EFL Female Emirati Students' Perception of the Use of an Interactive Mathematics Software Program in a CLIL Class at the Tertiary Level

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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.

Signature 

Abstract

The use of an interactive mathematics software program was applied to first-year Foundations-level female students in a CLIL classroom in the United Arab Emirates, utilizing PC tablets. The learning experience was made to be enjoyable as well as meaningful, all while utilizing technology in the hopes of creating more autonomous students who would benefit from the change in pedagogy as they embarked on their tertiary learning experience.

Their textbooks were integrated into an interactive program using Blackboard (Bb) to include video clips, authentic applications, and interactive applications in order to present the curriculum. Formative assessments were included throughout the process, all aimed specifically at second-language (L2) students with a minimum band of 2.5 level of English, in an attempt to give them immediate feedback on the learning process.

The students‘ perspective for this particular medium of delivery shall be discussed and compared with traditional teacher-centered teaching, using the textbook, via observation data, questionnaires, and focus group data analysis. It is hoped that the data accumulated will contribute significantly to the usefulness (or lack of) technology-based instruction and best practices in mathematical interactive software development, specifically for Foundations-level L2 students in the UAE.

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Chapter 1 Introduction

1.1 Nature of the problem

By the time students enter tertiary institutions, particularly into Foundations or College Preparatory programs, it is assumed they have been instructed in some basic mathematical skills-presumably more than once, according to Howard (2008:4) "but without success, or they would have placed in a higher level class." Basic math, Howard continues, is "the math concepts and skills that students need to prepare them to take college algebra at a postsecondary institution" (p.4). Traditional methods and classroom environments often fail to stimulate and encourage interest and concomitant abilities in some of the most important subjects. This is true for college students in the United Arab Emirates (UAE), where "[A]bout 80 percent of students accepted to federal universities do not have the required math, English or IT skills, and have to take remedial classes before starting their degree" (Swan 2011). Howard (2008:4) stresses that students' "experiences, attitudes, and learning strategies must be different than before; otherwise they will likely obtain the same results."

Further, students in remedial classes are not accustomed to a challenging curriculum or the work ethic necessary to be successful in college. Hacker (2010) notes that there are several reasons for this, but what results is that the teachers of these remediation classes can ultimately "find themselves with a roomful of knocked-down egos, and it can be difficult to get the students to take classes seriously." Stage and Kloosterman (1995) refer to college preparatory courses as "gate keepers" and suggest that such courses "effectively filter many students out of careers they might otherwise pursue." As one might expect, these students are not always instinctively

interested in taking mathematics, possibly because of their previous lack of success. Even for the most attentive learners, who can see relevance in a learning task, enthusiasm can diminish as the activity wears on. Dornyei (2001a:116) suggests "[I]t is difficult enough to control these students and keep them happy but teachers also have to teach them subjects that many (or most) students would not have selected for themselves." Compounding the problem, students who are learning a content such as basic mathematics in a second language (L2) environment – such as my students, who comprise the subjects of this study- have the additional burden of translation. Because this can also be an enormous mental challenge, the extra effort these students must put forth is evident.

Beyond the previously mentioned problems, the local educational structure is changing as a result of the massive changes the national culture has recently undergone. Findlow (2006:23) suggests there has been a "rapid modernization accompanying the acquisition of oil wealth," and that recently the UAE has suddenly gone from a collection of materially "poor and sparsely populated tribal homelands with no formal education systems to a politically, economically and technologically sophisticated federation of seven states." Their sudden and somewhat drastic national cultural changes have influenced the relevance they place on education. Due to these changes, much of the learning and knowledge of what the local people know and do and what they have known and done for generations, is suddenly forgotten and superseded by a more formal or modern Western style education. Foucault (1989, cited in Findlow 2006) suggests there is a strong interconnectedness between language, mindsets, the medium of delivery, and messages and perceptions ultimately determined by cultural circumstances. Accordingly, the sudden shift from rote learning to a method of critical thinking while learning has created what

Findlow (2006) suggests is an educational process is in a transition state. Because my students mainly communicate throughout their childhood in Arabic, learning English at age 18 "requires a substantially changed cultural mindset" (p.27). Thus I am basically one more teacher who transmits language to students, but this time in a different medium than what they are accustomed. Ultimately, it is up to such students, based on their values and culture, whether or not they will recognize the relevance in that language and make the necessary adjustments and adapt to the significant changes.

Ultimately my students are judged on their test scores, and in order for them to be successful and complete their first year of college, they must pass mathematics. Quite possibly, some of the students in the Foundations program simply do not like math "a fact that appears to be acceptable," notes Beilock (2010). "No one walks around bragging that they can't read, but it's perfectly socially acceptable to say you don't like math." Therefore, in order for my students to ultimately pass, I must present their curriculum in a manner to pique their natural curiosity and interest in pursuing it; it must be culturally appropriate, and I must recognize their lack of basic skills and how to get them to change their attitude, lest they fail yet again in a math class.

1.2 Rationale for the study

When I was younger, I despised mathematics and was convinced I was incapable of learning the subject – possibly much like my students today. However, when I returned to college as a non-traditional student in my mid-twenties, I learned to actually enjoy the subject, thanks in part to a special teacher, my first college math teacher, who made the class fun and challenging. This

allowed me to gain a confidence that I have never experienced, with my regret being that I had not been able to do so at a younger age. Given my experience, I too tried to make my class different or nontraditional yet fun and challenging, as had my first college math teachers. Specific activities were authentic and the students usually found them interesting. However, I only used them for a small percentage of the concepts I taught, and mine was primarily a teacher-centered classroom. That was certainly comfortable and familiar to me, and I could see myself repeating past mistakes, despite my recognition of the failure to be successful in the teacher-centered classroom myself. Kennedy (2005:329) suggests despite the fact that during their educational training teachers are often shown alternative approaches to teaching, many "teach as they were taught." Kennedy adds (2005:328) "[T]raditional education settings are often impoverished with respect to efforts to design learning environments that bring about conceptual change." Ultimately I recognized that I too had fallen into that trap of teaching the way I was taught, and I believed my students would eventually have the same experience I did at their age.

I could sense the obvious differences between the lessons in which I used manipulatives and was able to generate spontaneous conversations around the content, and those in which I simply taught out of the text, which was most of the time. I knew that I had a specific curriculum that the students had to learn, in order to pass the system wide assessment at the end of the semester. This assessment was mandatory for all students in the math class I was teaching, and was assigned by our home office in Abu Dhabi. I was doing just as McKernan (2008) suggests, I was part of the teachers "implementing state-developed programs with specified blueprints for strategy and outcomes," and despite my efforts to be innovative and creative, in the end

presenting the curriculum in a way that was most beneficial for the students and allowed for accountability on my part, was my priority.

Ultimately, the rationale for this study was based on several factors:

- I needed to prepare the students to handle a challenging curriculum so they could for the first time, be successful in a Foundations level math class
- Quite possibly there was a lack in interest in mathematics, especially given the fact they were L2 students
- I needed to assist them in the transition from rote learning to an approach where they incorporated critical thinking and problem solving
- I needed them to adapt to changes that required them to explore mathematics that piqued their natural curiosity and change their attitude towards the subject matter
- And finally, there was the issue of my own professional unease with regard to maintaining the status quo and the strong possibility that my students were at risk of repeating past mistakes, or at the very least, obtaining the results similar to those they had previously produced in their lower-level math class.

Thus, I began to speculate: Had the materials perhaps been presented to me, as a student, in another manner, where personal interest and autonomy were addressed, might I have been a better student? Had the subject matter been related to my life or carried an obvious purpose, would I have appreciated it more? Would I have had more intrinsic interest in the subject and studied it more deeply, thus becoming more skilled in the content at an earlier age? If the curriculum had been presented in a manner I was familiar with, technology perhaps, would it have altered my approach to learning? If it were changed for my students in a manner that included interest, stimulation, and interactivity, rather than just following a "dry and dusty" course book, would it be too much to expect increased levels of student activity, interest, and ultimately attainment? Recognizing that my students were much more engrossed in applications on their phones or programs on their computers than they were in my math class, I began to

speculate that quite possibly I could begin to bring about those changes with the use of technology. That notion was further tempting me because as mentioned earlier, the management team at my college was extremely supportive of the use of technology in the classroom, and encouraged innovative thinking and practices.

My expectation was that over time the negative feelings toward mathematics could be replaced by a more positive experience for the learners as they began work on a program designed to teach them mathematical concepts through an approach that used more visual appeal, authentic activities, and practical applications, all to enhance their learning. The students would inadvertently spend more time studying math as the activities began to appeal to them, and thus begin to participate in the prescribed activities for their own intrinsic value, not just as a means to an end. If they came to realize a direct correlation between the amount of study time and their grades, while gaining an appreciation of the concepts, they might eventually see mathematics as a real-life application rather than just problems in a book. All the while, they would have a pleasurable experience, something that observably would entice them to continue learning in a cyclical and self-perpetuating manner. I strongly believed the theoretical answer was yes; whether that was transferable to my students was another question completely. Given the high-tech nature of today's world, and watching my students engrossed in activities on their laptops and cell phones, I assumed they had relatively well-developed technological skills. According to Elish (2009), it is the schools and colleges, rather than the students, who need to keep pace with the rapid changes in digital media in order to stay relevant in the twenty-first century. She suggests that young people's learning is often more self-directed when dealing with digital media, due to autonomous behaviors that are less apparent in a traditional classroom setting.

Hallett (2007) has noted that students are changing and prefer active learning rather than passive learning; this would certainly be possible with the available technological tools today.

McKernan (2008) suggests that most teachers maintain overload schedules and lack the time for research and curriculum development. In the study presented here, however, as mentioned previously, the administration lent tremendous support to this research project and granted a reduction in my teaching hours so I could prepare, conduct, and present it appropriately. Given that I had taught this class for several years, I was familiar with the content areas that presented problems for the students and thus set out to create a better medium of delivery so students could have an alternative to learning from a teacher-centered approach. I therefore decided to conduct this action research study based on my own personal learning experience with mathematics and, ultimately, because I could see the same process happening for my students. I wanted to attempt to alter the approach and analyze the data, using a primarily qualitative methodology; however, I also wanted to analyze the students' grades and questionnaires to see if the data supported my notion. Thus, after ten years of teaching Foundations level students in the United States and more than half a decade teaching at the Foundations level in the UAE, I set out to create a study that took into consideration the challenges all teachers face, but especially mathematics teachers in L2 classrooms, and more specially those teaching students with extremely low English levels at the college level and who are thus under tremendous pressure to boost student success. The basic question was: How can this often dreaded subject be delivered in a more appealing manner? In light of this situation, the following specific aims of the study were formulated: (1) to create an interactive software program using the very content contained in the current textbooks, but in a manner applicable to student interests; and (2) to determine if this really

improves students' perception or interest in learning math. The study explores alternative methods of teaching and avoids the teacher-centered model, while striving to provide an opportunity for students to explore authentic applications in math and improve math discourse in English. This study also follows the lead of a pilot study conducted earlier.

1.3 Significance of the study

Ideally, ability should be seen not as an inborn trait, but, to some extent, a skill that can be learned and enjoyed while exploring individual interests. I began to seek answers as to how I, as an educator, could create an environment for learning that allowed my students the freedom to explore their unique interests, especially in a required content class in L2. How could I make their experience meaningful and satisfying so they could become students who enjoyed a mental challenge if it was appealing and had relevance? Littlejohn (2008) maintains that learning is enhanced if it comes from a positive emotional sensation or experience. He suggests that being read to as a small child, wrapped in loving arms, is appositive emotional experience that can give birth to a love of reading. In this project I set out to create a positive classroom environment in which students were inspired to explore mental exercises further and use mistakes as learning tools to improve academic excellence and their own learning situation. The hope was that their identity as students might be changed for the better as both academic and learned behaviors were changed in a more positive manner – one that is more conducive to learning.

In an ideal classroom, much of the learning should be individualized. Elish (2009:1) suggests that activities such as an interactive curriculum "have captured teens' attention because they

provide avenues for extending social worlds, self-directed learning and independence." Inevitably, my students will need to be shown *how* to learn, given the drastic change in pedagogy, however the curriculum does not allow time for this process. Therefore, the overall aim must be to create an environment that intrigues those with potential – of whom there are plenty – rather than preserving the status quo and allowing them to waste their time in class before rushing out to the coffee shop to focus on their social lives. With the help of the educational Technology Department at the college, I replaced the curriculum with an interactive form of delivery and began the process of changing the situation as I saw it. Because the students appeared mesmerized by certain aspects of their laptops and cell phones, and this was of interest to them and quite relevant to their daily lives, I hoped to be able to create that same kind of interest by using at least one of the same tools, perhaps teaching students to use their time on content classes and sparking an interest in a mental exercise or learning tool. The program included authentic applications that occurred in what I deemed to be a visually appealing application (examples are included in the appendices and discussed later in this paper) introduced at a level that was appropriate to their language level, thereby creating a curriculum that I believed would initially interest the students and ultimately become entwined with their previous experiences. A further hope was that the program captured the students' attention or, at the very least, encouraged autonomy.

It is not hard to conceive of drastic improvements in teaching and learning mathematics – indeed, all subjects – if the medium of delivering more challenging topics comes more into line with what the students find appealing or interesting, as well as culturally suitable. Moreover, if

students are presented with appropriate learning strategies and their language skills are sufficient, the experience is no doubt a more positive one.

1.4 Contribution to knowledge

Would altering a teaching approach improve students learning experience, especially when they must learn a concept they had previously failed to learn, and in a second language? Moreover, if the experience were positive for them, would they gain confidence and begin to see the subject matter as interesting and relatively easy? Answers to these questions could not only improve the experience of students who learn math in L2, but perhaps also pedagogically benefit teachers in such a situation, thus conceivably leading to educational efficacy. The real test lies in the fact that such students have a history, as Hunt (2011) suggests, and their attitudes are deeply rooted by the time they reach college. Is that too late to spark an interest in learning and create an appreciation for knowledge? Given the importance of technology both in and out of the classroom today, there is a need to generate knowledge about the role it can play in this particular culture, and whether it can help answer these questions, as well as others, as shown below.

1.5 Research questions

In light of the situation just described, I wish to delve deeper into the phenomenon of the use of an interactive software program to enhance my students' learning in L2 and answer the following research question and its three sub-questions:

Main research question: What are female pre-university students' perceptions of learning with technology in a Content and Language Integrated Learning (CLIL) context in the UAE?

1) **What are the students' perceptions toward using technology?**
2) **What are the students' perceptions toward the subject matter?**
3) **What are the students' perceptions toward this learning style/approach?**

The justification for the sub-questions is detailed in the following chapter.

I consequently created a program on Blackboard (Bb), an educational tool purchased by the UAE college of my employment that allows classes to be created as computer-based and available to the various campuses, system-wide, and at any time as long as there is Internet access. The program I created contains video clips and electronic textbooks called Didapages, which explain concepts by using real-world applications at an appropriate level of English for the second-language female students entering the Foundations program. I stress female students here because the presentation of the materials was feminine, colorful (often pink), and designed with young women in mind (see Appendix 10). Having taught this population for a number of years gave me the experience to incorporate items I believed would be particularly appealing to these students. Additionally, the program's interactive activities provide immediate feedback and are individualized so students can progress at their own pace. This enables fast-track students to finish earlier than their classmates and move onto more challenging and stimulating activities. During this entire process, because the teacher is not teaching, they are free to track the students' progress and recommend remediation where necessary.

Because it is not enough for me to acknowledge that since I believe a program like this would have worked for me, it will work for the students I am currently teaching, I need to evaluate the students' assessment results and their overall appreciation of this medium of delivery, in order to determine whether it is appropriate for this population of students. Further, in order to effectively evaluate this program and its success, it is imperative that I recognize what a considerable change in pedagogy it is for these students. My students are accustomed to using their textbook and memorizing all materials, and I am asking them to become interactive in their learning and explore on their own, with no specific map of what to memorize, but rather follow the activities on their laptop in numerical order. The students will shift to decision makers regarding whether or not they proceed with new material or go back over and review content where their formative assessments show they have not fully mastered the concepts. The teacher will play a significant role in giving guidance to the students, but ultimately it will be up to them to recognize what they know and what they do not know – yet the curriculum ideally, will be appealing to them and something they can relate to, and therefore they might possibly be inspired to investigate it further, thus ultimately learning while doing so. This is a drastic change in their education and ultimately it is imperative they have sufficient confidence in their ability to succeed. Archer, Cantwell, and Bourke (1999) suggest that in order for students to be successful in a task, they need "an awareness of the necessary cognitive and self-regulatory strategies, and when and how to deploy them," as well as prior declarative knowledge. My hope is this will come about naturally as they begin the program.

In a perfect world, the Didapages software program would be unique or as mentioned previously, individualized, for each students. But Keobke (1998:46) reminds us that "neither we nor our

students live in an ideal world, and teachers and learners need to involve themselves actively in adapting software to different learning styles." Therefore, my research seeks to determine whether knowledge or understanding is enhanced for students, given the pedagogical considerations and various learning styles that are evident in any classroom. I will discuss and compare the results of the students who participate in the program with those who remained in the traditional teacher-centered teaching classroom, using textbooks and the traditional approach. Pre and post-study questionnaires as well as observations will help examine the assessment results of this study for recognition of any enhancement in learning for the students who participated in the program.

1.6 Structure/organization of the thesis

In order to answer the posed research questions and meet the objectives of this research project, the second chapter delves into the history and culture of the students under study. This provides a foundation for the reader to more fully comprehend the students' situation and the possible ways to augment their success in the second-language mathematics class, specifically from their perspective. Chapter 3 reviews the literature on the main constructs of the thesis, including second-language learning, content learning in a second language, teacher-centered vis-à-vis student-centered approaches, the positive and negative aspects of using technology, CLIL, how to create technology in education, and the challenges involved. Chapter 4 reveals the research framework and the ideological position of the study. In addition to visiting the study's research question and sub-questions and the specific plans to answer them, it also addresses the improvements made to the pilot study and research methods, data collection, analysis procedures

used, the validity and reliability of the study, and possible limitations. Chapter 5 presents the key findings from the study and provides in-depth discussion of them. Finally, Chapter 6 provides conclusions and discusses the implications of the study with regard to using technology specifically for Foundations level L2 students in CLIL classes, as well as suggestions for further research and for the institution under study.

Chapter 2 Context of the study

2.1 description of the context

In late 2005, the country of the United Arab Emirates set out to reform education nationally.

Macpherson, Kachelhoffer, and El Nemr (2007) explain that the system in existence at that point was obsolete, and reconstruction was necessary for many reasons, including (but not limited to) 4,500 unqualified teachers, unsuitable curricula, and an ineffective school culture with weak discipline and high truancy rates, especially among male students. Healthy meals were not available, the buildings were poorly designed and badly equipped, and low levels of professionalism existed among teachers with low skills, qualifications, pay, and status. Further, teachers were not interested in professional development and had little loyalty to their schools or students. Budgets were insufficient and UAE students spent only about half the time in school that students in other countries spent.

Impressively, despite all these shortcomings, the UAE has made tremendous leaps in the last 60 years in eliminating illiteracy. A snapshot of the country's history of education in the last six decades shows that in 1950, illiteracy was over 90 percent; some half a century later, reports Shaw (2006:47), it was "in the region of 20 percent and confined to elderly people I the cities." The school systems are relatively new as their growth did not actually begin to accelerate until "the oil price bonanza of the 1970s" (p. 43). It is a complicated cultural picture that Findlow (2006) describes as consisting of a small indigenous, conservative population, a large expatriate population, and recent modernization accompanying the oil bonanza. With Arabic as the national language and Islam as the religion, the UAE remains ideologically and politically linked

with other Arab countries. Basically, as revealed in the previous chapter and according to Findlow (2006), it has undergone a transformation from a collection of poor rural tribes with little organization in their educational systems to a more economically and technologically sophisticated country.

One of those relatively new government institutions, part of a chain of seventeen federal technical colleges established in 1988, is where I teach and conducted this study. It is a government-funded tertiary institution with approximately 1600 students and 85 full-time faculty. The colleges employ primarily non-Arab expatriate instructors and teach almost exclusively in English, with Arabic being used only for Arabic and Islamic Studies (Findlow 2006). Although ultimately, decisions made with regard to policies come from the office of the Sheikh, for the most part, the institution is entirely run by expatriates who are relatively new to the UAE. O'Brien and Martin (2010:109) explain that the vision for this particular chain of colleges came from the need to eliminate "inappropriate methods of teaching and learning" and to shift the focus from "teaching to learning, from the teacher to the learner, from memorization to creativity, reflection, imagination and innovation."

Only Emirati nationals who have graduated from high school are eligible to attend this college. The students are enrolled in various programs, including higher-level Bachelor Programs, Foundation Programs, College Preparatory Programs, Continuing Education, higher-level Foundation Programs, and Work Readiness. The higher-level programs make up roughly 23 percent of the enrollment, which means that the remaining 77 percent of the students are enrolled

in programs in which their knowledge of English is considered very limited. This study focuses particularly on the students in the Foundations Program, who for the most part attended these government schools described above and who are enrolled in a very basic elementary-level numeracy class. Their ages range from 17 to 26 with the majority under the age of 20. All are female, as the college is a woman-only college. There are thirteen sections, or classes, in total, with approximately twenty students in each section.

2.1.1 Institutional description

The administration of this institution is fairly new, with the top three leaders having been in their respective positions for less than four years as of spring 2011. The director at the time of this study had a previous career in the West; after twenty years, he retired and began leading educational institutions there before moving to the Middle East. His experience in education was limited when he first began, but as Bush and Bell (2002) state, the framework for running an educational institution can come from commerce or industry. The next two top positions are filled by employees who have lived and worked in the Middle East for many years and had been employed by the institution for over fifteen years. Because of their experience together in education and in this particular culture, both of them provide support to the top position.

As recently as four years ago, the institution underwent sweeping changes and the basically a brand new administration came into being, with the exception of three remaining supervisors. The reason for the restructuring was rather complex, but the remnants of those changes remain, most profoundly the singular most important objective, to maintain an acceptable pass rate.

Furthermore, in a move to be more accountable system-wide, and no doubt as a result of the economic downturn, the emphasis on value-for-the-money has become the norm throughout the country. To its credit, the new administration recognized the need for effective leadership and management in an increasingly globalized economy, and the disruption and inclination to change existing policies has been dealt with for the most part in a professional manner, at least on a local level. The noticeable differences locally are tighter control of expenditures and increased workloads for the faculty and supervisors. Most faculty have accepted the changes yet are cognizant of the "way it used to be," compared to the "way things are done today." This is significant because of the constant pressure to have acceptable pass rates, despite the students' poor background in education and lack of study skills. It is significant also because despite the sweeping changes that have taken place, management at this particular institution was firmly behind my study and supported me throughout the entire process, even nominating me for an award at the end of the academic year.

2.1.2 Student description

In addition to the unique history of the institution and the country involved in this study, the student participants themselves came from even more unique circumstances, which could also constitute possible reasons for their lack of interest in studying. The immense welfare system of the society under study may have caused a gap in work-reward causation, according to Denicola (2005), resulting in little effort being made to actually learn (Fahnestock 2008). Dr. Neil Hunt, a teacher in the Bachelors of Education Department at the college where the study took place, also addresses learning incentive when he describes learners in this culture, their complex social history and background resulting from their experiences, and whether or not they are truly

interested in knowledge. Hunt (2011:63) further addresses the pedagogies the students are exposed to while in school:

> The model of pedagogy used in the schools, can be characterized as being generally transmission-based, with a curriculum dominated by assessment washback, where much teaching and learning is aligned with and constrained by assessment practices, having the effect of narrowing teaching and learning strategies so that only such ones that are validated in assessments are considered appropriate.

Perhaps this could explain the students' lack of interest in mathematics, as basically the pedagogy is driven by the assessments and what I know my students need to know in order to pass. I have essentially presented the material in their second language, while they attempt to translate into their mother tongue and comprehend the content simultaneously. For some students, no doubt because math can be more universal, they can grasp the concepts. However, as Archer, Cantwell and Bourke (1999) suggest, most students are unlikely to throw themselves into an activity they believe is beyond their capabilities. As a teacher, even I find it tedious and routine; in their situation I was not interested in the subject matter either, and it was presented in my mother tongue. It is not difficult to see that, despite trying to make math interesting and fun, any teacher advocating the importance of, say, dividing decimals, especially in L2, will no doubt make a minimal impression on the students, regardless of culture or language ability. Further, the actions I perform in front of them, which come directly from their textbooks, have little or no meaning or relevance for them; basically, they mimic me so they can pass the exam. I am simply wasting valuable time maintaining the status quo. It is not surprising, then, that they lack interest and often fail.

2.1.3 Assessment results

At the mid-semester assessment of the institution‘s fall term when this study took place, some eighty students taking their English exams scored at a level indicating that the likelihood of their eventually passing English for the year was virtually non-existent if they did not receive extra remediation. This constituted approximately 20 percent of the intake of the Foundations students for the year. Despite their entrance scores, determined from high school exit exams, showing they were indeed capable and placed in the appropriate class, these students actually could not complete the year in the lowest level program offered.

Anecdotally, these same students told me that not only did they have access to the high school exit exam ahead of time, it could even be delivered to their front door for the right price. This practice is now changing in the era of computer-based exams, which select random questions for each individual student. The procedure is becoming more and more computer based and eventually they will totally do away with paper based exams. The exams are proctored at the college and the probability of cheating is drastically reduced today.

In May 2011, the *Readers Digest* contained a story of a man with the pseudonym Ed Dante who has a thriving paper-writing business in the United States that, he suggests, stems from the desperation, misery, and incompetence the educational system has created. Over the previous year, he claimed, he had written approximately 5,000 scholarly pages for cheating students, while the *New York Times had* reported 61 percent of undergraduates having admitted to some form of cheating on assignments and exams. Dante suggests that there are basically three types of students for whom he writes papers: the English-as-a-second-language student, the hopelessly

deficient student, and the lazy rich kid. According to this description, my students are definitely included in the first category, and quite possibly one or both of the others as well.

Given the ultimate goal of this research project—to alter students' approach to learning and work to bring about improvements, encouraging optimal growth and granting them permission to be unique and who they ultimately want to be—I recognized that where the students were academically was not important; their English level and their overall basic skill level could always be improved. What was pertinent is that they were indeed attending college. Because of cultural restrictions, the girls were essentially confined to the campus until their timetable showed that classes were over for the day and their drivers or their brothers picked them up from school. They were the metaphorical "captive audience," and during that time of "captivity," for a few short hours each week, I wanted to try to spark an interest in the all-important subject of mathematics.

2.2 Cultural issues, power, authority and regard

Emiratis are taught mostly by Arab expatriates prior to entering tertiary school. Such teachers are on short-term contracts, much like many other categories of employees, and are viewed as dispensable or easily replaced. They have no status in a country that is very status-conscious and are here merely to perform a service few Emiratis want to do. They are often blamed for problems that are out of their control, so they must use caution when attempting student-centered or non-traditional education, not to mention when dealing with discipline issues. Hunt (2011:13) states that such a preoccupation "might include forfeiting classroom autonomy in order to follow Ministry of Education edicts in order to ensure continuing employment." This pattern, along

with other factors, must be the impetus for the high percentage of students in the range of low academic skills. It is more prudent for these teachers to maintain a safe environment within the classroom, where the instruction is teacher-centered and the students remain in their seats and work quietly.

According to a local Emirati teacher employed in a government-run-middle school, "Teachers have way too much pressure placed on them and are looked down upon by those in the community…especially the expatriates I work with. They are forced to give into the pressure" (Fahnestock 2008). This facet has broad implications for the pedagogies encountered in the Foundations Program at the institution under study. Foremost, the disparity between students' former classroom conduct and what is expected of them as they enter college no doubt strongly influences their academic performance, and not necessarily in a positive way. It can be a very contradictory transition as the discourse completely alters the balance of power to which they are accustomed. The teacher adds that some are "killing the talented students by handing out worksheets and then they go home." Pennycook (1990:304) refers to the "deskilling" of teachers who are basically powerless yet take on board the hidden socio-cultural values and value judgments. They are obliged to create a learning environment that is safe yet simultaneously breeds boredom, resentment, and dislike for learning or education in general.

Another contributing factor to students' unsuccessful academic experiences might be tied to the lack of respect they give to anyone in the field of education. Although women are taking up positions in the local school systems in increasing numbers, most are leaving the profession for higher-paying jobs with more prestige. The Emirati teacher introduced here earlier explains that

as a teacher he is "just a normal guy" because his choice of career does not allow him much, if any, respect within his culture (Fahnestock 2008). Why, then, would anyone with a choice wish to enter the field of education knowing at the outset that the job would provide little prestige and a low salary? Which would be most appealing, to be an Emirati secretary and make Dh 30,000 per month (US $8,152.17) or an Emirati teacher of future secretaries and make Dh 12,000 per month (US$3,260.87)? This Emirati teacher's salary, though more than twice that of the expatriates he works with, is extremely low compared to other government jobs and considering his education and workload.

A typical Middle Eastern expatriate teacher in the government schools who enforces appropriate classroom rules, including expecting students to participate in class, come prepared, arrive on time, do their own work, and not copy, can become most unpopular with students. The result can be low teacher evaluation ratings at the end of the semester, which will need to be addressed in the teacher's appraisal at the end of the academic year. Depending on the explanation, this can likely influence whether or not the teacher remains employed. The status of teachers is reliant on social structures, and this status was recently detailed by an employee of the UAE University: "You are expendable fodder, easily replaced. Your views, your moods, your feelings and your self-respect are not of the slightest concern. They will communicate to you at their leisure, not yours" (Swan 2011).

Improving incentives for teachers in the UAE is crucial to improving educational standards (*The National*, June 5, 2011). The field of teaching is not necessarily one many Emiratis venture into, given the low pay and status. For example, in the college where this study was conducted, one

female Emirati teacher went into the Teacher Trainer Program after graduating, but lasted only a few short months. She moved on to take a secretarial position in a government-run hospital, where she could greatly increase her salary as well as the level of respect from her community. At the beginning of academic year 2010-2011, one of the female Emirati library staff resigned because she could triple her salary and work for just six hours a day at a local hospital. Reforms have gotten underway. However, instituting such immense changes is a big challenge. Ismail (2011) points out:

> Teaching in UAE is akin to being a lab mouse in a labyrinth. One minute it's rote learning, worksheets and a regimented classroom. Then it's technological theories about what makes learning "meaningful." You have to make it fun, they say. . . . Really, the children aren't thinking that hard. For the most part they are just trying to figure out what you want them to do or patiently waiting for that one student who understands the assignment to finish so that they can start copying.

Marton (1975) and Entwistle and Marsden (1983) refer to the education of such students as "surface" learning. This is in contrast to "deep" learning, where the focus is more on understanding and making sense of underlying principles, and where the student may be truly interested. According to Barr (2007:9),

> Emirati students leave school with well-developed 'surface' learning abilities which enable them to memorize detail and learn by rote for an exam, not all have learnt to master, or perhaps not even grasped the need for, 'deep' learning strategies which enable learners to put their learning to use, to criticize ideas, to solve problems, and to carry on learning. Put another way, surface learning can easily be forgotten the next day, but deep learning stays with the individual since it promotes real understanding and capacity.

2.3 The role of English

All instruction in college in the UAE is delivered in English. The mathematics class is among the first content classes these students have taken solely in English; for some, it is one of their first opportunities to use English as a means of communication, not merely another subject matter to be memorized. The students have indicated that their high school English teachers spoke to them in Arabic. When asked if they use English outside the classroom, they often respond that it is only when they go out to eat.

This institution has graduate outcomes, which are part of a trend in making their very quality expectations explicit. These include a definition of what their graduating students are expected to learn, and are written in the form of learning outcomes. They continue to evolve and are under ongoing reviews. However, some of the key outcomes that are relevant to this particular study include communicating information and expressing opinions and concepts and ideas effectively in English through the spoken and written media, as well as using technology to perform effectively in their personal and professional lives. Other outcomes include working independently, reflecting on and evaluating one‘s own learning, analyzing, and communicating mathematical concepts with confidence in authentic contexts. According to a *National* editorial (2011a:19), Emirati parents are searching for a “solid grasp of English, a global outlook and other advantages for their offspring.” This describes in detail what the students are expected to learn and further justifies a program such as the one I created as a pedagogical tool for learning math in L2.

2.4 Issues specific to women

Because female students are under analysis in this study, women's issues are another important area of consideration here. Describing what defines and limits women's lives in a patriarchal society, Heilbrun (1988) suggests that if a woman is successful in this environment it must be due to luck or the support of others, and she must conform to behavioral expectations. This could ultimately have an impact on the subjects studied by women. Because mathematics is traditionally considered a male-dominated field and not especially important for women, men in this culture conventionally tend to major in engineering and similar subjects while women study such subjects as education and fashion design. This is changing as more and more engineering classes are offered at the women's campus; however, it is still highly likely that the lower-level students, especially those from the more traditional areas, have internalized countless messages, including those who say they do not belong in this particular math class, or perhaps they are not expected to do well. Heilbrun (1988) maintains this is a concern.

Many of the young ladies included in this study originated from the more traditional Bedouin rural pockets of the country; as a result, they lead very sheltered lives. Their traditions are natural and any type of authenticity or moving toward greater truth-telling will no doubt be met with considerable resistance. Often my students protest among themselves and complain to me about their lack of freedom and inability to make their own decisions. Some attend college as a means of escape from their unexciting and boring lives at home, until the unavoidable day when they will be married.

Consequently, many of my female students are not necessarily in college to learn, and specifically not to learn mathematics, as much as I would like them to enter my class with the same enthusiasm and passion that I have. Given their sheltered lives, their lack of freedom, and the restrictions placed on females in their culture, many of them enter college for the social experience, or as an escape from their restricted lives. Even those who do enroll because they truly want to learn (often the non-traditional older returning student) nevertheless have not experienced an academic environment that promotes learning, and often are not sure how to go about it. They have few if any female academic role models, and no awareness of appropriate study strategies or study skills.

To add to this, the fact that the students' interests are basically irrelevant in their patriarchal culture leaves little wonder as to why they tend to misbehave in class. Given the low levels of respect an educator receives in that culture, where peer pressure is exerted on those who suggest that others behave in order to maintain a proper learning environment, I have perpetuated an old practice or custom by using a teacher-centered approach. The current educational system is all this young country has known, and not only have these students been educated in this manner, but so have their mothers—those fortunate enough to have attended school. Even more important, so have the majority of the current Arab expatriate teachers. Change will not only be difficult, it will also take time.

2.5 Teaching context of the study

The math class used as the basis for this study is taught four hours per week during an eighteen-week semester. The students have had to take this class and the previous one (five hours per

week, also in an eighteen-week semester) to complete the required initial level math classes before advancing in the Foundations Program. At the same time, they have a computer class five hours per week and approximately 20 hours of English per week during both semesters. At the end of their first academic year in the Foundations Program, they are expected to have sufficient keyboarding and computer skills, in English, and have had approximately twenty hours per week of English language training, both semesters, as well as sufficient math in English. This should allow them to proceed in the program, where they enter the field of study of their choice. The fields of study include classroom assistance, business, and information technology, where most of the training qualifies them for support or administrative assistance positions, should they seek employment after college.

2.6 Conclusion

In light of the discussion above, I created the interactive Didapages program, combined with videos and placed them on Blackboard and set out to consider students' perspective of using this medium of delivery for mathematics. If the students were interested in the program, they could have a chance to become part of the above-mentioned 23 percent, who end up in the higher level programs. If these changes could be implemented, perhaps some of the needs for improvements could eventually be answered and progress could be made in teaching this all-important subject.

