the goods offered by a good teacher. In fact, research studies depict a different picture of the geography of educational opportunities. Analysing the results in the national examinations in relation to the different regions and
the social origin of the pupils Katsikas & Kabbadias (2000) argue that although the success rates of pupils from the urban centres of the country outside the three major prefectures have been considerably improved, the rural and semi urban regions are the “fourth world of education”. The authors give evidence to support the conclusion that in the prefectures of Greece with high success rates, achievement is associated with the privileged social strata living in urban areas whereas rural areas have the highest drop-out rates in the country. They conclude: “In 1994 the candidates in Evritania had a 100% rate of success, all making it to medical school. There were only two pupils. Where did the others go?”

Giorgos expressed the opinion that the teachers’ pedagogical deficiencies are the major cause for pupil underachievement and failure (In my opinion this is not education and I hold the teachers responsible for this, not the so called class character of education, teachers with a particular name and address). He seems to adhere to a widespread discourse that elevates the role of the teachers as a regulating factor of the quality and the outcomes of the educational process. As it is argued by Appelbaum (1995), teachers have been considered in a mythical fashion as the autonomous protagonists of the didactic act who determine the character and the effectiveness of education and are the pivotal forces behind the mechanisms of social change. According to the author this “myth” assigns too much power to the teachers’ pedagogical actions and initiatives, at the same time putting the blame for pupil underachievement on the teachers and obscuring the social, cultural and political dimensions of educational practice (Appelbaum 1995). Giorgos’ phrase “I the simple teacher who struggles in secondary education instead of making accusations” is indicative of this spirit.

Whenever he discussed pupil attainment, Giorgos did not foreground any considerations related to the inequality of opportunity as a factor for pupil
underachievement. However, responding to the argument that inequalities in cultural, linguistic, and educational capital vis-à-vis the specific academic requirements in combination with the nonexistence of effective compensatory programmes on the part of school exacerbate the conditions for differential pupil achievement, he expressed views that were highly resonant with this kind of discourse. In this discursive context he estimated that teachers cannot have a decisive effect on pupils’ learning outcomes if these pupils have a cultural and educational background that is deficient with respect to the required curriculum *(We teachers have the obligation to help the weaker pupils, to present things as clearly (but not simplistically) as possible. We can improve things but not decisively. This is an issue for the state to solve)*. In this sense, his adherence to the discourse that describes the teacher as the major regulator of the learning outcomes was weakened.

Although Giorgos accepted the inequality of opportunity discourse as plausible, he rejected any connection of this phenomenon with deliberate political planning that serves class interests and attributed the lack of compensatory programmes to the “state’s weakness”. In this respect I think that Giorgos’ phrase “I cannot imagine a brain that has planned things this way” represents an oversimplified and distorting version of the social reproductive discourse. This version is in circulation and has the effect of making this discourse more vulnerable to criticism. It resembles a conspiracy theory perspective according to which an elite group of leaders secretly conspire to promote their interests and maintain class inequalities (Perrucci & Wysong 2007).

A crucial point to be highlighted is where the inequality of opportunity discourse intersects with formative assessment considerations. If it is accepted that pupils carry differential intellectual baggage to profit from when coping with the given curricular requirements (depending on their social origin), then instructional strategies and activities must be devised by the teacher in order to probe the pupils’ prior knowledge.
and preconceptions so as to bridge the gap between the actual performance (especially of those pupils who are not cognitively prepared to meet curricular requirements) and the desired level of performance. Let us see where Giorgos stands in this problematique. First of all, he believes that he creates a dialogue that goes well beyond the replication of the material as it is presented in the official textbooks, providing not only the development of theory and the solution of the problems but analysing and resynthesising the component elements of the proofs in a “heuristic” way so that the logic of discovery would become discernible. In view of his rigid plan to be followed with no exceptions this dialogue resembles a text written by the teacher with many blanks to be filled by his pupils. In this sense this text has its shortcomings, especially if it is seen from the point of view of formative assessment. These shortcomings are best summarised by Giorgos in his phrase “Ideally, if you want to make this pupil learn you must deal with his view. Well, you cannot do that; you have to push the lesson on”. The suggested conclusion is that Giorgos sees his pedagogical approach firstly and foremostly as the optimal way of meaningfully implementing the curriculum ensuring at the same time that he gets a good picture of the capabilities of those pupils who are cognitively prepared to follow his dialogical style. For a good part of pupils whose participation is very weak he expresses his inability to “fill the gaps” between their performance and the desired level of attainment by his method. For them he has several suggestions to offer.

First, he asks for a significant increase of time in order to properly implement the curriculum. At this point it would be appropriate to quote one of the conclusions of a study conducted by the Hellenic Mathematical Society (2000) on the restructuring of the Greek mathematics curriculum. It concerns the official geometry textbook which exemplifies the geometry syllabus: “We believe that the new book, despite its innovatory and tasteful appearance, is excessively extensive in mathematical content
and that this content cannot be taught at all in the intended time”. The issue of time is a crucial matter. The time available for the implementation of the intended curriculum is a major factor affecting the way this implementation will take place and the pedagogical approaches that will be followed. If the teacher perceives that there is insufficient time his or her priorities will most likely shift towards presenting the mathematical content and will move away from satisfying the learning needs of the individual pupils. Giorgos estimates that he needs a 33% increase of time in order to properly implement the curriculum. Presumably this significant miscalculation on the part of the ministry is attributed by him to the “state’s weaknesses”. But why do these “weaknesses” persist for decades? Why has the ministry of education never evaluated the mathematics curriculum (National Council of Education 2006)? What is the role of the existence of the prosperous industry of crammer schools in influencing the shaping of state policy especially regarding the content taught and the time available? These are questions that Giorgos has not asked; questions that bear on the socio-political significance of formative assessment.

Giorgos’ second suggestion was to separate pupils into different groups that are taught the same mathematics for a different number of hours depending on the groups’ learning needs. His idea is different from the traditional setting by ability practice and it could be thought of as a compensatory programme that is intended to function in the direction of “levelling the playing field” (Roemer 1998). I think however that, as our discussion in the critical interview suggested, he failed to capture the full potential of his proposal. Firstly, he did not include this suggested practice to elementary education which is a crucial omission insofar as it concerns the formative period of the child and if opportunities for intervention are missed at this point any future intervention might be too late or might be too time consuming to be implemented. Secondly, he made haste to challenge his measure and qualify it as “not well worked out” and “utopian” on the
grounds that if it were not so it would have been implemented by the state already. This thinking is in line with his rejection of the social reproductive discourse and his categorical rejection of the claim that the state might serve class interests through education. Finally, he did not elevate the status of his suggestion to that of a political request. Such a move could be theoretically informed and supported by a constructivist theory of learning which suggests that in the learning process the learner’s prior knowledge cannot be ignored, in combination with the inequality of opportunity discourse which Giorgos theoretically accepted. To return to his suggestions regarding the underachieving pupils, he favours tracking for the remaining pupils who cannot profit from the remedial programmes as he is of the opinion that these pupils, as well as those pupils who do not succeed in the entrance examinations he proposes to be introduced, must follow technical and professional education. In his opinion these entrance examinations would eliminate the phenomenon of pupils with insufficient background attending the academic track (lyceum) which has as the undesired by him consequence that these pupils by virtue of social promotion policies will graduate and eventually will compete for places in the marketplace undermining meritocracy. Again in this context the equity issue did not enter his problematique despite his acceptance of the inequality of opportunity discourse. As I have already mentioned, technical and vocational secondary education draws disproportionate numbers of pupils from lower social classes (Tsakloglou & Cholezas 2005).

Giorgos did not seem to consent to the very widespread discourse that depicts the national examinations as having a catalytic effect on the pedagogical independence of secondary education and as causing serious side effects the most important of which is the undermining of the pedagogical process in the mainstream classes by the existence and the particular functioning of the private tutoring institutions (Katsikas, & Kabbadias 2000). On the contrary, he praised the pedagogical merit of the test items in the national
examinations that are thought by him to be “instructive” in his pedagogical endeavour. Moreover, invoking psychological studies he saw high stakes testing exclusively as a motivating force that enhances the learning outcomes.

Finally, his view of grades is resonant with the meritocratic discourse. For him grades first of all are informative of the pupils’ progress. We saw this argument in the review of literature where it was argued that high-stakes test results can be communicated to parents so that the latter are informed about their children’s progress and to administrators for the design of better teacher education programmes (Avdali 1989). What this argument misses is the consequential nature of grading. It is one thing to use grades exclusively as indicative of achievement in which case their function would be just to quantify a diagnosis for purposes of communication. Such a codification of achievement would provide very minimal feedback that could be used for remedial action anyway. On the other hand, it is a different thing to use grades at the same time as a criterion for taking consequential decisions such as promoting pupils or selecting them for particular courses of study which is what actually happens and there enters the issue of equity. As additional reasons in support for the existence of grades, Giorgos mentioned their rewarding aspect (grades give satisfaction to those who are good) and their motivational aspect (mobilise those pupils who do not show the necessary interest and do not make the appropriate effort) both of which are invoked by those who advocate the existence of grades on meritocratic grounds (Avdali 1989). Giorgos’ adherence to the meritocratic discourse both in the issue of high stakes testing and the role of grades seems to be unaffected by his recognition that the inequality of opportunity has “direct consequences on the pupils’ achievement”. The fact that he did not foreground this phenomenon in the above as well as in the various relevant discursive contexts generated by our discussions suggests that for him its recognition is
what Whitehead (1929) has called “inert knowledge”. Let us revisit two excerpts that are revealing in this respect:

I think that to an important degree students have not realised what is going on in school and how much they should study and be prepared for school and examinations. I would expect and I would like students to study more, to be better prepared, to be aware of the existing difficulties and act accordingly (I3.23.2.06).

Grades give satisfaction to those who are good and mobilises those pupils who do not show the necessary interest and do not make the appropriate effort” (I3.23.2.06).

These passages reflect the typical emphasis that meritocratic discourse accords to pupil industriousness and effort while at the same time it silences the differences stemming from (as Roemer puts it) “the differential circumstances of individuals for which we believe they should not be held accountable, and which affect their ability to achieve or have access to the kind of advantage that is being sought” (Roemer 1998, p. 5). From the point of view of an ideological analysis this is a meaningful silence. As it is argued by Macherey (Eagleton 1976, quoted in Gates 2000), “a work is tied to ideology not so much by what it says, as by what it does not say. It is in the significant silences of a text, in its gaps and absences, that the presence of ideology can be most positively felt”.
CHAPTER SEVEN

SUMMARY OF FINDINGS – TEACHERS’ IDEOLOGICAL PROFILES AND FURTHER REFLECTIONS ON THE TEACHERS’ IDEOLOGICAL STANDPOINTS

7.1 Introduction

In the preceding chapters I have described and analysed the teachers’ views of the assessment of pupil mathematical performance and its socio-political dimension. In this concluding chapter I summarise the findings that answer my research questions and relate these findings to the review of the relevant literature. Building on the report of the three case studies, I sketch each teacher’s ideological profile based on the available data.

7.2 Summary of findings and significance in light of literature review

7.2.1 Views of mathematics curriculum

Nikos’ references to mathematics and his reflections on the curriculum suggest that he sees mathematics education as a value neutral enterprise. His main preoccupation seemed to be the curriculum’s cognitive demand and breadth in relation to the negative effects of curriculum implementation on learning outcomes. Antonis sees the curriculum in socio-political terms. He has a sociological glance and shows theoretical awareness of the power issues involved in the educational institutional framework. But Antonis does not believe that education has any institutional autonomy as it is thought by him to be just an element of the superstructure that serves the economic base. Giorgos sees the mathematics curriculum from an old humanistic point of view (Ernest 1991) as a value neutral rigorous structured body of knowledge intended to cultivate the human rational faculties.
7.2.2 Purposes and consequences of tests and high stakes testing

Nikos sees tests as indicators of pupil knowledge, effort and responsibility and as best means for diagnostic purposes. He also points to the negative effect of high-stakes tests on the school’s educational mission and their class biased character. Antonis sees tests as a necessary means to motivate studying but points out that they may have adverse and at times detrimental effects on those who fail. He accepts high stakes tests on the grounds that they are a safeguard against corruption that is endemic in Greek society. He also qualifies them as class biased and generalises this conclusion to the whole education system. But he justifies this characterisation as reflecting historical necessity. On the other hand, he is sceptical about their diagnostic quality especially with respect to creative skills. Finally, he deplores the negative effect of high stakes testing on school’s educational autonomy. Giorgos regards all kinds of tests only as motivating and productive forces. He also thinks that past papers guide pedagogy in an enriching and instructive way. Finally, he thinks that school can adequately prepare for the high stakes exam minimising social consequences provided that teachers have the appropriate expertise and pupils have a receptive attitude.