Implementing a multimedia learning system, then, should provide an alternative to the traditional classrooms now in place and a package designed to offer similar content and allow each student to proceed at her individual pace, which was essential. The program I created could best be described as student-centered and designed to foster individual responsibility. Adequate

opportunities for interactive practice were provided with the chance to promote learning through immediate feedback, authentic applications, and positive reinforcement. The students were able to access the lessons repeatedly, so they could ultimately take some responsibility for recognizing their individual levels of understanding. Selected low-frequency words were defined in Arabic, aiding in comprehension.

Rather than repeating past mistakes, the goal of the program was to alter the students' learning, both pedagogically from my perspective, and by stimulating interest from their perspective. I wanted to help these students overcome the complexity of their educational experience up to that time, in order for their learning process to improve; or at the very least, improve from my paradigm. Perhaps they saw nothing wrong with the situation as it was. It is only through education that they can overcome the previously mentioned boundaries that exist for my female students, and I hoped to provide an opportunity for them to choose to move forward authentically while studying what interested them.

Chapter 3 Literature Review

3.1 Introduction

In reviewing the literature that supports this study, this chapter begins with a discussion of the theoretical framework that provides the principles of language learning and teaching used for the study design. The next section investigates the research on teaching a content subject through a second language, while the third section provides a comprehensive description of the technology used in learning and examines both its advantages and disadvantages found in the literature as well as teachers‘ and students‘ perspectives of its use. The chapter concludes with a brief explanation of how the design of this research study is derived from the principles covered in the literature.

3.2 Learning and teaching approaches

3.2.1 Teacher-centered approach

In the time-honored teacher-centered method of the mathematics classroom, the teacher determines what areas will be studied, what methods will be employed, and the significance of information presented. The method is carried out in a way that provides sufficient practice opportunities for students, using their textbooks and handouts, and assessments are designed to measure their level of comprehension and understanding. The guide for this type of pedagogy is the syllabus, which steers the direction of the teaching and is the justification for the assessment. The theoretical foundation is the idea of behaviorism. Dick, Carey, and Carey (2001) state that one can determine if learning has occurred by observing the behavior. Willis and Willis (1996) maintain that it is the foundation of many teacher training programs, though certainly not the only one, they note that what is taught is not necessarily what is learned and that the entire

learning process is extremely complex. Skehan (1996:18) states that the underlying theory for this type of approach has now been discredited.

> The belief that a precise focus on a particular form leads to learning and automatization (that learners will learn what is taught in the order in which it is taught) no longer carries much credibility in linguistics or psychology.

Despite the disadvantages, says Skehan (1989), teacher-centered is the easiest method to organize. It puts the teacher firmly in charge and lends itself to accountability, as the assessments can be easily prepared from the syllabus. Skehan also claims that the main reason it remains important despite being seen as outdated is because of the lack of an alternative pedagogy. He suggests there is no "alternative framework which will translate into classroom organization, teacher training, and accountability and assessment" (p. 94). Cullen (2001) states that with this approach under attack, many teachers no longer feel comfortable offering this one-size-fits-all approach.

One could argue that a classroom could be teacher-centered, yet still allow for student input and participation. Fairclough (1992) argues that despite what teachers say about encouraging students to talk and question, they are actually "compulsive talkers" and the students "compulsive listeners." Although teachers may assert that they indeed have a learner-centered syllabus and learner-centered classroom activities, they are still the designer, which means the learners have no choice over what they will learn; eventually, most new teachers return to the most comfortable or familiar teaching strategies they have experienced as that mode outweighs the new (Britzman 2003). In addition, tighter budgets and larger class sizes, together with

standards-based educational reform (which includes mandatory statewide competency tests), have further entrenched traditional methods of teaching (Grant 2007; Wiersma 2008).

In such a classroom, the teacher is active and the student is in more of a passive mode. This begs the question: Have the students involved in this study been in a passive learning mode for so long that taking a more active role in their learning, while reflecting on what they know and what they do not know, will lead to resistance on their part? Further, a teacher planning the curriculum in a teacher-centered approach must first consider the appropriate level at which to present the content. Given the content being taught in this study—elementary mathematics—it becomes apparent that such an approach has already been used by their teachers prior to this class, but has not been presented in a manner that the students could grasp, or they would have tested out of the Foundations-level class. Thus, this form of instruction could be improved by an alternative approach taken in future instruction, and I determined that if I did not alter this approach and try to effect some sort of change, the process would repeat itself for the students yet again. They would find themselves in a situation in which they were not only taking on an additional cognitive burden by learning content in a second language, but failing at it once again—a fact that would affect their confidence in their ability to ultimately succeed in college.

3.2.2 Student-centered approach

In contrast, the student-centered approach is derived from the constructivist point of view, whereby knowledge is communal and learning is achieved through students' commitment to activities in which they are invested. Kain (2003) proposes that students will do the work if it has meaning and seems purposeful to them, and suggests that although it sounds compelling,

there are often constraints based on practical considerations, such as student expectations and experiences. Ball (1993:377) concurs and suggests that despite the advantages of using authentic applications, there are indeed frustrations with employing real world problems:

> Teachers…are charged with helping *all* students learn mathematics, in the same room at the same time. The required curriculum must be covered and skills developed. With 180 days to spend and a lot of content to visit, teachers cannot afford to allow students to spend months developing one idea or learning to solve a certain class of problems.

Given that using authentic math problems could ultimately be detrimental to the students' learning, it was imperative that I create a program to include real-life situations and provide students not only with the power and information to solve the problems but with the tools as well in an attempt to simplify the process.

According to Kolb and Kolb (2005), because of this change in pedagogy, it is incumbent upon the teacher to set clear expectations for what the students are to accomplish and establish deadlines for the work to be done. Rendahl (2010:14) cites Robert Brooks as suggesting that entry-level students "learn basic concepts online first, and then be on campus for discussion with their peers during the last two years of their education." Fundamentally, this approach suggests that students begin with what they already know, then build on that knowledge through active and engaging activities. A key component of constructivism is that the learners create their own mental schemas in which to store the information. Ausubel (1963:217) suggests that "existing cognitive structure, that is, an individual's organization, stability, and clarity of knowledge, is the principal factor influencing the learning and retention of meaningful new material."

Essentially, this knowledge must build on prior learning, and if students are accustomed to rote memorization, where the knowledge stands alone and has no real connection to prior or present knowledge, then, according to the literature, this approach conceivably might not be appropriate. Von Glasersfeld (1989), however, suggests that it should be the responsibility of the learner to take an active part in the learning process, unlike with teacher-centered learning. Therefore, students will no doubt be influenced by their cultural views or the views of those around them, and when proffered knowledge does not agree with their prior knowledge, it is their responsibility to look for meaning and fill in the gaps or missing information. Whether this is a skill or desire the students have and can make use of will be highlighted in the results of this study.

Such pedagogy parallels the epistemological assumptions of objectivism—"the view that knowledge of the world comes about through an individual's experience of it" (Driscoll 2005:387). Ausubel (1961,1963) contrasts similar situations with meaningful learning wherein the process of relating potentially significant information is added to what the learner already knows in a non-arbitrary and substantive way. McKernan (2008:xvi) maintains that one of the most difficult challenges is "to teach for understanding as distinct from memorization and to view education as the construction of personal meaning rather than the reproduction of meaning." He advocates that teachers and administrators be allowed the freedom to decide what is important about the curriculum and move to a more decentralized system of curriculum control and accountability to the state. Obviously, I am limited as to how the curriculum can be presented, given that the students must pass a system-wide assessment at the end of the semester; thus, instead of giving the students complete and total freedom to explore, a more appropriate

student-centered approach allows the learning process to focus instead on what Harden and Crosby (2000:335) describe as "what students do to achieve this, rather than what the teacher does"—or a focus on how the students are "doing" the learning in my classroom.

Larsen-Freeman and Long (1991:3) concur and propose that language teachers' decisions about the actual process of teaching should be informed not only by the subject matter but also by "the knowledge of the unique group of learners with whom they are working." It is a given that social behaviors and relationships as well as cultural expectations play a central role in the behavior of diverse students in diverse situations. This eventually has an impact on cognitive development within this shared social practice (Lantolf and Thorne 2006). Corder (1976:7) notes, "Efficient language teaching must work with, rather than against, natural processes, facilitate and expedite rather than impede learning." No one knows for certain the most effective way to teach a foreign language, let alone the content in an L2 course, but it is safe to say there is no single way. Instead, say Willis and Willis (1996:81), when training teachers, we need to introduce "a range of core techniques, adopting a reflective, practice-driven approach, [that] stands a better chance of producing autonomous, thinking teachers than a course focused around mastery of one kind of methodology."

The literature reviewed to this point as well as the background information on the students at issue here, and the belief that the more traditional approach has not been successful for them, all indicate that the students should benefit from learning by constructing knowledge—i.e., a constructivist perspective. They should be required to combine new information with existing knowledge and experiences (Cohen, Manion, and Morrison 2001), recognize when they have not

effectively grasped the concept, and work to resolve those inconsistencies. My job, consequently, is to create an environment where that can happen, as well as the software that attempts to do that by creating authentic applications relevant to the students' daily lives rather than problems on paper with a teacher, the expert, transmitting the knowledge to the novice (Harden and Crosby 2000). The technology that could allow that to happen is detailed below, while the study data should determine whether the students reject this notion or find it an intriguing method of learning. Lea, Stephenson, and Troy (2003) suggest that this requires an "increased responsibility and accountability on the part of the student," and can ultimately be seen as contradictory to what the students in this study have previously known. Despite such possible disadvantages for the students, however, I had confidence in my ability to generate an interest in the content, through computers, that was not possible using the paper-based method of teaching math.

Ideally, the program I created would give students an opportunity to make use of formative assessments that would highlight any gaps in their learning. The determining factor would be their level of interest in resolving those gaps. As a researcher and teacher entrusted with the responsibility of presenting materials to the students in a meaningful yet appropriate manner, without risking their ability to effectively learn the material, I had to proceed cautiously. McKernan (2008) presents the idea of beginning curriculum design situations by asking what it is we are seeking to attain in the new millennium that is relevant to the lives and intelligent actions of students. He continues by recommending that the teacher, "as a professional, at whatever level of the educational system, has a role to play in curriculum decisions, inquiry and

improvement" (p. 6). I had to allow the data to determine whether I had created a curriculum that benefits these particular students, in due course.

3.3 Teaching and learning content (mathematics) through a second language (L2)

In addition to teaching and learning approaches, Celce-Murcia (2001) and others have addressed the key role of language in the acquisition of content. The significance of integrating mathematics and language skills is often overlooked, especially at the tertiary level. As indicated previously, students in such a program often enter with very low language skills and have difficulty with the mathematics vocabulary. Even native English speakers dread the entire genre of mathematics that involves "story problems" or "word problems," when the concepts are taught in their mother tongue. The discourse is very specific with distinguishing characteristics, and often L2 students in content classes have not acquired the necessary academic language. Thus, we shall examine content teaching and Content and Language Integrated Language Learning (CLIL) more closely here, with a brief look at how this eventually accentuated the creation of the software for this study.

3.3.1 Content teaching

If a student already understands a concept in her mother tongue, all she has to do is apply a label to it in English. The task is much more challenging, however, if she has to do both simultaneously (Cummins 2000). Most likely my students have a limited understanding of the concepts in their mother tongue and will face the more difficult challenge of learning both concurrently. Further compounding the problem for these students, suggest Solomon and Rhodes (1995), is the fact that academic language, the language they hear in the discourse of the

math classroom as it relates to communicating the curriculum—explaining, justifying, and evaluating content ideas and processes—is extremely complex. Cummins (1981) maintains that social language is learned quickly, whereas the academic language needed in a classroom must take years to develop and needs to be specifically taught. If a student communicates sufficiently in a social situation, Cummins adds, this may be mistaken as also sufficient for academic language proficiency as well.

My previous history with students in this Foundations math class paralleled what the literature shows and taught me that these students do not possess the vocabulary to express what they are often doing. Instead, they try to learn the symbols and numbers by following what they believe to be the steps I have outlined. After a demonstration and some practice, not only do they not understand what they are doing, they have no idea why. They are looking for key words that tell them what operation to use. Thus, in creating the software, I had to be cognizant of the fact that including Arabic would be a necessary component for the students' comprehension. I also had to consider what would enable them to best understand the mathematical concepts while providing a discourse that allowed them to develop their understanding of the linguistic characteristics of math and offering visuals as well as careful interactive demonstrations of the experience. As mentioned throughout this thesis, an obvious benefit to the program is the fact that students can go back over it as often as they like, with repeated opportunities to hear the targeted language they are learning. Indeed, the approach had to remain consistent with integrated language and content learning because both emphasize meaningful engagement and authentic language using oral and written language development (Blanton 1992). Finally, according to Crandall (1992), the instruction had to remain sheltered. In other words, in order to be effective, the texts,

strategic methods, and assessments had to accommodate the limited academic vocabulary the students possess.

3.3.2 Content and Language Integrated Learning (CLIL)

CLIL is a pedagogical approach that provides a more suitable environment for learning (Casal 2008). It was designed originally in order to improve English language proficiency, but to develop that skill in a content class, rather than English class, and specifically in potential problematic areas. According to Yassim et al (2010:47), CLIL "is an overarching term covering a wide range of educational approaches from immersion, bilingual, multicultural education, language showers, to enriched language programs." They continue (p.48) by stating, "it provides opportunities to study content through different perspectives, to access subject-specific target language terminology, and to prepare for future studies or working life." In my classroom, the language is one that is not spoken locally; students have contact with it in formal instruction situations, however upon graduation and entering the work force, most likely, it will be a requirement. The teaching staff at this college includes native speakers of the language of instruction, though not always. These teachers are often specialists in their own field, rather than language teaching, and the key difference is that the students are learning content while learning the second language. Often the content leads the curriculum rather than the language skills required to acquire the concepts, and the content is always the primary focus of the curriculum in this type of approach.

Content-based instruction and immersion programs were forerunners, where the integration of content and L2 provides the basis for meaningful and contextualized activities that increase

interest and encourage second-language students. CLIL evolved to include more, however, focusing on the overlap between L2 and the content subject as well as engaging the students cognitively so they connect with the subject manner in a way that promotes learning beyond the more traditional method. This includes the use of academic language concepts, which can be introduced both in English and Arabic in this software program, as well as the necessary discourse in order to allow the students to comprehend the content-area activities. The learning process is supported to a greater extent, so the students must be engaged emotionally in order to benefit from the conditions. Thus it shows the necessity to make the program visually appealing. Sherris (2008) suggests in doing so, it will have a positive impact on student learning.

When students are engaged in a learning activity they are actively working, and both the content and the new language they are studying are in their short-term memory. This is similar to a phrase on a blackboard: if it is not permanently placed in their long-term memory, it can easily be erased or forgotten. Chamot and O'Malley (1992) stress that a real challenge to minority students in content classes is the added load to short-term memory processing, which is trying to decode the new language as well as the content. Chomsky (1999) notes that in order for this to happen and for students' normal capacities to emerge, they need an inspiring and thought-provoking environment that will provide the incentives to do the activity repeatedly, so that it ultimately moves into their long-term memory. Buchanan and Helman (1997) concur and suggest that math teachers are able to make math more interesting and meaningful for literacy students in the design of the instructional activities if it builds on their real life experiences, and especially if taught via innovative strategies. Using the software, I can engage the students in authentic activities which promote higher order thinking skills, hopefully avoiding the so called

'overload' to their short-term memory, while making the students more active and independent, compared to working problems out of their book. Ideally, those activities need to be linked to previous knowledge which the students are able to connect to developing knowledge. Yet again, the benefits to repeating the exercises in the program are obvious, and Buchanan and Helman (1997) suggest this is necessary in order to allow students who understand the objectives to continue, which those who need more reinforcement, can return to the exercises.

As Casal (2008) suggests, one of the shortcomings of CLIL is that students are listeners most of the time. In the case of the students under study here, however, this should not be detrimental to their success. Although they would benefit from extended practice in speaking and writing, those in my particular class really need to listen, and being able to speak or write is not imperative. We already know that as students learn, "the information must be associated with previously learned and related ideas" (Driscoll 2005:368) and intellectual skills therefore must build on learned component skills. For these students, this refers to ideas that have been learned in their L1, which likely involved using rote memorization and thus could ultimately be problematic.

Celce-Murcia (2001) emphasizes that in the discourse of a classroom, most of the learning takes place and most of the instruction gets accomplished. Schwandt (1994:118) notes that through watching, listening, asking, recording, and examining, learners fashion "meaning out of events and phenomena through prolonged, complex processes of social interaction." It is here, says Celce-Murcia (2001:375), that teachers' most important classroom work happens, "where they provide a social interaction within the community of learners such that the learners may move

from what they know to what they don't yet know, from their own experiences to a new understanding of the disciplines represented by the content they are studying."

Davis and Gottliev (2008) suggest that in capturing students' attention, using some type of interactive mathematics deemphasizes the "talking to" or "lecturing at" them and instead engages them in active participation in the work. They further cite students that noted the beneficial aspects of this type of interactive teaching, including the ability to respond to individual students' needs, more so than in the more traditional classroom. They expand on this by suggesting the students take it upon themselves to find out what they do not know and improve their own metacognitive skills. This is my objective, to accomplish this natural process with my students. With the software package here, the goal would be to provide formative feedback to the students which will expectantly encourage revision without it being a requirement.

According to Sawanda (1997), creating problems that will act as the vehicle for moving children from their personal experiences to new, profound understandings is actually one of the most difficult, even vexing, aspects of planning instruction. However, Celce-Murcia (2001) suggests it is also one of the most creative aspects. Sorrentino (1996:640) stresses that "much behavior can occur without knowledge of the reasons for that behavior. Conscious thought does not occur in a vacuum; it is often the product of non-conscious forces. It can also occur by association or by environmental cues."

Although we cannot be sure how learners will make use of the language they are learning, we can be certain that their contribution to the learning process is pertinent. Therefore, it needs to

be something they enjoy and participate in for that learning to happen. Learning processes are natural, say Willis and Willis (1996), and teachers cannot necessarily choose what they want the students to learn. Given the information provided above, it is apparent that the type of program I created could provide students the opportunity to be successful in learning the discourse of the mathematics classroom as well as the content, should they choose to take advantage of it. One dilemma is the fact that I am attempting to create a situation where my students can solve problems through the use of appropriate academic L2, according to the goals of a CLIL classroom, and this particular software does not necessarily provide that opportunity for the students since they will be working independently. Therefore, I am hopeful that should the situation arise, they will take it up on themselves to peer tutor. Dalton-Puffer suggests that in this situation, the learners are more relaxed in using L2 since their focus is on meanings and not linguistics, or more natural. Mercer in Candlin (2001:7) suggests that the quality of interaction between learners, "if they work together, is a strong determining factor on what, and how much, is learned and understood by learners." I can suggest this throughout the study, both to my students and the teachers participating. Further, the use of appropriate academic language has never been a requirement in this class, but merely to get the students to pass the system wide assessment at the end of the semester. This assessment does not include discourse in the content area, but is paper based assessment where they work problems and provide the correct answer. They have never been tested on their communicative functions in this curriculum. Geese (1995) suggests that if the primary focus is not necessarily language, then perhaps this is more of an immersion type instruction, and he continues by stating that the academic material needs to rely on the linguistic skills that my students already have or they may not progress into the more complex instructional activities that demand even more complex language skills. Dalton-Puffer

suggests the website www.contentenglish.org , maintained by Rob Dickey in Korea, has 50 different terms referring to what CLIL is (p.2). Regardless if it is a CLIL classroom or immersion, because of my experience with this population of students, I am fully aware of their strengths and weaknesses and feel qualified to create a program that carefully selects the language, in order to enhance and encourage learning. Consequently I doubt I am necessarily letting the students down in this respect, as in this particular situation, speaking with the appropriate skills is simply not a requirement. It could only be beneficial for them if indeed it happens, however it is not a condition for them to pass. Finally, Hajer (2000) suggests there is a fear of learning being less than perfect for the L2 student, given that the presentation is in L2, however Dalton-Puffer (2012) suggest that generally, CLIL learners possess the same amount of knowledge as those who were taught in L1. Next, I shall examine the specifics of using technology in the classroom, including the benefits and its promotion of a learner-centered class, situated within the idea of CLIL.

3.4 Technology for learning

Recognizing the need to remain within the realm of a CLIL classroom, I initially investigated TELL (Technology Enhanced Language Learning). According to Dudeney and Hockly (2007) this type of learning offers enhanced opportunities for practice and availability since most students have Internet access both at school and at home. I shall investigate this further below.

Using the World Wide Web affords a window to the wider world outside the class and, as revealed earlier, a readily available collection of authentic material. Dudeney and Hockly (2007) suggest that it is probably best to work with other teachers who can share their favorite sites as a

starting point. Of course, the individual teachers can decide for themselves what exactly they want to achieve with computers in the classroom. Dudeney and Hockley (p. 44) note that the benefits to using Internet-based project work are many, including the fact that it "lends itself to communication and the sharing of knowledge, two principal goals of language teaching itself." They place a great deal of emphasis on the benefits of integrating subject areas that create a more authentic learning process and thus give a more real-life look and feel to the learner. Ultimately, this increases interest.

The intention is that as the shift in focus moves from instruction to the learner, the learner needs a well-developed metacognition. The need for a variety of learning levels and styles is a given in any classroom. Since this is unavoidable, it would seem logical that a more suitable system of learning would be one in which the students can progress at their individual speed and learn as they need to, given their learning style. Some students need only a brief review while others will not have mastered the basics and will need more time and opportunities to learn. Briggs and Keyek-Franssen (2009) propose that students will benefit as they progress through a program if they are allowed to take formative assessments as part of the process. This needs to be continuous and focused on the students' individual needs and successes. In other words, one should build summative assessments throughout the creation of the process so the students will know whether they understand the concept well enough to continue or if they need to backtrack and review first. Hardiman and Williams (1990) note that students with deficiencies often have difficulty with the reading and writing. This is especially relevant here given that the students involved in the present study were all L2 students at lower levels, or at risk, and most of their difficulties were in language comprehension, though other weaknesses certainly were possible as

well. Doolittle (2001) suggests that students will learn more if words and pictures are involved. This could be especially advantageous for L2 students in my classroom.

Dudeney and Hockly (2007) further maintain that teachers produce their own electronic materials if time allows, for several reasons: They can keep their own learners' needs in mind, provide extra practice for weaker students, and create a large bank of materials that can be used not only in the classroom but for self-study as well, or for the future. However, the choice of websites and materials will be far more limited for lower-level students than for students at higher levels. In this study, I created my own curriculum with the goal to create material that was not only visually appealing, authentic, and language-appropriate, but that introduced the concepts in a new way that was not cognitively overwhelming for the students yet provided an autonomous learning experience I anticipated they would find stimulating.

3.4.1 Principles for design of technology use in the classroom

Oxford (1989) states that any type of learning approach for students must include their learning styles and mind-sets as well as values, and must be based on their attitudes, beliefs and stated needs. Celce-Murcia (2001) notes that the teacher is the one who should design or guide the learning, and should do it in a way that the learners can relate to the beginning of the lesson. Thus, while keeping in mind the interplay between language and learning content, I needed to design situations in which the learners could move beyond where their thoughts were and allow them to develop new experiences to broaden or expand those thoughts. Celce-Murcia further suggests it is beneficial if teachers know their students well and can provide learning to which they can easily relate. Creating such authentic learning experiences can only be beneficial for my

students, however my reservations are set in the creation of the program and whether or not I will be able to authentically construct these types of conditions, given my limited technological skills.

Noting that one of the driving forces behind second-language development and change is comprehensible input, Krashen (1985) suggests that learning comes from listening (which is included in the present study, with audio and video accompanying the text). Listening alone, however, does not ensure that quality input is received, according to Skehan (1998). Pica (1994) recommends clarification and confirmation checks as well as comprehension checks, which are incorporated into the program by using formative assessments. This gives students immediate feedback on their individual comprehension levels and on whether there is a need to return to the previous portion of the program for further review.

With regard to video clips, which are included in the present study, Nuttall (1996) proposes that they must meet three criteria. First, they must be level-appropriate or just slightly beyond the students‘ ability. Mikulecky (1990) suggests that 61 percent comprehension is suitable for successful instruction. Second, by providing assessments throughout the process that both the teacher and the student can access, they can help determine comprehension levels and allow for back-tracking if necessary. Third, they should contain samples of the target language the students are to learn as well as its relevant elements. Nuttall (1996) echoes previous recommendations that the video clips contain content that is interesting to the learners, thus inspiring them to continue toward more comprehension.

Dudeney and Hockly (2007) stress that one should not discount text-based sites as well, which can be very beneficial and less likely to malfunction or cause problems. Following this suggestion, a major portion of the study program was created using the text not only as the basis, but by actually taking content directly from the text, which I read out loud while the students had a chance to read it on the screen.

Highlighting all of the requirements has complicated the process, and I hesitated due to my concern over whether I could create a package with all the preferences listed above. Such reservations, however, were alleviated by knowing that the Informational Technology Department at the college was providing adequate technical support and that management at the college was fully behind this project. Given what Celce-Murcia (2001) suggests above, I recognized that I was in the best position, given my everyday interactions with the students as well as my years of experience at this level of teaching this population, to create a program that would meet the students‘ needs.

3.4.2 Benefits of technology in the classroom

There are extensive studies on the use of technology in the classroom, yet I specifically wanted to examine those that looked at situations similar to what I had created as well as students at an equivalent maturity level. Specifically, for the purpose of this study, I wanted to search relevant studies that included the interactive component as well as students‘ and teachers’ perceptions of technology use in the classroom. Further reasons for selection and analysis of each study selected are discussed below Table 1.

Table 1. Similar studies with interactive component and perceptions of classroom technology use

Study	Context	Participants	Methods	Key findings	Comments
Halawi and McCarthy (2008)	Use of Blackboard as supporting learning and effectiveness and practicality	Both undergraduate and graduate students, 63% males, 0.8% freshmen, 25% sophomores, 22% juniors, 24% seniors, and 29% graduate students	Quantitative	Students will utilize online tools if they are seen as useful, while the technology is easy to use and supports their needs	Additional areas for investigation include other major educational software packages
Morgan (2008)	Interactive whiteboard use by students and its effect on student behavior during classroom instruction	Junior high students	Qualitative, observations, survey	Technology had a positive effect on behavior of all students and their engagement in classroom instruction. They exhibited more at-task behaviors	Findings suggest the interactive white board should be used as an instructional tool to engage, motivate, and stimulate students I the learning process and can thus ultimately improve student achievement
FitzPatrick (2001)	To investigate student interest and experiences and the extent to which the students are being affected or changed by educational technologies in their daily lives	Eighth-grade math students	Qualitative, including observations, verbal exchanges with students, classroom conversations with students and focus groups	Students have positive attitudes toward the level of control over their own learning previously not experienced	This study also looked at the interactive component of the program and found students more engaged, active, and collaborative

The justification for analyzing the study by Halawi and McCarthy (2008) more closely is that it examined the use of Bb, the very program I used. Further, they were seeking student perceptions on the use of this learning tool and then determined if there was a relationship between those perceptions and its actual use; they did not examine whether it affected learning. They found the students would indeed embrace an online educational tool if they saw it as useful, supportive, and easy to use. They also suggest this was the perception of students in the United States.

The study by Morgan (2008) is relevant because of her initial reason for wanting to conduct her study: its interactivity component, which engaged the students mentally and physically. She also wanted to determine if this interactivity had a positive effect on the students' behavior. Further,

she believed technology, with the support of the academic institution and proper training, could provide a range of tools to enhance teaching and learning both. This too is an area I am interested in, and I anticipated my students' involvement in their studies would also increase as they became more actively involved in learning. Morgan also regards the constructivist approach to learning as significant. However, one area in which I am critical of her study is the inclusion of motivation in her analysis. I too wanted to include the motivation component, yet that is such a broad concept, with a plethora of literature to highlight its significance. Nevertheless, she cites studies that talk about engagement and excitement and equate that with motivation. It would appear from the literature review of her study that student involvement equals motivation, which is where I take issue with her conclusion; however, her definition of motivation is not significant but what remains is the interactive component to the study and the finding that students were positive about the program.

The study by FitzPatrick (2001) clearly is significant in that the students' academic level was comparable to the students in this study. Of specific interest was a quote by one of her students: "Well instead of just, like, being told what to do, you get to think about what you're gonna do. Like you can choose what you wanna do" (p. 10). This showed the likelihood of students developing as students, unlike they had previously, and developing more of a sense of self and their academic abilities, simply by using the program. Further, the students noted that the immediate feedback was beneficial as well as the multiple methods of presentation, visual, and audio simultaneously. FitzPatrick goes on to discuss increased interest and engagement, yet not once does she refer to students' motivational levels, only referring once to the technology as motivational. Here I must pause and suggest that her adjective in this particular situation is

subjective; otherwise, her findings support the previous study regarding student involvement and interest and stimulation. Later, she refers to the technology as enhanced learning environments; that seems a better definition, yet it does not take away from the overall findings of the study.

Although they are not listed in the table above, two other significant findings, from two separate studies, are relevant and need to be included at this juncture. First is a finding made by Garner and Gallo (2005), who claim that multimedia would allow students to attain benefits similar to field trips, without actually leaving campus. This is important in the context of the present study because field trips can often be inconvenient or impractical and, within the UAE culture, families do not always grant female students permission to go on such trips. A second significant finding is the suggestion by Byrom and Bingham (2001:10) that digital technology is so effective because "new information is received through more than one of the five senses." This would be beneficial for students of various learning styles, as the traditional teacher-centered method is obviously not appropriate for all students, but specifically and most probably for the students in this study, as the delivery of their curriculum needs to be more flexible to meet their needs.

One final study that is significant to the benefits of technology was conducted by Twigg (2004), who looked at six institutions that were using a grant from the Pew Trusts to redesign the curricula, and were using Information Technology to address academic weaknesses for first-year students. She concluded that the result was "greater learning for less cost and, most importantly, more students able to achieve their academic goals." Twigg's study included working adults, which are not equivalent to the at-risk, first-year students in the present study. However, the similarities include both the weaknesses of first-year students and the possibility that students

might benefit from more flexible schedules (some of the students in my study here were mothers who would appreciate that aspect). The particular students in Twigg's study ultimately did benefit from the program.

The sociocultural element as well as the concept of constructivism are both under the umbrella of the paradigm used in this study and also in those discussed above. These studies, along with others read but not included here, have examined the link between the interactivity and student perceptions and the benefits to this type of program. The consensus appears to be that the approach proposed here would create an opportunity to enhance the delivery by simultaneously drawing on the visual aspects of the curriculum as well as the audio portion, all to enhance learning and create a more positive attitude toward education and a more active learning environment. This further justifies my study. Next, however, I shall examine studies with opposite conclusions.

3.4.3 Studies showing no real advantage

Again, specifically I wanted to examine studies that looked at situations similar to what I had created as well as students at an equivalent maturity level, but this time, ones who found conflicting results to those discussed previously. Further reasons for selection and analysis of each of these studies selected are discussed below Table 2.

Table 2. Similar studies with conflicting results to previous studies

Study	Context	Participants	Methods	Key findings	Comments
Stepp-Greany (2002)	Use of Multi-media for foreign language instruction	College level Spanish semesters 1 and 2 students	Quantitative	The teacher's role is significant in technology mediated instruction; technology resources alone in students' learning experience do not automatically result if improvement	Only 54.2% of students perceived the real-life nature tasks as relevant; relationship only between the Internet activities' authentic cultural material and improvement in cultural knowledge rather than in basic Spanish learning
Zhang (2005)	Determine effectiveness of computer-assisted instruction versus lecture-type instruction	Sixth-grade math class	Quantitative	No significant differences in student achievement	Computer-assisted instruction software should be used as a supplemental tool only
Goh, Ng, Rajah Baniamin, and Wan Mamat (2004)	Use of Web-based learning and implications for students and lecturer	Elementary college language students	Qualitative	Students enjoyed the visually attractive lessons and animations, but preferred the regular on-campus foreign language courses as they could focus learning on gaining knowledge of details in the garget language. Also stressed the importance of the teacher in technology-enhanced learning environments	They liked the idea of doing the lesson over and over if necessary, and overall it was a new and enriching learning experience for them, yet they felt they could concentrate more and better in a regular class

The study by Stepp-Greany (2002) is noteworthy on many levels, but initially because of the opening suggestion that the use of technology in learning a foreign language improves reading, writing, and conversational fluidity. The elimination of strong teacher dominance, the study suggested, frees the students to verbally express themselves independently, according to the literature review section. However, that is in contrast to the findings, where fewer than half of those students felt they had learned more Spanish language skills than they would have learned

in a regular Spanish course. The most persuasive data come from the lower-achieving students, much like those in the study I conducted. Those students reported they felt more pressure to finish lab assignments, which played a negative role in their perception of the effectiveness of multimedia. Further compelling data revealed the significance of the role of the instructor and how that process is more "evolutionary than revolutionary."

The study by Zhang (2005) is included because of the focus on studying what the author deemed to be an "interactive, entertaining, and multi-sensory" program. This description could also be used for the program I created. The curriculum was identical in comparing traditional to non-traditional pedagogy; however, the latter was naturally given more opportunity for flexible time regarding pace and exploration. Zhang's findings revealed that "it cannot be concluded that one teaching method was superior to the other" (p.14).

The study by Goh et al. (2004) is relevant because of the appreciation the authors have for the use of technology as a source for creating independent learning environments in which students can use the Internet, drill, and practice programs as well as participate in instruction at their own pace to meet their individual needs. It too is a study of foreign language learners, yet it remains significant to the study presented here, as it incorporates the use of technology in that process. The students were just beginning the process of learning French, Arabic, and Mandarin, and given the challenges with the Mandarin language, it could be extremely difficult to use outside the traditional classroom, with an ultimate effect on the results. That remains significant, yet the focus remains on the potential of technology as a tool for learning and what the students' perceptions are of that tool.

We should also consider a study by Elliott, Adams, and Bruckman (2002). The reason this study is noteworthy, though not included in the table above, is that this team set out to create a 3D video game in hopes of harnessing the power of technology to make new kinds of mathematics content available within a traditional school context. Basically, they were creating games which they believed, ultimately, would increase interest, thus sparking the students to naturally participate more in the learning. They anticipated a number of results: that the entertainment appeal would motivate students who do not normally enjoy math; that students with higher visual ability would no doubt benefit from the software with improved attitudes and a more positive experience; that more motivation would be exhibited, with learners remembering more in the year-end survey; that assessment results would improve; and that students with prior video game experience would benefit more from the software. However, as the researchers state, it was a "dream unrealized." Attitudes toward math did not significantly change, nor did the program have an impact on the students' performance. Ultimately, the high expectations became somewhat disappointing as the researchers felt they were competing against commercial video games. The example of how to create a massively multiplayer online role-playing game suggests a staff of over thirty people working for four years (Ragaini 2000), and the conclusion is that a research model made by a few graduate and undergraduate students and one faculty member could not contend with such high expectations. This study is significant because I related to their description of the type of program I created. Despite my belief in its value, I could not begin to compete with the expertise of professional software writers.

There are many other studies on the use of technology, interactive tools, and non-traditional methods of teaching and learning, yet I have touched on sufficient studies in various fields to

enable me to draw my own inclusive results. Those results indicate that technology does indeed have the potential to change the way students learn, but whether it is appropriate for my study participants had to be determined. Because my ultimate goal was to effect change in my students' math results, I next investigate some possible challenges related to the use of technology as well as the best way to go about creating the program.

3.5 Challenges in using technology for learning

It is to be expected that teachers might have reservations about using technology in teaching simply because it is a new medium of delivery, and they have either experienced success using another method or are moderately comfortable with it. Technology can be intimidating to people who are not as technologically savvy as they might consider they need to be. Learning through technology is expected by students, however, according to Dudeney and Hockly (2007). Elish (2009) echoes this and suggests it is the schools and teachers who need to keep pace with technology, not the students.

Given that teachers often teach as they were taught, and those pedagogies are deeply engrained in their methods of curriculum delivery, it seems inevitable that altering that method so drastically could meet with some resistance. Kent and McNergney (1999) suggest that the value teachers themselves place on the use of computers in education can affect how they implement technology in their own instruction. Dudeney and Hockly (2007) maintain that a negative attitude among teachers toward technology is likely due to one of several factors: lack of confidence, lack of facilities, or lack of training preventing them from seeing its benefits. Further, they stress that technology is not meant to replace the blackboard or whiteboard or other

traditional tools; at a minimum, however, it can complement and enhance regular classroom work. This is useful for the present study, because of the suggestion that technology should not be used to replace the teacher—which is the very idea behind my program. The distinction my study makes is that although the teacher is not lecturing, she does remain in the room and is still available to provide assistance to the students. This, in my opinion, negates the concern expressed above; however, caution has been exercised in this study to ensure the students' learning is not compromised.

Further, I need to address to use of technology with regards to actually facilitating learning. Jonassen et al (year) suggest that often educators use technologies to teach in the same manner they have always taught. The difference is that the computer is delivering the lessons rather than the teacher. Clark 1983 suggests it is delivering lessons much like trucks deliver groceries to supermarkets. Therefore I need to use not only text based materials, but instructional software which interacts with the students as well. Jonassem et al (year) go on to assume that technology should actually engage learners and support meaningful learning if learner initiated and controlled and suggest that students do not actually learn from either their teachers or their computers. Rather they suggest they learn from thinking – thinking about what they "are doing, what they did, thinking about what they believe, thinking about what others believe, thinking about the thinking processes they use." The real benefit will be the authentic learning environment and the individualized aspect, if only I can create an environment where that happens.

3.6 Suggestions for creating technology in education

In the initial stages of creating a curriculum, Bonk and Zhang (2008) suggest that an instructional designer create material for online learning using an easy-to-apply, practical model called *Read, Reflect, Display and Do*, or the R2D2 model. This is a framework that helps teachers or instructional designers diagram, plan, and deliver online materials in four distinct phases, enabling them to integrate various online learning activities with appropriate technologies for a diverse array of e-learners. The "Read" portion benefits verbal auditory learners, while "Reflect" benefits the observational learners,"—Display" the visual learners, and "Doing" the hands-on learners. "These…all help address diverse learner needs, backgrounds, expectations, preferences, and styles," note Bonk and Zhang (p. vii), who go on to suggest that learners are often reflective and like to determine whether they know the content well enough to pass required examinations or course requirements as well as identify areas where they have deficiencies or misconceptions" (p. 84). The authors propose that the teacher develop questions for the students frequently, throughout the learning process. Some questions might be provided by textbook publishers, and could easily be included in the process so the learners can "self-test or self-determine, with computer feedback, whether they are grasping the concepts or not" (p. 85). This would allow for immediate and individualized feedback and for the students to ascertain whether or not they need to proceed or review further. The plan for the curriculum is for the text to be the basis of the material, with videos and audio recordings accompany the online texts to demonstrate, step by step, the process of solving the math problems.

Bonk and Zhang (2006) also recommend profound pedagogical thinking related to reflective activities in online learning, which can lead to the possibility of online apprenticeship and

mentoring as well as self-directed learning. In theory this is intriguing, but whether it is applicable to the students under study here is indeed questionable. It would be an enormous conceptual leap for their learning. Either it would take more time than included in the study, or perhaps it would be too late to institute the process. The only way to find out was to try it with the belief that it is never too late to set a good example or try an alternative approach to learning if, indeed, it has the potential to benefit the students.

The definitive goal is to create digital excitement. Coorough (2001) cautions teachers and instructional designers to find the right balance and relationship between the media being created and its elements. She suggests discretion in selecting materials and to make sure the outcome does not overwhelm the students by using multiple media to simultaneously convey multiple ideas. Grigoryan and King (2008) endorse this notion and suggest that if the subject matter is interesting and relevant, a basic task-based lesson will create a student-centered environment that can become the foundation of communicative language teaching.

Because English, as an international language, is used in technologically mediated contexts, a plethora of options is available; in fact, the number of authentic activities available increases exponentially with technology. Students with extended absences, for any number of reasons, might still be able to maintain their studies because learning from home is quite possible. Therefore, geographic locations become less important.

3.7 Rote learning vs. critical thinking

Rote learning is defined by Wikipedia as the method used routinely when quick memorization is required and by the very definition it is an ineffective tool in mastering complex subject matter. I find it necessary to address this concept given the history of Islamic education, and as Semali and Stambach (1997:8) suggest, "schooling occurs within a cultural framework that extends beyond an official curriculum or syllabus." This type of education is primarily underpinned by the use of the Koran as the blueprint of knowledge, and is to be read and recited in order to receive full blessings. As addressed earlier, there has been a great deal of importance placed on learning using this approach, in their school, prior to entering college. Given the value my students place on the elders in their family as well as the significance of their culture and community, and how the practical knowledge from their family and community has little relevance in my classroom, I must be encouraging a practice that quite possibly emboldens my students to view their cultural history as out of date and perhaps even going so far as to demean or disrespect their previous authority. Seeing as not only me, but the overwhelming majority of the teachers at this college are new to the country and certainly not native to the local community, this could potentially be problematic. I am introducing an entirely new way of learning, which contrasts their traditional forms of education and as Semali and Stambach (1997:15) suggest, "represents a move away from the social, cultural, and historical context of the community in the teaching of young people." They further contend that the school systems might be better off if indeed they based their lessons on theories that are not just meaningful to the educational specialists, but incorporate that somehow with the beliefs that are meaningful and useful to the local people. They even go so far as to suggest that failure to incorporate an integration of the two different forms of education could possibly be perceived as a threat.

Initially I thought that to be an exaggeration, until I acknowledged that as Westerners we are used to the separation between church and state, and further, as Khan (1987:5) suggests, "the concept of Islamic education does not involve knowledge only but also actions."

Given this potential problem, I need to acknowledge that the more traditional education my students have received, prior to entering college, does indeed have value within their community. I believe it is certainly relevant to recognize there are indeed two different cultures existing here, and ultimately, I can in fact understand and include their cultures' significance and reluctance to my values and pedagogy. Therefore, the curriculum must be one that is inclusive and acknowledges their heritage and experiences and identities. I shall try my best, in creating the curriculum, to maintain this focus.

3.8 Summary

Although my classroom is a content classroom, language is the tool the students learn with and they cannot comprehend the content unless they can grasp that language. The informed use of technology allows the creation of a suitable environment for student-centered interactive work that is believed to aid in that language acquisition—which ultimately aids in content learning.

Though it is difficult to determine the success of an educational program, particularly a short program such as that designed for this study—too short to truly affect the way one looks at one's life—it should be judged more on the extent to which students possess a desire to go on with the things into which they have been initiated (Peters, Woods, and Dray 1973). No doubt students attend my mathematics class because they have to, not because they choose to. As Harlen

(2006:64) suggests, a real challenge is to get students "to participate in learning tasks they do not initially find interesting." Dörnyei (2001a) echoes this challenge and further suggests how to go about retaining student interest so they will not abandon those learning tasks.

Dörnyei (2001a) further proposes that teachers are under increasing pressure to bring up pass rates, and this institution is no exception—the emphasis eventually shifts from the process to the end product. In other words, creative approaches to teaching give in to the old standby of drill and practice in order to assure the necessary results in final assessments. Dörnyei adds that sometimes the curriculum will be sustainable and other times less attractive; therefore, students are certain to lose interest, again affecting the level of learning. A short two-month study is thus advantageous because it should remain new and different throughout the study, with hopefully little time to allow it to become monotonous. With a bit of luck, interest should diminish only slightly, if at all, if what is created is indeed appealing.

Chapter 4 Research Methodology

4.1 Introduction to the methodology

Together with a look at the research framework and the ideological position of this study, this chapter reexamines the main research question and its sub-questions, the pilot study, and the improvements that have been implemented. It describes the design of the actual software program, the data collection and analysis, and the research methods. Also included is a discussion of the credibility or trustworthiness of the study, as well as possible limitations.

4.2 Research framework

This study was informed first by constructivism, a framework that allowed me to determine how the students would construct meaning of the new pedagogy I planned to introduce and how they would create new meanings based on their previous experiences. The limitations of this theory suggest, however, that although I have been given a lens with which to see how the students respond to the new delivery of mathematics, it does not take into account the social structures that were operating, or the rather unique educational history of these students described in the previous chapters. These are crucial elements that must be addressed. Therefore, this study has been further grounded by introducing a critical component in that I was seeking not only change but what could ultimately be drastic change in the teaching and learning of mathematics in their L2 classroom. Two epistemological positions thus complement each other, as the critical perspective emphasizes the socially constructed knowledge and, through a fundamental examination, allows me to evaluate the results and gain deeper insights into their adaptation of a new mathematics pedagogy. This is a bit of a combined historical and constructivistic ontology in that the structures that exist within the culture I have studied exist based on their history.

Given my background as a mathematics teacher, this may seem peculiar insofar as professionals in this field often view the world from the position that it is non-negotiable, understood, and built on laws and rules that govern behavior. However, the opposite holds true in this case as the particular reality for these students is unique; therefore, a crucial goal of this study is to find the medium of delivery that works best within their reality. This is why, as revealed in the research question, this research has tried to respond to their perspective on the delivery of mathematics instruction in an L2 classroom.

In order to get a sense of the emerging picture, once the study began, I needed to analyze the data and draw conclusions that would show how the program worked in reality for my students or how it "might be changed so as to be more effective," as recommended by Cohen, Manion, and Morrison (2003:23). Tashakkori and Teddlie (1998:133) also suggest exercising caution so as not to "present an oversimplified view of the group." I was able to include some generalized profiles because the student participants were all within the same age group, culture, and tribal family background, allowing me to draw conclusions based on these characteristics. I did, however, have to ensure a combination of various types of data in order to avoid any preconceived notions or generalizations that would bias the findings in my attempt to understand if and how this program could benefit students.

Each person has an instinctive desire to fit in or be a participatory member of his culture or community of practice (Diamond 1999). That includes how we perceive learning, and across different situations we are bound to find some reservations and hesitation on the part of students. Shaw (2006:48) notes that within the UAE, "underachievement is very common," and suggests

that often students from the more unsophisticated traditional families do not always value education. Therefore, it was admittedly a challenge as to how to design the methods to accurately measure students' success with the proposed software, while recognizing that I was not likely to witness immediate conceptual change as a result of introducing such a new learning experience into their mathematics classroom, and, again in an attempt to be vigilant, so as not to overgeneralize. A further challenge was to design the software in such a manner that it generated interest in the content; however, that will be addressed later.

Because I was to approach this study from a sociocultural perspective, given that sociocultural and constructivist approaches complement each other, the most important component is the cultural value the students place on learning using an alternative approach. Therefore, I shall reexamine the research question and sub-questions, narrowing the focus as to what tools would allow me to answer the questions and describing the design of those tools and the procedures followed, as well as how I analyzed the data to determine if indeed this program was beneficial to the students.

4.3 Main research question: What are female pre-university students' perceptions of learning with technology in a Content and Language Integrated Learning (CLIL) context in the UAE?

1) **What are the students' perceptions toward using technology?**
2) **What are the students' perceptions toward the subject matter?**
3) **What are the students' perceptions toward this learning style/approach?**

The expectation in this study was to create a program that captured students' attention and inspired them to want to learn more. The goal was to present the subject in a way that was applicable to their lives and interests, and determine if the method could increase interest in math learning. In order to accomplish this I looked at educational research and how to accurately go about this process and measure or evaluate the results. According to Anderson (1990:48), research is "the systematic process of discovering how and why people in educational settings behave as they do," and is "largely influenced by the desired end product."

4.4 Research design

For the purpose of this particular study, what I hoped to accomplish was to interact with those I was studying and those who would give meaning to the data. Hannon (1998:150) describes this type of social research as "a living plant in interaction with its environment—constantly reviewing itself, sometimes growing, sometimes declining." In order to accomplish this, I decided the best method to find answers to the research questions was to rely on experimental data and questionnaires, as well as such qualitative methods as focus groups, observations, and discussions with colleagues participating in the study. I shall describe these further below. Given the power relations that exist between teacher and student, I need to address the significance of this with regard to this study. This should not significantly alter the study results as this power structure is non-threatening to the students and is, in fact, quite the opposite from the idea in which I, as the teacher, wield the power. The students are quite comfortable with expressing their displeasure, and have not hesitated to do so up to now.

Further, the sections or classes that participated in this study were not chosen at random, which would have been ideal; rather, it was only by teacher volunteer that the sections were chosen to participate in this study. This was unavoidable; however, precautions were taken to overcome it to a certain degree. The findings, as mentioned previously, remain localized.

This action research study was approximately 10 weeks long. Initially I was apprehensive as to whether or not I, as a teacher, was qualified to create a program that made such drastic changes in the delivery of an essential topic such as mathematics. Further, and most important, I worried that I was suggesting a change in learning that was contradictory to the students' reality and culture. Despite the fact that they were in this class initially because they were not previously successful in math class, how could I ensure that I was not compromising their chance to be successful? Given this concern, not only did I have to closely monitor the students participating in the study, I also had to report to management at the college on a regular basis regarding the students' progress. This began with the initial questionnaire, in which I questioned all students participating in the program, as well as three randomly chosen classes of students not in the program. The data below, though in the form of data results, needs to be included in this chapter because it is a part of the process of the program design. Therefore, I shall include my findings to the initial questionnaire here, as justification for continuing with the project.

4.4.1 Research design precautions

Just to reiterate two points, I am including data in this chapter, and this particular research question regarding the students' perception of the use of technology is significant, because of the distinct possibility of concluding that changing the medium of delivery was perfectly appropriate

and that the problem was simply the use of technology. Further, there was the risk that the participating students were possibly not of the same mindset as those who did not participate in the study, or perhaps they would be inclined to respond differently to the questionnaire knowing they were about to participate in the study. I was afraid that during the explanation of the upcoming trial of the software, my or another teacher's bias would possibly be unconsciously transmitted to the students; thus, the questionnaire was given to three other classes in the Foundations program, chosen at random, of students that were not privy to the research project.

Table 3. Student participant findings: Questions 4 and 6

4	I would enjoy learning math using a computer program. (The teacher would be in the room.)	**SDA** **3**	**DA** **35**	**A** **53**	**SA** **20**	65% agree or strongly agree
6	I think my technology skills are good enough to learn math using computer programs.	**17**	**39**	**55**	**19**	57% agree or strongly agree

Students participating in the study: (see appendix ?? for complete results and Appendix 1 for original questionnaire)
SA = Strongly agree, A = Agree, DA = Disagree, SDA = Strongly disagree

Table 4. Student non-participant findings: Questions 4 and 6

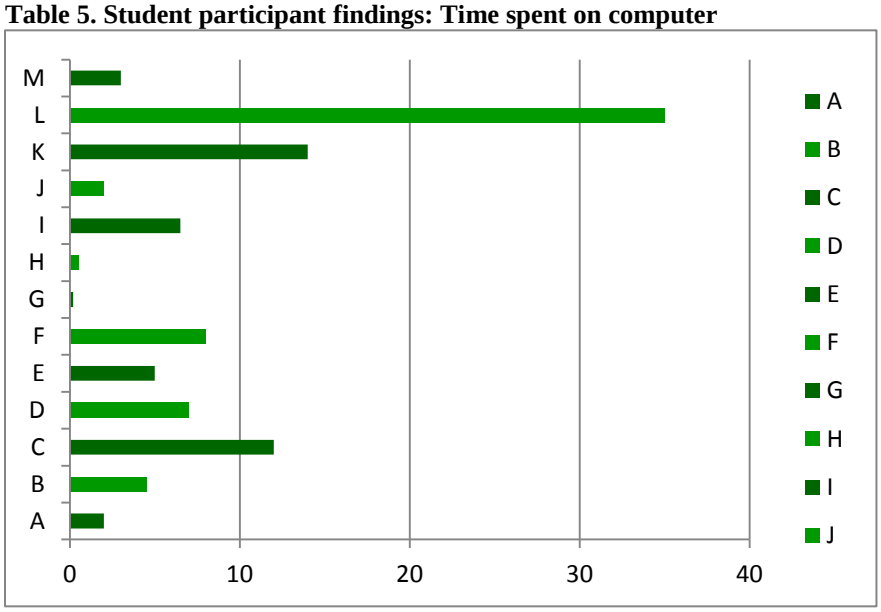
4	I would enjoy learning math using a computer program. (The teacher would be in the room.)	**SDA** **8**	**DA** **21**	**A** **17**	**SA** **8**	46% agree or strongly agree
6	I think my technology skills are good enough to learn math using computer programs.	**6**	**9**	**28**	**7**	70% agree or strongly agree

Students participating in the study: (see appendix ?? for complete results and Appendix 1 for original questionnaire)
SA = Strongly agree, A = Agree, DA = Disagree, SDA = Strongly disagree

As Table 3 shows, of the students participating in the program, 65 percent agreed they would enjoy learning math using a computer, whereas 57 percent agreed that their technology skills were sufficient to learn math using a computer program. However, as seen in Table 4, only 46 percent of those not participating in the program agreed they would enjoy learning to use a computer; this could be an unavoidable result of the Hawthorne effect. Further, comparing the results of the two cohorts of students, there was some evidence of concern regarding question 6: technology skills for learning math using the computer. The non-participant students had no reason to be concerned about their grades, but there appears to have been some concern from those participating in the study. This could indeed be a result of their awareness of the upcoming study, and this was further reason to proceed with caution, particularly with the design of the program.

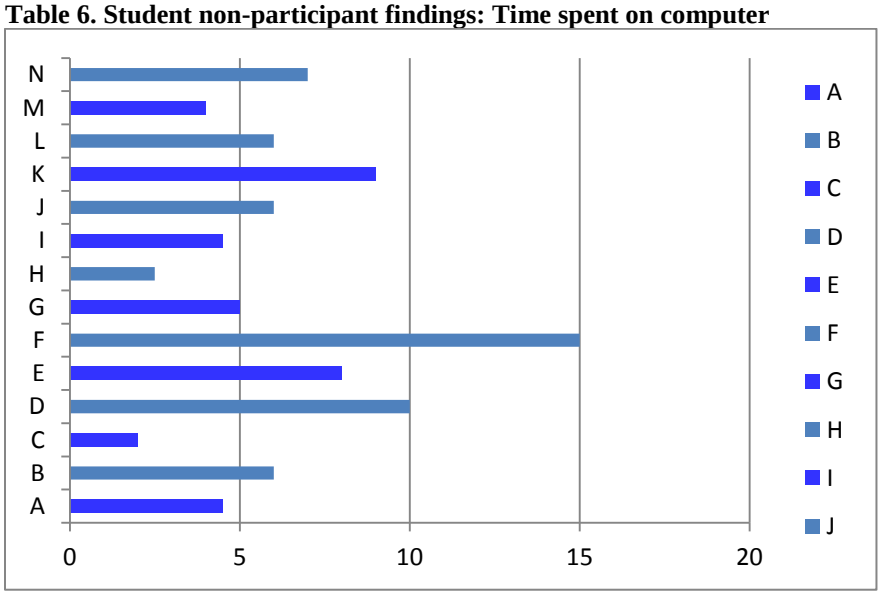
Regarding their frequency of using computers, the comparison of the two cohorts is in Tables 5 and 6, below. Seventy percent of the non-participants agreed that their skills were adequate with regard to learning using technology. When asked how much time they spend on their computers each week, the range was from 10 minutes to 35 hours, with one student stating that she did not have a time limit. (These are all the responses, and some appeared more than once) It appears from this data, that both the students who were not in the study and those that were, were at a minimum, familiar with using computers, as is to be expected.

Table 5. Student participant findings: Time spent on computer



A	2
B	4.5
C	12
D	7
E	5
F	8
G	0.2
H	0.5
I	6.5
J	2
K	14
L	35
M	3

Table 6. Student non-participant findings: Time spent on computer



A	4.5
B	6
C	2
D	10
E	8
F	15
G	5
H	2.5
I	4.5
J	6
K	9
L	6
M	4
N	7

These data were reviewed by my supervisor, who gave permission to continue with the study, though he wanted regular updates. He further planned routine observations of his own as well as to be apprised of any concerns of mine and those teachers participating in the study.

I also scheduled observations of participating classes taught by other teachers, at five hours per week, not including my own classes. The progress of both cohorts was compared throughout the study, and if there had been any indication that the study was compromising the participating students' ability to complete the class, it would have been terminated immediately.

4.4.2 Further research design

In my attempt to remain focused on the study's aims and the tools that would allow me to answer the research questions, I again referred to the literature and this time I examined Rogoff (1991:351) who maintains: that children become skilled practitioners in the specific cognitive activities in their communities, and are basically carriers of the behaviors produced by their role models. Thus, I decided it was imperative to have more data, to get to the justification for the behaviors the students would exhibit during the study, especially given what has been discussed previously with regard to the cultural educational history. I was hoping to a certain extent, to be able to measure enjoyment, and how could I begin to do so without extensive time observing the students interacting with the software? Therefore I planned to combine qualitative data collection methods including focus group discussions and observations. The qualitative component of my study was somewhat unique in that while I wanted to observe my students and be involved, I did not want my involvement to go so far as to get too involved and wanted to be able to remain objective, yet not allow my actions to alter their behavior in anyway.

Walker (1985) describes the choice of method as perhaps an act of faith rather than a coherent response to a clearly formulated problem. I was confident that I chose the appropriate methods, principally in light of McCracken's suggestion that the researcher should not just "survey the terrain" but rather "mine it" (1988:17), as I considered that was what my methods would allow.

Such a multi-method approach allowed the various methods, questionnaires, observations, and interviews to complement each other, as well as to unite the details and experiences of the participating teachers and students, along with me, the researcher, to make a more collective and accurate data evaluation. Greene, Caracelli, and Graham (1989) suggest that the purposes for these types of studies are not only to provide triangulation but also to allow for overlapping facets of a phenomenon and add breadth to the project, thereby allowing the data to generate somewhat numerical as well as narrative answers to the questions.

4.4.3 Critical study components

It is obvious that prudence was a critical consideration in this project, but not only with regard to the students' success in the classroom. Dewey (1929:34) long ago warned researchers that a critical interpretative process is "filled with interpretations [and] classifications, due to sophisticated thought." This is precisely what Foucault reaffirms when stressing the significance among behaviors, judgments, and history. Past cultural guidelines and societal norms create the outcomes and, as Dewey maintains, are likely to "obfuscate and distort" unless they are detected. Instead, as Crotty (1998:159) suggests, I had to "insist that the culture and the accounts it informs be radically called into question." This very act had implications of its own, as the study context was not my culture but rather one in which I was immersed. The dichotomy between thought and action had to be strictly avoided and the conclusions had to be based on autonomous student criticism, suggestions, and reactions, as well as assessment results and recognition of the goals set out to monitor in the observations.

Other concerns were that as the project began, in the initial phase of the pre-study questionnaire, I had hints of the Hawthorne effect. Therefore, it was imperative that the data be carefully analyzed throughout the study, to determine if they were a result of this effect or a true representation of the students' experience using the program. This entire process had to be transparent while utilizing multiple dimensions, in order to increase confidence in the findings and provide a base for a plan of action. All of this lends credence to the notion of designing the entire process so that it was "evident throughout the work" (Clough and Nutbrown 2002:31) that the research activities were endless and interwoven, rather than confined to this particular chapter.

As guided by Richards (2003:20), I planned to "understand the very essence of an experience with my students and hope that the 'outcome' [was] to be more than merely superficial." I attempted to approach this analysis from a constructivist viewpoint because it was important that I strive to understand the "relationship between the researcher and the object of investigation" (p. 38). This was "of fundamental importance" in my data collection process as I attempted "to get a sense of an emerging picture" (p. 277).

4.4.4 Pilot study

As indicated in Chapter 1, this study was based on an earlier study, using interactive software so as to aid against the repetition of mistakes and help make substantial improvements in the design and delivery of the program. The difficulties encountered were threefold. Initially, the study encountered technological problems, which may have been unavoidable. Perhaps they could not be eliminated entirely; however, the frequency of occurrences could be substantially reduced.

Second, the curriculum did not match the curriculum taught to the students, so the previous study was short-lived. The final concern was the issue of language, as the original trial used software designed for native English speakers.

To circumvent these predicaments, a longer software trial was necessary, allowing for a more accurate determination of whether the students not only enjoyed the learning process but could indeed learn content in that manner as well. The curriculum was broken down into eight different modules, each taken one at a time, and in numerical order. With my supervisor‘s permission, I decided to reproduce module 5, in interactive form, on Bb because it contained work with material the students had already covered, in addition to an introduction to new content. This was a perfect opportunity for them to become familiar with student-centered autonomous learning before new content was added. The entire process would take one-eighth of the curriculum of the entire year, and change the delivery of the materials, which would take approximately nine weeks.

I was sensitive to the idea that the software needed to be language-appropriate, emphasizing and drawing attention not only to key words, as in the teacher-centered situation, but also to new vocabulary as it was introduced. I also knew the frustration we had experienced with the original software: often sitting for an extended period of time, watching the hourglass spin on the computer screen, or having the computer freeze on us, eventually spending more time solving technological problems than learning math. With the assistance of the Educational Technology department, we made sure the program worked as well as could be expected before it was tried with the students.

Having learned so much from the original trial, I knew how to properly prepare the students for using their computers to learn, including bringing equipment to class, such as headsets and power cords, in addition to their calculators, rulers, and so on. This allowed for the trial to be more structured and to have the students ready to begin the process on the first day.

4.4.5 Participating teachers

I met with the various math teachers concerning my project and introduced the software program I had created. I explained what would be necessary and how they could best prepare their students to be organized and ready to go on the first day of the trial, should they decide to participate. Some teachers on my team were very supportive, yet unable to participate for various reasons, and they made me aware of these. Some did not bother to show for the meeting and did not reply to the invitation to attend the presentation, or indicate their willingness or unwillingness to participate in any manner. Despite their lack of communication, I felt it spoke volumes as to their readiness to participate in the study and therefore decided not to broach the subject with them any further. Granted, if they chose to participate, it would require an extra effort on their part, beginning with the initial meeting. Pennycook (1999:346) recognizes that an important component of this type of work is to continually push one‘s thinking farther and remain open to question. If these teachers were not willing even to reply to my invitation, then most likely they were not willing to remain open to an alternative pedagogy and would not benefit from the study nor help me in gaining a fuller understanding of the data. So it was just as well. For the most part, it was only those teachers whose classroom management style and teaching approaches were similar to mine who eventually participated in the study.

4.5 Theoretical justification

Action research has allowed me to prove what I believe to be the theory: Students will benefit from the interactive software I have created, much the same as I believe I would have benefited from a program of this type when I was in their position. How better to improve the educational situation for my students than by virtue of studying them during changes? My plan was to collect data (post-trial questionnaire); decide if the study should continue, given the drastic changes I was proposing, and then how to go about it; implement those steps; collect further data and monitor the participating students; and analyze the data with focus groups, post-study questionnaires, and observation evaluations.

The danger with this type of action research is that it not only requires of the researcher rational conclusions about complex human behaviors that are underpinned by sociocultural norms, but also, notes Richards (2003:256), to "recognize that the process of engagement is an ongoing and dynamic one." Richards stressed that it must be "more than mere tinkering, awareness raising or information gathering, and the challenge facing the coordinator is to build research development into team development" (p. 257). These details were collectively shared with the other teachers participating in the study, as I observed not only my class but a minimum of four hours in other teachers' classes each week, thus endeavoring to ensure reliability during the observation process.

4.6 Participants

A total of 260 students were enrolled in the Foundations Program, and approximately 140 of those participated in this study, meaning that just over half (54 percent) trialed the software. The

students were slightly more than midway through their first year of the Foundations mathematics course, with six months of schooling in English only, and they were very accomplished in using technology, specifically their individual laptops, as a learning tool.

I observed two sections of my own students, Sections A and B, for eight hours per week, as well as five sections of other teachers' students, each section for one hour per week. I shall give more detailed information regarding the observations below.

4.7 Research sampling, data collection, and analysis

Table 7 shows the plan for data collection and shall be explained in detail below.

Table 7. Data collection plan

Date	Instrument	Participants	Data	Research issue
February	Introduction to participating students and pre-questionnaires	All first-year Foundations students, participating and non-participating	Tabulated responses	Are the students comfortable with the subject matter, technology, and using computers to learn content
February (after 1 week of using software)	Post-trial questionnaires	First year foundation students, participating in the study	Tabulated responses	Challenges they faced and whether they are willing to continue with new material
February – April	Observations	First year foundation students, participating in the study	Notes, discussions with classroom teachers	Challenges faced by all, myself, students and participating teachers
May	Focus groups	One representative group per class, as designated by the classroom teacher	Audio transcripts later transcribed into a Word document	Challenges, concerns, likes, dislikes, suggestions for use of software

4.7.1 Questionnaires

Once I had determined how many classes would be participating, I visited each one and brought an Arabic speaker to explain the project to the students. We answered their questions and made an effort to ensure that they understood the process, then carefully explained the consent form and asked them to sign it (see "Student Participation Form," Appendix 5).

Consent forms were eventually collected from all students participating in the project. During each visit to the various classrooms we strove to ensure that students were indeed willing to participate, that they fully understood their identity would be protected, and that they had the right to withdraw at any stage of the study and not complete either the questionnaire or use the software if they so desired.

As the project began to take shape, and as previously discussed, I became concerned with the possibility of compromising the students' ability to learn by taking them out of the teacher-centered classroom situation and placing them in a student-centered one. This was not only a concern of mine; management at the college cautioned me about it as well. Wanting to avoid this possibility, I determined initially that I needed to prepare a questionnaire regarding their opinions on this as pedagogy and whether or not they were willing to attempt this approach (see "Pre-questionnaire," Appendix 1).

Again, as previously addressed, I was hopeful to be able to alleviate some of this concern, as I designed the software to begin with the first unit of module 5 in their textbook, as the curriculum for the trial; the unit contained revision material for the first three sections, and a bit of new

content on scientific notation in the final section. I was also concerned about the Hawthorne effect in preparing to hand out the initial questionnaires. Thus, I decided to have 3 additional sections of students answer them, not just those participating in the project, in order to allay any assumption that the students possibly felt more motivated, anxious, or apprehensive because their teacher had told them about the upcoming project. This allowed me to compare the results of all the students, to ensure that there was no prejudice due to any behavior or action of either the teachers or the student participants.

Those results were evaluated, both by me and management at the college, and a determination was made to continue with the study. The analysis procedure was determined, based on the number of expressions of concern with those in the program, compared with those not in the program. This required a close qualitative analysis of the responses in an attempt to assess in detail why any differences might have been presented. All data percentages were compared on all questions, and any glaring differences were addressed and will be discussed further in the following chapter.

To ensure a thorough understanding of the questions, it was necessary to include them in both English and Arabic. I designed the questions in English, then had the questionnaire translated into Arabic. The students could use the language they preferred to answer the questions.

I designed the questionnaires to be visually appealing, as recommended by Cohen, Manion, and Morrison (2000). Further, I made sure they were worded as clearly as possible and not complex or too time-consuming, yet simultaneously something to which the students were willing to give

serious reflection and truthful responses. I also intentionally placed two opposing questions, one immediately after the other, on the questionnaires in an attempt to check for validity. My purpose was to be able to survey the students with little or no personal interaction, allowing me to establish a broad picture of their "experiences or views" (Clough and Nutbrown 2002:118).

Once I determined the main objective for the various questionnaires, I identified subsidiary topics that related to this objective. Finally, I narrowed down the specific information required of each topic. Looking for practical data, I designed the questions in the most appropriate way to provide the kind of data I needed. The questions were clear and to the point. Some were dichotomous and some required a response other than just yes or no. Ultimately, however, I considered the questionnaires a suitable tool for this particular research project, and an appropriate tool to aid in recognizing the themes that began to emerge from the data. Besides providing numerical data to triangulate the observations and focus group discussions, which are discussed below, the questionnaires allowed me to gather qualitative data without having to be in the room and allowed for the students to remain anonymous and thus provide more honest feedback to the research questions. The annotations were later combined with the data evaluation from the assessments and the conclusions from the focus group interviews, as well as the data determined from the observations, in order to get an idea of the overall student evaluation of the interactive software; my approach was to bring together the qualitative and quantitative data. As a researcher, I directed my attention to the project "as a whole" (Richards 2003:251) and carefully considered the contributions from the various approaches.

Once the program was finished and the students had completed all the work, a final questionnaire (see "Post-Activity Questionnaire," Appendix 3) was created in both English and Arabic and handed out to the student participants to determine their overall satisfaction with the program. These results shall also be discussed in the next chapter, as part of the data analysis, again closely analyzing the quantitative percentages.

4.7.2 Change in the strategy of the study

Even though the project was moving forward, it became apparent that some alterations were necessary. For example, after the initial one-week trial, one of the teachers participating in the study concluded that she did not want to rely on only the program to teach her students, and asked if it would bias the results if she were to teach as well as use the program simultaneously with the teaching. She based this on the observations of her students working independently as well as comments they made.

Reflecting on what the literature had revealed at that time, I considered that if she wanted to do both concurrently, that was indeed appropriate. This is the beauty of an action research project: the ability to make adjustments as needed throughout the study. Further, I felt it reflected the quality of teachers that participated in this project. Not only was she willing to try this alternative paradigm, which ultimately required more effort on her part, but she was also concerned about the success of her students, to the extent that she identified potential problems and suggested an intervention. Technology in this study was being used not only to teach but also to enhance learning, and if it meant it could still possibly benefit the students, then it added another dimension to the research project.

An additional alteration was necessary because of changes made by management in the home office, and as a result, once this study was completed, the students would be assessed not only on this particular chapter but on two separate chapters. This came about as a result of a change in the middle of the semester, altering their course outline; it was unavoidable and as a result, I was not able to compare the marks of the students in the program compared to those who were not in the program. Although I was initially very disappointed, in the end, I believe I have sufficient results to determine whether the software is appropriate or not.

Once the study had begun, I planned to meet weekly with the participating teachers to determine their opinions of the interactive software. In the end, this was not possible, as these were voluntary meetings and, given everyone's busy schedule, it was not practical as well. Ultimately, what happened was that as I observed the classes, the individual teacher and I would discuss any concerns or issues we had recently observed and those were noted on a regular basis. This did not allow us to have an overall regular meeting as I had hoped, but I did address the same concerns with each individual teacher. Whole group discussions occurred on three separate occasions only, during regular team meetings. I would address behavior problems, amount of time spent studying outside of class, and any recognition on the teacher's part of increased autonomy or independence. The main purpose of this, of course, was to add data to the project; however, I further wanted to ensure the students were indeed learning and that the teacher was satisfied with any issues that arose as the study progressed. I made notes at these meetings and highlighted themes as the study progressed; as they emerged, I took great care to exclude any possible preconceived notions I brought to the meeting, while focusing on data from the

participating teachers. These data did aid in recognizing the themes that eventually emerged, which is discussed in the following chapter.

4.7.3 Observations

Despite my lack of experience as a researcher, I decided it was imperative to include observations in my data collection process, though it could be a double-edged sword. Cohen, Manion, and Morrison (2001) suggest taking sufficient notes that could adequately provide a reasonably vivid picture of the situation months later. It was imperative, however, to design the observations procedure with the idea of transparency in mind, making clear what was being observed. Cohen et al. (p. 305) stress that observed incidents add "a certain freshness to this form of data collection that is denied in other forms, e.g., questionnaire or test." Therefore, before I entered a class for an observation, I had a plan to look for specific behaviors and to remain as systematic as possible.