Most of the features of tests identified by the teachers above have been identified by other teachers in the studies referred to in the review of literature. One novel element is Nikos’ association of tests with pupil responsibility. Its novelty lies in that although tests have been connected with pupil accountability in other studies of quantitative character, what this study offers is the richness of meanings this statement acquires when it is seen within a broad system of beliefs, values and conflicts characteristic of a work ethic moralist outlook. Another novel element is the big distance that separates the views of Nikos on the one hand and Giorgos on the other regarding the impact of the national examinations on pedagogy. Although differences of opinion have been recorded, as in Clarke et al. (2003), the difference in appraisal of this impact ranging
from dissolution of the pedagogical process to the enhancement of pedagogy is impressive. Finally, Antonis’ invocation of corruption as a reason to support high stakes testing merits particular attention insofar as it is illustrative of how certain factors that may not arise in a specific culture may be significant in a different one.

7.2.3 Role and meaning of grades and criteria for assigning grades

Nikos regards grades as indicators of acquired knowledge and as a means of establishing hierarchy. Moreover, he is against grade inflation practices. Antonis sees grades as extrinsic motivation but necessary tools. He also sees them as means of establishing a hierarchy that reflects the social stratification school necessarily serves. Finally, he sees them as psychologically detrimental and potentially pernicious to those who fail. Giorgos believes that grades enhance motivation for studying, are informative of pupil progress, and reward effort and achievement. All three teachers use the same criteria for assigning grades, namely class participation and test performance with Giorgos giving more weight to the latter.

Most of these findings have been reported in the literature. It is noteworthy that the context of the teachers’ grading practices gave Nikos the opportunity to express a major part of his ideological position. This shows one of the advantages of the qualitative approach to social research. In fact, most studies related to grades have focused on the criteria for assigning grades and have followed quantitative approaches (Brookhart 1994). Finally, Antonis’ support of the hierarchical role of grades is typical of a conservative ideology but has not been previously reported in the literature to be a position of an advocate of the idea that school serves social reproduction.

7.2.4 Purposes and consequences of grade retention

Nikos expressed his strong disagreement with social promotion practices. In this latter context he developed his work ethic moralism discourse. Antonis was practically against grade retention except for very few exceptions of proven unjustified indifference
in all subjects. Giorgos was in favour of grade retention and against the lenient law for pupil promotion and lenient teacher practices with a view to creating a homogeneous pupil potential for the academically oriented lyceum. Nikos’ position embedded in his whole ideological stance fits the description characterising the work ethic moralists in the study conducted by Tomchin & Impara (1992). Using the same study, Antonis is close to being an antiretentionist and Giorgos is a standard-bearer.

7.2.5 Teachers’ (formative) assessment practices and their underlying rationale

Nikos usually conducted his lessons in three different phases. The reviewing of old content was devoted to the solution of homework tasks and was done by a minority of volunteers on the board. As the pupils who were chosen had successfully dealt with the assigned tasks, this phase did not provide any opportunity for formative assessment feedback with respect to the majority of pupils who had difficulties dealing with these tasks. Nikos used this phase mostly for grading purposes. The introducing of new content was a quasi lecture type with a few lower levels questions asked of the pupils. Nikos justified this pedagogical choice in this phase by invoking time constraints and the pupils’ cognitive inadequacies. The practice of new content was entirely marginal in terms of the time devoted to it and the feedback received and provided was associated with what Nikos qualified as single routine steps that mostly served the mobilisation of passive pupils. Overall, Nikos gives and receives what he qualified as poor formative assessment feedback and only on lower cognitive level knowledge and considers the cognitive demand and the breadth of the curriculum, as well as the time constraints as serious impediments to an effective implementation of a rich variety of formative assessment schemes.

Antonis conducts his lesson in two different phases. In the review of old content phase, when there are no homework tasks to be reviewed he has the pupils recapitulate the major theoretical points of the previous lesson and at times he asks of a pupil to give
the proof of a whole proposition. The homework tasks are done by a minority of volunteers on the board with Antonis often interrogating both the volunteers and the whole class. Antonis uses this phase for purposes of learning and the consolidation of the material and not for grading purposes. The introduction and practice of new content is done in an identical way and primarily consists of a whole class dialogue guided by the teacher through a series of questions ranging from lower cognitive level to problems solving questions all required to be answered within a very short period of time. Antonis gives primacy to the implementation of the curriculum to the requirements of which, in his opinion, pupils must conform, and undervalues the importance of formative assessment. His view is reinforced by his belief that mathematical ability is innate and hence formative assessment is of little practical value. Moreover, Antonis supported the idea that assessing a pupil’s knowledge is primarily a matter of intelligence.

Giorgos conducts his lessons through an exhaustive series of questions of a rich spectrum of cognitive levels, following a rigid predetermined plan intended to implement the curriculum and in his opinion ensuring at the same time that he gets a good picture of the capabilities only of those pupils who are cognitively prepared to follow his dialogical style. Giorgos gives primacy to the meaningful implementation of the curriculum and believes that formative feedback beyond the feedback provided by his dialogic form of pedagogy cannot be extended to the pupils with cognitive gaps.

It should be noted that all three teachers do not use other means to collect formative assessment information except for those described above and the forty-minute exams administered once a year in which they do not systematically collect information about pupil misconceptions and error patterns that could be used for formative purposes. Using the categorisation constructed by Gipps, McCallum and Brown (Gipps 1994b) all thee teacher would be classified as intuitives.
It should also be noted that all three teachers invoked time limitations as a factor constraining their formative assessment-related practices. Regarding the issue of what they evaluated as limited time for the implementation of the curriculum, Nikos spoke with the usual aggressiveness with which he referred to curricular issues and to his pupils’ inadequate effort condemning the ministry this time. On the other hand, Giorgos proposed a considerable increase in time. Both saw it as a technical issue peripheral to the institutional arrangements. In contrast, Antonis with his usual sobriety and the sentimental distance he kept in his descriptions from what he described saw it as an essential element serving the purposes of the hidden curriculum.

The study showed that the teachers gave different interpretations of the relationship between curriculum design and assessment procedures. Antonis and Giorgos were influenced by their ideological commitments. In contrast, Nikos’ pervasive and ubiquitous critique of curricular arrangements had no effect on his basic value system.

7.2.6 Teachers’ evaluations of the degree to which they are satisfied with the picture they form of their pupils’ knowledge of mathematics and their reflections on the results of this evaluation

Nikos expressed his dissatisfaction with the model his constructs of his pupils’ cognitive inadequacies, misunderstandings and misconceptions and attributed his inability to construct a richer model to curricular constraints. He saw the significance of formative assessment in a markedly heterogeneous learning environment and the adverse effects of its absence in this environment with admirable clarity both theoretically and as an emotionally painful result of lived experience. However, insofar as he did not connect this cognitive heterogeneity to the pupils’ differential social endowment but saw it primarily through the prism of work ethic morality, the results of his evaluation did not serve to challenge the education system from an equity point of view.
Antonis believes that through his interactive method of questions and answers soon he forms an overall picture of his pupils’ capabilities. However, he stressed that no detail mapping of a pupil’s knowledge can be constructed in school because that would need individualised teaching which is not within the school’s mission. He does not attach considerable importance to formative assessment although he accepts the inequality of opportunity discourse and is an advocate of the idea that school serves social reproduction. The two factors that influence this underestimation of the value of formative assessment are his theory of mathematical ability as a genetically determined attribute and his view of education as an institution subjugated to the social, political and economic imperatives which necessarily dictate its current structure and aims.

Giorgos is content with the formative assessment opportunities provided by his pedagogical approach although he is aware that many pupils with cognitive gaps cannot be profited to an adequate degree by his approach. The two factors that influence this underestimation of the value of formative assessment are his trust for his pedagogy as a means to implement a curriculum to which he expresses his unreserved consent and his belief in curricular differentiation which would purportedly result in homogeneous classes.

7.2.7 Teachers’ evaluations of the action they take to provide differentiated, individualised learning within their classrooms

All three teachers expressed their inability to provide individualised learning because of curricular constraints. Nikos deplored the situation and was very critical of the curriculum. Antonis claimed that the school structure and the necessity of implementing the curriculum, to which he gave his support, preclude individualised learning. Giorgos was rather satisfied with his pedagogical approach and advocated a more cognitively homogeneous pupil potential that would meet the demands of his
whole class directed dialogue style of teaching which did not emphasise individualised learning.

Previous research findings have shown that teachers are not mere implementers of curriculum but active agents who construct the enacted curriculum on the basis of how they interpret the learning situation (Remillard 2005). This study suggests that the reverse may happen. The excessive demands of the curriculum in combination with the time constraints may dictate the possibilities or rather the impossibility of differentiated, individualised learning however this may be seen through the teachers’ ideological lenses.

At this point, with regard to the teachers’ pedagogical approaches and the opportunities these approaches afford for formative assessment as revealed by the lessons observations, some crucial considerations are in order. The persistent kind of information all three teachers received that could be used as feedback for their pedagogical approaches was the very poor (or non) participation of a very large part of the pupils in their classes. This was not casual but persistent feedback. There was no instance in the observed lessons where the reasons for this non participation were explored by any of the teachers for any of the pupils by inquiring the reasons (cognitive or other) for which a pupil could not do an assigned homework task or could not answer a question. Instead, the teachers based the flow of the lesson entirely on their initiative and on the contribution of a minority of pupils.

With regard to the feedback provided to the pupils by their teachers this feedback was infrequent. In the first place, most of the teachers’ questions were answered correctly by a minority of participating pupils. In those cases where pupils gave erroneous answers, the errors where associated with short answered questions and the short answer corrective feedback was immediately provided either by the teacher or by some other pupil. On the other hand, no opportunities were created by the teachers’
instructional strategies and activities where the teachers probed the pupils’ prior knowledge and preconceptions or followed the pupils’ line of thought in order to identify the sources of their misunderstandings and misconceptions and to subsequently try to address them.

7.3 The teachers’ ideological profiles and further reflections on the teachers’ ideological standpoints

In the previous section, I summarised those teachers’ views that appeared to be directly relevant to my research questions. This might be considered as the first level of the research findings. Insofar as each teacher’s answers do not have an isolated existence but are part of a broader whole, my next task in the interpretive analysis was to seek an answer as to how the ideas and emergent themes that appeared as responses to what I asked them were related to one another. Finally, and most importantly, from the point of view of ideology critique, I sought to uncover those ideas that are dominant and at the same time have a directionality in the sense they work to favour some social groups and to disadvantage others (Purvis & Hunt 1993). This allowed me to sketch the teachers’ ideological profiles. Each profile was constructed on the basis of the available information that was obtained by synthesising the teachers’ positions with regard to the chosen assessment related issues. Consequently, they are amenable to enrichment, refinement and possible modification, given additional evidence. The teachers’ ideological profiles are followed by some additional reflections to those appearing in each teacher’s critical analysis regarding the teachers’ ideological standpoints.

7.3.1 Nikos

7.3.1.1 Nikos’ ideological profile

Nikos’ ideological characteristics in the educational context fit admirably within the framework of the conservative values of industrial trainers as described by Ernest (1991). In various contexts his discourse reflected the Victorian values of hard work,
identification of work and industry with virtue and ease or play with evil, self help, duty, obedience, acceptance of inequality, freedom of will and personal choice. Nikos subscribes to the idea of education-based meritocracy and is concerned with the negative consequences of the lack of meritocracy in schools which in his opinion is fostered by teachers’ lenient grading practices. The latter are supposed by him to result in pupil indifference and to have detrimental effects on most pupils’ characters.

7.3.1.2 Further reflections on Nikos’ ideological standpoint

Nikos views the issues of pupil mathematical achievement and the social function of assessment from a conservative perspective and through the prism of the work ethic morality. In various contexts his discourse reflected the Victorian values of hard work (overcoming the difficulties), identification of work and industry with virtue and ease or play with evil (you get rid of the evil), self help (just as your fellow pupil understands and participates, you can do the same), duty (you are big kids and you have an obligation to yourselves), obedience (the conscientious pupil accepts the curriculum whether he likes it or not), acceptance of inequality (tell me what can we do?), freedom of will and personal choice (they don’t want to improve, the pupil comes face to face with his responsibility) (Ernest 1991).

Concepts and ideas are socio-historical constructions and their function changes with the social context. In recent history, work ethic morality was a product of the conditions and reflected the power struggles that are characteristic of the early stages of industrialisation. As it is argued by Bauman (2005, p.7), its main ideological function was to

control and subordinate people, used to putting meaning into their work through setting its goals and controlling its course, so as to expend their skill and their work capacity in the implementation of tasks which were now set and controlled by others and hence meaningless for their performers.

This description resonates with Nikos’ statements

… pupils don’t understand anything… knowledge is given in such a way that resembles being pounded in the head by a hammer
the conscientious pupil accepts the curriculum whether he likes it or not
because he wants to have good grades and because he thinks that he has been
sent here for work and he must be worthy of himself

with the only difference being that the school has been replaced by factory and grades
with earnings. Here, the highest virtue advocated by Nikos is the unquestioned
obedience of the child and the acceptance of the rules of the game even if these rules are
strongly questioned by Nikos himself. In both cases the work ethic morality serves the
smooth functioning of the established institutions even though these institutions by
default have differential benefits for the people who serve them.

In the Greek educational field the work ethic rhetoric in the form of a critical
position towards what has been called as “the least effort mentality” has been invariably
used by the parties in power as an argument for the justification of policies that intend
to introduce accountability systems based on pupil attainment that are characteristic of a
neo-liberal conception of education mostly prevailing in the Anglo-Saxon countries
(Therianos 2008). In fact, Nikos has expressed his unreserved consent for such a policy
(CR.20.1.06) in contradistinction to the official position of the strong teacher union of
secondary education teachers that has resisted the implementation of such a policy on
the grounds that

Beyond the myths of power, the truth is that scientific expertise, pedagogical
grounding and the ability to teach are not measurable quantities (Kabbadias &
Fatourou undated). That which is ultimately achieved through assessment-
supported accountability is the teacher’s ideological manipulation and a more
effective inculcation of the dominant ideology (Therianos 2008).

Nikos’ support of accountability has been strongly manifested with regard to pupil
accountability. This despite the fact that he depicted a scholastic environment which
repeatedly and in various contexts he evaluated as particularly adverse both to the
teaching and learning process. He used adjectives in the superlative degree and harsh
metaphors in order to condemn curricular content and time constraints and their
“catastrophic” effects on the learning outcomes. But this markedly negative appraisal of
the learning situation and the ensuing learning outcomes did not seem to challenge the prominence of hard work and effort in Nikos’ attribution theory regarding pupil achievement. On the contrary it only showed the strength with which he holds these values. One would be tempted to say that in view of his markedly negative appraisal of the curriculum and the learning process it entails, his praise and urge for work and effort gives the latter a metaphysical strength and a fetish-like quality.

There was an exception to the omnipotence of work and effort, the only hurdle in the unfolding of Nikos’ meritocratic discourse, and that was the issue of the national examinations for entry into higher studies. At the final moment of the educational process Nikos saw what is not always publicly acknowledged or projected by the mainstream media, namely that the selection is class biased and that usually effort is insufficient if it is not accompanied by paid tutorial assistance. However, this did not prevent him to say that the examination “shows exactly what happens when the pupil is alone” and that “the pupil comes face to face with his responsibility”. Here, Nikos depicts the examination as an academic tribunal (Bourdieu 1990) that makes it possible to “qualify, to classify, and to punish” and “establishes over individuals a visibility through which one differentiates them and judges them” (Foucault 1995).

Nikos’ notion of responsibility as emerged from the textual analysis has several dimensions. In holding pupils responsible Nikos has been subject to a distinctive range of moral sentiments such as resentment (they are something like a mischief in the school environment), indignation (They shrug their shoulders ... They refuse to try. They don’t want to improve; they don’t want to overcome their problem) and guilt (characterising the indifferent kind of behaviour on the part of pupils as shameful) in his dealings with his pupils (Wallace 1996). These emotions are distinguished by their connection with expectations (Wallace 1996). This is seen in the following excerpt

I think that once the kid comes to school, sent by his parents for some purpose, it is not at all pleasing if this purpose is not realised, primarily for the kid but also for the parents who expect the kid to have some progress.
The connection to expectations also situates moral responsibility in relation to the notion of moral obligation. Here, it should be noted that in Greek “obliged” literally means “under debt” or “under duty”. According to Nikos, this obligation may refer to the parents as reflected in his expression “The pupil must make the effort anyhow. I think that he is obliged”. “Obligation” as it is construed by Nikos may also refer to oneself (You are big kids and you have an obligation to yourselves). In the latter case, Nikos projects his values and aspirations and expects his pupils to accept them as their own. It is an instance of what Bourdieu and Passeron (1970) have called symbolic violence as we saw in the review of literature. In his preaching of self-obligation, Nikos presents a simplified and distorting picture or his appraisal of educational reality insofar as he focuses on pupil responsibility leaving out his own responsibility as a teacher and concealing the structural factors at play which he has so vehemently condemned throughout the study. Another facet in Nikos’ notion of responsibility is his disposition to blame and sanction pupils with a view to influencing their behaviour as well as the behaviour of other pupils so as to be deterred from engaging in what he considers as undesirable actions (Wallace 1996).

A last issue to be discussed with respect to Nikos’ notion of responsibility is the conditions that make it fair to adopt the stance of holding people responsible (Wallace 1996). With regard to mathematics achievement, Nikos’ discourse suggests that he considers the set of conditions of responsibility to be void; Nikos dispenses with such conditions. His notion of moral agency seems to be that each pupil just by virtue of his attribute of being a pupil is “bound by moral requirements and therefore is subject to blame or moral sanction for failing to comply with those requirements” (Wallace 1996). In my opinion, with the exception of the final moment of the twelve year educational process, Nikos generally undervalues, underestimates or ignores the importance of
structural factors which co-shape learning outcomes and which may either render effort inefficient or might thwart its manifestation altogether.

7.3.2 Antonis

7.3.2.1 Antonis’ ideological profile

Antonis expressed views that locate his discourse within the correspondence theory of social reproduction. According to this perspective, schooling functions through its classroom relations to instil in students the attitudes and dispositions that make them docile and receptive to the socio-economic imperatives characterised by hierarchically structured patterns of values, norms, and skills (Giroux 1980, p. 225). Antonis goes further into assuming that there is a direct correspondence between the economy and the mathematics curriculum, pedagogy, and evaluation. The adoption of a deterministic perspective in educational phenomena is strengthened by his theory of intelligence as an innate human characteristic. As a result, Antonis sees his role as a servant of a historically inevitable educational process, fully conforming to the prevailing institutional arrangements and their demands.

7.3.2.2 Further reflections on Antonis’ ideological standpoint

With regard to the current mathematics education, Antonis subscribes to the view, first systematically elaborated and formulated by Bowles and Gintis (1976) for the whole educational process, that

… the structure of social relations in education not only inures the student to the discipline of the workplace, but develops the types of personal demeanor, modes of self-preservation, self-image, and social class identifications which are crucial ingredients of job adequacy.

Bowles and Gintis (1976, p.113)

Moreover, he shares the social reproductive perspective according to which the particular selection of curricular content, the way knowledge is organised and transmitted in schools, and finally the modes by means of which knowledge is assessed are crucial factors in the reproduction of class relationships in industrial societies (Apple
Social reproductive theories strip formal education from its socially neutral character, a position that resonates with Antonis’ claim about the class biased character not only of the national examinations but of the whole educational process.

How does the perspective adopted by Antonis affect his views on the assessment-related issues? First, he is sympathetic to the lenient law of social promotion and practically against grade retention thus taking a position that favours pupil advancement and the reduction of drop-out rates. Antonis regards the mathematics curriculum as an inescapable historical necessity and he is loyal to its social reproductive aims. Consequently, he consciously subjugates his pedagogy to the curricular constraints he approves of and is little sensitive of and responsive to the individual pupils’ learning needs about which he knows little. His view of the necessity of grading as a means to establishing a hierarchy within schools as preparation for a future social hierarchy is also in harmony with his curricular allegiance. Finally, he accepts the selection system for entry into higher studies based on the national examinations on the grounds that it is deprived of subjectivity and corruption, despite his perception of its class bias. His minimalist position seems to be based on his belief that the current social paradigm undergoes its normal phase (*no one said we should make a revolution to replace it)*.

The views expressed above point to the conclusion that Antonis subscribes to the view that schools are “mere ideological reflections of the dominant interests of the wider society” and not “relatively autonomous institutions that have a particular relationship to the wider society, one which is marked not only by domination and docility, but also by contestation and resistance” as argued by Giroux (1982, p. 95). In fact, Antonis explicitly stated that education cannot be a vehicle of social change. I think that his case is paradigmatic to the extent that in some of his views one can discern the traces of the transition in Greece from the era of the socialist ideals and social contestation to the era of practically complete subjugation of any radically
different alternative perspective to the established reality (Katsoridas 2006). Specifically in the educational field, along this social transition there has been an ever increasing reliance of pupils on extra scholastic assistance and a shifting of pupil attention away from the life at the lyceum. Here, the falsified hopes for educational change and the teacher disillusionment, helplessness and resignation stemming from the current educational conditions at the lyceum might be thought to be reflected in Antonis’ statement that “in regular public schools these issues have been set aside for ever”. Whether this spirit prevails widely and whether it has led to the abandonment of the quest for alternative pedagogical approaches to such an extent that the Greek lyceum can hardly be considered as a site of resistance, at least on the part of teachers, needs a large scale research to be decided upon. Lastly, perhaps it would be of worth to speculate that Antonis’ views may not be unrelated to some extent to his long engagement with the direction of schools insofar as such engagement leads to the adoption of the official perspective. Here, the influences of a critical perspective and of his personal sensitivity might be constrained by, modified by or enter into a conflict with the simultaneous presence of a bureaucratic spirit that the exercising of his managerial role may impose upon him.

There is one element of Antonis’ ideology that merits separate reference and analysis: his view of innate mathematical intelligence. This exemplifies teacher stereotyping of pupils’ abilities in which, as remarked by Ruthven (1987, p.248), teachers characterise pupils in terms of a “summary global judgment of cognitive capability, and entertain correspondingly overgeneralised expectations of them”. In Antonis’ case this view is not unrelated to his underestimation of the usefulness of formative assessment feedback on an individual pupil basis and the ease with which he accepts a fast pace implementation of the curriculum. Moreover, it is also not unrelated to his underestimation of the socio-political significance of formative assessment. The
adoption of what Bourdieu (1990) called the ideology of natural “gifts” on the part of Antonis has also an immediate effect on his attribution theory regarding pupil failure and thus may be said to function in the direction of legitimating the dominant social order by naturalising differences that are at least partly social. As Bourdieu (1990, p.208) remarks “the verdicts of the academic tribunal are so decisive only because they impose simultaneously conviction and ignorance of the social grounds of conviction”.

7.3.3 Giorgos

7.3.3.1 Giorgos’ ideological profile

Giorgos views mathematics from the perspective of an old humanist, namely as a value neutral rigorous structured body of knowledge intended to cultivate the human rational faculties (Ernest 1991). Supporting the existing Greek mathematics curriculum, he is against the dilution of standards and advocates curricular differentiation which purportedly ensures homogeneous classes. He considers as his main pedagogical concern to meaningfully deliver mathematical knowledge to those pupils who exhibit the level of ability and maturity required. Giorgos sees the teachers as the major regulating factors of the quality and the outcomes of the educational process, and as the protagonists who determine the character and the effectiveness of education and are the pivotal forces behind the mechanisms of social change. Giorgos rejects the view that schools are sites of social reproduction and accepts the meritocratic discourse, attributing any observed education-related social injustices to the teachers’ pedagogical deficiencies and to organisational parameters that are peripheral to the logic of the social system.