Although videos would have been an ideal situation in this study, they were not used because of the cultural dictates against taking any sort of pictures of young women. I would have needed the permission of the students and their families, and most of the students likely would not have agreed to participate, given cultural expectations for young females. Some families had even gone so far as to insist their daughters' pictures were not on their ID cards. Even had the students agreed, it would have created an environment too artificial for a true data-collecting experience or an accurate determination of the interest in the interactive program.

Because members of management had been so supportive throughout the project, I wanted them to observe also. My aim was to study what I believed was important to my research project, in a way congruent with my value system. Given the multiple realities I believed existed in the classroom, including but not limited to my reality of how a classroom should operate as opposed to how my students' reality defined it, I knew I could make some determinations of the success of the subject software through mere observation. Knowing how the students typically behaved in a teacher-centered situation, I was anxious to observe what would happen in a student-centered classroom and share that with management. Further, I knew I could provide invaluable data that would allow me to answer my research questions, based on watching both mine and others teachers' classes.

One reservation I had of either me or members of management observing students using the software was that sitting in the classroom obviously documenting their actions could lead to unnatural behavior on their part. Just simply having an outsider in the classroom introduces changes and can ultimately lead to an artificial situation unlike the so-called normal classroom. Tashakkori and Teddlie (1998) suggest that this can affect data accuracy. It was obvious that I could not do a lot during management's visits to overcome the possible Hawthorne effect this might cause; once they were over, however, I chose to approach the classroom observations as if I were there to help in the event of technological problems and to offer tutorial help, rather than observing their behaviors. In the event that I observed things I wanted to note, I made an attempt to create a situation such that I appeared to be sitting at the computer, working on a project of my own, while they worked individually, at their own pace, on their laptops. Although this went against my beliefs of how an effective teacher works and contributes to an ideal learning

environment, it occurred only occasionally, when I wanted to note something I did not want to forget. Often notes were taken or even rewritten at the end of class so I could reevaluate them later. Most generally, I made an effort to remain as unobtrusive as possible so that the students would "behave in as natural and uncontrolled a manner as they [did] when they [were] not being observed/studied" (Tashakkori and Teddlie:97).

To maintain my goal of being the "fly on the wall" and keep from interrupting the regular discussions in the other classrooms, I tried to create an environment as authentic as I could make it. Any outside interference making students behave in a manner that created a non-natural reproduction environment was unacceptable. I had to observe their behaviors as they worked independently, again, making mental notes and typing them up at the end of each class or unobtrusively during class. To ensure that I remembered some particular aspect of an observation, I would sit down at the desktop computer on the teacher‘s desk and type in notes briefly, creating the impression that I was merely working on something else. I noted the number of students in the class, how they were working, (individually or together) and whether all were actively involved in the work, not just on their computers, as well as their level of interest in starting work at the beginning of class and their desire to problem solve or further understand, once they had completed a formative assessment. Standing at the back of the classroom, and looking around, I could plainly see all the students‘ computer screens and easily determine whether any student had wandered off the Bb site and into a chat room or someplace else she was not supposed to be.

The observations occurred while they were using this program and I planned to compare their behaviors to the more traditional classroom, ultimately to see if it made any difference in their desire to begin working, if it did indeed spark an interest in the authentic applications. I also wanted to notice if they began to recognize after taking the formative assessments, what they did not understand, and return over that part of the content again, in order to better understand the subject matter.

The observations allowed me the freedom to monitor the classroom as the students worked, in order to determine whether they remained on task, whether they helped one another and whether they slipped away from the program and moved into a chat room, as often happens when they have their laptops open and are allowed some freedom. As Clough and Nutbrown (2002) suggest, observations are not intended so much to intervene, but to understand. The context did not vary, but was always the regular classroom time under normal classroom circumstances and settings. The hope was to set up a scenario with my data, which "people who [were] not present at the real events could become part of, engage with and bring their own meaning," according to Clough and Nutbrown (p. 48). Moreover, I again took care to avoid imposing my own framework of interpretation as defined within my culture and instead seek the structures of the individuals being studied.

In other teachers' classrooms, I reminded the students that I had created the interactive software, and was there to help them or their teacher with it. I did not explain anything further to the students about the benefits of the program they were trying, as that had been done previously. Nor did I clarify instructions, believing that the program was self-explanatory enough, to allow

them to work independently. I gladly helped out any students who had mathematical questions, were unsure of what to do, or had technological problems.

Because I had no way of determining what made the students behave in particular ways, while working independently, I structured the observations so I could focus on students' levels of observable interest and willingness to continue working. Following my considerable experience in a teacher-centered classroom, I wanted to contrast that with the student-centered one, where I could note the students who worked as they should have, asking questions, and remaining interested, as well as those who ultimately talked to their friends and had little if any desire to proceed through the program.

Also because of my experience with such girls, I knew the difficulty of getting them settled down to begin class. I wanted to focus on their interest in beginning the program without having to be reminded to do so, and to notice whether they remembered the necessary materials, such as pencils, paper, calculator, ear pieces, laptops, more so than in the traditional classroom. Further, I wanted to contrast their levels of interest and consider whether they appeared confident or frustrated, interested or bored, or even enjoying the experience and having fun. I looked for a genuine interest in understanding and not just a desire to tick the boxes and move on, once a particular activity was complete. I looked for definite recognition of lack of understanding and a desire to engage more actively in expanding personal meaning in the content. Having created the material, I wanted to see if there was any benefit to their interaction with it and if they began to take charge of their own learning.

In making notes of my observations, I tried to create a realistic impression of what I actually observed in the classrooms while participating as much as possible in the students' learning experience in an attempt to understand the way they viewed this particular medium of delivery. I would review these guidelines before most observations, in order to remember what I needed to be cognizant of when in the classroom. Although I had to form opinions of what I was witnessing, I did not always choose to make notes throughout the observations, so as not to draw attention to myself and cause the students to behave unnaturally.

At the end of the session, when typing up all I wanted to retain from the visit, I included the date and time of the observations, and any technology problems encountered, as well as the number of students in the classroom, and the visible interest they displayed in the program. I also made note of any unexpected issues that were raised and themes that emerged and put them into a summary table (see Appendix 7). This process helped me analyze the findings without having to reread the extensive notes, when it came time to analyze the data.

A fundamental goal during the observation process was to keep from foisting my values on the students and suppressing their ordinary inclination toward their studies. Just to reaffirm, allow me to say that I believed in the product I had created, I was and am still certain of its possible advantages, yet I wanted to allow the classroom environment to remain transparent, so I could clearly determine whether the students were as enthusiastic about it as I was. Further, I entered the arena from my own paradigm with the intent of respecting the "complexity of the social world and its workings" and avoid "having already decided what [I wanted] to find" as my results (Richards 2003:267). Because the findings from the observations would not be

straightforward, I made an extra effort to follow appropriate procedure in maintaining the integrity of the research project.

Without a doubt, my perceptions, values, or understandings of a particular set of circumstances could vary widely from those of others observing the same situation. Moreover, it was unlikely that a significant generalization was possible, according to Pring (2000), because each person's awareness and interpretation can differ a great deal. Hence, it was necessary to draw up "clear instructions to observe only certain things and to record behaviors for each of those," as well as to consider "the meanings and motives of those [persons being] observed" (Pring 2000:34-35). In any case, observations, however necessary, should not shroud the experience of what was happening in the classroom.

Using this data in the evaluation process, I believed, would allow me to highlight specific events relevant to the study and explain to the reader, my ideas of what happened, rather than simply by representing them with theories or principles. Anecdotal information hardly justifies data collection or a method of research. However, McCracken (1988) notes that the right "feeling" or "hunch" is an important methodological consideration. In the current study, I felt it could add substantially to the data collection. Further, McCracken (1998) suggests this process can give the research project a method of combining the wealth of detail and experiences with shared consensus and collective meaning-making.

Given my pedagogy of constructivism, I looked for situations where the students gained or from all appearances, it seemed they gained personal meaning or appeared intrinsically interested in

pursuing their studies, similar to what I have witnessed when I see them in a chat situation or on their laptop or phones. I began to search for emerging themes that suggested the students had begun to take charge of their own learning and that the opportunity to interact with the program had indeed benefited them and they made use of the feedback they received after a formative assessment and actually returned to the materials they had not yet mastered. I looked at the actual program, where it recorded their time spent actively working and on task, to determine if this program eventually lead to an increased or difference in their amount of time studying, according to their responses to the initial questionnaire, and eventually to any increase or difference in their customary grades.

4.7.4 Focus groups

Cresswell (1995) suggests that numerical and narrative data can answer similar research questions, so although observations as a method of data collection method are valuable, they alone do not provide sufficient data, if I did not include small group discussions, where I got individual verbal feedback from the students as well. Foucault (in Oksala: 2007) says human beings' actions are based on 'the results of social, rather than natural processes' and he stresses that when studying the individual, we need to remember the 'unconscious' processes at work under the surface. After observing my students and drawing my conclusions, I had to obtain their perspective as well in order to ensure the conclusions were accurate.

I decided to interview a subgroup of those under study in order to triangulate the observations and questionnaires. This, according to Cohen, Manion and Morrison (2000), would allow for the participants' agenda, rather than mine, to dominate the conversation, providing for the

interaction of those in the focus group to clarify their opinions of the study, and more clearly allowing those to emerge. Classifications can cause humans to behave in certain ways. According to Oksala (2007:15) knowledge "is constructed in networks of social practices which always incorporate power relations and exclusions." Because the very behaviors I observed were socially constructed, the rules and constraints caused limitations and forced my students to act in certain ways. I therefore needed to seek their feedback and input on the medium of mathematics delivery while maintaining the so-called power relations, the history and social practices forming that input. A close examination of the power and influence had to be shared if I wanted the results of the study to be reliable and not just socially constructed rhetoric, based on my social structure and not that of those being studied.

A well-designed, focused, group conversation, according to Clough and Nutbrown (2002) includes a familiarity among the group members as well as a willingness to explore ideas based on their own experiences and personal histories. Such conversations were held with students from various sections participating in this research project.

I needed to carefully select those participating in the focus group to ensure that it reflected the homogeneity of the regular classroom, and that each participant bore the characteristics required to represent those under study. This was also the tool I used to fill gaps in the contextual knowledge about what shapes and affects the culture. Clough and Nutbrown (2002:23) maintain that something more must happen—the researcher should not simply "describe the situation under enquiry, filling in informational blanks… [but] actually refine and define the topic." This is why the view of the students was crucial to truly understanding the situation being observed.

As Oksala (2007: 31) affirms, rather than look for great individual discoveries, one should dig "deep into the soul of our thought to define larger timescales and the more general modes of thinking that lie behind the individual's diverse opinions and actions." This, she says, is where "all the knowledge of the world has to conform to the human way of experiencing it." I felt it necessary to include an Arabic speaker in the focus group A interviews, the low level section I was teaching and observing, to ensure that the students fully comprehended the questions posed to them and could more freely express their answers in their mother tongue, which could then be translated to ensure a more detailed understanding of their comments. By conveying to the student participants the significance of their input and how vital it could be in shaping the development of mathematics teaching, I would have a better chance at receiving honest and straightforward responses to my questions. Thus, not only would they see the opportunity to take some ownership of their mathematics curriculum, but I would be able to make more precise determinations regarding the study.

The plan was to provide very informal relaxed group conversations in which the students could express fluidly their honest interpretation of the project and its results, according to their paradigm. This required a personal involvement and again, a relationship between the researcher and those being researched.

With regard to the focus groups, for students other than my own, I asked the teachers to pick a small group of students, four or five that most closely reflected the various academic levels of students in that particular class who had used the interactive software and were willing to truthfully participate in a discussion about their experience. The teachers were to explain the

significance of the students' opinions of their experience and how it ultimately could help to create a better mathematics classroom experience for future students. I did the same with the students I chose to interview from my classes. I could not be the only person in the interviews because, as discussed previously, these students were at such a weak L2 level they would not be able to express themselves sufficiently. So I asked for a native Arabic speaker to help out with the interview process, one the students felt comfortable with. The students were streamed according to their academic levels, and only one section did not need a translator: the top section, whose students were able to express themselves sufficiently in L2.

I reserved a specific room for the discussions and gave the students an appointed date and time to attend, which had to be arranged around their schedules and mine, as well as the translator. I also served coffee and cake to the students and the translator, allowing them to feel more at ease and hopefully creating an environment in which they were eager to provide useful feedback on their experience, before I began to ask them specific questions. I used an audio recorder in the sessions and made sure that pseudonyms were used for the students. Before I began, I obtained their permission to record, though this was simply a courtesy to them, as their teachers had already discussed that it would be audio recorded before the session began. With my ultimate goal of reaching a group viewpoint, I attempted to get everyone involved to participate, though that was not always possible.

I began the focus groups by thanking the students for participating and reminding them that their names would not be used. Those who agreed to participate in interviews signed additional consent forms (see "Interview Participation Consent Form," Appendix 6). I briefly discussed the

software and then began to ask questions about their individual interpretations of the experience, using student-centered learning solely. At the end, I thanked them for their time and assured them it had been most valuable. With the conversations recorded, I was able to go back and transcribe the sessions word for word, which allowed me to read the valuable data over and over, in order to make more accurate determinations of the findings.

4.8 Validity and reliability

To understand rather than intervene in the learning process, it was imperative that I concluded as to the facts of the data, used them as my starting point, and then drew inferences or conclusions about the reality of this program with this particular population of students, and that my results be legitimate. Although the results from my observations provided much needed data, I had to exercise caution in "looking critically, looking openly, looking sometimes knowing what [I was] looking for, looking for evidence, looking to be persuaded, looking for information" (Clough and Nutbrown 2002). The results from the observations had to parallel the students' input into their candid position on the program and its usefulness and practicality in their classes, thereby facilitating a more objective determination rather than simply the way the researcher saw things. Observations were only one element of the evaluation process and specifically aided me in gaining insight into the situations, as recommended by Cohen, Manion, and Morrison (2001). Those authors further suggest that observation be used with other methods of gathering data in order to provide triangulation, stressing that such a process will "ensure that reliable inferences are derived from reliable data" (p. 315). These all-important practices constitute a situation in which the viability of the project shall be deemed appropriate (Denscombe 1998). I had to prompt myself to be suspicious of the findings, to ensure the reliability of the project. And not

only did I need to be convinced of the project's reliability, I needed to convince the teacher participants and the reader as well.

My intentions were to make well-informed inferences regarding what the data revealed, and the impression that was produced, given the fact that I had a "reference to the social rules and practices within which these intentional actions [took] place and [made] sense" (Pring (2000:67). Therefore, my conclusions were made not on a cause-and-effect situation but rather in terms of how I, as a researcher, saw what was revealed in light of a wider set of realities, and based on triangulation. This, combined with my effort to ensure that the observations and their interpretations were replicable within a similar situation, rendered the findings trustworthy. My persistent observations, reflective journals, and frequent meetings with the participating teachers further added merit to the findings.

I also welcomed an opportunity to develop new and deeper understandings of my students and their culture. Hence, I was motivated by a resolve to bring about change. As Clough and Nutbrown (2002:4) ask, "Why would you want to carry out a piece of research if you didn't in some way want to persuade somebody of the value of what you're doing?" Anecdotally, I wanted to bring about that change in a reliable way.

4.9 Ethical dimensions

As one would expect in an ethical study, I have taken precautions to ensure that the students who participated in this study remain anonymous; if a student is quoted or referred to at any time during the results or conclusion portion of this study, a pseudonym is used in place of her name.

The students who agreed to take part in the study all signed consent forms, as previously discussed. I made sure they fully understood that their identity would be protected and that they had the right to withdraw at any stage of the study and not complete either the questionnaire or use the software if they so desired. This was reiterated with the students who participated in the interviews and is clearly stated in the recordings made during the interviews.

The remaining concern, at least from my perspective, is the power issue; I am a teacher, and as the one traditionally wielding the power, I worked to ensure the students felt comfortable not participating in the study. Given the fact that one teacher, who had one section in the study, wanted to continue to lecture as well as use the software, I demonstrated my willingness to compromise or allow for flexibility. Further, it has been addressed that oftentimes within this culture, a teacher does not necessarily have such power—or so has been the case for these students. They too have power, and I believe I created a situation in which they felt comfortable expressing their unwillingness to learn in this manner or their concern for their learning.

4.10 Challenges

I had numerous responsibilities with regard to this study. First, I had to design a study that was valid and reliable while not compromising the students' ability to succeed in their first content class in a second language. Second, I had an obligation to design a software package that was aimed at their language and math levels, as well as one that took into consideration various learning styles. Initially, I tried to create a program that organized and combined previously learned information with new information, with which the students could construct new knowledge through their own experiences. As noted by Dick et al. (2001:5), a teacher's primary role is "creating appropriate learning environments, sometimes called problem scenarios, in

which the students' learning experiences are authentic representations of real practices in applied settings."

The content structure, the sequence of new materials being presented, and the strategies used for instruction were all important considerations. Finally, and perhaps most important, was the delivery of that content; I needed to consider the visual design, the page layout, and the audio portion of the software. The big question was how it could be done in a way that captured, maintained, and controlled students' attention. Thus, I decided not only to focus on very basic English, with an Arabic word used on occasion, but also to create a program that allowed for physical appearance, targeted to female students, to go along with a description of a problem. There is clearly a division between the sexes within this culture, and undoubtedly I used a design that was feminine, rather than one that would appeal to either gender, (see again appendix 10). Further, I used authentic applications in which I drew attention to key words and assisted the students in developing their language skills for mathematics classroom problems.

4.11 Limitations of the study

It is still likely that some students, especially those I did not teach, had some misrepresentations about the questions, but that was inevitable. Again, the classes that participated in this study were not chosen at random but rather by teacher volunteers, adding an unavoidable bias. In the end that presumably has not altered the results significantly; however, that is discussed further in the following chapter.

The risk of the Hawthorne effect was always present, especially given that several members of management observed the classes. As the study would take some time, I knew I would be able to make determinations, based on several data sources, so I was not concerned that they would fail to provide discourse that would seek to persuade me and position themselves as the authentic source of information for their culture through a detailed account of their experience with the software.

Perhaps using this program for only nine or ten weeks was not long enough to get a real sense of what it was like to learn by merely using technology. Perhaps as a result, this has further biased the study. That is a consideration that will be made later, in the final sections, but again something the reader needs to be made aware of. The next chapter presents a breakdown of the data results.

Chapter 5 Data Presentation and Discussion

5.1 Introduction

This chapter presents the data collected in response to the study's research question. The direct interview responses from the participating students are presented verbatim, as are their free responses to the questionnaires. The data are presented according to the direct relevance with each question and organized into categories, collectively creating a resemblance to the students' experience and explaining their perception of the self-directed, student-centered pedagogy.

The chapter is designed to address each question separately. Once the data are adequately explained, all the information is merged to answer the main question, thus allowing the facts to incorporate all parts. Following the presentation of the results, the chapter offers some additional information on the students under study, circumspectly allowing conclusions to come into light, based on all the data presented, while calling attention again to the student participants' specific characteristics and unique history with regard to education. In doing so, it attempts to highlight areas of disagreement or disparity and endeavors to resolve those inconsistencies, in the end.

The information for each particular research sub-question shall be organized and presented using the responses from the questionnaires as well as examining the free response comments made by the students. Data will then be added from observations.

5.2 Question a: What are the students' perceptions of using technology?

This section presents results in answer to the first sub-question: What are students' perceptions of using technology? Once more, this question is significant because of the distinct possibility of

concluding that changing the medium of delivery was perfectly appropriate and that the problem was simply the use of technology. This portion of the question set out to resolve that possible concern.

The program began with the above-mentioned review material and a new, relatively short section on scientific notation. This took the students approximately one week, depending on their individual pace, how often they chose to repeat the process, technology issues, and so on. All the concepts but one had been taught previously in their first semester of mathematics. Further, the one new concept, scientific notation, was straightforward and simple, and had given students in previous years little or no trouble. Because the students had done it previously, in Arabic, they were mostly able to grasp the concept easily.

At the end of this section, the second questionnaire (see "Second Questionnaire," Appendix 2) was given to participants to determine their level of satisfaction with the program, as shown in Table 8.

Table 8. Satisfaction levels

1	I enjoyed using the computer to study.	**SDA 14/11%**	**DA 30/23%**	**A 49/38%**	**SA 35/27%**
14	If I could access this software package at any time, and it contained more sections that were included in this math class, I'd use it to help me study outside of class	**SDA 12/10%**	**DA 16/14%**	**A 54/46%**	**SA 35/27%**

It should be noted that although 65 percent of the students agreed they enjoyed using the computer and 73 percent agreed they would use it to help study outside of class if more sections

were included, this information is later contradicted by these same students at the end of the study, after completing the program (see Table 9).

Table 9. Post-study dissatisfaction levels (a)

1a	I don't like it and would rather have my teacher teach me	**51**
1b	I prefer to use it rather than having my teacher teach me	**17**
1c	I like it, but would rather still have my teacher teach me at the same time	**54**
1d	I would prefer to have this only for supplemental studying, if I need it, but don't want to use it otherwise	**73**

Regarding Table 9, the 131 students given the final questionnaire were allowed the choice to respond or not respond, as I was attempting to adjust the questioning technique. Obviously some did not bother to respond to all questions, leading me to presuppose that they only responded to those questions they agreed with, or felt strongly about. Initially, in the first questionnaire their opinions took a more positive stance toward the program, and perhaps the fact that they were only studying material they had previously studied made the difference. That variable was not seriously considered, but rather the review material was used initially in order to allow the students time to become familiar with using the computer to learn. Thus, these results are their responses, once they were familiar with the program, and once they had experienced independent autonomous learning. There are evident differences of opinion, indicating their attitudes toward the program had drastically changed.

In the initial questionnaire, 62 percent either agreed or strongly agreed they would like to use the program on the next module, and 65 percent suggested they liked the advantage of being able to go back as many times as they needed to get help with concepts they did not understand (see Table 10).

Table 10. Post-study dissatisfaction levels (b)

15	I would like to use this type of learning for next module in math class	**SDA 14/14%**	**DA 26/25%**	**A 34/33%**	**Sa 28/27%**
12f	I liked being able to go back as many times as I needed to get help with something I didn't understand	**83/65%**			

Not only are these data well contradicted in the final questionnaire, they are additionally being called into question during the analysis of the observation data (see Observation data, Appendix 7).

The responses from the post-activity results after the initial trial, though no doubt in response to their obvious approval of the program as well, demonstrate their desire to use technology. For example, initially, when creating this program, my desire was to put this program on a CD to be used by students who did not have Internet access at home, thus giving all students access at any time. However, this proved impossible for our Educational Technology team, as some of the files were somehow corrupted and the program would never work properly. I was told that in order to make it work, we could have to recreate the files in their entirety. I learned this only after first mentioning the possibility to the students. When I was unable to follow through on that option, I apologized to the students for being unable to provide them with a CD. Students responded to this issue on their questionnaires.

As stated previously in the literature review, students no doubt expect to use a computer for learning, especially given the fact that they must purchase a laptop by the beginning of the semester or they will be withdrawn from the college. Students and parents are fully aware of this requirement. Overall, the data give the impression that the students are satisfied in their ability to use technology, and their previous experience was sufficient to enable them to feel comfortable with this tool. The above-mentioned inconsistencies, with regard to students' preference of using the computer or having the more traditional teacher-led classroom, shall be addressed below, bearing in mind the remaining data perhaps will shed more light on this.

5.3 Sub-question b: What are the students' perceptions of the subject matter?

I believed this question to be significant given the possibility that mathematics is often seen as a subject majored in by males and might possibly prove the data results invalid. I did not want there to be any doubt that the students were truly evaluating the medium of delivery and not the fact that it was possibly a challenging subject or one that went against their perception of culturally appropriate behavior.

Although the students who were initially questioned but did not participate in the study answered this question, and I have made no references to the suggestion that I was going to compare the two groups, their answers remain pertinent and I want to include them at this juncture. They further add merit to the findings of those participating, and they add supplementary evidence which provides an answer to this question. Of the students who did not participate in the program, 91 percent either agreed or strongly agreed they were good math students in high school, and 87 percent said they were good math students in college (Table 12). This is within 4

percentage points of the same answers for the study participants, (see Appendix 4). There was no apparent hindrance to learning mathematics for these particular students, at least, according to their own estimation; they appeared satisfied with their mathematical abilities. The findings were very similar for the student program participants (Table 13).

Table 11. Student quality perception: Non-participant students

1	I was a good math student in high school	**SDA** **2**	**DA** **3**	**A** **25**	**SA** **23**	**91% agree**
3	I am a good math student in college	**SDA** **1**	**DA** **6**	**A** **30**	**SA** **16**	**87% agree**

Table 12. Student quality perception: Participant students

1	I was a good math student in high school	**SDA** **1**	**DA** **9**	**A** **63**	**SA** **60**	**92% agree**
3	I am a good math student in college	**SDA** **2**	**DA** **12**	**A** **82**	**SA** **44**	**90% agree**

5.4 Sub-question c: What are the students' perceptions of this learning approach?

From the questionnaire after the initial one-week study, the students suggested that they could not learn math as well from the computer as from their teacher (Table 14). Sixty-six percent either disagreed or strongly disagreed with the statement that they could learn as well using this method. Only 34 percent agreed or strongly agreed, while only 23 percent suggested they preferred the program over their teacher, as taken from the same questionnaire. From the final questionnaire (Table 15), only 17 students out of the total 131, felt strongly enough to suggest they prefer this to having their teacher teach. Moreover, from the comments section of the final questionnaire, the comments in Table 16 are relevant in answering question b.

Table 13. Ability to learn and teaching method preference

8	I can learn math just as well from the computer as I can from my teacher	**SDA 37/29%**	**DA 47/37%**	**A 25/20%**	**SA 18/14%**
12d	I prefer it rather than listening to my teacher talk	**29 students or 23% either agreed or strongly agreed**			

Table 14. Preference and program enjoyment

1b	I prefer to use it rather than having my teacher teach me.	**17 students ticked this response**	
3	Overall, I enjoyed using this interactive software and would like to use it more	**Yes 56**	**No 73**

Table 15. Question b comments, final questionnaire

8	I don't like the interactive software
9	I don't want to use this program
10	I didn't like the program because I didn't understand anything and I like my teacher to teach me
11	I don't like this program it just helps us to practice the exam
12	I don't like this program
18	I don't like this program because I don't understand any thing so, I prefer teacher teach me
19	I don't like this program because it is very silly
20	I can't understand math in the computer
21	I don't prefer use this program because something we don't understand and we need the teacher to explain for us
22	I don't think this program is useful

Some of the data were echoed during my annual classroom observation, conducted while the students were using this program, in which my supervisor wrote, "I can see how using this

software is making a big difference for the students. The students are engaged and working quietly and independently."

The management team provided very positive comments from the observations as well. From all appearances during their visits, the students were working quietly at their desks, on task and learning, with the extra advantage of being able to use the program from home when technology was available. This impressed the management team enough to nominate me for a system-wide information technology award. Although the observations did indeed allow for insights into the study, at the same time, what management saw was only selective and superficial behavior. They visited the classes during the early stages of the study (again, with the students fully aware they were there), when the program was still new to the students. As other members of management visited the classroom, with prior notice and again at the beginning of the study, I shared that with the students. The managers made no formal written observations; however, their comments ranged from "This is marvelous" to "Wow! What a quiet classroom." An English teacher ironically noted, "That classroom seemed unusually quiet."

Table 16. Observation data: behavioral and research issues

Month	Behaviors of significance	Research issues
April	Classrooms becoming a somewhat stressful environment for teachers. Students arguing why they have not been given credit for work completed, when it was not completed correctly, yet they failed to redo it. Recognition of frequent off-task behaviors and failure to begin work without being told to do so. Contrary to the initial month, this period is not reflective of a positive educational experience and at least in some situations, concern that perhaps the study should be terminated as the students were not working for understanding, but rather simply to complete tasks.	Challenges faced by all; myself, students, and participating teachers. Higher level students still working on schedule and marks are as expected. Lower level students continue to fail and show no concern, no desire to return for revision, no awareness of lack of understanding or the significance of comprehension.

Eventually, the data from the observations (Table 17) reveal that as management no longer observed, and as I became more of an "insider" rather than an observer, the students' true behaviors emerged, allowing me to "see how events evolve over time, catching the dynamics of situations, the people, personalities, contexts, resources, roles, etc." as defined by Cohen et al. (2000:311), and make accurate determinations of this piece of data.

Over time the data reflect a gradual return to the unfortunate situation of having to begin each class by reminding the students to open their laptops and begin working. Frequently, despite the fact that is was five minutes past the class start time, several students still did not begin working and there was no clear interest in beginning work until they were forced to do so. Initially there was at least some interest shown in working on their laptops; however, that behavior was not consistent throughout the study. This is not to suggest that the students were strongly opposed to using the program in the end, but rather may have been equally as disinterested as when they

were told to open their books in the traditional classroom. There was a clear distinction between the behaviors noted originally and those later in the study; those inconsistencies are addressed below.

At the time, there appeared to be no visible advantages to the program, at least for the teacher, because the classroom could ultimately be more of a stressful experience. This was due partly to several factors: technology problems, students needing assistance, students not following the proper order and simply clicking on any icon they wanted, students arguing because they had not been given credit for completed homework—all while I tried to observe and check homework. I attempted to simplify learning for them, provide built-in advantages, take some of the pressure off the classroom teacher to allow for closer monitoring of the students, and improve students' content-learning ability. However, there was no recognition or appreciation of this; the students simply believed they had completed the process and were ready to move on and, as in their previous academic experiences, receive a passing mark.

In reflecting on the data from the final questionnaire (See "Table 2,"Appendix 4), it was obvious that students had difficulty understanding the language and concepts, yet during the observations there was little if any questioning the concepts or contextual assistance required, only technological assistance. More than half said they liked the videos, but, when asked if they could learn math from their computer as easily as they could from their teacher, only 34 percent said yes.

Those students with low formative assessment results were among those who spent the minimum time on the program. This may be indicative of a student who has limited recognition of study skills or discipline, and one that rather does as she is told by her teacher, with little regard for the low levels of learning being achieved. It suggests a need for closer monitoring by the teacher and indicates that the independence required for autonomous learning is possibly contrary to convention and could eventually lead to failure for these students. However, 68 percent did agree that they would like to use both their teacher and the computer to learn math. It is also important to note that 53 percent agreed they spent more time studying using this medium of delivery than the traditional method, while 59 percent said they did not necessarily have more fun learning by using this method.

The more advanced students in the higher-level classes (the students were somewhat streamed to a specified extent) did tend to get to work right away. However, in my attempt to create a stimulating environment by introducing this program, I often found them not working any harder than they would have in the more teacher-centered environment. The emerging and somewhat disheartening picture was, again, one in which the students behaved much the same as they would in the traditional classroom.

This behavior is generally in keeping with Dörnyei's (2001) idea that students' level of interest and motivation to begin working will eventually wane. Originally, and when outsiders were in the classroom, they were eager to please, yet when the newness began to wear off and management was no longer involved, their old behavior began to emerge and they could be just as disinterested in this type of classroom as in another. According to observation data, they

forgot materials and again had to be reminded to open their laptops and begin working, much the same as in the traditional classroom. Further, it was obvious from the observation data there was no increase in their work desire or ethic. Coorough (2001:138) describes a "gorgeous high-impact Web animation with resounding musical tracks and sound effects:" yet what I had created, containing similar colorful animation and music, obviously had little if any impact on this population of students. This is again consistent with what Elliott, Adams, and Bruckman (2002) found when they tried to introduce 3D video games into education. Their overall conclusion about assessments was that there was not statically any significance using this medium. Interestingly, this contradicts what Twigg (2004) concluded in her study in the United States in which she used a similar program for at-risk students. Student learning was compared to those students who remained in the more traditional teacher-centered classrooms, of thirty participating community colleges. Of those, 22 showed statistically significant increases in student learning. Again, this suggests that this particular situation perhaps differs because at the root of the circumstances is the students' cultural aspects and academic history, addressed previously and further addressed below, as well as their exceptionally low academic levels in English.

Observing the return to the normal slow pace of work and the unwillingness of the students to immediately start class with an obvious desire to work, the observations reflect no significant lasting differences in their behavior when using the student-centered approach over the teacher-centered approach. During one particular class observation, a small group of girls actually stopped working to begin talking and laughing, and had to be told to "get back to work." One student in particular looked as if she were working while listening to her head-set. As I

surreptitiously approached her desk, I noticed she was actually listening to music and, rather than writing, was drawing pictures on her desk. The addition of music, bright colors, and authentic situations to the leaning program clearly had not influenced this student to work any harder or pay more attention.

Despite my having labeled the parts of the curriculum in numerical order, the students just clicked on a lesson and began the program without any concern for whether or not they had done the previous lesson or understood what was being introduced. They had no concept of building on prior learning or any understanding as to why this was essential, despite the fact that the order they chose had no logic; it was not significant in their eyes. This laissez-faire approach suggested to me that they were merely performing a task so they could claim to have finished and move onto the next lesson.

When they would complete a particular task and take an online assessment, this also did not influence their behavior or learning practice. They simply proceeded with the program regardless of their level of understanding or what order they completed the activities in. Because of the built-in tracking element in this program, students and teacher alike could get immediate feedback on their formative assessments. However, this made little if any impression on the students; they merely proceeded with the program oblivious to the fact that if they did not master it they would comprehend even less in the next lesson.

It is quite possible, given all the data presented above, that perhaps I had gone beyond the students' perceptions and provided data to show the perceptions of myself, management, and

other participating teachers as well. That is highly likely; however, it is all relevant in gaining a more thorough understanding of the data in order to answer the research questions. The next section takes us to the primary research question.

5.5 Main research question: What are female pre-university students' perceptions of learning with technology in a CLIL context in the UAE?

Because this question encompasses all the previous data, it is necessary to organize it so as to draw attention to the themes that have emerged during data analysis and as I begin to draw conclusions. The first theme is that the data reveal the students' lack of understanding of the concept of autonomous learning or building on prior learning—the fundamental requirement and advantage to using this type of technology. Two significant examples follow and illustrate this point more clearly.

5.5.1 Autonomous learning as contradictory and anxiety about teacher's role

A student in one of the focus groups (see focus group C transcript, Appendix 9) and one of the top students, who was expected to easily pass math class, complained about having no free time to use something like this. In response, I asked if she would use this program more if she had more free time, and she replied, "Yeah." She said some class time needed to be "freed up to let her use the program," indicating that she saw it as additional work required by her teacher rather than as an alternative and/or useful learning tool in the curriculum. When I asked if she could see any other benefits to the program, she suggested it would be very helpful for students who want to challenge their placement by taking a challenge exam; if they passed they could move up to another level. After her contribution, another student followed with, "Maybe make a special class for students who want to use this program." A final comment was made by a student who

suggested she was “bored” with the program. (Perhaps “bored” is not the correct English word, but it was the one she used.)

There was one additional set of data which further demonstrated the students’ lack of recognition for autonomous, independent self-study. Because the students were doing independent seat work, when I was not helping with technology problems I had, on occasion, the advantage of being able to examine their homework more closely than I did in the more traditional classroom. Prior to this study, homework checks were done at the beginning of class and I often suspected the work was merely copied. Since I had no proof, I merely ticked the box that it had been completed, but did not check for mistakes. I left that up to the students. I was at times able to actually watch them complete it, and then I could check it and return it for immediate feedback while simultaneously observing their behaviors.