7.3.3.2 Further reflections on Giorgos’ ideological standpoint

Giorgos is an advocate of school’s ideological neutrality and an ideological herald of the institutional arrangements. While he consented to the inequality of opportunity discourse when he was exposed to it, in reality his acceptance was purely intellectual
and does not seem to have been derived from his preoccupations, concerns and interests neither to play a role in his explanatory schemes. In accordance with his ideological orientation by and large he views the educational process including the selection system for higher education as meritocratic and socially just to the extent that certain distortive effects of a technical character are not at work. Insofar as these distortions are not considered to have an institutional character, grounded in the very social structure, they are attributed by him to administrative weaknesses and the choices of individuals. The above ideological features are reflected in his following views: (a) the national exams and more generally the educational process are thought by him not to violate the equity principle provided that schools have the appropriate organisation, teachers are inspired and pedagogically adequate, and pupils are mature enough to be delivered the goods; (b) grades are considered exclusively as informational, rewarding of individual effort and merit, and psychologically motivational; (c) exams are thought to provide incentives and keep pupils vigilant; (d) curricular differentiation and tracking are favoured despite some “utopian” personal reflections on the introduction of compensatory programmes; (e) an additional entrance examination is proposed by him from the gymnasium (years 7-9) to the academically oriented lyceum in order to ensure pupil cognitive homogeneity, and (f) social promotion is rejected on meritocratic grounds.

Giorgos trusts his pedagogical approach. To paraphrase Appelbaum (1995), he evaluates himself as combining the best of the Socratic Method with Polya’s specific heuristic oriented questioning strategies in order to help his pupils reproduce an accurate development of structured mathematical theory. He goes further to elevate the role of the teacher as a key determinant of the pupils’ learning progress. Giorgos’ definition of the teacher seems to be confined to the technical ability to teach with impeccable method and organisation a predetermined content for a specific purpose. His definition does not include attributes such as
the ability to understand the social and ideologico-political determinations of the knowledge taught and the ability to locate the social and cultural differences or inequalities between pupils … the ability to use the contradictions of the pedagogical process for the sake of an emancipatory choice … the sociological imagination to recognise the social and ideological implications of the various pedagogical choices in a classroom regarded as an arena of cultural and social conflict, resistance and reproduction. (Mavrogiorgos 1989, my translation)

Giorgos does not think that the individual teacher as he sees him or her is all powerful. But he does think that if all teachers followed his pedagogical approach then failure would have been drastically reduced. From an ideological point of view, his perspective reduces social problems and their solutions to the appropriate personalities of isolated individuals and thus effectively obscures institutional and social constraints on educational practice (Appelbaum 1995).

7.4 A cross sectional analysis of the teachers’ ideological perspectives – similarities and differences

In section 7.2, when providing a brief summary of the research findings, I juxtaposed, compared and contrasted the teachers’ views regarding the specific research questions chosen for this study. In the previous section, I sketched the teachers’ ideological profiles and provided some further reflections on their sociological significance. The construction of these profiles was based on those elements of the teachers’ answers regarding my assessment related research questions that were judged to have an ideological character in the sense that they positioned the research participants’ views in a certain way with respect to the power struggles at the situational, institutional and social levels of reality. In certain cases, these ideological elements derived in the context of the research questions went beyond what was actually asked, throwing light on the teachers’ wider perspectives regarding the role of education and specifically of mathematics education. In a sense, the texts produced by the research questions contained a surplus semantic meaning that emerged in the teachers’ responses bringing forth some central beliefs and ideas in the teachers’
ideological systems related to education. Insofar as these central conceptions may refer to different aspects of the broader issue of education, they are not necessarily comparable by means of a “bijective” correspondence between the teachers’ respective positions in similar themes. What I attempt in this section is to analyse how the different ideological elements that have emerged in each teacher’s discourse may be seen to comprise different unifying frameworks, with their similarities and divergences, that explain how the participants are positioned with respect to what critical researchers consider as the most important socio-political aspect of assessment as related to equity, namely that summative assessment \textit{legitimates decisions that affect pupils differentially depending upon their socio-economic status} (Bourdieu & Passeron 1970). This function of assessment justifies my assertion that in this study assessment is chosen as a privileged window from which the researcher can view how the investigated teachers perceive the implication of school in the reproduction of unequal social structures of power and domination.

Assessment is intimately related to success or failure. As it is argued by Perrenoud 1989a), without an institutionalised assessment procedure supported by and sanctioned within the logic of a particular socially contingent curricular framework these latter concepts would be deprived of meaning. It follows that the teachers’ attribution theories regarding school failure as they emerged in the process of answering the research questions designed in this study are of paramount importance for the identification of the ideological similarities and differences in their conceptions of the nature of assessment. The three teachers differ in their underachievement attribution theories. Nikos stresses moral attributes such as propensity and determination for hard work, duty, obedience, perseverance and effort and claims that these qualities are purportedly lacking in most underachieving pupils. He is also critical of the lenient teacher practices that purportedly facilitate pupil indifference to learning. In both cases it is individuals
and their choices that are to blame. Giorgos shares the same opinion as to who are the major protagonists who co-shape learning outcomes. But in his case, these protagonists lack qualitatively different attributes than those projected by Nikos. As far as pupils are concerned, Nikos focuses on moral values, whereas Giorgos emphasises the lack of pupils’ awareness as to what the requirement of scholastic life entail, a phenomenon which in his opinion is related to a specific mentality that has detrimental effects on the pupils’ achievement. In relation to the teachers, in Giorgos’ case it is not certain practices that are criticised but lack of pedagogical expertise, something Giorgos claims to possess himself. Both cases are paradigmatic and illustrative of power struggles at the situational level but also of conflicts within the educational field. In contrast to these two teachers, Antonis attributes low pupil mathematical attainment to factors that transcend individual will, namely to a stable trait such as genetics and to social structure.

Regarding the legitimacy of the current summative assessment regime, by and large all three teachers vindicate the summative assessment practices that are conformant to the institutional arrangements. Thus, with the exception of the national examinations administered by the state, throughout secondary education they see tests and grades as necessary machinery that establishes a hierarchy of excellence and furnishes a selection tool whose reliability and validity have not been seriously questioned in any of the teachers’ discourses. Considerable differences appeared among the three teachers with regard to the character, quality and effects of the existing system of student selection for higher education. Nikos and Antonis agreed on the socially biased character of this national external examination in view of the extra-scholastic assistance it was thought by the two teachers to require. Thus, with regard to these high-stakes examinations the two teachers raised the issue of consequential validity (Messick 1998) which is the appraisal of both potential and actual social consequences of applied testing. On the
other hand, by claiming that school can adequately prepare the pupils for these examinations, provided that teachers have the appropriate expertise and pupils exhibit the appropriate attentiveness and diligence, Giorgos once more emphasised the importance of individuals over social structure. The teachers also disagreed on the reliability and validity of the examination for entry into higher studies. Nikos was the most adamant in his claim that the content and level of difficulty of the examinations items transcend the knowledge delivered within schools. Antonis’ critique had a narrower scope insofar as he only expressed some reservations about the possibility of diagnosing and selecting pupils with extraordinary creative and imaginative powers by means of the existing exams. On the other hand, Giorgos not only did not raise any issue of validity and reliability of the test items but considered preparation for these particular exams as enhancing his pedagogical practice. In this latter aspect he was diametrically opposed to the other two teachers who saw test preparation as undermining the school’s educational mission.

Another assessment-related topical area that is equity-sensitive and lends itself to the identification of ideological differences and similarities in the teachers’ conceptions is the issue of grade retention versus social promotion. One common element in the teachers’ positions was that they viewed a multidimensional phenomenon from a rather narrow perspective. Nikos and Giorgos were on the same side on the issue but for different reasons. Nikos argued from a meritocratic and moralist perspective rejecting social promotion practices as purportedly having a detrimental effect on the pupils’ character and as enhancing social phenomena of corruption. Giorgos favoured grade retention as a measure that in his opinion would work against the dilution of standards and supplemented this policy with suggested entrance examinations that would ensure the existence of homogeneous classes. Arguing from a meritocratic perspective, both teachers made no association of grade retention with increased drop-out rates and did
not seem to recognise the associated pupil attrition problem. Moreover, they failed to refer to the lack of strategies within the Greek educational context intended to prevent academic failure and intervene when students need extra assistance in order to meet the curriculum’s high standards. On the other side, Antonis favoured social promotion in most cases, perhaps mostly influenced by his social reproductive perspective and his acceptance of the inequality of opportunity discourse. His social justice considerations seemed to have influenced his opinion towards favouring social promotion practices although he was aware of the problems that ensue in non homogeneous classes.

Finally, as far as the socio-political significance of formative assessment is concerned, although all three teachers agreed with the existence of an incompatibility between the mathematics curriculum requirements and a comprehensive implementation of formative assessment tools, their interpretative schemes reflected different ideological positions. On the one hand, Nikos and Giorgos, through their attachment to a value neutral framework, interpreted this incompatibility in terms of system dysfuncationg and organisational imperfections of technical nature that are peripheral to the logic of the social system into which the educational field is embedded. In this sense they expressed a depoliticised view. On the other hand, Antonis’ politicised discourse did not contain any considerations regarding the socio-political significance of the appraised impossibility of extensively and consistently implementing formative assessment schemes in his classrooms. The most plausible reasons for this omission was the interference of two additional ideological elements, namely his theory of mathematical ability as an innate characteristic, and his view of education as an institution that is subjugated to the socio-political and economic imperatives that necessarily determine its current structure and aims. A common feature in all three teachers’ views regarding formative assessment is that none of them used their evaluations of the small degree to which they were satisfied with the picture they
formed of their pupils’ knowledge of mathematics and of the action they took to provide differentiated, individualised learning within their classrooms in order to question the legitimacy of the existent summative assessment regime.
CHAPTER EIGHT

FINAL REFLECTIONS ON THE STUDY

8.1 Introduction

In this concluding chapter I delineate the steps that I took to enhance the trustworthiness of my research findings. The discussion focuses on the notion of the different types of triangulation, the constant comparative method, and reflexivity. I then discuss the limitations and weaknesses of the study and reflect on the beneficial effects that this research project had on my development both personally, professionally and methodologically. Finally, I conclude with some suggestions for further research and with a closing remark.

8.2 The trustworthiness of the study

To strengthen the internal validity and reliability of the knowledge produced, I used three different modes of triangulation (Patton 2002). The first type of triangulation used was juxtaposing data derived at different times and from different sources such as the three theoretical semi-structured interviews before the observations begun, multiple interviews before and after each lesson, interviews after the transcriptions of each lesson, an evaluative interview after the transcriptions of all lessons, one extensive active discussion, the lessons transcripts, the electronic material obtained from the observations, and the field notes taken during each lesson.

The second type of triangulation was to submit my analyses for discussions with each participant. This resulted in negotiation of meanings between us, mutual clarifications, acceptance or rejection of my interpretations on their parts, debates during the active interviews, and the addition of supplementary texts to be analysed. In this sense, the participants were involved in the analytic process enhancing the coherence truth criterion of my findings (Gates 2000). As it is argued by Lincoln and Guba (1985), this approach where data, analytic categories, interpretations and
conclusions are discussed with the participants is the most crucial condition for establishing credibility.

Apart from the participants’ contribution to the textual analysis, my interpretations of selected episodes from the teachers’ lessons were discussed in detail with John Thomaidis who holds a PhD in the Didactics of Mathematics and is currently a consultant and teacher educator working for the Greek Ministry of Education. Moreover, Elias Daskalakis who holds a PhD in the sociology of education and teaches in a secondary school was involved in the analytic process in three ways. First, he went through large parts of the whole text produced by the first participant in its annotated form with the memos and attached codes and provided useful comments. Second, he scrutinised my interpretations of each participant having read the reports just before they were finalised. But most importantly, he provided valuable insights in our discussions on the ideological part of my analysis and interpretations (I have their permission to name them here).

There is a last type of triangulation used in this study which involves viewing the investigated phenomenon from different theoretical perspectives (Denzin 1970). In my opinion theoretical triangulation serves as a kind of reflexivity which in this inquiry might mean that the social change orientation should not imply that all concerns be subsumed to a social justice rhetoric. There is another sense in which I used theoretical triangulation and this is related to the analysis of classroom observations. As I have said earlier, the largest part of this analysis took exclusive account of the teachers’ beliefs, goals and priorities and thus can be considered to have a phenomenological flavour.

Another approach that contributed to the enhancement of the validity of my findings is the constant comparative method (Glaser and Strauss, 1967) which was actually an important ingredient of the analytic process itself. This method is a continuous process of comparing the patterns, relationships, themes, identifications and conclusions that
one has established at each point of the analysis, with the ongoing flow of newly visited data in order to confirm the analyst’s schemes and interpretations, to partly modify them in order to accommodate the new data if necessary or to refute them altogether. Although constant comparison is usually associated with grounded theory, it actually predated this method of analysis (Heath & Cowley 2004) and I found it applicable in my own analytic approach with a slightly different scope insofar as in grounded theory all categories are susceptible to change upon the suggestion of new data, whereas in the my analytic approach certain categories remained fixed and unalterable.

Rejecting the criteria of validity, reliability and objectivity as they are understood in the scientific research paradigm, Lather (1991, p.68) defined catalytic validity within the framework of feminist research as “the degree to which the research process reorients, focuses, and energises participants toward knowing reality in order to transform it”. This kind of validity is related to a pragmatic criterion of truth as expressed by Marx’s (1845/1976, p. 615) dictum “Man must prove the truth … of his thinking in practice. The dispute over the reality or non-reality of thinking which is isolated from practice is a purely scholastic question”. As far as I am concerned, the knowledge I have produced in this thesis, i.e. my interpretation of what the participants’ interpretation of the world might socially entail, is seen as a political act intended to be my contribution to the strengthening of a critical perspective in the general struggle for the social construction of meanings. In this respect, as it is argued by Gates (2000, p. 275), its quality should be judged in terms of whether it is historically situated, it takes account of the social, political, cultural and economic factors in which it is located, erodes misunderstandings, and clarifies exploitative relationships by critiquing practices of domination. How it will be received and what effects it will have to the research community, especially the Greek mathematics education community to which it is mostly addressed, depends on the historical juncture that may provide fertile ground for
some of my ideas to grow or may deprive them of further life. My contribution has also
a moral component, reasserting the centrality of ethics in the research process, for it
requires of me to interrogate my allegiances, responsibilities and self-interestedness
(Burgess, quoted in Cohen et al. 2003). This interrogation forms part of a larger process,
the researcher’s reflexivity as a prerequisite for valid, reliable and good quality research.

To understand how the notion of reflexivity is construed in this inquiry, a brief
elaboration is needed by introducing some ontological and epistemological
considerations that bear on critical social research. Historical realism is based on the
assumption that the conceptual categories by means of which human beings identify and
understand social events are not extra-social but socially and historically conditioned.
Moreover, these contingent social constructions are reified, i.e. they are treated as
natural, inevitable, permanent, unchanging and ever-recurring (Thompson 1990); they
are part of common sense (Gramsci 1971). Research conducted from the critical
perspective aims to strip the socially situated norms, values and practices of their
apparent naturalness that is the result of the socialisation processes (Hamel 2008). Here
is where reflexivity comes in. Insofar as the researchers are not immune to this
alienating process of misrecognition, they need to conduct a self socio-analysis which
means that they must trace their trajectory within the field of power and identify their
present location within the various fields in order to reveal as much as possible the
nature of the sources and maintenance of their interest, as well as their social
relationship to the object of study (Grenfell et al. 1998). According to Bourdieu (2003),
reflexive researchers must explore the social conditions of possibility of their lived
experience and therefore the effects and limits of the act of this denaturalisation process
which the author calls participant objectification. In addition, they must constantly
interrogate the adequacy of their theoretical tools and of their intellectual resources and
provide further enrichment and development of them throughout the research process.
(Grenfell et al. 1998). Bourdieu (1989) emphasises that participant objectification cannot not be an exclusively individual act but a product of some collaboration with co-researchers. Along that direction I used peer debriefing as explained earlier in this report, on page 90.

8.3 Limitations and weaknesses of the study

This study attempts to depict the teachers’ discourses on certain assessment-related issues as suggestive of how these teachers are positioned with respect to the claim that mathematics education is implicated in the reproduction of unequal social structures of power and domination. I have tried to identify the teachers’ discourses and to locate them within broader ideologies. I have tried to uncover in the teachers’ beliefs the interplay between the social and the personal and what seemed to me to be their contributions to the ongoing educational dialogue, through their alliances with and their resistance to dominant discourses. Finally, I have described the context in which certain of the teachers’ beliefs have emerged, what purpose I think that they serve as social practices and how in my opinion they help to sustain unequal relations of power and domination or they contest established norms and values. On the other hand, this inquiry is not intended to investigate the conditions of possibility of the teachers’ beliefs and conceptions formed by their socialisation experiences as a result of their positions within social space (Thompson 1990). This would require to trace the teachers’ biographical trajectory and to uncover the thoughts that have been generated by key events in their lives, as well as the interpretation of these events by the participants to the extent that this information would be judged communicable by them.

In the study of the classroom learning processes and the teachers’ instructional behaviour, I collected no data from a very important source: the learners themselves. Thus, I chose not to take the opportunity to have the pupils’ perspectives on the whole learning process, on how they judged the quality of the feedback they received from
their teachers, and the opportunities their teachers’ instructional approaches afforded for their self-expression, self-reflection, self-assessment and extensive participation in the learning activities. Had I decided to elicit the pupils’ perspectives they could have been used as a source to stimulate teacher reactions by responding to issues raised by the pupils, as well as to the pupils’ evaluations of the teachers’ pedagogical behaviour as related to formative assessment. On the other hand, such a decision would raise ethical issues and the teachers’ consent is not given. The pupils’ perspectives could also be used for triangulation purposes with respect to the teachers’ beliefs of what happens in their classrooms.

In this study I confined my attention to the teachers’ beliefs and conceptions and did not refer to their associated practices. An exception to this was the lessons observations, although even in that case I tried to capture what the teachers envisaged and perceived and how they justified their actions as recorded by the investigator (Schoenfeld 1998). An area of practice that could reveal underlying conceptions and beliefs is the teachers’ testing practices. As this area is associated with the psychological paradigm and its main concern is to explore what learning objectives are tested by the teachers, as well validity issues, I thought that it was outside the scope of the present study which has sociological orientation. Another area of practice that could reveal implicit beliefs is the teachers’ grading practices. My rationale for not investigating this area was that although the information revealed by this practice would contribute to forming a picture of how the teachers enact some of their beliefs, this information would not be of much value if it could not be embedded into a broader informative scheme that would involve the practices of other teachers. For example, evidence that a teacher gives failing oral grades to 30% of his pupils in the two semesters alone cannot establish a conclusion that the teacher is strict in grading. More factual evidence is needed regarding the practices of other teachers, the performance level of pupils, etc. A more extended or future study
could benefit from such a background obtained by conducting side research at least at the local level of the island of Corfu.

In research concerned about social change and social justice it would be useful to explore how teachers reconcile their actions and choices with the larger societal implications and patterns (P. Appelbaum, personal communication, 21 February, 2006). A presentation of the implications of their choices and actions would be important from the point of view of enacting research with catalytic validity. In this sense, in the case of the two teachers who adopted the meritocratic discourse and were more or less advocates of the ideological neutrality of school, instead of only presenting some general arguments on the inequality of opportunity, I could have legally obtained data on the socio-economic status of their pupils who received failing oral grades or finally failed and present this data to them for their reactions. In this context, other very important information would be the pupils’ attainment as related to whether they attend private tuition. Another way to enhance catalytic validity would be to hold more extensive conversations of the active style I adopted in the critical interviews, something that would be outside the scope of the “blitzkrieg” ethnographic approach (Rist 1980) that was followed. This would mean that I would have to move to a third level at which beliefs can be investigated. I have already talked about the first two levels in the context of the traditional versus the active interview. At the third level, which may demand prolonged engagement in the field, the participants’ beliefs will have to be systematically and meticulously challenged and deconstructed by the researcher and what the researcher will record is how and to what extent a participants’ belief system is transformed and how and in what respect it resists change. It should be noted that the researchers should not consider themselves as the infallible holders of truth and that they themselves may have their discourses challenged and deconstructed and as a result they may change in this process.
Finally, another limitation was related with the data collection process. Regarding the lessons observations, insofar as the audio-recorder was placed at a particular place in the classroom, there were cases where the private dialogue between the teacher and a student in tasks done independently by students on their desks was not perfectly intelligible. These cases were very few insofar as it turned out that seatwork was marginal in all three teachers. More serious would be the loss of information in view of the fact that being a non participant observer I had no access to the material on student notebooks which additionally had the effect of making some dialogues unintelligible. Again, that loss of information was not substantial insofar as walking between desks was not a frequent teacher practice.

8.4 Reflections on the study – personal, professional and methodological gains

When I started my research journey, I was quite unsuspicious of the rough terrains I would have to go through and of the chaos that I had to tame. The acquisition of the necessary background that is required of the researcher who conducts critical qualitative social research proved to be a very demanding process for me. Accustomed to the lucidity and univocality of mathematical terms and the unambiguousness and precision of mathematical thinking and inference, I had to delve into an intellectual territory characterised by fundamental disagreement as to how basic concepts are construed and how reality is perceived and apprehended by the various schools of social thought.

Witnessing, through my various readings of the literature, the terminological disparities and the fluidity of meaning as different humans endeavour to analyse and comprehend social phenomena, I acquired a much better sense of how language can work as a communication tool but also as a potential source of misunderstanding. This experience was not only valuable for my required task of a text interpreter but will be of enduring benefit affecting my everyday communication potentialities. With respect to the fundamental paradigmatic differences among the various schools of thought what I
found most difficult was to understand to a sufficient depth the controversies over the basic ontological, epistemological and methodological principles that underpin the different research paradigms and to connect them with my work. To the extent that this philosophical part proved to be even more interesting to me than the research study itself, my prolonged preoccupation with it, characterised by what proved to be long deviations of dubious direct utility for accomplishing my research objectives, turned out to work against the timely completion of my thesis report. This was a methodological lesson to be learned.

Writing up the report was a constant exercise in discipline. Everyday discussions in non academic circles, even if they do not refer to trivialities, are usually anarchic in that they jump from topic to topic, superficial as they do not go deeply into the issues discussed, and based on little evidence. They are also fast and fastness usually does not enhance linguistic precision and richness; as Kundera (1997) says it militates against thinking. These everyday practices form a specific “habitus” (Bourdieu 1990) that I had to struggle against in order to meet the requirements of academic discipline. I had to tame my thoughts, I had to interrogate them, I had to base them on solid knowledge of the alternatives, I had to struggle to put my thoughts in order and then find the appropriate words to express them and reformulate if necessary, and this took as much time as it was finally rewarding. What I learned from this experience is that, to paraphrase Castoriadis (1997)\textsuperscript{13}, we do qualitative research and reflect on the issues involved primarily in order to save our thinking and our coherence.

The observation of 100 hours of lessons conducted by five different teachers was an enriching and exciting experience. Viewing the classroom from the new perspective of the observer gave me a vantage point from which I could see the familiar ground of definitions, theorems to prove, equations to solve, problems to tackle, traversed by other

\textsuperscript{13} Nous ne philosophons pas – nous ne nous occupons pas d’ontologie – pour sauver la révolution, mais pour sauver notre pensée, et notre cohérence (Castoriadis 1997).
teachers. Observation gave me the opportunity to watch and judge from a distance how certain pedagogical routines that I share in common with other teachers work and what are their strengths, their limitations and weaknesses. It was also felt as a constant step by step comparison of what I usually do with the teachers’ pedagogical choices. As an outsider in the class I realised, not by theoretical readings but through lived experience, that teaching involves making a variety of choices as to what to ask, when to ask, how much to wait for an answer, whom to ask, when to probe further when an erroneous answer is given and in what direction, when to give a task to be done independently to the pupils in their desks and how to monitor their progress in this task. Moreover, I verified through my own experience what has been argued by Hiebert et al. (2003), namely that studying teaching practices different from one’s own can reveal taken-for-granted and hidden aspects of teaching that appear as the natural way to do things rather than choices that can be re-examined and be changed in order to improve learning outcomes.

8.5 Suggestions for further research

The investigation of three mathematics teachers’ views of pupil assessment gave rise to three different ideological perspectives from which these teachers view assessment and more broadly the socio-political role of school and their place in it. Further case studies are needed in the Greek educational context in order to examine whether there are alternative teacher ideologies that act as unifying frameworks within which the teachers’ ideas about assessment and more broadly about the role of mathematics education acquire specific meanings. These case studies should also seek to elucidate whether there are variations to the three ideologies that this study revealed. For example, it is crucial from the point of view of critical research to elucidate whether teachers who agree with Antonis that education is a mechanism of social reproduction also share his submissive attitude or they show some kind of resistance and in what
ways this is manifested in their assessment-related conceptions and practices. The case studies should also include teachers who mostly teach at gymnasium (years 7-9) and teachers who have experience at both levels and investigate the influence this may have on their beliefs. These case studies could be followed by a large-scale quantitative study intended to provide an ideological map of the Greek secondary education teacher force.