Beginning to see a pattern of common mistakes in that homework, I would interrupt students and explain the problematic areas and then return their homework, insisting that corrections be made. Often this was not done, as the students appeared to be under the impression that once it was completed no additional work was required. I came to recognize that correcting homework, much like repeating the lessons when the concept was not grasped, was merely extra work to them, and unless they were made to do it while I watched, they failed to do so. Eventually I designed a spreadsheet with the student‘s names and their current status in the program in an attempt to help keep them on track and recognize where they should be in order to finish on time. When I placed the spreadsheet in the classroom for the students to monitor and to remember that it also gave them credit for homework completion, I could see the confusion in their faces and

they began to question why I had not given them credit for work that was, in their opinion, completed. When I explained it had not been completed properly, it merely seemed to burden them with additional work. When they were forced to do it, the obvious frustration and lack of recognition of the benefits were physically visible in their body language and comments, the latter being mostly in Arabic. I concluded that homework, in their view, was merely another task to perform and the immediate feedback essentially was ignored. I suspect homework never has been used to help reinforce what had been taught, but was simply seen as one more activity to be completed. Ultimately, as they used this program, they began to recognize that, at least to them; it meant required extra work on their part.

As I further searched through my notes, I came across one particular observation concerning my observation of a class in which the teacher was initially describing the upcoming study. It was a low-level class and after the explanation, one student asked, "You mean you won't teach us anymore?" There was obvious concern in her voice and she appeared uneasy as she tried to imagine learning math on her own. Yet nowhere was this revealed in the initial questionnaire. The teacher attempted to alleviate her fears by explaining that she would be in the room while the students were learning from the computer and that anyone who had questions could still ask. Based on the students' facial expressions and comments, I noticed their apprehension and hesitance toward such computer-learning. One student even said, "But we want you to teach us." The teacher went on to assure them that if it was not working out, she would return to teaching them, but simply asked if they would give it a try. They agreed, at least from all appearances. This echoes the premise of Celce-Murcia (2001) that students are accustomed to an obligatory and non-negotiable curriculum. My attempt to change that, after so many years, and for such a

short time, obviously caused some serious discomfort, despite our repeated attempts to reassure the students.

This is pertinent because the answer to the question is not so much "yes" or "no," they liked it or they did not like it, but rather, it was so foreign to their method of learning that they could not accurately answer the research question because they simply did not have sufficient knowledge to be autonomous learners. One final data piece corroborates my suspicions regarding the students' lack of understanding of the program benefits. Again, mindful of the one teacher who asked if she could simultaneously teach while using this program, I went back to the computer to examine one further piece of data. I carefully examined the online times for her students and compared them to the other classes. The findings suggested that the students basically used the software during class and after her lecture, which she was observing, but basically little or no time was spent outside of class. For the most part, their timings were much less than any other classes overall. This suggests that they used the program while they were made to, but did not take advantage of it for further study outside of class. These concerns however, are restricted to the scope of this research project, and are applicable only to those very people.

5.5.2 Summative assessments

At this juncture, I need to revisit the original design of the study. When it began, the plan was to compare the marks of the students participating to those who did not participate and see if there was any noticeable difference. As discussed previously, I was unable to do this in the end because of the way the semester assessments were changed and ultimately redesigned by central services.. This was most unfortunate, as there was no individual assessment for the students

solely using the software to learn, because the only assessment covering the module under study was also linked with other modules as well, due to obligatory schedule changes throughout the college. Therefore, I was not able to carry out this part of the plan for my study, as this information was not available. As disappointing as this is, I still believe I have sufficient data to determine the students' perceptive of this pedagogical approach.

5.6 Discussion of the findings

Initially there were glaring differences between students' responses to research questions about the use of this program and whether it was beneficial to them. Although they originally appeared interested during the observations, the data ultimately shows this was not the case. I believe this is reconciled, as clearly the data shows the interest in the program simply began to wane as the study progressed. Unfortunately, as revealed previously, the newness of the program eventually wore off and the students began to act much the same as they would during teacher-centered lessons. Given this information, I have no choice but to conclude that these students were altering their behavior in response to having someone of authority visiting their classes; they were eager to make a good impression, yet ultimately that was artificial and the behavior did not last very long. Obviously, the Hawthorne effect came into play here, despite my attempts to avoid it. Again, the data revealed little understanding on the students' part regarding autonomous learning.

One final discrepancy occurred during the focus group A interview that ultimately provided invaluable data. This group of students came from one of the lowest level classes; Mr. Sam, their former math teacher whom they admired so greatly, volunteered to translate for me during

the focus group discussion. His accounts of the comments of the students in this section (see transcripts focus group A, Appendix 8) begin with:

> *Student 1: "*The student said the program is very good, it is easier than listening to the teacher, easier to understand, it's detailed, it's easier for the student and the teacher as well, because the teacher doesn't need to repeat things, we can repeat it [meaning they can listen to the lessons over and over] and it's very useful."
>
> *Student 2:* "Yes, listening and accessing the program was easier to understand the subject than with the teacher."
>
> *Student 3:* "The program is easy, or it was easy for her, and, um, and it was useful during exams because she could go back to it and use it."

These comments were particularly surprising because I knew the students would not make use of the program to prepare for exams. Student 2 in particular admittedly did not study, and in the end she failed. Most of the students were not on track to pass.

Huda (a pseudonym), the lone dissenting student, although not verbally identified, for all intents and purposes assumed the leader position among her peers, making her contribution to the focus group invaluable. Remarkably, this particular student dodged the peer pressure and spoke directly and truthfully, saying (as translated by Mr. Sam):

> "For this student, she used the program, obviously, but it doesn't matter to her, whether to learn using the program or the teacher, but she prefers the teacher. She prefers to use the teacher during that [class] time and this outside of class."

She was passing the class at the time, but her grades were borderline. What is most significant here, however, is that Huda, by giving this response, justified my assumption about the power

structure in this culture. Had there been any previous doubt that perhaps that played a considerable role in the outcome of the data, she put that suspicion to rest with her statement. She was in a situation where she could impress a person she greatly admired, Mr. Sam, knowing he was an advocate of the program, yet she voluntarily chose instead to speak the truth. This is significant because apparently the environment within the focus group was such that she felt empowered to genuinely speak her mind; this gives further relevance to the data she and some of her peers provided. She also ran the risk of perhaps going against the grain, not only with what had previously been discussed by her peers but also perhaps insulting me, knowing full well this was the program that I had created. From all appearances she ignored not only the peer pressure but any related to the power structure as well, which further adds validity not only to her response but to the data that perhaps previously was questionable due to the power issue (see transcript focus group A, Appendix 8).

Most of the students in this class had an International English Language Testing Standard (IELTS) band at the end of the year of level 3, which labeled them as a very limited user, one who "conveys and understands only general meaning in very familiar situations and for whom frequent breakdowns in communication occur" (O'Connell 2002:7). Many of the students eventually were withdrawn from the college because of their failures and did not qualify for a challenge exam.

I can only assume the first three students' probable intention was to say the "correct" (or desired) comment, given that Mr. Sam, and perhaps I as well, may have unintentionally given the impression that we advocated the significance of this program (although such words were never

directly spoken). Cohen et al. (2001) suggest precautions for reducing this Hawthorne effect, and although those precautions were taken in this case, it is not surprising the students gave responses that showed them behaving differently when subjected to inquiry, especially knowing their desire to please Mr. Sam.

5.7 An exception to the findings

The data provided above are conclusive for all the students participating except one. Originally, when this lone student responded to the software in a different manner, I was puzzled; ultimately, however, it was a pleasant surprise, and one that suggests the need for further research for this type of program, which shall be addressed further in the following chapter. This student alone did not fit the above student description but varied considerably. Her pseudonym is "Fatima" and she was a returning student, meaning she had attended college previously and, for one reason or another, had withdrawn only to be readmitted this semester. When she had originally enrolled in the college, she had been a student in the Higher Diploma Program. The Foundations Program was not a program she belonged in, but she had been placed there because readmitted students must go where there is a place for them. Her skill level was clearly superior to the students with whom she was now attending class. She was not an at-risk or Foundations-level student, and she had been told that once she passed this level she would be able to challenge into a higher level program. Initially, however, she needed to complete at least one semester here, where there was an opening.

Fatima's work ethic, attendance, study skills, and general behavior were nothing like what has been previously described. She always did her homework, was extremely respectful, and did not

participate in any behavior that would have been seen as inappropriate or non-academic in any way. When this study began, Fatima, along with all the other students, was shown a demonstration of what they would begin to do the following week. They were shown the location of the program on the college portal and how to access it via the Internet, and were told to make sure they brought the proper equipment the following week to begin the initial program trial. I also mentioned during that introduction that the students would be able to access this program from home as well. Apparently that is what Fatima did.

On the first day of in-class program use, as I started the process, Fatima raised her hand and told me she had completed the first part of the program at home over the weekend. I asked whether she had actually completed it all, and she insisted she had. A look at the teacher view of the program confirmed that, not surprisingly, she was telling the truth. I had not even considered this a possibility. Left with nothing else to tell her, I suggested she could assist me in helping the other students, who had not started or did not remember how to access the program. In the end Fatima proved quite valuable as a peer tutor; however, I was extremely disappointed at not having anticipated this—the very thing I had hoped would actually occur, though not necessarily to such a degree. Had I prepared sufficiently, I would have had more challenging and worthwhile work for her during class time. Instead, she was indeed helpful, and I am certain she did benefit to some degree from the peer tutoring. Nevertheless, if she takes the initiative to work ahead of her peers, she should ultimately not be held back by the other students and at least be provided with work to help her grow academically, rather than help her peers.

Because of this surprising occurrence, I was certainly more prepared during the remaining trail of the software, after the determination was made to complete the study, and after the first questionnaire was evaluated. Not only did Fatima ultimately work on more challenging problems, she was also given permission to continue into the next module and work ahead independently, if she wanted. This she did, and remained ahead of the other students for the remaining weeks in the semester; she also finished the semester with one of the highest averages in all the classes.

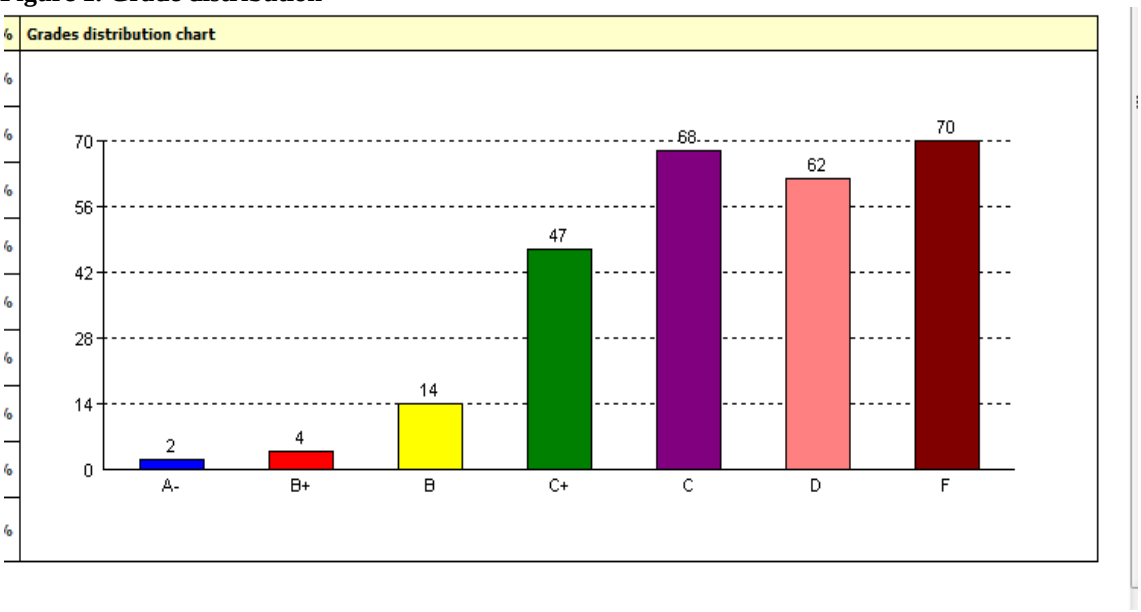
5.8 Analysis and discussion of the results

Although the student participants have been described in detail in previous chapters, it was only during the process of this study that more information on their language skill levels became apparent. Accurately drawn conclusions to the research questions necessitate the divulgence of this information, which, though not incorporated in those questions or the previously presented student backgrounds, speaks to the students' overall aptitudes.

Details of the students' language levels addressed in prior chapters are detailed more fully in Figure 1, which shows the results of their mid-semester English exams during their second semester in college (given in April, during the actual study). The chart indicates that of the 265 students assessed at this point, both participating and non-participating, only the top two students received an A-, while half scored either a D or an F—despite the fact that they were in the lowest-level college classes offered in the country, where they were given remediation and attended more than the regular twenty hours of English per week. Further, it is worth noting that these students entered college with scores that placed them in this class, with the understanding

that they indeed had the skills to pass at this level. However, not only did they earn no A's, the highest percentage of students scored F on the reading, writing, listening, and speaking exams in English—just 10 weeks short of the completion of their initial year in college. Moreover, 27 percent of the students were in danger of failing English at this point, while, even more important at the time, 49 percent scored either D or F on this exam.

Figure 1. Grade distribution



The students' overall mathematics grades were significantly better. Again, however, math is more of a universal language, and the grades did not really reflect the crucial component that needed to be attended to, their overall skill level in English. This information is significant because, as Lonigan (2009) suggests, "reading skills make up the cornerstone of children's academic success." Anecdotally, one of the Arabic-speaking teachers who helped with questionnaire translations and class explanations told me that during this study, even when writing or speaking in Arabic, the students had trouble finding the Arabic words to use. According to her, "They can't even express themselves appropriately in Arabic, and often ask me

for help." This creates a unique situation not only because of the distinctive characteristics of the students in the study, but because of their overall academic levels as well and contributes to the idea of the distinctiveness of this particular population of students under study.

5.8.1 Themes

Two conflicting themes have emerged from the data in this study, along with one exception to those arguments. The first is that the students tended to see the math software program as beneficial, but nevertheless preferred being instructed by a teacher. Their comfortable and familiar mode of operation was teacher-centered, and regardless of the supposed software advantages, they preferred what they were accustomed to.

The two schools of thought or themes regarding the answer to this question, as discussed earlier in this chapter, can both be explained here. The many complex characteristics of the students under study have been addressed previously; understandably, they entail a complicated and multifaceted position when evaluated. The findings and results of this particular research project hold true only for this particular situation, and that must include a return to the previous discussion of the concept of culture on evaluation of their success in an educational situation. Although the Koranic style is taking a back seat presently, I must remember that fundamentally, that is the methodology my students have used for 12 years, before entering college. It is still happening somewhat today, according to the Emirati math teacher mentioned earlier. Asking for such a conceptual leap in such a short time, almost in hind sight, seems doomed to failure. It is uniquely different from the educational practice I have asked them to undertake for 10 weeks, and despite the fact that I seem them mesmerized by their cell phones and laptops within the

social context of their lives, it is clearly not transferrable to their academic lives. My beliefs about behaviors and academia in general conflict with and contradict those of the students under study, and include a very different ontology.

It was evident that these students preferred the teacher-centered classroom, almost overwhelmingly. Although they were willing to give the new program a try, for them the teacher was the ultimate authority and needed to remain in the classroom to do the lecturing, regardless of any possible advantages to altering that approach. Some chose to respond untruthfully to the "outsiders" concerning their expectations of this medium of delivery. This is ultimately not surprising, given the cultural importance of the prestigious visitors. Because of the significant social roles these visitors played in their lives, the students were eager to impress them. Ultimately, though, I conclude that the notion of independent study, for these particular students, who experienced a unique educational environment prior to college, is seen more as a hindrance or not necessarily the approach to learning whereby they will achieve success.

Reading further through my observation notes regarding off-task behaviors throughout the end of the study, I began to realize that learning using this medium seemed to be much the same as teacher-centered; there was no noticeable incentive to work any harder, nor was any apparent improvement in interest demonstrated. Tuksinvarajarn and Todd (2009) say that when creating a new delivery, a user-friendly design that is aesthetically pleasing is a good starting place. That was clearly not enough for the students in this study. They could just as easily ignore the colorful, authentic applications as they could the teacher lecturing in front of the class—with the one exception of Fatima.

In one particular portion of the software, in which I was teaching ratios and proportions, a video clip showed a dirty wall in the hallway that had been stained and I discussed the possibility of painting it. Picking out the color blue and using different combinations of blue and white to come up with a color that was not too bright, I ultimately found a proportion one part white and two parts blue, two parts white and four parts blue, etc. I designed the lesson so that together, apparently accidently, we discovered they were the same color. In another portion of that same section, I explained how old the earth was and introduced scientific notation to the students. I included a video of the Earth captured from Google Earth, and I discussed how scientists use a 'shortcut' to write very large numbers, and I zoomed in on the UAE in the video, as the Earth rotated on its axis. (see appendix 11).

Both of these activities were originally planned to be authentic learning experiences in which the students watched me determine the final color to paint the wall and learned about large numbers, watching the world spin and end up on their hometown. It was clearly not enough to involve these students visually; apparently more hands-on involvement was required with them to actually spark an interest. Such autonomous learning required a certain amount of discipline in the students. In hindsight, given their history and background, it ultimately should not be surprising that they lack that ability. Learner autonomy is quite an abstract leap for students who have been exposed only to teacher-centered and inflexible learning situations. Genesee (1995) suggests that the content must be of interest or valuable to the learner, in order to stimulate them to want to explore the concept further. Perhaps the activities I chose were not of interest to the students and that is why they did not work at understanding. Semali and Stambach (1997) also suggest that regarding the curriculum, it must be grounded in the local ways of thinking and

knowing and being, and further it must acknowledge their individual identities. Clearly, the curriculum I created came from a Western perspective, where I hoped to stimulate student autonomy and foster growth via independent study. In such a short time, and given what I know today, I almost feel it should have been anticipated. I shall address this further in the next chapter.

In fairness to the students, there were also printing problems with one of the particular pages in the software package, which added to the frustration. Once this was discovered, I decided it was not imperative that the students print this page and suggested that they raise their hands once it was completed so I could observe and record their individual level of comprehension from there. This also gave me an opportunity to suggest to those who had not done so well that perhaps they could go back and work on the lesson again in an attempt to aid in comprehension. Few if any took advantage of these suggestions.

In addition, because some of the files were large, at times the computers tended to be slow and the girls would sit for a while, watching a seemingly endless hourglass. Granted, this required patience, and there were frustrations beyond their control and mine. However, there were also many cases in which the work was not done as it should have been, again giving me the impression that their priority was simply to finish even without a complete understanding.

Often when visiting the other classes, I would end up assisting with technical problems or helping the teacher who was unsure about certain aspects of the program. This showed that more training needed to be made available to the other teachers so they could be more familiar with

the program. It was not possible in this case; the teachers were doing me a favor by giving the software a trial at all, and in-depth training would take up more spare time than they might be willing or able to give up. As McKernan (1996) suggests, most teachers work at full capacity or on overload and do not have time even for necessary training. Moreover, although I was granted reduced hours, these teachers were not.

Basically, through this study, I gained a fuller understanding of the reason this program was not suitable for these students, with the one exception of Fatima. The findings herein are contextualized and applicable to these specific students, and as such cannot be generalized for Foundations Program students in other locations.

Chapter 6 Conclusion

6.1 Summary of main findings

The purpose of this study has been to determine students' perceptions of the use of an interactive mathematics software program. Given that the last chapter highlighted the dissimilarities in the various themes that arose this chapter examines the implications of the findings for the research question. Initially I summarize the findings from the research sub-questions 1, 2, and 3, then answer the main research question and establish the conclusions. Subsequently I shall make recommendations for the future direction of the software, given the population under study and the sociocultural aspect of their perceptions. The chapter concludes with personal reflections on the thesis journey and the way forward.

6.2 Sub-question 1: What are the students' perceptions of using technology?

The initial theme to emerge in the previous chapter suggested the use of technology was clearly expected by the students. The college required them to purchase laptops before they were enrolled in the college and parents and students alike were fully aware of this requirement. When I moved toward their laptops, both as part of the observations and when I was assisting them during those observations, it was interesting to see the variety of downloaded programs, pictures, and features they had included as part of their everyday technology use. They used not only their laptops but their Blackberries as well and it was apparent that this was an intrinsic part of their lives. The conflict arose when I tried to make it a part of their academic life as well. That was a difficult step. Aside from my observations, the findings from Chapter 5's analysis of the questionnaires suggest that the students had used technology in the past and had little if any reservations about using it again, albeit the concern for their lack of English skills. They spent a

great deal of time on a computer each week and some free responses indicated their desire to have a math program similar to the one I created, so they could utilize it at home. This echoes the findings presented in the literature review, where the use of technology is truly expected by students.

6.3 Sub-question 2: What are the students' perceptions of the subject matter?

There were few if any reservations regarding the subject matter. The students suggested they were good in math in high school (less than 25 percent of them did not enjoy it prior to college) and felt they were continuing with that success in tertiary education. Undoubtedly, the subject matter was not a concern for most of these students. They had to take a high school departure exam and, according to their test scores, were placed in this class and assumed capable of passing. Given their interpretation of their success in mathematics classes prior to this study, it appears the data reflected a positive opinion on the subject matter.

6.4 Sub-question 3: What are the students' perceptions of this particular learning style/approach?

In order to determine the students' perceptions, I first needed to hear from them via the questionnaires and focus groups, but additionally I was looking for a positive change with regard to their learning and classroom behavior. As there is obviously a relationship between the two, I was hoping to recognize an improvement in the students' behaviors from their traditional classroom routine. I also needed to determine what behavioral consequences were indeed responsible for that change, and whether the interactive program was the basis for that change. Then the program could ultimately be said to have made a difference for them. If I determined that the change was of a positive manner, I could ultimately ascertain that it was indeed

beneficial for the students. This did not occur during the study with the exception of student we call Fatima. It was contradictory for the students in that it did not coincide with what was comfortable and familiar. In hind sight, this study almost seems like a fragmented modern technological interruption to the indigenous curriculum they are accustomed to and the discomfort of exploring on their own using a learner-centered pedagogy was extremely problematic. They preferred the teacher-controlled method in which they were told ahead of time what they needed to memorize and how to memorize it so they could pass the test. They were not accustomed from previous math classes to the independent and cognitive processes required to be successful in this learning pedagogy and aside from initially finding the program interesting, they ultimately returned to their customary classroom behaviors.

Essentially, in creating this program I introduced a change in the curriculum that attempted to develop students as autonomous learners in the hopes of introducing an opportunity for them to think and make "critically informed choices." My justification for this type of approach was constructivist theory, which requires "free and unrestricted thought" (McKernan 2008:40). Using their imagination, especially in a required basic college math class, was unfamiliar and uncomfortable for the students, and they were not prepared for this type of free thought. Thus, I introduced a type of "collision" between what they were used to and the interactive math program. Albeit a potentially useful program for certain populations of students, in this context it was largely an unpopular medium of content delivery. Therefore, their perception was that they did not enjoy it, did not learn anymore from it, and did not want to continue with it. This is in no way a reflection on their innate abilities, but rather their practice, and they could not understand, because it was so foreign to them, the idea of total student independence in the

classroom. This point is made clearer in a response to one of my questions during a focus group discussion. The student was one of the highest-level performers and (to paraphrase; see Appendix 9) she said she gave it a serious try, knowing she should do what her teacher said to do but not wanting to continue once she got started because she could not get sufficient help from her teacher. I found it very ironic that she was able to communicate with me so clearly, yet had missed the point that she could stop the program and ask her regular classroom teacher for an explanation if she came across something she did not understand on the program—a point that was stressed over and over during the actual program. She seemed to describe the situation as hopeless if she did not comprehend something. Throughout the program delivery I placed recorded messages on which I would remind the students to stop at any time to ask for help if they did not understand the material, or to be sure and go back again if they felt they needed more revision. Apparently this fell on deaf ears in a context of overwhelming dependence on the classroom teacher and the familiar teacher-centered medium of delivery.

This program is designed so that students can assess their learning as they progress through it, but these students did not seem to comprehend this. I was hopeful the students would take it upon themselves to determine what they knew and did not know and repeat lessons until they attained a sufficient score on the formative assessments before progressing. Davis and Gottliev (2008) found that their students were able to do this; however, their study was conducted with students who were mathematics majors, rather than students enrolled in a developmental math course. Given the differences in participant backgrounds, the differing results should not be surprising.

6.5 Main research question: What are female pre-university students' perceptions of learning with technology in a CLIL context in the UAE?

In order to answer this question, answers to the previous sub-questions were imperative. I could not accurately determine their perception of learning with technology if I did not initially question their perception of their skill level with the subject matter and, separately, with the use of technology as well as their perception of this type of approach.

There were four main findings which are now addressed. First, it is apparent that the first-year Foundations-level students who participated in this study liked the idea of the teacher being firmly in charge and guiding their learning. Although I tried to stimulate interest using the non-traditional methods and creating a whole new classroom environment, I failed to do so at this point in their academic careers. From the data, specifically sub-question 1, it did not appear they necessarily had the knocked-down egos that were suggested in Chapter 1, but rather felt confident with their ability to pass math class, as long as their teacher remained the one who guided them through the process rather than leaving them to their own devices.

Second, the process of providing relevance to the topics also failed to stimulate the students. Relevant or not, they were disinterested in approaching the learning process with any enthusiasm, but rather anxious to complete the process according to their teacher‘s guidance, without necessarily gaining further knowledge. As mentioned in Chapter 1, the students are ultimately judged by their test scores and they are fully aware of that. In order to be successful, they need to score 60 percent or above, and they feel it is more achievable with the teacher

guiding the process. Just because they are intrigued by their cell phones or chats on their laptops does not necessarily translate to the same level of fascination using this medium in academic subjects. Although students tend to prefer active learning, as stated in Chapter 1, these students preferred to pass and believed that could ultimately happen with the teacher, rather than by relying on their own autonomous learning. I was indeed given total freedom by my administration to create this curriculum, but ultimately the students preferred the way they had always learned.

Initially I questioned whether this would have worked for me as a student; would I have been more intrinsically interested in the subject, studying it more deeply and becoming more skilled at an earlier age? The answer for my students at the tertiary level is, quite simply, no. Perhaps earlier, but at this level, the interest, stimulation, and interactivity did not generate to increased levels of student interest and attainment. Further, they did not spend more time on the subject, only on what was required.

Nor did the appealing delivery of the program improve their interest in learning math. I assumed if they had access to an alternative resource, they would be stimulated to grow academically, learn the content, and improve their study skills, but that was not the case. I further assumed they would jump at the chance to take advantage of the many benefits the program provided. What I found, however, was contrary to this assumption. The students were indifferent to the advantages and, for the most part, simply remained inattentive throughout their time using the program.

I realize many of these students have innate abilities and I suggested in Chapter 1 that those skills could be learned and enjoyed while the students were exploring. However, this study apparently did not provide that opportunity for them. Despite the fact that the work had relevance and I believed the classrooms were situated in environments that were positive, the behaviors of the students remained the same as in the traditional classroom. I did not necessarily foster personal or independent growth with regard to learning as I had initially hoped.

Before this study took place, I was especially sure that one particular part of the program would grasp their interest: the section in which I was actually driving in my car. There was exciting music playing and I eventually ended up at a place of business (see "Appendix 12"). I had previously visited this business—a money exchange company—and through several letters from me and from my supervisor I finally gained permission to go behind the scenes there, exchange money, and record the process, all in order to authenticate student learning. Someone with me was doing the recording and we edited the video to show a very stimulating and enjoyable learning experience. Ultimately the students were indifferent to this particular section of the program.

The third relevant finding was that despite all the negative data, including free responses as well as data obtained from the focus groups, the comments signify that the students were honestly seeing possible advantages in certain specific situations. For example, it might be beneficial to use as a type of blended-learning tool, but to ultimately replace the teacher and suggest they would benefit from a total student-centered pedagogy was not a correct conclusion. The interactive program as a medium of delivery for this particular population of students can be

beneficial only in the event of a possible substitute during extended absences or perhaps as additional study material. The program could also be used in conjunction with a teacher, as long as the teacher leads the presentation of the curriculum. During the presentation, breaks are imperative, so the teacher can reiterate what was presented, provide examples that the students must try for themselves, answer questions, and lead the learning from their responses, making sure they remained attentive and on task. This could be construed as very similar to simply having the teacher present the material without the use of technology; however, the technology allows for more authentic applications to be introduced in the learning process rather than just examples to read about in the textbook. Allowing the students the freedom to explore this on their own, however, is not conducive to a beneficial learning experience, at least not for this population of students.

The fourth and last finding regarding the data for this project was that the apparent pattern of reliance on the traditional classroom confirms the likelihood that the habits of the students twelve years prior to entering college had become so ingrained that just less than three months of a non-traditional learning medium was simply not sufficient to convince many of them of its advantages. It was not the fault of the software or the subject matter; it was not tied to their lack of confidence in the subject matter or their lack of English skills; rather, the experience provided results that were very similar to the teacher-led medium: that higher-level students generally seemed to be on-task and working as the program was designed, though how much learning was actually taking place was not obvious. Additionally, these were the same students who were expected to eventually pass at the end of the semester and who were attentive and on-task during the teacher-centered classroom as well. The lower-level students, although initially keen on

giving the software program a try, because they were away from the structured classroom environment to which they were so accustomed, they struggled between competing tendencies, so to speak. They were so unfamiliar with the ways of presenting the materials that they failed to take advantage of what I deemed "opportunities" presented. It was easy to see how, in due course, this would become the same problematic learning experience that happened in the traditional classroom.

6.6 Implications of the findings

Technology certainly has advantages in the classroom as far as delivering content is concerned. However, it needs to be used cautiously as it is beneficial for specific populations; the students with no recognition of their meta-cognitive skills and the students with poor study habits would benefit more from the teacher-centered and teacher-guided classroom instruction. These students rely on the teacher for guidance and close monitoring; providing the freedom to explore on their own was not successful. Once they achieve the fundamentals of the subject and are cognizant of the rigor required for academic subjects, technology could potentially benefit them in that they can study at their own pace, they can repeat as often as they like, their learning becomes more meaningful and authentic, and they can learn asynchronously. These all bode well for using learning technology, however that change in pedagogy needs to happen gradually. Initially it needs to be very much a teacher facilitated experience, and a blended learning approach would be the best. As the students progressed, and if they were willing, the content could indeed be offered as totally autonomous, however according to the findings here, that curriculum should be democratic and acknowledge their individual heritages and experiences.

The data further reveals that although I changed pedagogical approaches, the students approached learning much the same as they did in the teacher-centered classroom. I hoped for increased level of interest in understanding the content, sparked by the visually appealing presentation of the curriculum. I anticipated a deeper level of understanding, brought on by active engagement in the program. None of this materialized. All levels of students approached this medium much the same as they did the traditional classroom setting. They could just as easily come to ignore the colorful, authentic applications as they could the teacher lecturing in front of the class. I presume, based on all the data accumulated, that learning through this medium seems, at least to these students, to be much the same as teacher-centered learning, with no noticeable incentive to work any harder, nor any apparent increase in enthusiasm—with the one exception of Fatima, discussed earlier.

Often in Foundations-level programs, teaching study skills is a required part of the curriculum. Therefore, because the students have not attained these skills, this type of learning approach in any subject at such a level could ultimately produce the same results. This reaffirms the findings of Howell (2008), who suggests, "It was evident from the observation data in the classroom that these students are used to and still prefer the teacher to be the centre of attention" (p.168).

Further implications for me as a teacher and researcher are not to assume that because I believe a program would have worked for me, then naturally my students will benefit from it. Despite my earlier assumptions, these students have shown there is little justification for such speculation. This is because frequently they are lacking either the knowledge or discipline to study appropriately and what is required, in order to be successful in college. It is in no way reflective

of their abilities, but rather a result of their educational experiences to date, and the lack of role models prior to entering college. Many of the students are quite clever and have a great deal of potential, however, that is not always utilized.

I need to remember that "societies developed differently on different continents because of differences in continental environments" (Diamond 1999:426). It is significant to recognize that Diamond is referring to innumerable examples of those with more technological and military advantages, "spreading at the expense of other groups, until either the latter groups became replaced or everyone came to share the new advantages." The majority of those examples include violence, and despite the fact that that is irrelevant in this particular study, the phenomena are similar in that the developing country of the UAE is doing its best to acquire the "latter's technological …advantages." Ultimately, the UAE is moving forward, yet still holding on to the customs of the past, which is expected. Therefore, this process needs to proceed cautiously—as Chomsky (2007:6) suggests, allowing these people their "own lives, [and] not have their society and culture destroyed," according to our normal mode of functioning. Given the very complex world of social interactions that exists, often unbeknownst to some among its very members, I would not be privy to such traditions, and it would have been just as easy for me to fault the students for inappropriate behavior. Yet once Huda stepped forward in the focus group and, despite the peer pressure, admitted readily that this software program was not appropriate for her or her classmates, I recognized the determination she possessed and the courage it took on her part to go against the grain. Thus, rather than only finding fault with the students, these findings, given the sociocultural aspect, suggest that, as recommended above, some of the students in this study were indeed expected to pass and ultimately would be

successful in college. They just preferred a teacher to monitor their progress closely, because they were not sufficiently disciplined to do so themselves, or at least did not believe they were. Given the lack of adequate or proper study skills, the students showed little recognition for the desire to solve problems of any substance. This further indicates that the notion of social reconstructionism—or rather, to use this particular class as an agency for academic and personal change—was contradictory to the values in the students' lives. In fact, the failure of this study to make a positive difference in their academic experience was through no fault of theirs.

Although Harlen (2006) advocates that a teacher must convince students to focus on learning tasks that they do not find interesting, while Dörnyei (2001) adds that the teacher must then work to retain their interest so they do not abandon those tasks—and although I did indeed make those attempts in creating this program—that was not enough for the students under study here. Most likely, this was not only because of the autonomy required in this particular situation, but, as McKernan (2008:xvi) suggests, it is a difficult challenge getting students to "view education as the construction of personal meaning rather than the reproduction of meaning." Dörnyei (2001) echoes this concern and reminds us to consider individualistic and societal perspectives in order to better study motivation. This could go a long way to explaining the findings in this study as, ultimately, I was expecting a great conceptual leap for these students and the findings are therefore not all that surprising.

6.7 Recommendations

As discussed in previous chapters, educational reform is obviously a priority for the UAE and its development, but this will involve more than attempting an alternative pedagogy. According to *The National* (Editorial 2011), emphasizing the impact teachers make on students and showing those teachers the respect they deserve is an important first step. "Emirati teachers, who are in particularly short supply, are tempted by pay and status to move to other fields of work." As revealed in Chapter 3, teaching is a very low-status job in this country. Ultimately that must change, and students should no longer enter the classroom with the notion of making the teacher conform to their inclinations. If education ultimately becomes a priority and more central I the lives of the students, perhaps then they can begin to take their scholarly obligations more seriously and show more respect to the teacher. Conceivably this type of autonomous pedagogy could enjoy more success. At present, with this level of student, it does not.

Another recommendation might be to use this type of program for cases in which a student wants to challenge a particular course. Obviously this would involve students at a higher skill level who, if they are able to use this program to brush up on their skills and then take a challenge assessment, would not have to sit through an entire semester in a class and could possibly progress through the program faster.