This study was confined to the teachers’ espoused beliefs. Future studies can in addition provide an account of the relationship between the teachers’ espoused assessment beliefs and their actual practices. The latter might include their grading practices compared to other teachers’ grading practices, the level of difficulty of their final exam, the relationship between their oral grades and the pupil results on the final exam and finally their grading behaviour in the oral exam and the make up exam taken by pupils who have failed the course during the academic year and are given a second chance just before the new academic year begins. These practices could be located within the practices of a broader sample for comparison and categorisation purposes. As far as formative assessment is concerned, a quantitative large scale study could investigate the formative assessment schemes used by the Greek mathematics teachers in the classrooms. If Hiebert et al.’s (2003) contention that certain basic teaching approaches follow more or less a uniform pattern within each culture, with few exceptions, is true, then, based on what we saw in the three case studies, it is expected that Greek mathematics teachers rely exclusively on informal observation at the level of lyceum. This remains to be verified by research results both at the lyceum and the gymnasium level. If it happens to be true, it would be of worth to also investigate if teachers are content with their formative assessment practices and in the negative case how they interpret a perceived restricted possibility of formative assessment depending upon their educational ideologies.
Another area to be investigated is what messages the teachers of different ideologies convey to the pupils through their assessment related discourses and behaviours. An issue to be explored that has not received attention in the literature is how pupils judge the grades given to them by their teachers and what effect this judgment has on their subsequent learning behaviour. For example, what effect does a grade have on pupils when it is judged by them to be unfairly strict? On the other hand, how do the grades that are perceived by the pupils as lenient affect pupils who receive them and how are the teachers’ practices of grade inflation related to the pupils’ notions of fairness? In relation to this issue it would also be of worth to investigate the parents’ reactions to the teachers’ grading choices.

Finally, two other suggested areas for further study is defined by the following questions: (a) How are the teachers’ views and practices of assessment influenced by the views and practices of their colleagues and how do they vary with different school levels, across different regions in the country and especially in urban and agricultural deprived areas? (b) How do the teachers’ conceptions and practices of assessment and the fundamental ideological values that underpin them vary with seniority, age and gender?

8.6 Concluding remarks

This thesis investigated three mathematics teachers’ conceptions of the assessment of pupil attainment in mathematics and its socio-political dimension. In the first place, the study explored how assessment is conceived by teachers and especially how their conceptions of formative assessment relate to their teaching practices and their views of curriculum design. As we saw this research area has received little attention in the literature. Moreover, the qualitative research approach provided opportunities for the researcher to explore a broad spectrum of themes that emerged in the context of the discussions with regard to the chosen assessment-related issues. This allowed the
construction and critical analysis of the teachers’ ideological perspectives from which they view the socio-political role of pupil assessment in mathematics, of education in general, and their own role as active agents in the education system. With reference to the broad purpose of the study as it was delineated in section 3.2.1, this inquiry has shown that overall the three participants, despite their reservations and criticisms, illustrate the power of the established curriculum and assessment system to gain strategic compliance (Lacey 1977) of teachers and to overcome contrarian, critical responses from even politically aware teachers. The ideological analysis of the teachers’ conceptions made from a critical theoretic point of view elucidated how the interpretive frameworks used by the teachers led them to accept and promote the established educational reality with all the consequences this may entail in terms of social justice.

I believe that the major importance of my study lies in initiating an effort to politicise the issue of assessment, including formative assessment, in the teacher beliefs literature by using it as a tool to critically analyse from an equity point of view the teachers’ stances with respect to the role of assessment in mathematics education. This is, in my opinion, my main contribution to the literature. As it is argued by Bourdieu & Passeron (1990, p. 141) in the context of their analysis of the role of examinations

it is only by making a … break … with the illusion of the neutrality and independence of the school system with respect to the structure of class relations, that it becomes possible to question research into examinations so as to discover what examinations hide and what research into examinations only helps to hide by distracting inquiry from the elimination which takes place without examination.
APPENDIX 1

A reference to the Cockcroft report and the Pedagogical Institutes’ instructions

Similar views with those developed by the National Council of Teachers of Mathematics, as delineated in the main text at the end of section 2.2, were expressed earlier in the Cockcroft report (1982) intended to propose reforms in the context of the English mathematics curriculum. The particular committee of inquiry into the teaching of mathematics in schools responsible for this report stressed the need for enlarging the spectrum of learning objectives to be developed and assessed in the English mathematics curriculum. Thus the group of these educators classified the different learning outcomes into four broad categories: facts and skills, conceptual structures, general strategies and appreciation in school mathematics. According to the Cockcroft report (1982, paragraph 243), to serve the development of this broad repertory of mathematical competences, mathematics teaching at all levels should include opportunities for exposition by the teacher; discussion between teacher and pupils and between pupils themselves; appropriate practical work; consolidation and practice of fundamental skills and routines; problem solving, including the application of mathematics to everyday situations; and investigational work.

Reflecting constructivist views, the Greek Pedagogical Institute’s official curricular guides share the principles of the National Council of Teachers of Mathematics and the Cockcroft report as delineated above. In the general instructions manual concerning the implementation of the curricular goals addressed to the Greek teachers, the Greek Pedagogical Institute advocates the active involvement of pupils in the in-class learning activities and in the construction of their knowledge, as the following excerpt suggests.

In each didactical hour in the teaching of mathematics the personal work of pupils should dominate. The classroom should be a place where pupils are not passive receptors (of knowledge) but explore situations, discover new knowledge and try to interpret and use the knowledge that they have acquired (Ministry of Education 2007, p.11).
The Greek Pedagogical Institute is sceptical about the effectiveness of the “traditional” model of teaching as the exclusive teaching approach (pp. 8, 10) and advances a number of suggestions for a more “active” pedagogy, basing its arguments on what it qualifies as “a modern conception about the way pupils learn” which is characterised by the following principles (in my translation from the Greek):

1. Knowledge is not “transmitted” by the teacher to the pupil. On the contrary, the pupil actively participates in the construction and development growth of his knowledge (p. 9).

2. The process of learning depends on the already existing knowledge. Everything I learn depends on what I know. Consequently, the teacher of mathematics should be aware of the fact that there are pupils in the classroom who have not comprehended previous concepts which is indispensable for the participation in the development of new content and that there are pupils who have constructed previous knowledge in erroneous ways (p. 9).

3. There is a continuous interaction between the personal meanings constructed by each pupil and the social dimension of knowledge within the framework of the classroom. Personal meanings are negotiated in the classroom so that they become homogenised in order to become compatible and consistent with what is accepted by the mathematical community (p. 9).

4. Research has pointed out that pupil collaborative work produces multiple and different approaches to a problem. An additional advantage seems to be the opportunity that pupils have to discuss their opinions and ideas so that the required negotiation of meanings occurs. However, the most important feature of collaborative work is that it enhances the ability for self-reflection (p. 13-14).
The Greek Pedagogical Institute points out that “the acceptance of the above principles leads to the adoption of more “active approaches towards learning” which consists in “investigative work, problem solving and work in small groups” (p. 10).
APPENDIX 2

OVERVIEW OF THE FIVE EDUCATIONAL IDEOLOGIES

The following table gives a summary of the five educational ideologies studied in Ernest (1991)

Table 2: Overview of the five educational ideologies Ernest (1991, pp. 138-139)

<table>
<thead>
<tr>
<th>Social group</th>
<th>Industrial trainer</th>
<th>Technological pragmatist</th>
<th>Old humanist</th>
<th>Progressive educator</th>
<th>Public educator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Political Ideology</td>
<td>Radical right, ‘New Right’</td>
<td>meritocratic, conservative</td>
<td>liberal</td>
<td>Democratic socialist</td>
<td></td>
</tr>
<tr>
<td>View of Mathematics</td>
<td>Set of Truths, and Rules</td>
<td>Unquestioned body of useful knowledge</td>
<td>Process view: Processed maths</td>
<td>Social constructivism</td>
<td></td>
</tr>
<tr>
<td>Theory of Ability</td>
<td>Fixed and inherited Realized by effort</td>
<td>Inherited ability</td>
<td>Inherited cast of mind</td>
<td>Varies, but needs cherishing</td>
<td>Cultural product: Not fixed</td>
</tr>
<tr>
<td>Mathematical aims</td>
<td>‘Back-to-Basics’: numeracy and social training in obedience</td>
<td>Usef ul maths to appropriate level and Certification (Industry-centred)</td>
<td>Transmit body of mathematical knowledge (Maths-centred)</td>
<td>Creativity, Self-realization through mathematics (Child-centred)</td>
<td>Critical awareness and democratic citizenship via mathematics</td>
</tr>
<tr>
<td>Theory of Learning</td>
<td>Hard work, effort, practice, rate</td>
<td>Skill acquisition, practical experience</td>
<td>Understanding and application</td>
<td>Activity, Play, Exploration</td>
<td>Questioning, Decision making, Negotiation</td>
</tr>
<tr>
<td>Theory of Teaching Mathematics</td>
<td>Authoritarian Transmission, Drill, no ‘frits’</td>
<td>Skill instructor, Motivate through work-relevance</td>
<td>Explain, Motivate, Pass on structure</td>
<td>Facilitate personal exploration, Prevent Failure</td>
<td>Discussion, Conflict Questioning of content and pedagogy</td>
</tr>
<tr>
<td>Theory of Resources</td>
<td>Chalk and Talk Only Anti-calculator</td>
<td>Hands-on and Microcomputers</td>
<td>Visual aids to motivate</td>
<td>Rich environment to explore</td>
<td>Socially relevant, Authentic</td>
</tr>
<tr>
<td>Theory of Assessment in Maths</td>
<td>External testing of simple basics</td>
<td>Avoid cheating External tests and certification Skill profiling</td>
<td>External examinations based on hierarchy</td>
<td>Teacher led internal assessment Avoid failure</td>
<td>Various modes, Use of social issues and content</td>
</tr>
<tr>
<td>Theory of Social Diversity</td>
<td>Differentiated schooling by Class Crypto-racist, Monoculturalist</td>
<td>Vary curriculum by future occupations</td>
<td>Vary curriculum by ability only (maths neutral)</td>
<td>Humanize neutral maths for all, Use local culture</td>
<td>Accommodation of social and cultural diversity a necessity</td>
</tr>
</tbody>
</table>
APPENDIX 3
INTERVIEW QUESTIONNAIRES

FIRST SEMI-STRUCTURED INTERVIEW

1. In your opinion what is mathematics?

2. Do you agree with what the ministry of education considers as the aims of mathematics education as these are reflected in the curriculum guides and the mathematics textbooks?

SECOND SEMI-STRUCTURED INTERVIEW QUESTIONNAIRE

1. What do you think are the characteristics of efficient mathematics teaching?

2. On many an occasion, you have doubtless urged your pupils to “learn mathematics”. Would you analyse what your injunction really means?

THIRD SEMI-STRUCTURED INTERVIEW QUESTIONNAIRE

1. What do you think are the purposes of testing?

2. What do you think are the consequences of testing?

3. Discuss the character, quality and effects of the existing system of student selection for higher education.

4. What do you think is the role and meaning of grades?

5. Describe the factors in your assessment policy that contribute to a student’s grade and the relative importance and weight that you attach to them. Provide explanations for your choices.

6. What do you think are the purposes and consequences of grade retention?
APPENDIX 4

FAIRCLOUGH’S FRAMEWORK

Fairclough (1989, pp. 110-112) lists 10 questions and some sub-questions that can be asked of a test when it is analysed from the point of view of critical discourse analysis. According to the author, in order to interpret the textual features it is necessary to take into account what other choices might have been made.

The questions are divided into three main groups:

A Vocabulary

1. What *experiential* values do words have?
   - What classification schemes are drawn upon?
   - Are there words that are ideologically contested?
   - Is there rewording or overwording?
   - What ideologically significant meaning relations (synonymy, hyponymy, antonymy) are there between words?