6.7.1 Recommendations with regard to the software program itself

Although I have stated before that this program has potential, the technology has improved just since this study began and can continually be improved. For example, students would be locked out of a following lesson if they do not score accordingly on a current lesson, then allowed to

proceed only after they have learned the content and obtained the appropriate score on the formative assessment. Another idea would be to set up the program so that the students would only be able to proceed through the lesson in the correct numerical order, so that future lessons would be unavailable until they had finished the prior lesson and attained sufficient scores. Many tools are available today, such as Google Plus and Wimba, which I am presently using in teaching online courses; perhaps these could be utilized with students, as well as creating programs using flash animation and Prezis, which eventually could provide many more authentic activities and a more enjoyable experience. Again, though, all of these ideas and the change in pedagogy where they explore on their own, independently and individualized, would need to be introduced in their early academic years so that ultimately they would be more comfortable using it in college. This assumption is substantiated by two sources: first a study of young Emiratis in late 2010, according to Fitch and Shaheen (2010), in which the researchers determined that a shift in preference could be reversed with "education and career guidance at an early state"; secondly, "prerequisites for employment" require that the pupils must cultivate computer literacy from the very beginning" if they are to be competitive for jobs in a global labor market (*National* Editorial 2010b).

6.8 Suggestions for further research

With the vast financial resources available to the UAE government, and so much emphasis placed recently on the benefits of technology in the classroom, along with modernization, it is significant to identify the particular population that would indeed benefit from its use. It would be futile for students at the college level to suddenly change their pedagogy and the money could be better used with a slower progression of remediation, gradually changing their academic style

from one that is accustomed to learning by rote to one that begins to see the significance of problem-solving activities and authentic applications. This is in line with al Subaihi (2011:18), who suggests "the process of learning and adapting to a new cultural milieu is often an exhausting and painful process." The substantial wealth, therefore, could still benefit the students if it were used in a much different modus operandi. In addition, Fatima was clearly indicative that my program could work for students of higher math skills. This is also quite possible and worthy of further study.

Allowing for total student autonomy would have to be studied in an environment in which students have the option to take classes using this method or the more traditional teacher-centered classroom. Despite a hesitation for students to choose this method of delivery, there could always be an incentive for them to be given the opportunity to finish early if they are disciplined enough to work ahead and not have to wait on the rest of the class. In other words, this would not be their only choice; they could opt in or out. This could entice more students to eventually consider this alternative approach, also warranting further investigation.

The program might also be beneficial duplicated on a CD, however some of the newer laptops no longer allow for the use of CD's. Students would then be able to avoid electronic connectivity issues and the time-consuming downloading of large files. If they do not have Internet access at home (which a very few of the study students did not), they might still be able to work from home at any time. Further, for those who are late in obtaining a laptop, or while their laptop is being repaired, it could allow them to keep up with the other students in the classroom as they could access the program on a library computer.

One could argue that a student in a traditional class could study at any time without a program like this. However, the benefit of the program is that it provides material far beyond what the normal textbook provides. If used, a CD would allow for access to the automated explanations and examples as well as the authentic applications, when and where needed. One student suggested that all eight modules should be made available, not only the ones studied here—which is indeed true if this medium of delivery is made available to future students. A study where this is introduced would also be worthy of consideration.

6.9 Changes in teaching philosophy

When I began the EdD program in 2005, my knowledge of a non-western educational theory was virtually nonexistent and I had no regard for the cognitive systems necessary for learning in different cultures. This study, though disappointing in some respects, ultimately provided valuable data. I now recognize I need to cautiously approach changes in the classroom given the fundamental differences that exist within our cultures.

Through reading Foucault, I was inspired to confront what we believe with an open mind and remain cognizant of the structures of thought in modernity as underpinned by history. I could not have imagined when I began this study that all the work it entailed would show little or no improvement in students' classroom behavior. However, after closer examination of their history and the Koranic cultural, it is not as if the program has no potential in this environment; rather, change must happen at different levels and in a slower process than I had anticipated. Foucault suggests we are all influenced by dominant practices within our own society. Throughout the course of human history, as we have ultimately been transformed to the

individuals we are today, we have evolved based on social constructions rather than just natural facts. We have been taught how to practice behaviors within a complex arena, which is what underpins the results of the social process. That is again why it was imperative that, with regard to this study, I seek the students' feedback and input in an attempt to understand their reasoning, rather than attempting to construct it for myself.

As Oksala (2007:27) affirms, rather than look for great individual discoveries, we should dig "down deep into the soul of our thought to define larger timescales and the more general modes of thinking that lie behind the individual's diverse opinions and actions." This is where "all the knowledge of the world has to conform to the human way of experiencing it" (p. 31). That quote has helped me to understand the students' thought processes. I suppose what made an impression on me the most is not that the data reveal results different from what I expected in this study, but rather how deeply Foucault understood human nature and cultures and that he had the awareness to recognize that. It would have been so easy to be overly critical of the students and their culture and blame both for the failure of this study to produce the results I anticipated. Ultimately, this has certainly opened my eyes with regard to various paradigms not only in my professional career, but personally as well.

In the end, I believe a full understanding is necessary in order to change our practices, rather than just replace them with others that rely on the same principles. For what is the point of changing our behaviors if we rely on power and knowledge and, as Oksala (2007:99) suggests, ignore "the proliferation of diversity and uniqueness"?

Appendices

Appendix 1. Pre-questionnaire

Math 0155

Questionnaire

1) I was a good math student in high school.	1) كنت طالبة جيدة في مادة الرياضيات في الثانوية العامة .
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** SDA DA A SA	
2) I did not enjoy math in high school.	2) لم أكن أستمتع بدراسة مادة الرياضيات في الثانوية العامة.
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** **SDA** **DA** **A** **SA**	
3) I am a good math student in college.	3) أني طالبة جيدة في مادة الرياضيات في الكلية.
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** SDA DA A SA	
4) I would enjoy learning math using a computer program (the teacher would be in the room).	4) قد أستمتع بدراسة مادة الرياضيات عند استعمال برامج الحاسوب. (بوجود المدرس في غرفة الفصل)

أوافق جدا **أوافق** **لا أوافق** **لا أوافق أبدا** SA A DA SDA	
(5 استعملت برامج الحاسوب في دراستي سابقا.	5) I have studied using computer programs before.
نعم Yes	لا NO
أذا كان الجواب (نعم) فماذا كانت المادة.	If yes, what subject or class was it?
(6 أعتقد أن مهاراتي الحاسوبية تؤهلني أن أتعلم الرياضيات باستعمال برامج الحاسوب.	6) I think my technology skills are good enough to learn math using computer programs.
أوافق جدا **أوافق** **لا أوافق** **لا أوافق أبدا** SA A DA SDA	
(7 لغتي الانكليزية غير كافية لأتعلم الرياضيات باستعمال برامج الحاسوب.	7) My English is not good enough to allow me to learn math using computer programs.
أوافق جدا **أوافق** **لا أوافق** **لا أوافق أبدا** SA A DA SDA	

8) How much time do you spend each week studying math outside of class?	8) كم من الوقت تقضينه في دراسة الرياضيات خارج حصة الرياضيات؟
8) How much time do you spend using your computer each week?	9) كم من الوقت تقضينه في استعمال الحاسوب كل أسبوع؟
10. What is your age?	ما عمرك؟

Appendix 2. Second questionnaire

Math 0155

Questionnaire

1) I enjoyed using the computer to study.	1)استمتع باستخدام الكمبيوتر للدراسة.
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** SDA DA A SA	
2) I enjoy using my laptop to learn math .	2) استمتع باستخدام الكمبيوتر النقال لأتعلم الرياضيات.
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** **SDA** **DA** **A** **SA**	
3) It is hard to learn math from the computer.	3) صعب جدا أن أتعلم الرياضيات من خلال الكمبيوتر.
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** SDA DA A SA	
4) I had difficulty understanding the language and concepts.	4) كان لدي مشكلة في فهم اللغة والمفاهيم الحسابية الأخرى.
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** SDA DA A SA	
5) I liked the videos in the software package.	5) لقد أحببت الفيديو الموجود في برنامج الكمبيوتر

أوافق جدا	أوافق	لا أوافق	لا أوافق أبدا
SA	A	DA	SDA
6) أحب الميزات المتوفرة في برنامج الكمبيوتر.		6) I like the features in the computer program.	
أوافق جدا	أوافق	لا أوافق	لا أوافق أبدا
SA	A	DA	SDA
7) أحب أن أتعلم مواد أخرى باستخدام هذا النوع من برامج الكمبيوتر.		7) I would like to learn other subjects using this type of software.	
أوافق جدا	أوافق	لا أوافق	لا أوافق أبدا
SA	A	DA	SDA
8) استطيع أن أتعلم مادة الرياضيات من خلال الكمبيوتر تماما كما أتعلمه من المدرس.		8) I can learn math just well from the computer as I can from my teacher.	
أوافق جدا	أوافق	لا أوافق	لا أوافق أبدا
SA	A	DA	SDA
9) أعتقد بأن فكرة التعلم من خلال استخدام الكمبيوتر أحيانا ومن خلال المدرس أحيانا أخرى.هي فكرة جيدة		9) I think it would be a good idea to use the computer some times and have my teacher teach me sometimes.	
أوافق جدا	أوافق	لا أوافق	لا أوافق أبدا
SA	A	DA	SDA
10) هل أمضيت وقت أطول في الدراسة عندما استخدمت برنامج الكمبيوتر أو عندما درست الرياضيات باستخدام الطريقة التقليدية؟		10) Did you spend more time studying using this software than you do studying math the traditional way?	
أوافق جدا	أوافق	لا أوافق	لا أوافق أبدا

SDA	DA	A	SA
11) I had more fun learning math this way than having my teacher teach.		11) أمضيت وقتا ممتعا عندما درست الرياضيات من خلال برنامج الكمبيوتر أكثر مما استمتعت بها عندما درستها مع المدرس؟	
لا أوافق أبدا	**لا أوافق**	**أوافق**	**أوافق جدا**
SDA	DA	A	SA
12) What aspects of using this software did you enjoy? Tick any that apply. a. I could work at my own pace b. I like working with my laptop c. It was easy to use d. I prefer this rather than listening to my teacher talk e. I liked the examples f. I liked being able to go back as many times as I needed to get help with something I didn't understand g. I like the idea of being able to use this from home if I want to		عند استخدامك برنامج الكمبيوتر هذا، ما هي أكثر ميزة أمتعتك؟ ضعي اشارة صح عند الاجابة التي تختارينها. أ) استطيع أن أعمل بمفردي. ب) أحب أن أعمل على الكمبيوتر النقال. ت) التعامل مع الكمبيوتر النقال سهل. ث) أفضل العمل على الكمبيوتر أكثر من الاصغاء للمدرس. ج) أحببت الأمثلة ح) أحببت فكرة أنه بامكاني عند الحاجة الرجوع الى الصفحات السابقة عدة مرات للحصول على المساعدة وفهم أي شي لم أفهمه في المرة الأولى. خ) أحب فكرة أنه بامكاني استخدام هذا البرنامج من المنزل عندما أريد ذلك.	
13) What aspects of using this software did you not enjoy? Tick any that apply. a. I didn't like working at my own pace b. I don't like doing my work on my laptop c. It wasn't very easy to use d. I prefer to have my teacher teach me rather than learning on my own e. I didn't like the examples f. Being able to go back as many times		13) ما هي الأشياء التي لم تعجبك في هذا البرنامج؟ ضعي اشارة صح عند الاجابة التي تختارينها. أ) لا أحب العمل بمفردي. ب) لا أحب العمل على الكمبيوتر النقال. ت) لم يكن استخدام هذا البرنامج سهل. ث) أفضل أن أتعلم من خلال مدرستي أكثر من أن أتعلم بمفردي. ج) لم أحب الأمثلة. ح) امكانية الرجوع الى الصفحات السابقة عدة مرات كلما أحتجت الى ذلك لم تساعدني. خ) لن استعمل هذا البرنامج من المنزل على الاطلاق.	

as I needed to wasn't helpful to me g. I would never use this from home	
14) If I could access this software package at any time, and it contained more sections that were included in this math class, I'd use it to help me study outside of class.	14) اذا كان بامكاني أن استخدم هذا البرنامج في أي وقت، واذا كان هذا البرنامج يحتوي على معلومات أكثر من التي تعطى في الفصل، فانه بامكاني استخدام هذا البرنامج كي يساعدني على الدراسة خارج الفصل.
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** SDA DA A SA	
15) I would like to use this type of learning for the next module in math class.	15) أحب استخدام أسلوب التعلم نفسه في الفصل الثاني من مادة الرياضيات.
لا أوافق أبدا **لا أوافق** **أوافق** **أوافق جدا** SDA DA A SA	

Appendix 3. Final questionnaire

1. Now that you've had a chance to use the interactive software a little more, please tick which all that apply:

الآن وقد استعملت لمده كافية برنامج الرياضيات التفاعلي بواسطة الحاسوب فالمطلوب أن تضعي دائرة حول احدى الخيارات التالية:

a. I don't like it and would rather have my teacher teach me.

- لا يعجبني هذا البرنامج وأفضل أ ن يدرسني الأساتذة مباشرة.

b. I prefer to use it rather than having my teacher teach me.

- يعجبني هذا البرنامج وأفضله أكثر من أن يدرسني الأساتذة مباشرة.

c. I like it, but would rather still have my teacher teach me at the same time.

- يعجبني ولكنى أفضل أن يدرسني الأساتذة مباشرة

D. I would prefer to have this only for supplemental studying, if I need it, but don't want to use it otherwise.

-أفضل استعمال هذا البرنامج إذا احتجته كدراسة إضافية فقط وليس كبديل عن تدريس الأساتذة .

2. Do you feel like you can learn as well using this as when your teacher is teaching you?

yes no

-هل تعتقدي انك باستعمال هذا البرنامج ستستفيدين تماما كتدريس الأساتذة مباشرة ؟

نعم لا

3. Overall, I enjoyed using this interactive software and would like to use it more.

yes no

-عموما استمتعت باستعمال هذا البرنامج وأرغب باستعماله أكثر.

نعم لا

4. Please write any additional comments you want regarding the use of this software. It can be in English or in Arabic.

-أذا كان لديك أي تعليقات إضافية عن هذا البرنامج فالرجاء كتابتها أما باللغة العربية أو الانجليزيه,

Appendix 4. Results of all questionnaires

Results of pre-questionnaire - students not in program

SDA = strongly disagree, DA = disagree, A = agree, and SA = strongly agree

1) I was a good math student in high school

SDA	DA	A	SA
2	3	25	23
Percent Agree			91%

2) I did not enjoy math in high school

SDA	DA	A	SA
18	23	7	5
Percent Agree			23%

3) I am a good math student in college

SDA	DA	A	SA
1	6	30	16
Percent Agree			87%

4) I would enjoy learning math using a computer program (the teacher would be in the room)

SDA	DA	A	SA
8	21	17	8
Percent Agree			87%

5) I have studied using computer programs before

Yes	No
25	25

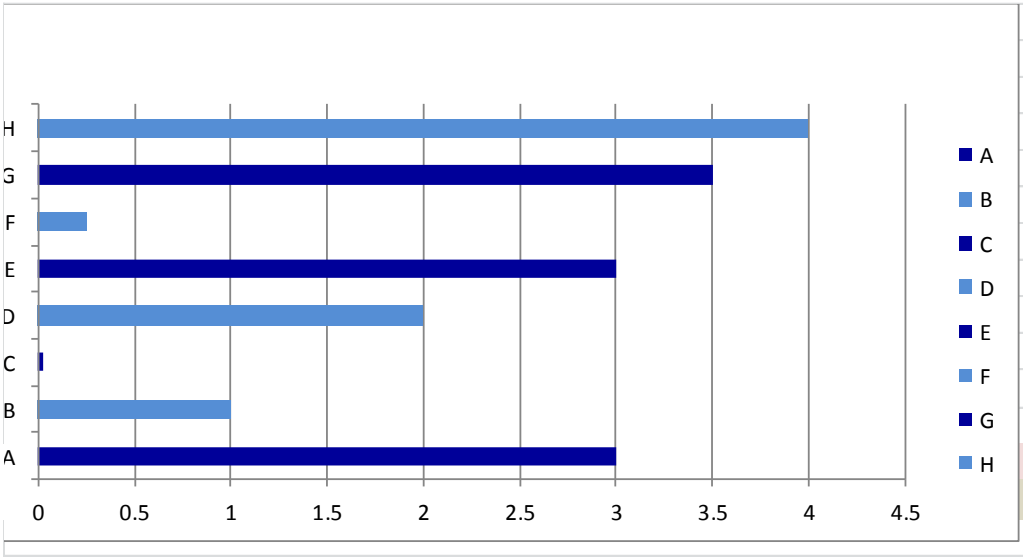
6) I think my technology skills are good enough to learn math using computer programs

SDA	DA	A	SA
6	9	28	7
Percent Agree			70%

7) My English is not good enough to allow me to learn math using computer programs

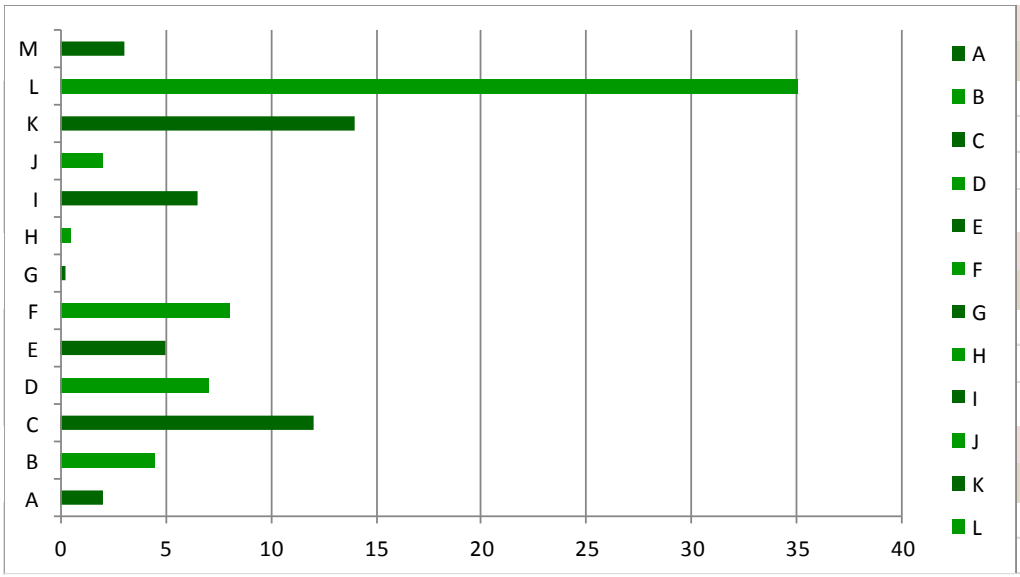
SDA	DA	A	SA
1	21	24	6
Percent Agree			59%

8) How much time do you spend each week studying math outside of class?



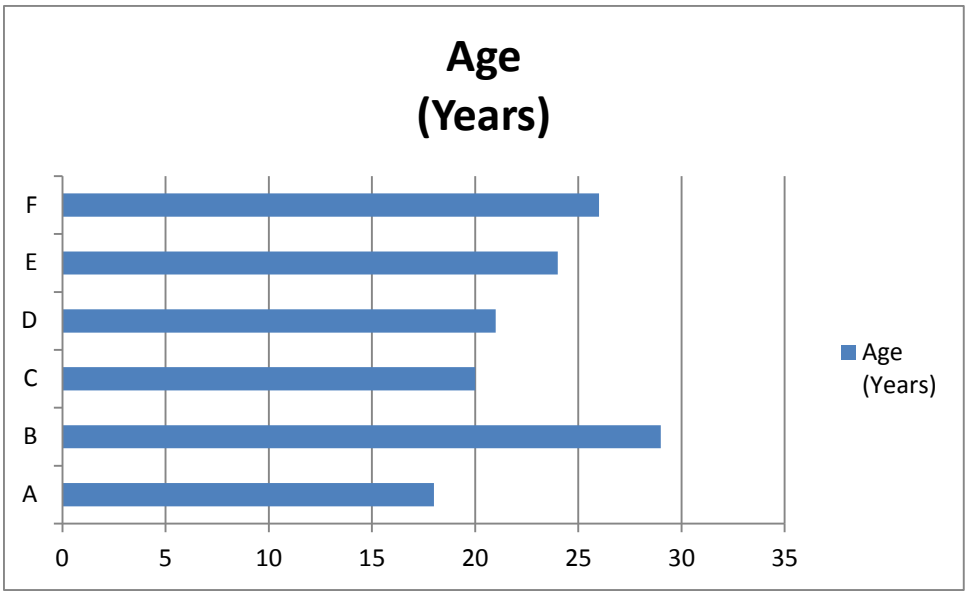
A	3
B	1
C	0.02
D	2
E	3
F	0.25
G	3.5
H	4

9) How much time do you spend each week using your computer?



A	2
B	4.5
C	12
D	7
E	5
F	8
G	0.2
H	0.5
I	6.5
J	2
K	14
L	35
M	3

10) What is your age?



	Age (Years)
A	18
B	29
C	20
D	21
E	24
F	26

Results of pre-questionnaire - students in program

SDA = strongly disagree, DA = disagree, A = agree, and SA = strongly agree

1) I was a good math student in high school

SDA	DA	A	SA
1	9	63	60
Percent Agree			92%

2) I did not enjoy math in high school

SDA	DA	A	SA
47	46	27	14
Percent Agree			31%

3) I am a good math student in college

SDA	DA	A	SA
2	12	82	44
Percent Agree			90%

4) I would enjoy learning math using a computer program (the teacher would be in the room)

SDA	DA	A	SA
3	35	53	20
Percent Agree			65%

5) I have studied using computer programs before

Yes	No
45	88

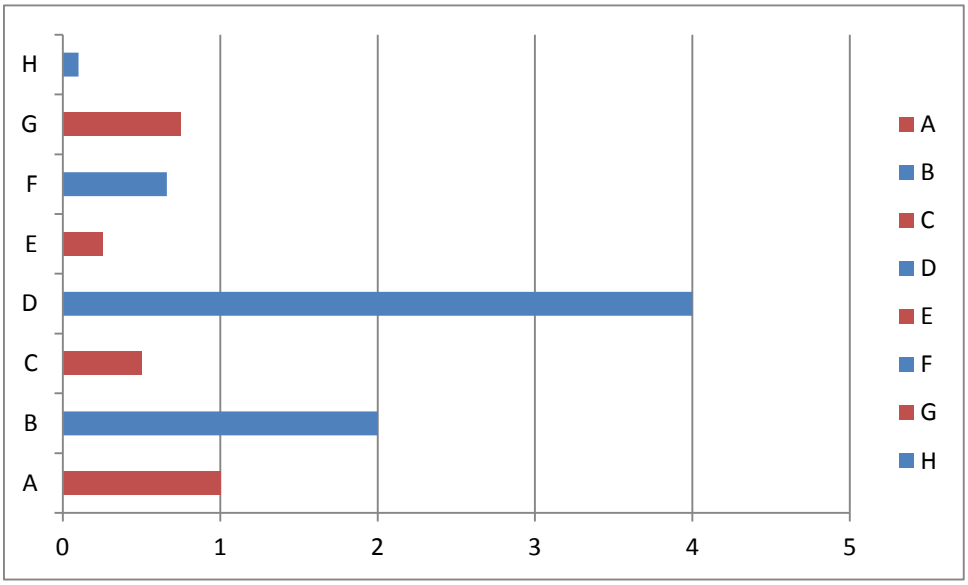
6) I think my technology skills are good enough to learn math using computer programs

SDA	DA	A	SA
17	38	55	19
Percent Agree			57%

7) My English is not good enough to allow me to learn math using computer programs

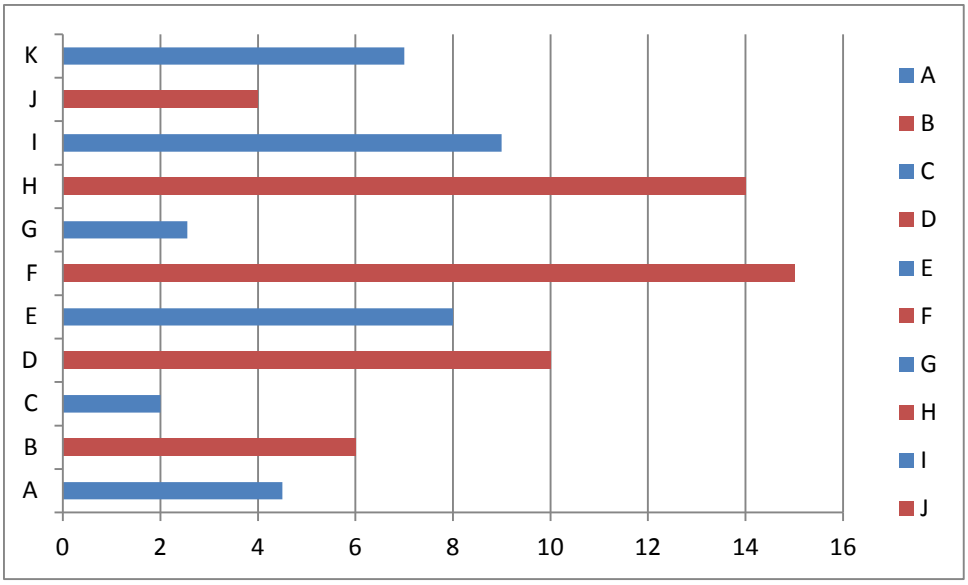
SDA	DA	A	SA
6	48	55	22
Percent Agree			59%

8) How much time do you spend each week studying math outside of class? (hours)



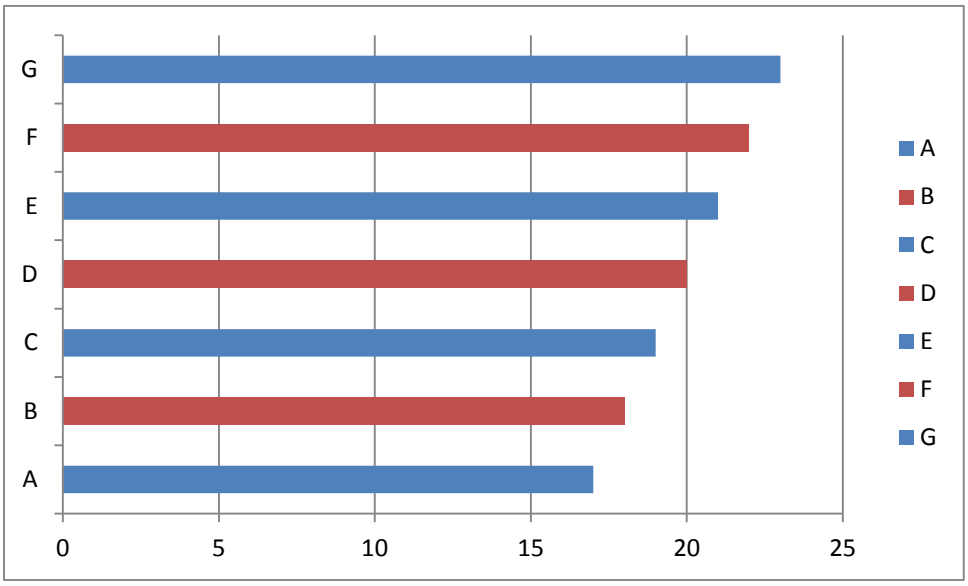
A	1
B	2
C	0.5
D	4
E	0.25
F	0.66
G	0.75
H	0.1

9) How much time do you spend each week using your computer?



A	4.5
B	6
C	2
D	10
E	8
F	15
G	2.55
H	14
I	9
J	4
K	7

10) What is your age?



A	17
B	18
C	19
D	20
E	21
F	22
G	23

Post activity results – students who had completed one week of using program

	Question **SDA = strongly disagree, DA = disagree, A = agree, and SA = strongly agree**	**SDA**	**DA**	**A**	**SA**
1	I enjoyed using the computer to study.	14/11%	30/23%	49/38%	35/27%
2	I enjoy using my laptop to learn math	27/21%	42/33%	26/20%	32/25%
3	It is hard to learn math from the computer.	18/14%	46/36%	35/27%	30/23%
4	I had difficulty understanding the language and concepts	16/13%	45/35%	57/45%	9/7%
5	I liked the videos in the software package.	15/12%	42/33%	48/38%	23/18%
6	I like the features in the computer program.	4/3%	19/15%	74/58%	30/24%
7	I would like to learn other subjects using this type of software.	15/12%	34/27%	29/23%	30/23%
8	I can learn math just well from the computer as I can from my teacher.	37/29%	47/37%	25/20%	18/14%
9	I think it would be a good idea to use the computer some times and have my teacher teach me sometimes.	17/16%	17/16%	56/53%	16/15%
10	Did you spend more time studying using this software than you do studying math the traditional way?	8/7%	45/40%	47/42%	12/11%
11	I had more fun learning math this way than having my teacher teach.	32/25%	43/34%	30/24%	21/17%
12a	What aspects of using this software did you enjoy? Tick any that apply. . I could work at my own pace	69/54%			
12b	I like working with my laptop	60/47%			
12c	It was easy to use	48/38%			
12d	I prefer this rather than listening to my teacher talk	29/23%			
12e	I liked the examples	53/41%			
12f	I liked being able to go back as many times as I needed to get help with something I didn't understand	83/65%			
12g	I like the idea of being able to use this from home if I want to	87/68%			
13a	I didn't like working at my own pace	38/30%			
13b	I don't like doing my work on my laptop	38/30%			

13c	It wasn't very easy to use	21/16%			
13d	I prefer to have my teacher teach me rather than learning on my own	52/41%			
13e	I didn't like the examples	22/17%			
13f	Being able to go back as many times as I needed to wasn't helpful to me	21/16%			
13g	I would never use this from home	30/23%			
14	If I could access this software package at any time, and it contained more sections that were included in this math class, I'd use it to help me study outside of class.	12/10%	16/14%	54/46%	35/30%
15	I would like to use this type of learning for the next module in math class.	14/14%	26/25%	34/33%	28/27%

Final Questionnaire – students who completed the study

Question	**Number of responses**	
1. a. I don't like it and would rather have my teacher teach me.	**51**	
1b. I prefer to use it rather than having my teacher teach me.	**17**	
1c. I like it, but would rather still have my teacher teach me at the same time.	**54**	
1d. I would prefer to have this only for supplemental studying, if I need it, but don't want to use it otherwise.	**73**	
2.do you feel like you can learn as well using this as when your teacher is teaching you	yes **31**	no **100**
3. Overall, I enjoyed using this interactive software and would like to use it more.	yes **56**	no **73**
4. Please write any additional comments you want regarding the use of this software. It can be in English or Arabic.		
Comment:		
1- I like it, but would rather still have my teacher teach me at the same time.		
2-I like this program but I prefer teacher.		
3-I prefer teacher to teach us.		
4- I prefer this program just to help us beside the teacher in our class.		
5- I think this program is good to the student in college because it is improving our skills.		
6-I improved my skills in math too much.		
7- This program is slow sometimes .		
8- I don't like the interactive software.		
9- I don't want to use this program.		
10-I didn't like the program because I didn't understand any thing and I like my teacher to teach me.		

11- I don't like this program it just help us to practice the exam.
12-I don’t like this program.
13-I hope you download this program in CD because the internet in not working sometimes.
14-This program just help us to study beside the teacher.
15-I like this program to help me in my class and I need it in my free time and my home. I would prefer the teacher to teach me.
16- It’s good but I prefer teacher.
17-I need this program in my house.
18- I don't like this program because I don't understand any thing so, I prefer teacher teach me.
19- I don't like this program because it is very silly .
20- I can't understand math in the computer.
21- I don't prefer use this program because something we don't understand and we need the teacher to explain for us.
22- I don't think this program is useful.
23- The program is good but we still need a teacher.

Appendix 5. Interactive Mathematics Study Participation Form

Interactive Mathematics Study Participation Form

It is very important that both the researcher and the participants understand and agree to the following points. Please read carefully and if you are happy with the agreement, please sign your name.

1. I will agree to take part in the research project with Nancy concerning my position on the use of interactive software in math class.
2. The purpose of this study will be to help Nancy create the best learning environment possible in math class.
3. I understand I can withdraw my participation in this research project at any time and I can tell the researcher not to use any of the information I provided in the project.
4. I understand that any discussion I might have regarding the use of this program, will be confidential and I may speak freely and if Nancy uses any of my comments, she will use a pseudonym, not my real name.
5. I understand that Nancy will make every effort to preserve my anonymity.
6. I understand that the section number of this class will not be mentioned or referred to in any of the materials written by Nancy or in any presentations she may give.
7. I understand that all information I give will be treated as confidential and Nancy will strive to keep her word and keep my identity private and maintain the integrity of the project.
8. I understand that my honest opinions regarding this software` will have no effect on my grades in math class.

Your name: _____ Date: _____

Signature: _____

The participant will receive a copy of this form and one copy will be kept by the researcher. If you wish to contact the researcher about this agreement at a later date, please feel free to call. Thanks very much for your time.

Researcher's signature: _____

Nancy Fahnestock 03 7095 252

Appendix 6. Focus Group Participation Form

Focus Group Participation Form

It is very important that both the researcher and the participants understand and agree to the following points. Please read carefully and if you are happy with the agreement, please sign your name.

1. I will agree to take part in the research project with Nancy concerning my position on the use of interactive software in math class.
2. The purpose of this discussion will be to help Nancy create the best learning environment possible in math class and my input is important.
3. I understand I can withdraw my participation in this research project at any time and I can tell the researcher not to use any of the information I provided in the project.
4. I understand that our group discussion will be recorded and I may speak freely and if Nancy uses any of my comments, she will use a pseudonym, not my real name.
5. I understand that Nancy will make every effort to preserve my anonymity.
6. I understand that the section number of this class will not be mentioned or referred to in any of the materials written by Nancy or in any presentations she may give.
7. I understand that all information I give will be treated as confidential and Nancy will strive to keep her word and keep my identity private and maintain the integrity of the project.
8. I understand that my honest opinions regarding this software` will have no effect on my grades in math class.

Your name: _____ Date: _____

Signature: _____

The participant will receive a copy of this form and one copy will be kept by the researcher. If you wish to contact the researcher about this agreement at a later date, please feel free to call. Thanks very much for your time.

Researcher's signature: _____

Nancy Fahnestock 03 7095 252

Appendix 7. Observation data

Month	Behaviors of significance	Research issues
February	Introduction resulted in mostly positive responses from students, quiet classrooms, on task and interested, most all materials remembered by students. Overall environment noted as positive and conducive to high quality independent learning.	None. All data reports students comfortable with the subject matter, technology, and using computers to learn content.
March	Becoming routine, starting work without being told, quiet students and on task, some copying of homework noted but most still participating positively. Frequent visitors besides researcher, observing classrooms to satisfy their own curiosity regarding the program.	Unbeknownst to me, and revealed during routine team meetings, some students suggested to their teachers their concern about learning the material. Teachers provided assurance and given formative results, determined no reason to withdrawal from study.
April	Classrooms becoming a somewhat stressful environment for teachers. Students arguing why they have not been given credit for work completed, when it was not completed correctly, yet they failed to redo it. Recognition of frequent off task behaviors and failure to begin work without being told to do so. Contrary to the initial month, this period is not reflective of a positive educational experience and at least in some situations, concern that perhaps the study should be terminated as the students were not working for understanding, but rather simply to complete tasks.	Challenges faced by all, myself, students, and participating teachers. Higher level students still working on schedule and marks are as expected. Lower level students continue to fail and show no concern, no desire to return for revision, no awareness of lack of understanding or the significance of comprehension.

Data obtained from observations in all classes and noted by researcher and management and participating teachers, as well as during discussions with teachers, outside of class, in team meetings.

Appendix 8. Transcripts focus group A

Transcripts Focus group A

May 14, Thursday, Mr. Sam, the translator, and Nancy and four students.