2. What *relational* values do words have?
   - Are there euphemistic expressions?
   - Are there markedly formal or informal words?

3. What *expressive* values do words have?

4. What metaphors are used?

B Grammar

5. What *experiential* values do grammatical features have?
   - What types of process and participants predominate?
   - Is agency unclear?
   - Are processes what they seem?
   - Are normalizations used?
   - Are sentences active or passive?
Are sentences positive or negative?

6. What relational values do grammatical features have?
   What modes (declarative, grammatical question, imperative) are used?
   Are there important features of relational modality?
   Are the pronouns we and you used and if so, how?

7. What expressive values do grammatical features have?
   Are there important features of expressive modality?

8. How are (simple) sentences linked together?
   What logical connectors are used?
   Are complex sentences characterised by coordination or/ subordination?
   What means are used for referring inside and outside the text?

C Textual structures

9. What interactional conventions are used?
   Are there ways in which one participant controls the turns of others?

10. What larger scale structures does the text have?

The definitions of the three terms experiential, relational and expressive are of great importance to the understanding of the framework. According to Fairclough (1989, p.112), a formal feature with experiential value is a trace of and a cue to the way in which the text producer’s experience of the natural or social world is represented. Experiential value is to do with contents and knowledge and beliefs. A formal feature with relational value is a trace of and a cue to the social relationships that are enacted via the text in the discourse. Relational value is to do with relations and social relationships. And, finally, a formal feature with expressive value is a trace of and a cue to the producer’s evaluation of the bit of reality it relates to. Expressive value is to do with subjects and social identities. In addition, a formal feature may have a connective value, i.e. in connecting together parts of the text.
Legitimation: Relations of domination may be established and sustained by being represented as legitimate, as just and worthy of support. There are three strategies to achieve this:

1. Rationalisation: A chain of reasoning is constructed which seeks to defend or justify a certain set of social relations or institutions.
2. Universalisation: Institutional arrangements which serve the interests of some individuals are represented as serving the interests of all and which are open in principle to anyone who has the ability and inclination to succeed in them.
3. Narrativisation: Claims are embedded in stories which recount the past and treat the present as part of a timeless tradition. This tradition may be invented to create a sense of belonging to a community and a history which transcends the experience of conflict, difference and division.

Dissimulation: Here relations of domination may be established and sustained by being concealed, denied or obscured, or by being represented in a way which deflects attention or glosses over existing relations or processes. It may be achieved by means of three strategies:

1. Displacement: A term customarily used to refer to one object or individual is used to refer to another, and thereby the positive or negative connotations of the term are transferred to the object or individual.
2. Euphemisation: Actions, institutions or social relations are described or re-described in terms which elicit a positive valuation (e.g. restoration of order).
3. *Trope* (The figurative uses of language): Through *synecdoche*\(^{14}\) social relations are dissimulated by confusing or inverting the relations between collectivities and their parts, between groups and broader social and political forms. Through the use of *metonymy*\(^{15}\) the referent may be implied without being explicitly stated, or may positively or negatively valued by association with something else; Finally, through the use of *metaphor* social relations or the individuals and groups embedded in them may be dissimulated by being represented as endowed with characteristics which they do not literally possess. Fairclough emphasises the importance of metaphors in structuring our thinking and ‘our systems of knowledge and belief in a pervasive and fundamental way’ (Fairclough 1992, p. 195).

**Unification**: This is achieved through constructing a form of unity which embraces individuals in a collective identity, irrespective of differences and divisions that may separate them. It is achieved by two strategies:

1. **Standardisation**: Symbolic forms are adapted to a standard framework which is promoted as the shared and acceptable basis of symbolic exchange.

2. **Symbolisation of unity**: It refers to the construction of symbols of unity or collective identity and identification, which are diffused throughout a group.

**Fragmentation**: Fragmenting individuals and groups that challenge dominant groups by using two strategies:

1. **Differentiation**: It consists in emphasising the distinctions, differences and divisions to disunite them.

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\(^{14}\) Synecdoche is the semantic conflation of part and whole.

\(^{15}\) Metonymy is the use of a term standing for an attribute or related characteristic of something to refer to the thing itself, although there is no necessary connection between the term and that to which one may be referring.
2. **Expurgation of the other:** It is the technique of constructing an enemy who is portrayed as evil, harmful or threatening and whom individuals are called upon collectively to resist or expurgate.

**Reification:** Here a transitory, historical state of affairs may be represented as natural or timeless\(^{16}\).

1. **Naturalisation:** Social and historical creations are treated as natural events or inevitable outcomes.

2. **Eternalisation:** Social phenomena are deprived of their historical character by being portrayed as permanent, unchanging and ever-recurring.

3. **Nominalisation/passivisation:** Actors and agency (usually in dominant positions) are deleted and processes are represented as things or events which take place in the absence of a subject who produces them.

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\(^{16}\) Castoriadis (1975) builds his notion of *alienation* in terms of the subject’s relation to the socially constructed reality and advocates a project of individual and social autonomy where social constructions are sought to be denaturalised by being recognised as debatable human creations. I agree with Fotopoulos (2003) that this should be one of the primary aims of critical education.
The code **Ix.day.month.year** refers to the interview x (x = 1, 2, 3) transcript and the date the interview was taken. For example, I3.22.11.05 refers to the transcript of the third interview taken on 22 November 2005.

Depending on the context, the code **Lx.day.month.year** refers either to the lesson x transcript (x = 1, …, 8 or 10 in Nikos’ case) or to the transcript of the preactive, interactive and postactive interviews taken on the same day with the corresponding lesson, and the day the lesson was held. When I describe that something happened in a lesson, the code refers to the lesson transcript. When I describe the teacher’s views then the code refers to the transcript of the preactive, interactive and postactive interviews taken as a whole with regard to the particular lesson.

The code **LxF.day.month.year** refers to the transcript of the discussion that was held after the transcription of the particular lesson x and the date the discussion was held.

The code **CR.day.month.year** refers to the transcript of the critical interview and the date the interview was held.

The code **EvI.day.month.year** refers to the transcript of the final interview that was held in the context of the lessons observations in which I asked the teachers to reflect on the significance of the results of the evaluations made in the previous interviews, and the date this interview was held.
In other subjects Nikos started with a brief review of the material that was pertinent to the introduction of new content and then introduced new content much the same as in geometry. Thus, in the first and fourth observed lessons, intending to derive the formulas that connect the $\tan x$ with the $\sin x$ or the $\cos x$, Nikos had the pupils repeat the four basic trigonometric formulas that were involved in the proof of the new formula and then he chose both to take the major two strategic steps of starting with the formula $\sin^2 x + \cos^2 x = 1$ and dividing both sides by either $\sin^2 x$ or the $\cos^2 x$ and to perform the algebraic manipulations himself asking some “minor computational questions” (L1.4.11.05). In the seventh observed lesson he started by asking how the sine and cosine are defined by means of the trigonometric circle and then he introduced the solution of the trigonometric equation $\sin x = a$ by taking the particular case of $\sin x = \frac{1}{2}$. Nikos asked four questions: Which one is the sine axis, which one is the cosine axis, what angle in the first quadrant has $\frac{1}{2}$ as its sine, and how many degrees are $\pi$ radians. In the third observed lesson, Nikos reviewed relevant material by asking about basic facts on a linear equation before he introduced the derivative of a function as a limit of the Newtonian quotient. At that later stage, he followed a lecture-type pedagogical approach on the grounds that given the knowledge background of his pupils and their “mathematical maturity” they would not have been able to contribute (L3.10.10.05).
APPENDIX 8

EXAMPLES OF NIKOS’ QUESTIONS

Recalling and reproducing some mathematical fact

Would anyone tell how is the tangent defined?

Angle bisector means what property?

Supplying one or two steps in some routine procedure

Let me hear, what is the cosine going to be (referring to \( \cos^2 x = \frac{1}{5} \))

Making a simple computation or recalling a method

So what is the square root of zero?

How do we compute this \( \lim_{x \to 1} \frac{1 - \sqrt{x}}{1 - x} \)?

Locating errors and reading off information from a figure

Is what Jack has written correct? \( \sin^2 x = \sqrt{1 - \cos^2 x} \)

Mathematical reasoning

Of all the angles formed here by parallelism which ones are equal and why? (In the context of the angle bisector theorem shown in figure 5)

Figure 5: Figure and enunciation of the angle bisector theorem

An angle bisector of a triangle divides the opposite side into two segments which are proportional to the other two sides of the triangles.
APPENDIX 9
EXAMPLES OF NIKOS’ FEEDBACK

Corrective feedback

A. Teacher provided the correct answer as a response to an erroneous answer (three instances observed).

Example

T. What should we divide by?

P. By $\cos x$

T. By $\cos^2 x$

B. Teacher let some other pupil provide the correct answer (two instances).

Example

T. Remind us, how do we differentiate $f(x) = \frac{x^3 - 1}{x^3}$?

P. The derivative of $x^3 - 1$ over …

T. (interrupts) No, it is not that simple. Giorgos, can you help us?

G. (applies the formula)

C. Teacher repeated the correct part and waited for a correction of the erroneous part (three instances).

T. How is the tangent defined?

P. The ratio of the opposite perpendicular side over the hypotenuse

T. The ratio of the opposite perpendicular side over …

P. The adjacent side.

Direct answer to a pupil question with no elaboration (five instances)

(Regarding the solution $x = 2k\pi \pm \vartheta, \kappa \in Z$ of the trigonometric equation $\cos x = \cos \vartheta$)

P. What is this 2?
T. The $2\pi$.

**Other types of feedback**

A. Rejection of a pupil suggestion as irrelevant to a particular solution or proof with or without justification (three instances). An example is shown in figure 6

**Figure 6: Textbooks proof of the midpoints theorem**

| Theorem 1: The line segment whose endpoints are the midpoints of the two sides of a triangle is parallel to the third side and equal to its half. |
| Let ABC be a triangle and D, E be the midpoints of AB and AC correspondingly. We shall prove that $DE \parallel \frac{BC}{2}$. We extend DE by a segment EZ=DE. The quadrilateral AΔCZ is a parallelogram since its diagonals are bisected. Hence $AD=\parallel CZ$, therefore $DB=\parallel CZ$, since $AD=\Delta B$. Hence, the quadrilateral DBCZ is a parallelogram, so (a) $DZ=\parallel \Gamma C$, hence $DE=\parallel BC$ and (b) $DZ=\parallel \Gamma C$ or $2DE=\parallel BC$ or $DE=\parallel \frac{BC}{2}$. |

P. AE = EC. (This was said after the assertion that $AD=\parallel CZ$)

T. This is correct but I want something else so that we can proceed in the appropriate direction.

B. Feedback given to pupils who were working independently at their desks – Short hints

Example

T. When you are given the $\cos x$ what do you do? Give it a look.
APPENDIX 10

EXAMPLE OF ANTONIS’ REVIEW OF OLD CONTENT

A VOLUNTEER SOLVES A HOMEWORK PROBLEM ON THE BOARD

Figure 7 below gives an illustration of how Antonis reviews old content.

Figure 7: Example of Antonis’ review of old content

<table>
<thead>
<tr>
<th>OBSERVED LESSON 6 – DATE</th>
<th>6 March 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antonis:</strong></td>
<td>[Reads the problem from the textbook]. For any triangle $\triangle ABG$ and any interior point $P$ prove that $\frac{PA}{AD} = \frac{(BPG)}{(ABG)}$</td>
</tr>
</tbody>
</table>

Write down the hypothesis over there, $\triangle ABG$ is a triangle, ok?

**Volunteer:** Yes

**Antonis:** What’s the conclusion?

**Volunteer:** $\frac{PA}{AD} = \frac{(BPG)}{(ABG)}$

**Another pupil:** Is $P$ any point?

**Antonis:** Yes … write it down over there. Well, tell us what we should do.

**Volunteer:** Triangles $\triangle BPG$ and $\triangle ABG$ have $BG$ as a common side. Therefore the ratio of their areas is equal to the ratio of their altitudes.

**Antonis:** Correct.

**Volunteer:** We draw the altitude.

**Antonis:** Correct. We draw the altitudes $\nu_1, \nu_2$. Then $\frac{(BPG)}{(ABG)} = ?$

**Volunteer:** $\frac{(BPG)}{(ABG)} = \frac{\nu_2}{\nu_1}$ (1)
Antonis: Why?

Volunteer: Because they have a common side.