First student spoke in Arabic so she could freely express herself and Mr. Sam translated. He made notes as she spoke and then he read the notes and translated to English what she had said. "The student said the program is very good, it is easier than listening to the teacher, easier to understand, it's detailed, it's easier for the student and the teacher as well, because the teacher doesn't need to repeat things, we can repeat it, meaning they can listen to the lessons over and over, and it's very useful."

I asked student 2 if she felt she learned better using this or with me. Sam translated this to her in Arabic. She answered in Arabic and he translated. "Yes, listening and accessing the program was easier to understand the subject than with the teacher."

Third student spoke to Mr. Sam in Arabic and he translated. "The student said the program is easy, or it was easy for her, and um, and it was useful during exams because she could go back to it and use it."

Fourth student spoke to Mr. Sam. When she talked, she seemed adamant about it and talked so fast that he had to slow her down so he could take notes. He translated, "For this student, she used the program obviously, but it doesn't matter, to her, whether to learn using the program or the teacher, but she prefers the teacher. She is also saying that the program is available at any time, but the teacher is not. So she says she can depend on the teacher and then use the program on a break, at home, which is a very good point.[1] So it's always available for the student, but the teacher is only available on that hour. She prefers to use the teacher during that time and this outside of class." An aside here, this student, even though her English was weak, was quite motivated during class time. This student further added and the others concurred that if all 8 modules were available, it would be very helpful to the students. She further added, "If you can't reach your teacher, you always know you have a back up. You can always go back to this, access the program, and revise the subject."

[1] I am not sure, at this point, whether this is a point Sam is making or if he is translating what the student said. I failed to ask, and only did I think of this, as I was translating the notes.

Appendix 9. Focus Group C

Transcripts Focus group C

First student, Aysha, "the first time I use it, I felt confused. Then Mr. XXXXXX explained how to use it, I tried, but honestly, we can't use it all time because we don't have any time for this. We start from 8 o'clock and finish until 4. When I go home, I am tired and I can't use it more. If we have a free time…then it's helpful".

"Do you think if I included instructions, would that help?"

"Yea".

"And if you had more free time would you use it more?"

"Yea."

"Miss, if we give us ummmm….a class for skills like this…any day…ummm….if we change the schedule to make the classes less hours, we can use this."

"So what if you fail the final exam, and you have to come back to the college and do the challenge exam? Would that be helpful for you?"

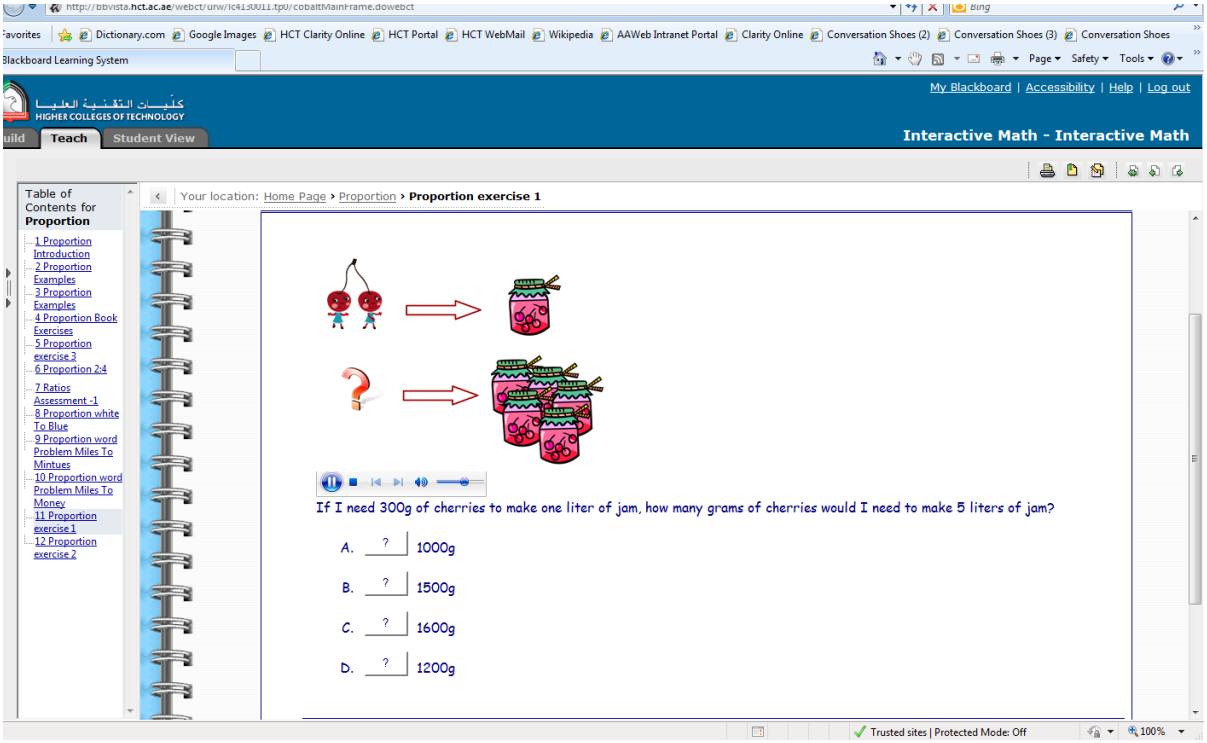
"Yes, of course. It would be very helpful for students who want to do challenge and don't have regular class."

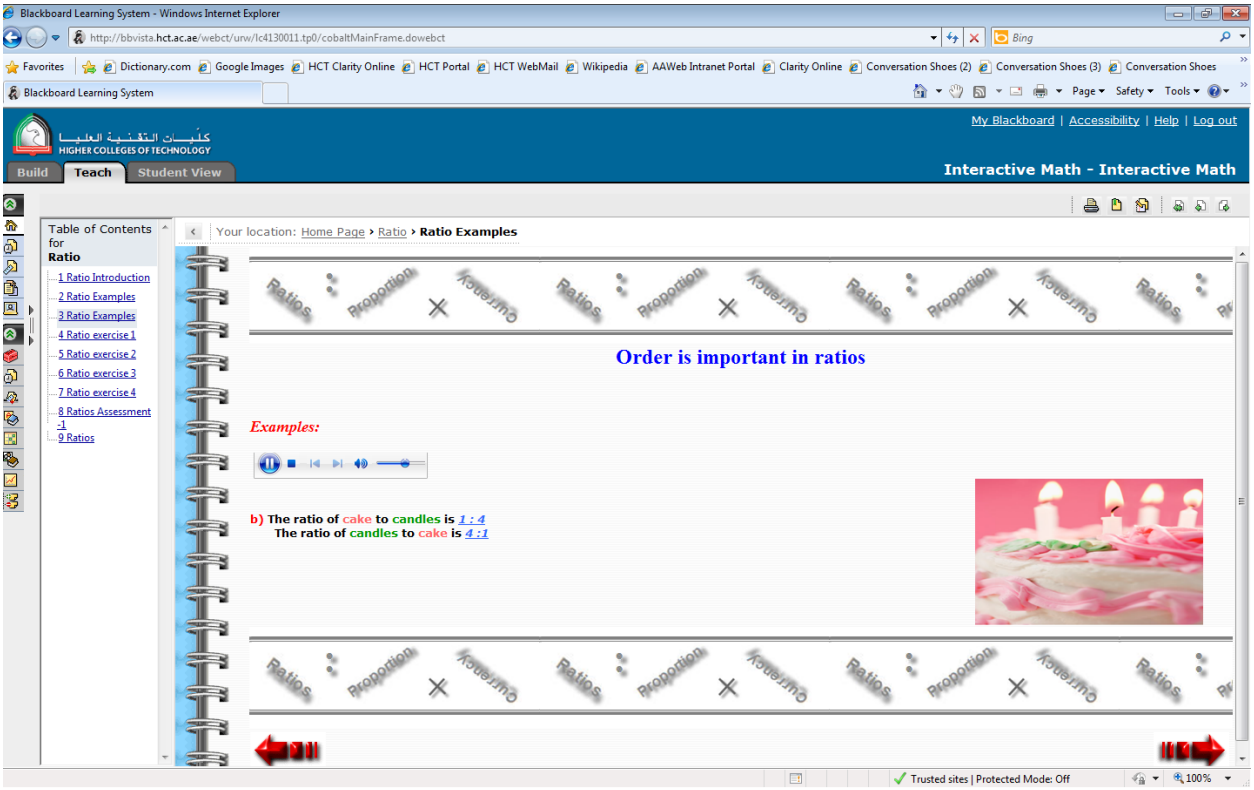
My ummm…friend…she was sick…and if she had this in home…that would help her to pass class.

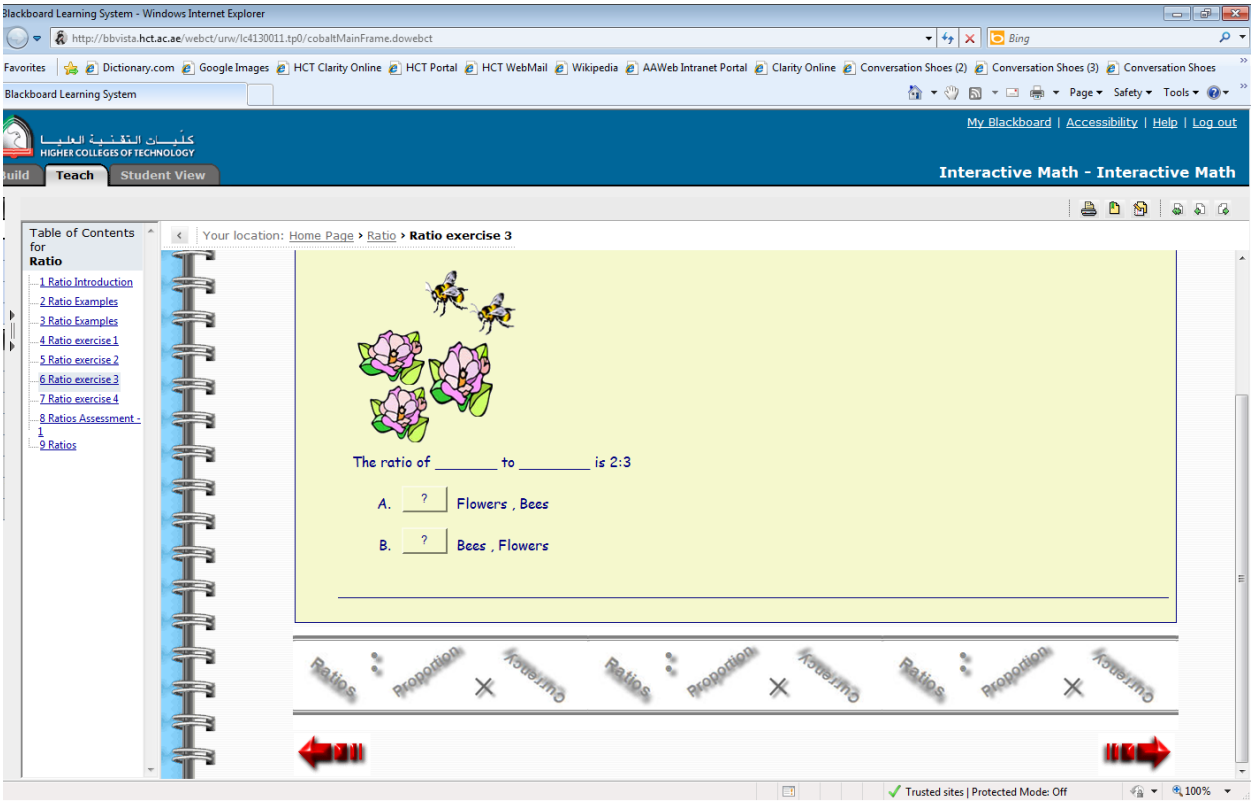
Another student…"I think this programs is very useful for another student, not for me, in my opinion. I um…more comfortable when the teacher teach. And the second reason, I don't like to work on the computer for many times. Maybe if any girls fall sick and she miss many important things, so she can use this. it's useful, but for me, I prefer my teacher. And um…each teacher have many different way…and I like my teacher way. I know the computer is very important this day and sir Bogdan say to me use this program, but I don't want to use it. He always say do what I say, and I know I should, but I don't like it. he think this program useful and I try but I don't like it. and in the class, if I have problem, I can say to the miss or sir, come to help me, but in the computer I can't say Miss Nancy, come to help me. I can't. and I feel bored."

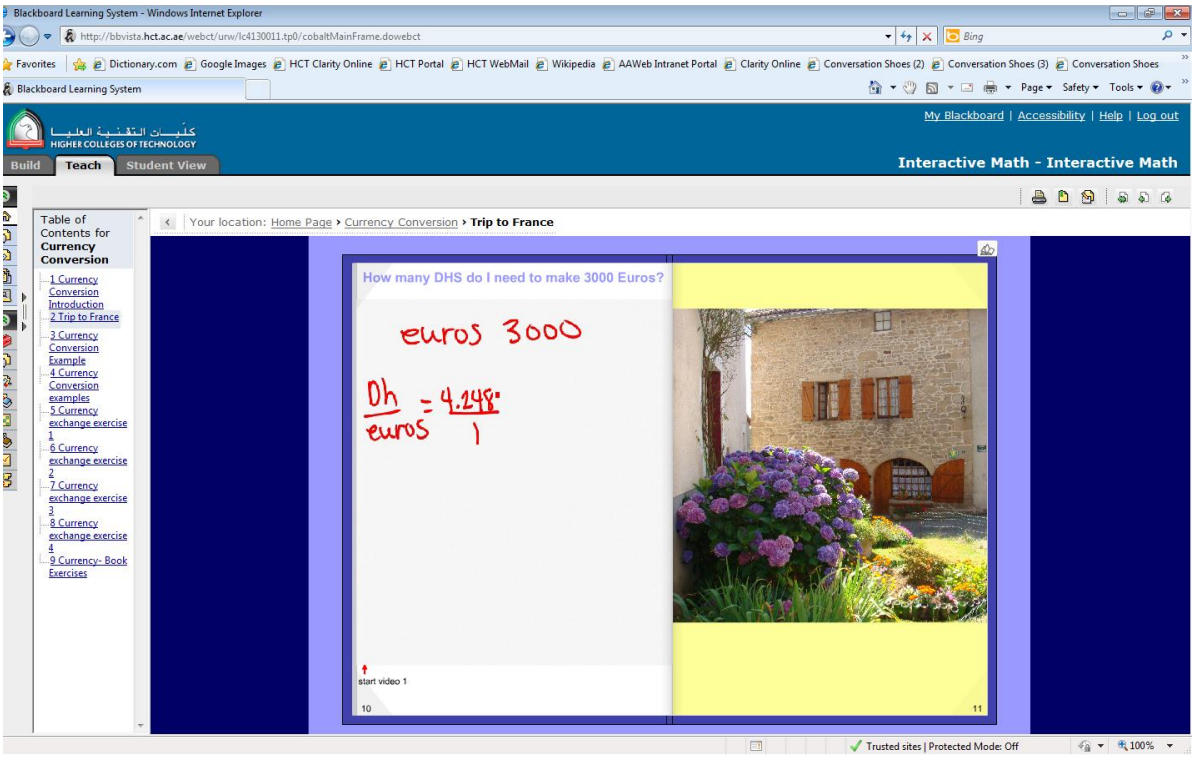
"Make a special class for students who want to use this program. The teacher will be there and the student open BB Vista and work one day a week. Miss, in your program where you explain everything and it's like I see you in class, and I can understand it."

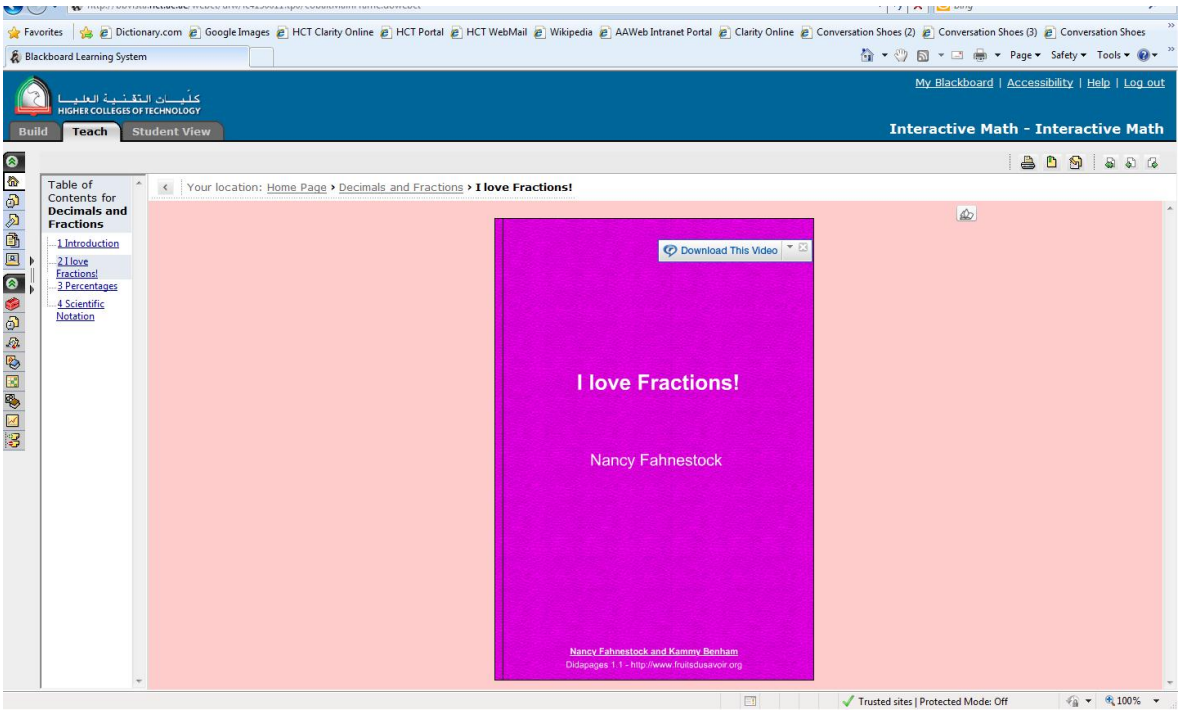
Appendix 10 – Screen captures from program (showing feminine appeal)

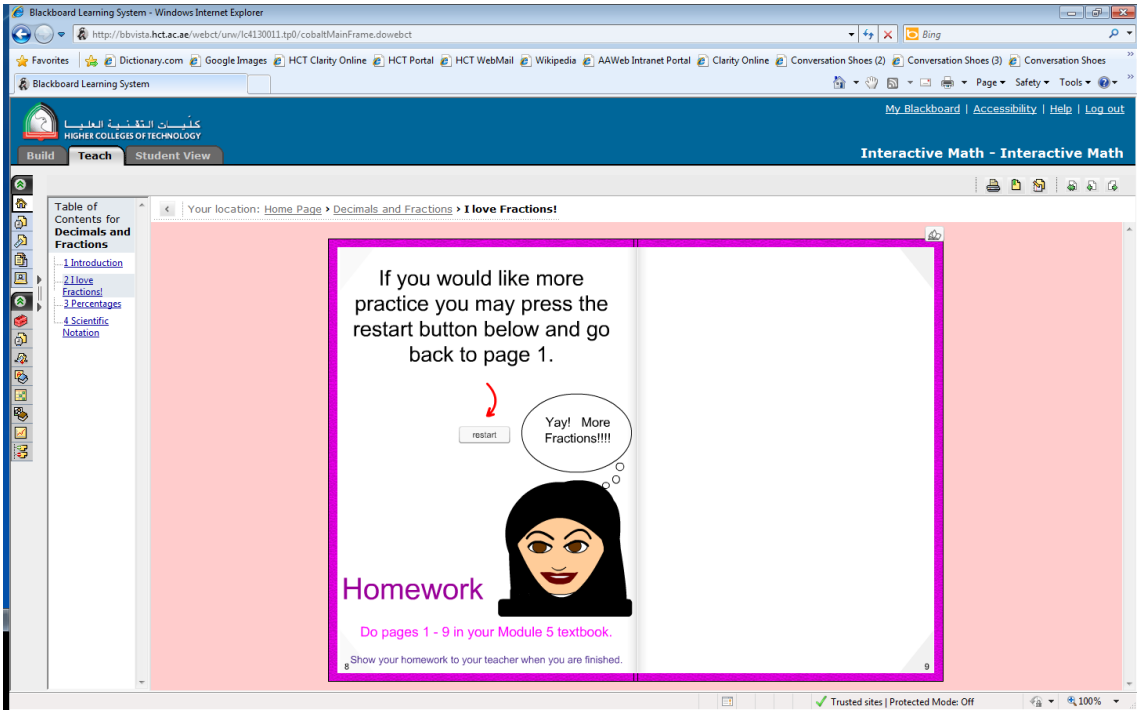


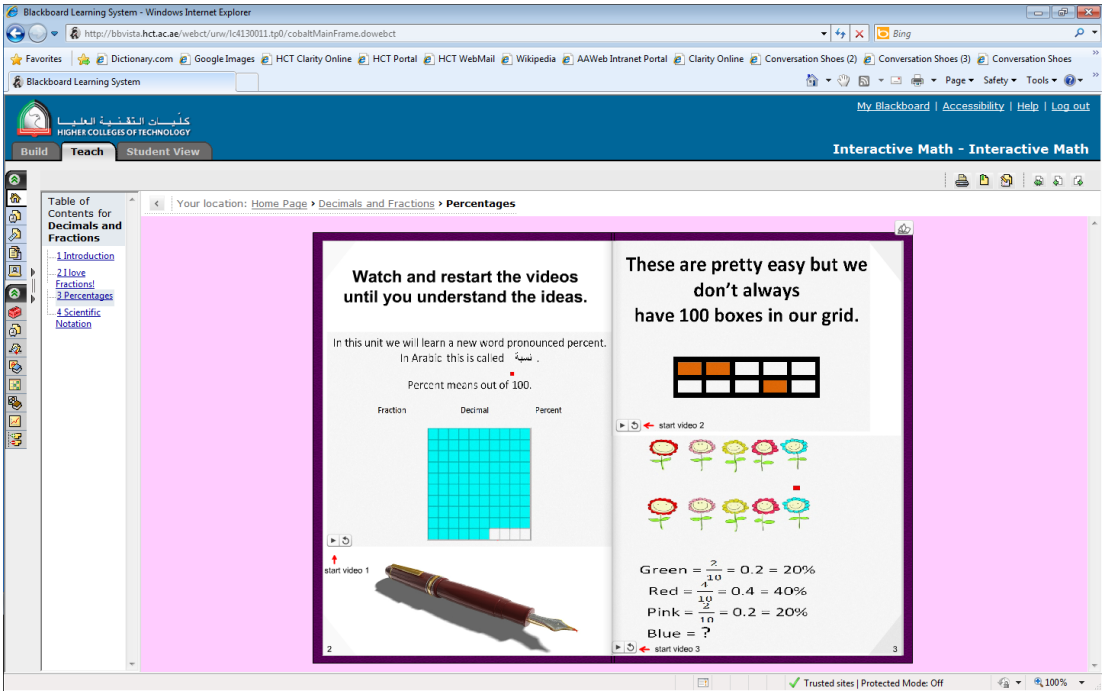



Blackboard Learning System - Windows Internet Explorer
http://bbvista.hct.ac.ae/webct/urw/lc4130011.tp0/cobaltMainFrame.dowebct
HIGHER COLLEGES OF TECHNOLOGY
My Blackboard | Accessibility | Help | Log out
Build
Teach
Student View
Interactive Math - Interactive Math
Table of Contents for Ratio
1 Ratio Introduction
2 Ratio Examples
3 Ratio Examples
4 Ratio exercise 1
5 Ratio exercise 2
6 Ratio exercise 3
7 Ratio exercise 4
8 Ratios Assessment - 1
9 Ratios
Your location: Home Page › Ratio › Ratio exercise 3
The ratio of _____ to _____ is 2:3
A. ? Flowers , Bees
B. ? Bees , Flowers
Ratios
Proportion
Currency
Trusted sites | Protected Mode: Off
100%

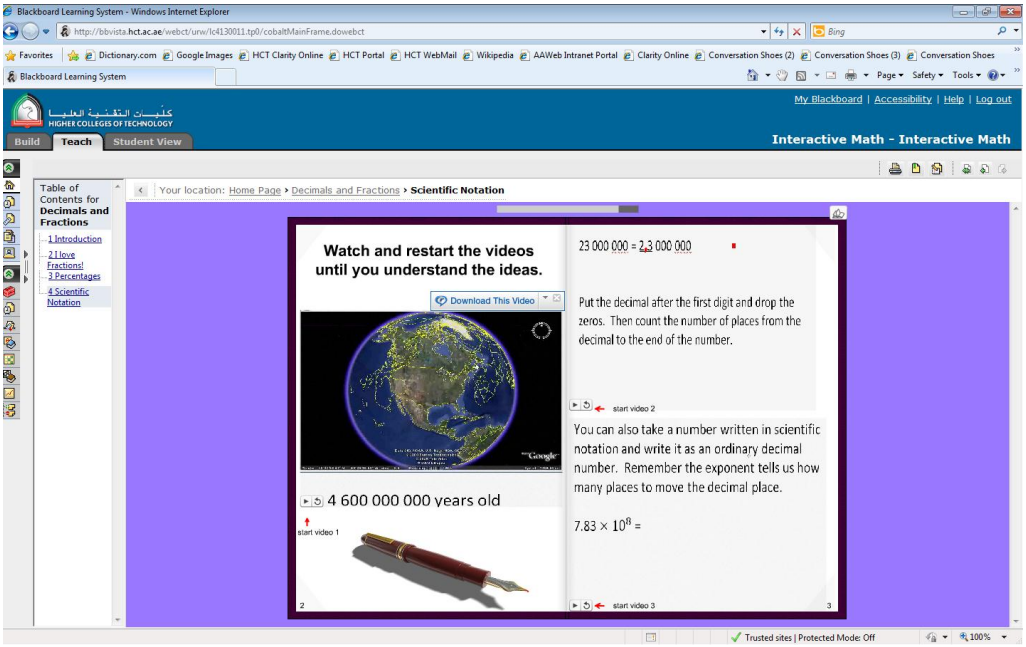

Blackboard Learning System - Windows Internet Explorer
http://bbvista.hct.ac.ae/webct/urw/lc4130011.tp0/cobaltMainFrame.dowebct
HIGHER COLLEGES OF TECHNOLOGY
My Blackboard | Accessibility | Help | Log out
Build
Teach
Student View
Interactive Math - Interactive Math
Table of Contents for Currency Conversion
1 Currency Conversion Introduction
2 Trip to France
3 Currency Conversion Example
4 Currency Conversion examples
5 Currency exchange exercise 1
6 Currency exchange exercise 2
7 Currency exchange exercise 3
8 Currency exchange exercise 4
9 Currency- Book Exercises
Your location: Home Page › Currency Conversion › Trip to France
How many DHS do I need to make 3000 Euros?
euros 3000
Dh / euros = 4.248 / 1
start video 1
10
11
Trusted sites | Protected Mode: Off
100%

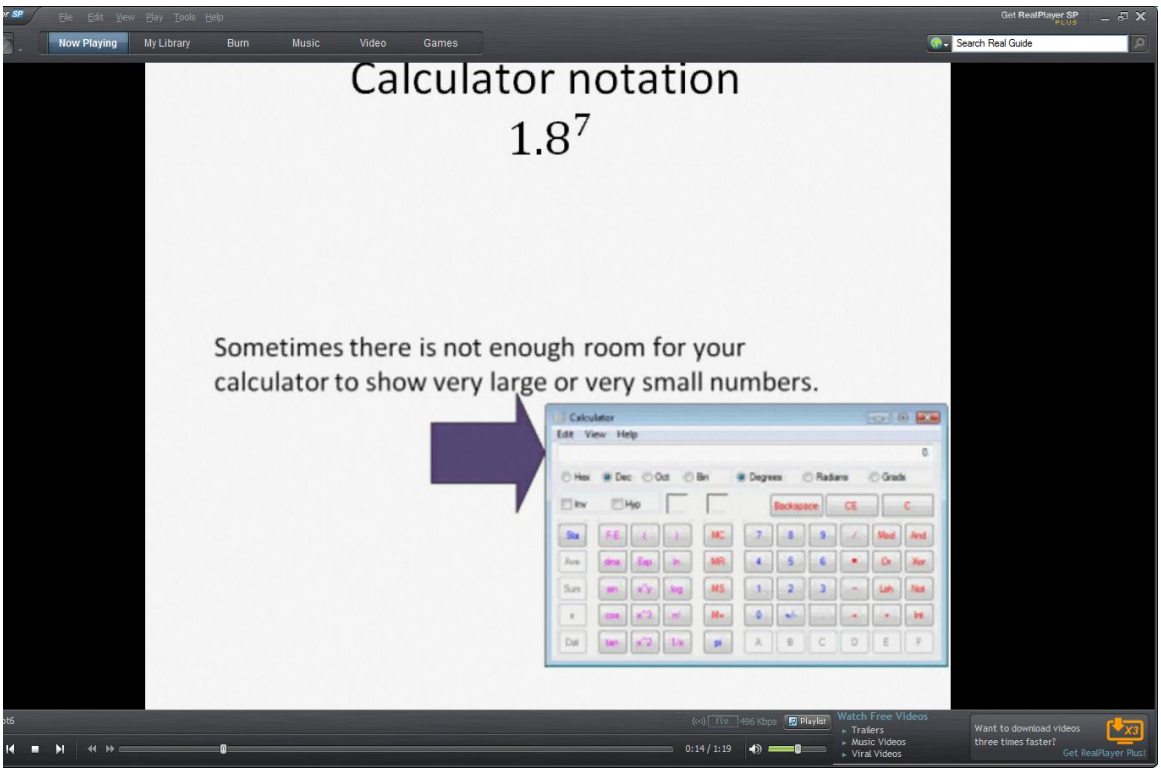

Blackboard Learning System
My Blackboard | Accessibility | Help | Log out
Build
Teach
Student View
Interactive Math - Interactive Math
Table of Contents for Decimals and Fractions
1 Introduction
2 I love Fractions!
3 Percentages
4 Scientific Notation
Your location: Home Page › Decimals and Fractions › I love Fractions!
Download This Video
I love Fractions!
Nancy Fahnestock
Nancy Fahnestock and Kammy Benham
Didapages 1.1 - http://www.fruitsdusavoir.org


Blackboard Learning System - Windows Internet Explorer
My Blackboard | Accessibility | Help | Log out
Build
Teach
Student View
Interactive Math - Interactive Math
Table of Contents for Decimals and Fractions
1 Introduction
2 I love Fractions!
3 Percentages
4 Scientific Notation
Your location: Home Page › Decimals and Fractions › I love Fractions!
If you would like more practice you may press the restart button below and go back to page 1.
restart
Yay! More Fractions!!!!
Homework
Do pages 1 - 9 in your Module 5 textbook.
Show your homework to your teacher when you are finished.

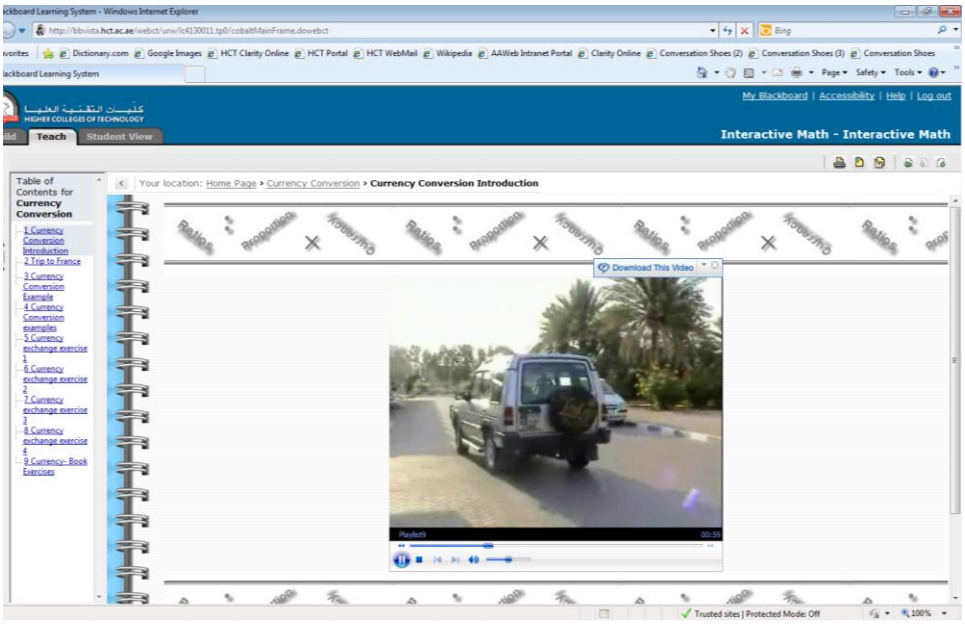

Blackboard Learning System - Windows Internet Explorer
HIGHER COLLEGES OF TECHNOLOGY
My Blackboard | Accessibility | Help | Log out
Build
Teach
Student View
Interactive Math - Interactive Math
Table of Contents for Decimals and Fractions
1 Introduction
2 I love Fractions!
3 Percentages
4 Scientific Notation
Your location: Home Page › Decimals and Fractions › Percentages
Watch and restart the videos until you understand the ideas.
In this unit we will learn a new word pronounced percent.
In Arabic this is called نسبة .
Percent means out of 100.
Fraction
Decimal
Percent
start video 1
2
These are pretty easy but we don't always have 100 boxes in our grid.
start video 2
Green = 2/10 = 0.2 = 20%
Red = 4/10 = 0.4 = 40%
Pink = 2/10 = 0.2 = 20%
Blue = ?
start video 3
3
Trusted sites | Protected Mode: Off
100%

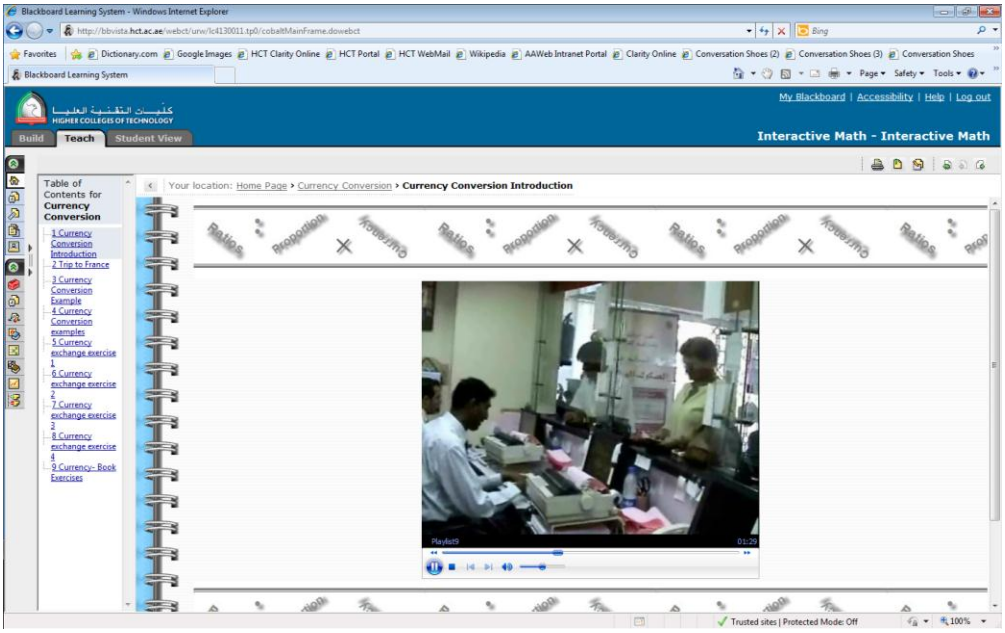
Appendix 11 – Screen captures from program (showing authentic activities)

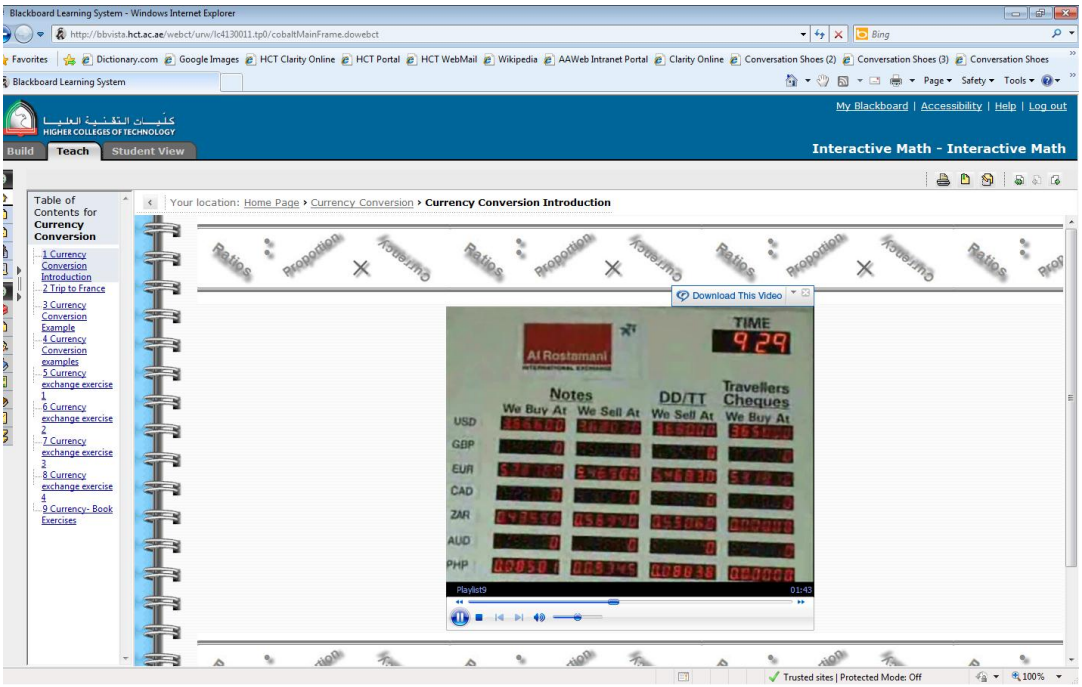




Appendix 12 – Screen captures from program (showing money exchange portion)






Blackboard Learning System - Windows Internet Explorer
My Blackboard | Accessibility | Help | Log out
Build
Teach
Student View
Interactive Math - Interactive Math
Table of Contents for Currency Conversion
1 Currency Conversion Introduction
2 Trip to France
3 Currency Conversion Example
4 Currency Conversion examples
5 Currency exchange exercise 1
6 Currency exchange exercise 2
7 Currency exchange exercise 3
8 Currency exchange exercise 4
9 Currency- Book Exercises
Your location: Home Page › Currency Conversion › Currency Conversion Introduction
Download This Video
Al Rostamani
TIME
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Notes
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Trusted sites | Protected Mode: Off
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Bibliography

Al Nowais, S. (2004, November 25). Education system to get overhaul. *Gulf News Online*. Retrieved from http://gulfnews.com/news/gulf/uae/education/education-system-to-get-overhaul-1.339648

Al Subaihi, T. (2011, May 12). There are risks, but the private sector is the right choice. *The National*, p. 18. Retrieved from http://www.thenational.ae/news/uae-news/education/education-aids-private-sector-jobs-for-emiratis

Alkhatnai, M. (2011). Learning styles of EFL Saudi college-level students in on-line and traditional educational environments. Unpublished dissertation, Indiana University of Pennsylvania.