Antonis: They have a common side. Write, $\angle B \Gamma$ is common.

Volunteer: Now …

Antonis: Label with letters if you want over there

Volunteer: I observe that $\triangle \Lambda \cup \Delta \cap \Theta$, $\triangle \Pi \cap \Delta$ are similar because each one has a right angle.

Antonis: Yes

Volunteer: and $\Delta$ is common.

Antonis: Yes, write, $\triangle \Lambda \cup \Delta$ is similar to …

Volunteer: to $\triangle \Pi \cap \Delta$.

Antonis: $\triangle \Pi \cap \Delta$. Write why they are similar.

Volunteer: Shall I write the proportion now?

Antonis: Write $\frac{\Pi \cap \Delta}{\Lambda \cap \Delta} = \frac{\Delta}{\Pi \cap \Delta}$ and $\Delta$ is common.

Volunteer: $\frac{\Pi \cap \Delta}{\Lambda \cap \Delta} = \frac{\Delta}{\Pi \cap \Delta}$ (2)

Pupil: $\frac{\Pi \cap \Delta}{\Lambda \cap \Delta}$

Antonis: $\frac{\Pi \cap \Delta}{\Lambda \cap \Delta}$, the third ratio is not needed.

Volunteer: No, it is not needed.

Antonis: Put (1) over there.

[Pupil labels relations (1) and (2)]

Antonis: Yes. What do you conclude from (1) and (2)?

Volunteer: That the ratio of the area is equal to this.

Antonis: Correct. Who didn’t understand it?

Pupil 1: Sir, I can’t see what’s written over here.

Antonis: Where?
Pupil 1: Below the ratio of the areas.

Antonis: The triangles are similar.

Pupil 1: No over there.

Antonis: The triangle ΑΚΔ.

Pupil 1: Ah, ok.

Antonis: ΑΚΔ and ΡΘΔ are similar. Why are they similar? Nick … Helen

Pupil 2: Triangle ΑΚΔ

Antonis: Triangle ΑΚΔ with the big one.

Helen: Because they have …

(Another girl intervenes): One right angle and they have Δ as a common angle.

[Teacher briefly repeats the proof from that point onwards] Do we understand it? May I erase it?
APPENDIX 11

EXAMPLES OF ANTONIS’ QUESTIONS

Recalling and reproducing some mathematical fact

What can you tell me about the ratio of the areas of two similar triangles?

What can we say about the sines of two supplementary angles?

Supplying one or two steps in some routine procedure

\[ R^2 - \frac{R^2}{4} = \frac{\lambda_3^2}{4}. \] So what do we do next? (In solving for \( \lambda_3 \))

Applying some property, formula or theorem

How do we express the side of the inscribed square in terms of the radius of the circle?

(It required the application of the Pythagorean Theorem in an already drawn triangle.)

Relatively simple mathematical reasoning

How can we find the central angle of an inscribed regular hexagon?

Recognising patterns

After finding the means of the observations 1, 3, 6, 7, 8 and 4, 6, 9, 10, 11 he asked: “what do you observe?”
APPENDIX 12
EXAMPLES OF ANTONIS’ FEEDBACK

Provision of the correct short answer by the teacher without explanation

(8 instances)

Example

T. And what happens to the standard deviation?

P. It remains the same.

T. It will be multiplied.

Provision of the correct short answer by the teacher with explanation

(7 instances)

Example

T. It is not written like that. -1 should be in a parenthesis.

P. It’s the same sir.

T. It’s not the same. Without parenthesis it’s -1 whereas in parenthesis it makes 1

Brief probing into the pupil’s thinking and then providing the correct answer

(7 instances)

T. How many roots does a first degree equation have?

P1. One

T. Always one?

P1. Yes

P2. A double root

T. What are you talking about man? It may not have any root.

Asking different pupils to provide the correct answer (4 instances)

Figure 8 in the next page provides an illustrative example of this kind of feedback.
Figure 8: Antonis – An example of letting a pupil provide correct answer

T. Does anybody see any triangles with the same area?

P1. The triangle $\Delta \Gamma \Delta$ and the triangle $\Delta \Gamma \beta$

T. It’s not even with the eye.

P2. Can I say?

T. Yes

P2. The triangle $\Delta \beta \Delta$ and the triangle $\Delta \Gamma \beta$

T. The triangle $\Delta \beta \Delta$ has the same area as the triangle $\Delta \Gamma \beta$

Providing a small hint to aid the pupil’s thinking (4 instances)

T. What is the standard deviation?

P. 4

T. But it’s raised to the square

P. 2

Another pupil interrupts the teacher probing and provides the correct answer (6 instances)

P1. (Writes) $a^2 = a^2 + \nu_a^2$

T. Why do you put $a$ again?

P2. It is $\frac{a}{2}$
APPENDIX 13

AN EXAMPLE OF GIORGOS’ REVIEW OF OLD CONTENT PHASE

Figure 9 below provides an example of how Giorgos conducts the review of old content phase

Figure 9: An example of how Giorgos reviews old content

<table>
<thead>
<tr>
<th><strong>OBSERVED LESSON 2 – 27 JANUARY 2006</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Giorgos:</strong> Let us remember what we said last time about areas. Who will say? Yes</td>
</tr>
<tr>
<td><strong>Pupil 1:</strong> The area of a square is ( a^2 ).</td>
</tr>
<tr>
<td><strong>Giorgos:</strong> First we talked about the area of a square and we saw it was ( E = a^2 ), write it up in the corner. And then we talked about the area of what?</td>
</tr>
<tr>
<td><strong>Pupil 2:</strong> Of the rectangle</td>
</tr>
<tr>
<td><strong>Giorgos:</strong> Of the rectangle. ( a \cdot b ), ( E = a \cdot b ), and then?</td>
</tr>
<tr>
<td><strong>Pupil 3:</strong> We talked about the area of a parallelogram which is ( a \cdot h_a )</td>
</tr>
<tr>
<td><strong>Giorgos:</strong> ( a \cdot h_a )</td>
</tr>
<tr>
<td><strong>Pupil 4:</strong> Equal to ( b \cdot h_b )</td>
</tr>
<tr>
<td><strong>Giorgos:</strong> Equal to ( b \cdot h_b ), correctly. And then we talked about the area of what Bardi?</td>
</tr>
<tr>
<td><strong>Pupil 2:</strong> The area of the triangle which is ( \frac{1}{2} a \cdot h_a )</td>
</tr>
<tr>
<td><strong>Giorgos:</strong> Yes. Does anybody have to add anything? Balanika</td>
</tr>
<tr>
<td><strong>Balanika:</strong> it’s also ( \frac{1}{2} b \cdot h_b )?</td>
</tr>
<tr>
<td><strong>Giorgos:</strong> ( \frac{1}{2} b \cdot h_b )</td>
</tr>
<tr>
<td><strong>Balanika:</strong> equals ( \frac{1}{2} c \cdot h_c )</td>
</tr>
<tr>
<td><strong>Giorgos:</strong> ( \frac{1}{2} c \cdot h_c ). We also talked about the area of a trapezoid which is ...</td>
</tr>
</tbody>
</table>
Pupil 5: It is $E = \frac{(B + b) \cdot h}{2}$

Giorgos: Correct. Then we talked about the area of the equilateral triangle of side $a$. Binis

Binis: $\frac{a\sqrt{3}}{2}$

Giorgos: $a\sqrt{3}$ over?

Binis: 2

Giorgos: 2

Pupil 6: $\frac{a^2\sqrt{3}}{4}$

Giorgos: Over four. One moment. What is $\frac{a\sqrt{3}}{2}$? What element of the equilateral triangle?

Pupil 7: The altitude

Giorgos: The altitude, correct. Finally, we talked about the area of a quadrilateral, under what condition? Panayiotou

Panayiotou: They intersect perpendicularly.

Giorgos: Which ones?

Panayiotou: $\delta_1$ and $\delta_2$.

Giorgos: What are $\delta_1$ and $\delta_2$?

Pupil 4: perpendicular

Pupil 7: diagonals

Giorgos: Diagonals. And we’ve seen that this is equal to ... Panayiotou

Panayiotou: $\delta_1 \cdot \delta_2$

Giorgos: Do you all agree? Moshos

Moshos: It is $\frac{1}{2} \cdot \delta_1 \cdot \delta_2$

Recalling and reproducing some mathematical fact

*What is the equation of a circle whose centre is the origin and its radius is r?*

*If two triangles have equal altitudes what can we say about the ratio of their areas?*

(Theorem in the book)

Supply one or two steps in some routine procedure

*We have the equation \( x^2 + 4y^2 = 4 \). What shall we do to express it in standard form?*

Application of some property

*Given a triangle ABC with (\( \hat{A} \)) = 60°, b = 1 and c = 2, how would we find a?*

Reading off information from a figure or formula

*Can we find a here? \( \frac{x^2}{4} + y^2 = 1 \)*

Relatively simple mathematical reasoning

*What can you conclude from the equation \( 4\rho^4 + 7\rho^2 + 12 = 0 \)?*

Repeating the hypothesis or part of the hypothesis of some proposition

*Is this any triangle or a special triangle? (It was stated in the beginning of the exercise that the triangle was a scalene triangle)*

Pattern recognition

*Can you observe anything about the powers of a and x in the expression \( x^{-1} + x^{-2}a + x^{-3}a^2 + x^{-4}a^3 + \ldots + a^n \)?*

Translating verbal data into some mathematical symbolism or the inverse

(Regarding the expression \( x^n - a^n \)) *What do we have here? How would you describe what we have here in words?*

Finding analogies

Figure 10 in the next page shows an example of this kind of feedback.
For any point $P$ inside the triangle, prove that

\[(1) \frac{PA}{\Delta} = \frac{(BP\Gamma)}{(AB\Gamma)},\]

\[(2) \frac{PA}{\Delta} + \frac{PE}{BE} + \frac{PZ}{\Gamma Z} = 1,\]

\[(3) \frac{PA}{\Delta} + \frac{PB}{BE} + \frac{P\Gamma}{\Gamma Z} = 1\]

**Giorgos**: Here $PA$ plays some role. What other segments play an analogous role?
APPENDIX 15

EXAMPLES OF GIORGOS’ FEEDBACK

Corrective feedback supplied by the teacher himself or by asking a different pupil

Example 1

T. So it is enough to prove that the triangle is isosceles.

P. The square of the hypotenuse

T. (interrupts) Don’t use the concept of the hypotenuse yet.

Example 2

T. And we saw that the area of a rhombus is?

P. \( \delta_1 \cdot \delta_2 \)

T. Do you all agree absolutely? Jim

P. \( \frac{1}{2} \cdot \delta_1 \cdot \delta_2 \)

T. That’s it … Over two … Correct.
APPENDIX 16

PUPIL’S IRRELEVANT ANSWER

Figure 11 below describes Giorgos pedagogical approach when a pupil gave an irrelevant answer to one of his questions.

Figure 11: Giorgos’ response to a pupil’s irrelevant answer

<table>
<thead>
<tr>
<th>OBSERVED LESSON 2 – 27 JANUARY 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Giorgos:</strong> Pap, Can you read exercise 5?</td>
</tr>
</tbody>
</table>

Prove that the area of a trapezoid is equal to the product of one of its non parallel sides times the distance of the midpoint of the other side from this side.

| **Giorgos:** Yes. Bal, can you repeat it? |
| **Pap:** repeats. |

**Giorgos:** … from it. This wording is hard to understand. Let us proceed slowly to the construction of a figure. What do we make first?

**Pupil 1:** A trapezoid.

**Giorgos:** A trapezoid. Let us all make a trapezoid and name it ABCD. (to the volunteer) Write hypothesis, conclusion. Prove that the area of the trapezoid ABCD is equal to the product of one of its non parallel sides, which one do you want to take? Yes

**Pupil 2:** AB

**Giorgos:** AB. So we have the product of AB times the distance of the midpoint of the midpoint of the other, which one?

CD

**Giorgos:** CD. We take the midpoint M, time the distance of the midpoint of the other form it, which one?

AB

**Giorgos:** AB. What should I draw at this point Panayiotou?

**Panayiotou:** The median

**Giorgos:** The median. [Addressing some other pupil] Yes?
**Pupil 3:** The perpendicular from M to AB.

**Giorgos:** The perpendicular from M to AB. We all draw MK. Times MK I will reread the exercise … Are you finished with the figure?
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