Anderson, G. (1990). *Fundamentals of educational research*. New York: Falmer Press.

Anderson, J.R. (1983). *The architecture of cognition.* Cambridge: Harvard University Press

Anderson, J.R. (1985). *Cognitive psychology and its implications* (2nd ed.). San Francisco, CA: Freeman.

Anning, A. (1997). *The first years at school* (2nd ed.). Buckingham: Open University Press.

Archer, J., Cantwell, R., & Bourke, S. (1999). Coping at university: An examination of achievement, motivation, self-regulation, confidence, and method of entry. *Higher Education Research & Development, 18*(1), 31-54.

Aston, G. (1986). Trouble-shooting in interaction with learners: The more the merrier. *Applied Linguistics, 7*(2), 128-143.

Auerbach, E. (2001). "Yes, but….": Problematizing participatory ESL pedagogy. In P. Campbell & B. Burnaby (Eds,). *Participatory practices in adult education* (pp. 267-319). London: LEA.

Ausubel, D.P. (1961). In defense of verbal learning. *Educational Theory, 11,* 15-25.

Ausubel, D.P. (1963). Cognitive structure and the facilitation of meaningful verbal learning. *Journal of Teacher Education,14,* 217-221.

Ausubel, D.P., Novak, J.D., & Hanesian, H. (1978). *Educational psychology: A cognitive view* (2nd ed.). New York, NY: Holt, Rinehart & Winston.

Babbie, E. (1992). *The practice of social research* (6th ed.). Belmont, CA: Wadsworth Publishing.

Ball, D.L. (1993). With an eye on the mathematical horizon: Dilemmas of teaching elementary school mathematics. *The Elementary School Journal, 93*(4), 373-397.

Barr, P. (2007). Working toward graduate outcomes. In P. Barr (Ed.), Foundations for the *future: Working towards graduate outcomes* (pp. 7-13). Abu Dhabi: HCT Press.

Baugh, A.C., & Cable, T. (1978). *A history of the English language.* London: Routledge & Kegan Paul.

Beal, C.R., Walles, R., Arroyo, I., & Woolf, B.P. (2007). On-line tutoring for math achievement testing: A controlled evaluation. *Journal of Interactive Online Learning, 6(*1), 43-55. Retrieved from www.ncolr.org/jiol

Beauvois, M. (1994). E-talk: Attitudes and motivation in computer-assisted classroom discussion. *Computers and the Humanities, 28*(1), 177-190.

Beauvois, M. (1996). Personality types and megabytes: Student attitudes toward computer-mediated communication (CMC) in the language classroom. *CALICO Journal, 13*(2-3), 27-45.

Beauvois, M. (1998) Conversations in slow motion: Computer-mediated communication in the foreign language classroom. *The Canadian Modern Language Review, 54*(2), 198-217.

Beauvois, M.H. (1998). Conversations in slow motion: Computer-mediated communication in the foreign language classroom. *Canadian Modern Language Review*, 54(2), 198-217.

Beilock, S.L. (2010). *Choke: What the secrets of the brain reveal about getting it right when you have to;* quoted in "Research 2011—Researchers probe causes of math anxiety," *The Dyscalculia Forum,* August 10, 2011; retrieved from http://dyscalculiaforum.com/forum/viewthread.php?thread_id=4533&pid=35486

Beilock, S.L. (2011); quoted in Sparks, S.D. (2011). The problem with math. *Vancouver Sun,* May 21. Retrieved June 2, 2011, from http://www.vancouversun.com/business/problem+with+math/4821798/story.html?id=4821798

Bernstein, B.B. (1996). *Pedagogy, symbolic control, and identity: Theory, research, critique.* Boulder, CO: Lanham; New York, Oxford: Rowan & Littlefield.

Blanton, L.L. (1992). A holistic approach to college ESL: Integrating language and content. *ELT Journal, 46,* 285-293.

Block, D., & Cameron, D. (2002). *Globalization and language teaching*. London: Routledge.

Bogdan, R.G, & Biklen, S.K. (1992). *Qualitative research for education* (2nd ed.). Boston, MA: Allyn & Bacon.

Bonk, C.J., & Zhang, K. (2006). Introducing the R2D2 model: Online learning for the diverse learners of this world. *Distance Education, 27*(2), 249-264.

Bonk, C.J., & Zhang, K. (2008). *Empowering online learning: 100+ activities for reading, reflecting, displaying & doing.* San Francisco, CA: Jossey-Bass.

Bourdieu, P. (1997). The economics of linguistic exchanges. *Social Science Information, 16*(6), 645-668.

Briggs, C.L., & Keyek-Franssen, D. (2010). Clickers and CATs: Using learning response systems for formative assessments in the classroom. *Educause Quarterly, 33*(4). Retrieved from http://www-cdn.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/ClickersandCATsUsingLearnerRes/219138

Britzman, D. (2003). *Practice makes practice: A critical study of learning to teach*. Albany, NY: State University of New York Press.

Bruce, T., Findlay, A., Read, J., & Scarborough, M. (1995). *Recurring themes in education.* London, Eng.: Paul Chapman Publishing.

Bryce, J. & Rutter, J. (2003). Gender dynamics and the social and spatial organization of computer gaming. *Leisure Studies*, 22, 1-15.

Bryce, J., & Rutter, J. (2002). Killing like a girl: Gendered gaming and girl gamers, visibility. CGDC Conference Proceedings. University of Tampere Press. Finland, 243-255; retrieved May 5, 2004 from http://www.digiplay.org.uk/media/cgdc.pdf

Bryson, B. (1990). *The mother tongue: English and how it got that way*. New York, NY: William Morrow.

Buchanan, K. Helman, M. (1993). *Reforming mathematics instruction for ESL literacy students*. NCBE. http://www.ncela.gwu.edu/.

Bush, T. (2003). *Theories of Educational Leadership and Management*. (3rd Ed.). London: Sage.

Bush, T., & Bell, L. (2002). *The principles and practice of educational management*. London: Sage.

Byram, M. (2000). *Teaching and assessing intercultural communicative competence*. Clevedon: Multilingual Matters.

Byrom, E., & Bingham, M. (2001). Factors influencing the effective use of technology for teaching and learning: Lessons learned from the SEIR/TEC intensive site schools. Durham, NC: SouthEast Initiatives Regional Technology in Education Consortium. Retrieved from http://www.seirtec.org/publications/lessons.pdf.

Carey, J.W. (1986). The dark continent of American journalism. In R.K. Manoff & M. Schudson (Eds.), *Reading the news* (pp.14-196). New York, NY: Pantheon.

Casal, S. (2008). Cooperative learning in CLIL contexts: Ways to improve students' competences in the foreign language classroom. Universidad Pablo de Olavide, Sevilla, Spain. Retrieved from http://www.iaie.org/download/turin_paper_casal.pdf

Cassell, J., & Jenkins, H. (1998). Chess for girls? Feminism and computer games. In G. Cassell & H. Jenkins (Eds.), *From Barbie to Mortal Kombat: Gender and computer games* (pp. 2-45). Cambridge, MA: MIT Press.

Cazden, C.B. (1979). Curriculum/language contexts for bilingual education. In E.J. Briere (Ed.), *Language development in a bilingual setting* (pp.129-138). Los Angeles: National Dissemination and Assessment Center, California State University (ERIC Document Reproduction Service No. Ed 224 661).

CBS News (2009, February 26). Study: Obama should reach out to Muslims. Retrieved from http://www.cbsnews.com/stories/2009/02/26/national/main4831594.shtml?source=related_story

Celce-Murcia, M. (Ed.) (2001). *Teaching English as a second or foreign language* (3rd ed.). Boston, MA: Heinle & Heinle.

Chamot, A.U. (2004). Issues in language learning strategy research and teaching. *Electronic Journal of Foreign Language Teaching, 1*(1), 14-26.

Chamot, A.U., & Kupper, L. (1989). Learning strategies in foreign language instruction. *Foreign Language Annals, 22*, 13-24.

Chamot, A.U. & O'Malley, J.M. (1986). *A cognitive academic language learning approach: An ESL content-based curriculum.* Wheaton: National Clearinghouse for Bilingual Education.

Chamot, A.U., & O'Malley, J.M. (1987). The cognitive academic language learning approach: A bridge to the mainstream. *TESOL Quarterly*, 21, 227-249.

Chamot, A.U., & O'Malley, J.M. (1992). The cognitive academic language learning approach: A bridge to the mainstream. In P.A. Richard-Amato & M.A. Snow (Eds)., *The multicultural classroom: Readings for content-area teachers* (pp. 39-58). White Plains, NY: Longman.

Chamot, A.U., & O'Malley, J.M. (1994). Language learner and learning strategies. In N.C. Ellis (Ed.), *Implicit and explicit learning of languages* (pp. 371-392). London: Academic.

Chinnery, G.M. (2006). Going to the MALL: Mobile assisted language learning. *Language Learning and Technology, 10*(1), 9-16.

Chlopek, Z. (2008). English teaching forum. *The intercultural approach to EFL teaching and learning, 46*(4), 10-19.

Chomsky, N. (1968). *Language and mind.* New York, NY: Harcourt Brace Jovanovich.

Chomsky, N. (1999). *Language and problems of knowledge.* London, Eng.: MIT Press.

Chomsky, N. (2007). *What we say goes: Conversations on U.S. power in a changing world: Interviews with David Barsamian.* New York, NY: Metropolitan Books.

Clark, (1983). In *How does technology facilitate learning*? Pearson Allyn Bacon Prentice Hall. Retrieved from http://www.education.com/print/how-does -technology-facilitate-learning/,

Cloran, C. (1989). Learning through language: The social construction of gender. In R. Hasan & J. R. Martin (Eds.), *Language development: Learning language, learning culture. Meaning and Choice in language: Studies for Michael Halliday, Vol. 1.* (pp. 111-151). Norwood, NJ: Ablex.

Clough, P., & Nutbrown, C. (2002). *A student's guide to methodology*. London: Sage.

Cohen, L., Manion, L., & Morrison, K. (2001). *Research methods in education*. (5th ed). London: Routledge Falmer.

Coorough, C. (2001). *Multimedia and the Web.* Fort Worth, TX: Harcourt College Publishers.

Corder, S.P. (1976). The study of interlanguage. In G. Nickel (Ed.), *Proceedings of the Fourth International Congress of Applied Linguistics* (pp.[7]). Stuttgart: Hoschschul Verlag.

Covery, S., & Merrill, R. (2006). *The speed of trust: The one thing that changes everything.* New York, NY: Free Press.

Covington, M. (1992). *Making the grade: A self-worth perspective on motivation and school reform.* Cambridge, MA: Cambridge University Press.

Crandall, J. (1992). Content-centered instruction in the United States. *Annual Review of Applied Linguistics, 13,* 111-126.

Creswell, J.W. (1995). *Research design: Qualitative and quantitative approaches*. Thousand Oaks, CA: Sage.

Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process.* London: Sage.

Cullen R. (2001). PPP and beyond: Towards a learning-centered approach to teaching grammar. In H. F. Mora et al. (Eds.), *Teaching English in a Spanish setting* (pp. 13-26). Valencia, Spain: Department of English and German Philology, University of Valencia.

Cummings, J. (1979). Cognitive/academic language proficiency, linguistic interdependence: The optimum age question and some other matters. *Working Papers on Bilingualism, 19,* 121-129.

Cummings, J. (1996). *Negotiating identities: Education for empowerment in a diverse society.* Ontario, CA: California Association for Bilingual Education.

Cummins, J. (1981). The role of primary language development in promoting educational success for language minority students. In California State Department of Education, *Schooling and language minority students: A theoretical framework* (pp. 3-49). Los Angeles: Evaluation, Dissemination and Assessment Center, California State University.

Cummins, J. (1983). Conceptual and linguistic foundations of language assessment. In S.S. Seidner (Ed,), *Issues of language assessment: Vol.2. Language assessment and curriculum planning* (pp. 7-16). Wheaton, MD: National Clearinghouse For Bilingual Education.

Cummins, J. (1984). *Bilingualism and special education: Issues in assessment and pedagogy.* Clevedon, Eng.: Multilingual Matters.

Cummins, J. (1992). Language proficiency, bilingualism, and academic achievement. In P. A. Richard-Amato & M.A. Snow (Eds.), *The multicultural classroom: Readings for content-area teachers* (pp. 16-26). White Plains: Longman.

Cummins, J. (2000) *Language, power and pedagogy: Bilingual children in the crossfire.* Clevedon, Eng.: Multilingual Matters.

Dalton-Puffer, C. University of Vienna. Outcomes and processes in content and language integrated Learning (CLIL): current research from Europe. Appears in Werner Delaney and Laurenz Volkmann, (eds.) *Future perspectives for English language teaching*. Heidelberg: Carl Winter.

Dansereau, D.F. (1985). Learning strategy research. In J.W. Segal, S.F. Chipman, & R. Glaser (Eds.), *Thinking and learning skills,* Vol. 1 (pp. 209-239). Hillsdale, N.J.: Erlbaum.

Davis, G., & Gottliev, S. (2008). Presentation at the Mathematical Association of America's Research in Undergraduate Mathematics Education (RUME) conference, Raleigh, NC February 28-March 1, 2008.

Dean, M. (1994). *Critical and effective histories: Foucault's methods and historical sociology.* London: Routledge.

DeNicola, C. (2005). Dubai's political and economic development: An oasis in the desert? Unpublished doctoral thesis, Williams College, Williamstown, MA.

Dewey, J. (1929). *The quest for certainty: A study of the relation of knowledge and action.* London: Unwin.

Diamond, J. (1999). *Guns, germs, and steel.* New York, NY: W.W. Norton.

Diaz-Rico, L.T., & Weed, K.Z. (2002). *The crosscultural, language, and academic development handbook.* A complete K-12 reference guide. Boston, MA: Allyn & Bacon.

Dick, W., Carey, L., & Carey, J. O. (2001). *The systematic design of instruction* (5th ed.). New York: Addison-Wesley, Longman.

Dickey, M. D. (2006). Girl gamers: The controversy and relevance of female-oriented design for instructional design. *British Journal of Educational Technology*, 35(5), p. 785-793.

Doolittle, P. (2001). *Multimedia learning: Empirical results and practical applications*; cited in Mandernach, B.J. (2009), Effect of instructor-personalized multimedia in the online classroom. *The International Review of Research in Open and Distance Learning, 10*(3). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/606/1263

Dörnyei, Z. (2001a). *Motivational strategies in the language classroom.* Cambridge: Cambridge University Press.

Dörnyei, Z. (2001b). *Teaching and researching motivation.* Harlow, Eng.: Longman.

Dörnyei, Z., & Otto, I. (1998). Motivation in action: A process model of L2 motivation. *Working Papers in Applied Linguistics (Thames Valley University, London), 4*, 43-69.

Driscoll, M.P. (2005). *Psychology of learning for instruction.* Boston, MA: Pearson Education, Inc.

Dudeney, G., & Hockly, N. (2007). How to teach English with technology. London: Longman.

Elish, J. (2009, January 6). Facebook generation learning social, technical skills online, Florida State researcher says. Florida State University, *FSU.com e-News.* Retrieved from http://www.fsu.edu/news/2009/01/05/digital.youth/

Elish, J. (2009). FSU professor wins $5 million grant to train next generation of education researchers. Florida State University, *FSU.com News & Information.* Retrieved September 2, 2009 from http://www.fsu.com/pages/sppo9/08/10/education_research_training_grant.html

Ellerton, N.F., & Clarkson, P.C. (1996). Language factors in mathematics teaching. In A.J. Bishop et al. (Eds.), *International handbook of mathematics education* (pp. 987-1034). Dordrecht, Neth.: Kluwer Academic Publishers.

Elliott, J., Adams, L. & Bruckman, A. (2002). No magic bullet: 3d video games in education. *Proceedings of ICLS 2002*, Seattle, Washington, October 2002.

Fahnestock, N. (2008). Data analysis and presentation. Unpublished manuscript for EED D003, University of Exeter, Exeter, UK.

Fairclough, N. (1992). *Critical language awareness*. London and New York, NY: Longman.

Findlow, S. (2005). International networking in the United Arab Emirates higher education systems: Global-local tensions. *Compare, 35*(3), 285-302.

Findlow, S. (2006). Higher education and linguistic dualism in the Arab Gulf. *British Journal of Sociology of Education,* 27(1), 19-36.

Fitch, A., & Shaheen, K. (2010, December 13). Education aids private sector jobs for Emiratis. *The National*. Retrieved from http://www.thenational.ae/news/uae-news/education/education-aids-private-sector-jobs-for-emiratis

FitzPatrick, S.B. (2001). Students' experiences of the implementation of an interactive learning system in their eighth grade mathematics classes: An exploratory study. Retrieved August 12, 2011, from http://www.eric.ed.gov/PDFS/ED470137.pdf (A).

Flavell, J.H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-development inquiry. *American Psychologist, 34*, 906-911.

Forman, E.A., & McPhail, J. (1993). Vygotskian perspective on children's collaborative problem-solving activities. In E.A. Forman, N. Minick, & C.A. Stone (Eds.), *Contexts for learning: Sociocultural dynamics in children's development* (pp. 213-229). New York, NY: Oxford University Press.

Foster, P. (1998). A classroom perspective on the negotiation of meaning. *Applied Linguistics, 19*(1), 1-23.

Foucault, M. (1980). *Power/knowledge: Selected interviews and other writings, 1972-1977.* New York, NY: Pantheon.

Foucault, M. (1984). *Essential works of Foucault 1954-1984.* Vol. 3. London: Penguin Books.

Foucault, M. (1989). *The archaeology of knowledge.* London: Routledge.; orig. publ. 1969.

Gagné, R.M. (1985). *The cognitive psychology of school learning.* Boston, MA: Little Brown.

Gagné, R.M., & Glaser, R. (1987). Foundations in learning research. In R.M. Gagné (Ed.), *Instructional technology: Foundations* (pp. 49-83). Hillsdale, NJ: Erlbaum.

Garner, L.C., & Gallo, M.A. (2005). Field trips and their effect on student achievement and attitudes. *Journal of College Science Teaching, 34*(5), 14-17.

Genesee, F. (December 1995). *Integrating language and content*: Lessons from Immersion. National Center for research on cultural diversity and second language learning. Online Resources: Digests Retrieved from http://www.cal.org/resources/digest/ncrcds05.html,

Giddens, A. (1990). *The consequences of modernity*. Cambridge: Polity Press.

Giroux, H.A. (1992). *Border crossings: Cultural workers and the politics of education*. New York, NY: Routledge.

Giroux, H.A. (1994). Teachers, public life and curriculum reform. In A.C. Ornstein & L.S. Behar (Eds.), *Contemporary issues in curriculum* (pp. 41-49). Boston, MA: Allyn and Bacon.

Goh, Y.S., Ng, A.S., Raja Baniamin, R.M., & Wan Mamat, W.A. (2004) Technology and foreign language learning: Student perceptions on the feasibility of using wWBI (Web-based instruction) to supplement the on-campus foreign language courses in UiTM. Retrieved from http://www.readingmatrix.com/conference/pp/proceedings/gohyingsoon.pdf

Grant, S.G. (2007). High-stakes testing: How are social studies teachers responding? *Social Education, 71*(5), 250-225.

Greene, J.C., Caracelli, V.J., & Graham, W.F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 11*(3), 255–274.

Grigoryan, A., & King, J.M. (2008). Adbusting: Critical media literacy in a multi-skills academic writing lesson. *English Teaching Forum, 46*(4), 2-9.

Hacker, H.K. (2010, March 21). Students playing catch-up as they hit college. *Dallas Morning News.* Retrieved July 5, 2011, from http://www.dallasnews.com/news/education/headlines/20100320-Students-playing-catch-up-as-they-4288.ece

Hajer, Maaike. 1000. Creating a language-promoting classroom: content-area teachers at work. In Hall, Joan Kelly and Lorrie Stoops. Verplaetse (eds.) 2000. Second and foreign language learning through Classroom interaction. Mahwah J.J. and London: Lawrence Erlbaum Associates, 265-285.

Halawi, L., & McCarthy, R. (2008). Measuring students [sic] perceptions of blackboard using the technology acceptance model: A PLS approach. *Issues in Information Systems, 9*(2), 95-102.

Hallett, D.H. (2007). The teaching of mathematics: What changes are on the horizon? Paper presented at the Learning Technologies and Mathematics Middle East Conference, Sultan Qaboos University, Muscat, Oman March 31-April 2.

Halliday, M.A.K. (1975). *Learning how to mean: Explorations in the development of language.* London: Edward Arnold.

Hannon, P. (1998). An ecological perspective on educational research. In D. McIntyre & J. Rudduck (Eds.), *Challenge for educational research: New BERA Dialogues* (pp. 150-156). London: Paul Chapman Publishing.

Harden, R. M. & Crosby, J. (2000). AMEE Guide No 20: The good teacher is more than a lecturer—The twelve roles of the teacher. *Medical Teacher 22*(4), 334-347.

Hardiman, B., & Williams, R. (1990). Teaching developmental mathematics: The interactive videodisc approach. *Technological Horizons in Education, 17*. Retrieved from http://www.questia.com/googleScholar.qst?docId=5000114009

Hargreaves, L., Cunningham, M., Hanson, A., McIntyre, D., Oliver, C., & Pell, T. (2007). *The status of teachers and the teaching profession in England: Views from inside and outside the profession*. Published manuscript, Research Report RR831A, University of Leicester.

Harlen, W. (2006). The role of assessment in developing motivation for learning. In J. Gardner (Ed.)., *Assessment and learning* (pp. 61-80). London: Sage.

Heilbrun, C. (1988). *Writing a woman's life.* Boston, MA: Random House.

Heinich, R., Molenda, M., Russell, J., & Smaldino, S. (2002). *Instructional media and technologies for learning* (7th ed.). NJ: Prentice Hall.

Henderson, E. (1993). *The strange eventful history: Memoirs of earlier days in the UAE and the Sultan of Oman*. London: Motivate Publishing.

Holt J. (1964). *How children fail.* New York, NY: Holt, Rinehart and Winston.

Holt J. (1968). *How children learn.* New York, NY: Dial.

Holt J. (1969). *The underachieving school.* London: Penguin Books.

Howard, D. (1985). *Cognitive psychology.* New York, NY: Macmillan.

Howard, L. (2008). Developmental students' perceptions of unsuccessful and successful mathematics learning. Unpublished doctoral dissertation, Utah State University, Logan, Utah.

Howell, E. (2008). Learner identity and agency in a pre-university intensive English for Academic Purposes program. Unpublished dissertation, University of Exeter.

Hunt, N. (2011). The development of student-teacher identities through undergraduate action research projects: An Emirati case study. Unpublished doctoral thesis, University of Exeter, Exeter, England.

Ismail, M. (2011, May 22). Amid the din of reform, teachers' voices are drowned out. *The National (UAE).* Retrieved from http://www.thenational.ae/thenationalconversation/comment/amid-the-din-of-reform-teachers-voices-are-drowned-out)

Jarvis, P. (2007). *Globalization, lifelong learning and the learning society sociological perspectives.* London: Routledge.

Jones, B.F., Palincsar, A.S., Ogle, D.S., & Carr, E.G. (1987). *Strategic teaching and learning: Cognitive instruction in the content areas.* Alexandria, VA: Association for Supervision and Curriculum Development.

Kahveci, M. (2010). Students' perceptions to use technology for learning: Measurement integrity of the modified Fennema-Sherman attitudes scales. *The Turkish Online Journal of Educational Technology, 9*(1), 185-201.

Kain, D.J. (2003). Teacher-centered versus student-centered: Balancing constraint and theory in the composition classroom. *Pedagogy,* 3/1, 104-108.

Ke, F. (2008). Computer games application within alternative classroom goal structures: Cognitive, metacognitive, and affective evaluation. *Educational Technology Research & Developme*nt, 56(5/6), 539-556.

Kennedy, D.M. (2005). Challenges in evaluating Hong Kong Students' perceptions of Moodle. *Proceedings of ascilite 2005 Conference: Balance, fidelity, mobility: Maintaining the momentum?* (pp. 327-336). Retrieved from http://www.ascilite.org.au/conferences/brisbane05/blogs/proceedings/38_Kennedy.pdf

Kent, T.W., & McNergney, R.F. (1999). *Will technology really change education?* Thousand Oaks, CA: Corwin Press.

Keobke, K. (1998). Computers and collaboration: Adapting CALL materials to different learning styles. In J.M. Reid (Ed.), *Understanding learning styles in the second language classroom* (pp. 46-52). Upper Saddle River, NJ: Prentice Hall Regents.

Khan, M.S. (1987). *Humanism and Islamic education.*Muslims educational quarterly.

Kincheloe, J., & McLaren, P. (1994). Rethinking critical theory and qualitative research. In N. Denzin & Y. Lincoln (Eds.), *Handbook of qualitative research* (pp. 138-157). Thousand Oaks, CA: Sage.

Kolb, A.Y., & Kolb, D.A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Management Learning*, *4*(2), 193-212.

Krashen, S. (1982). *Principles and practice in second language acquisition.* Oxford: Pergamon.

Krashen, S. (1985). *The input hypothesis: Issues and implications.* London: Longman.

Kublin, K.S., Wetherby, A.M., Crais, E.R., & Prizant, B.M. (1989). Prelinguistic dynamic assessment: A transactional perspective. In A.M. Wetherby, S.F. Warren, & J. Reichle (Eds.), *Transitions in prelinguistic communication* (pp. 285-312). Baltimore, MD: Paul H. Brookes.

Lantolf, J.P., & Thorne, S.L. (2006). *Sociocultural theory and the genesis of second language development*. Oxford: Oxford University Press.

Larsen-Freeman, D., & Long, M.H. (1991). *An introduction to second language acquisition research.* New York: Longman.

Lea, S. J., D. Stephenson, & J. Troy (2003). Higher education students' attitudes to student-centered learning: Beyond 'educational bulimia'. *Studies in Higher Education 28*(3), 321-334.

Lee, Y.L. (2005). *Integrating constructivist approaches in e-learning to enhance mathematical self-study*. In: The Mathematics Education into the 21st Century Project: Reform, Revolution and Paradigm Shifts in Mathematics Education. Nov 25th – Dec 1st 2005, Universiti Teknologi Malaysia, Johor Bharu, Malaysia. Retrieved June 28, 2009, from http://math.unipa.it/~grim/21_project/21_malasya_ZLee%20Ya%20Ling238-242_05.pdf

Littlejohn, A. (2008). Speaker, Cultivating Real Readers Conference, Al Ain Men's College, Center of Excellence for English, Al Ain, UAE, April 9.

Lortie, D. (1975). *Schoolteacher: A sociological study.* Chicago: University of Chicago Press.

Lubis, M.A., Yunus, M.MD, Diao, M. Muhamad, T.A., Apha, R. Ishak, N.M. (2011). *The perception and method in teaching and learning Islamic education.* International Journal of education and information technologies. Issue 1, Volume 5, 2011.

Lukes, S. (2005). *Power: A radical view* (2nd ed.) Basingstoke: Palgrave Macmillan.

Macpherson, R., Kachelhoffer, P., & El Nemr, M. (2007). The radical modernization of school and education system leadership in the United Arab Emirates: Towards indigenized and educative leadership. *International Studies in Educational Administration (ISEA), 35* (1), 60-77.

McCracken, G. (1988). *The long interview (Qualitative research methods #13).* Newbury Park, CA: Sage.

McCulloch, G., & Richardson, W. (2001). *Historical research in educational settings*. Buckingham: Open University Press.

McKernan, J. (1996). *Curriculum action research: A handbook of methods and resources for the reflective practitioner* (2nd ed.). London: Kogan Page.

McKernan, J. (2008). *Curriculum and imagination: Process theory, pedagogy and action research.* New York, NY: Routledge.

McLaughlin, B. (1987). Reading in a second language: Studies with adult and child learners. In S.R. Goldman & H.T. Trueba (Eds.), *Becoming literate in English as a second language* (pp. 57-70). Norwood, NJ: Ablex.

McLeod, B. & McLaughlin, B. (1986). Restructuring or automaticity? Reading in a second language. *Language Learning, 36*(2), 109-126.

Mercer, N. (2001). Language for teaching a language. In: Candlin, C.N. and Mercer, N. (eds.), *English Language teaching in its social context.* London: Routledge.

Meyer, M. (1991). Developing transcultural competence: Case studies of advanced foreign language learners. In D. Buttjes & M. Byram (eds.), *Mediating languages and cultures* (pp. 136-159). Clevedon: Multilingual Matters.

Mikulecky, B.S. (1990). *A short course in teaching reading skills.* Reading, MA: Addison-Wesley.

Moll, L.C. (1990). *Vygotsky and education: Instructional implications and Applications of sociohistorical psychology.* Cambridge, Eng.: Cambridge University Press.

Morgan, L.G. (2008). Improving student engagement: Use of the interactive whiteboard as an instructional tool to improve engagement and behavior in the junior high school classroom. Unpublished dissertation, Liberty University, Lynchburg, Virginia.

National Editorial (2011a, May 15). Respect teachers to reduce turnover. *The National,* p. 19. Retrieved from http://www.thenational.ae/thenationalconversation/editorial/respect-teachers-to-reduce-turnover

National Editorial (2011, October 31). , Technological tools are vital for schools, *The National. Retrieved from* http://www.thenational.ae/thenationalconversation/editorial/technological-tools-are-vital-for-schools

Neile, C.S. (2008). Spinning on the stump. *Toastmaster, 74*(11), 8-11.

Netten, J. & Germain, C. (2002a). *L'apprentissage intensif du Francais: Rapport final.* Ottawa, OH: Department of Canadian Heritage.

Netten, J. & Germain, C. (2002b). Transdisciplinary approach and intensity in second language learning/teaching. *Canadian Journal of Applied Linguistics/La Revue canadienne de linguistique appliqué, 3*(1-2), 107-122.

Norton, B. (2000). *Identity and language learning: Gender, ethnicity and educational change.* London: Pearson Education.

Nuttall, C. (1996). *Teaching reading skills in a foreign language.* Oxford: Heinemann.

O'Brien, M. & Martin, T. (2010). Local needs, external requirements: Balancing the needs of a country's educational system with the requirements of international recognition. In N. Reynolds & M. Banfa (Eds.), *Developing a nation through educational emiratization: Reflections on the development and implementation of a transformational teacher education program in the UAE;* Book 3 in M. O'Brien (Ed.), New classroom voices; HCT Teacher Education Series.

O'Connell, S. (2001). *Focus on IELTS: Coursebook.* London: Longman.

O'Malley, J.M., & Chamot, A.U. (1990, 1992) *Learning strategies in second language acquisition.* Cambridge: Cambridge University Press., New York, NY: Cambridge.

O'Malley, J.M., Chamot, A.U., Stewner-Mazanares, G., Russo, R. & Kupper, L. (1985). Learning strategies applications with students of English as a second language. *TESOL Quarterly, 19,* 285-296.

O'Sullivan, E. (1999). *Transformative learning.* London: Zed Books.

Oblinger, D.G. (1999). Hype, hyperarchy, and higher education. *Business Officer, 33*(4), 22-24, 27-31.

Oksala, J. (2007). *How to read Foucault.* New York, NY: W.W. Norton.

Oxford, R. (1989). Use of language learning strategies: A synthesis of studies with implications for strategy training. *System, 17,* 235-247.

Oxford, R. (1990). *Language learning strategies: What every teacher should know.* Boston, MA: Wadsworth.

Oxford, R.L. (1985). *A new taxonomy for second language learning strategies.* Washington, DC: ERIC Clearinghouse on Languages and Linguistics.

Oxford, R.L., Park-Oh, Y., Ito, S., & Sumrall, M. (1993). Learning a language by satellite: What influences achievement? *System, 21,* 31-48.

Pape, S.J., & Smith, C. (2002) Self-regulating mathematics skills. *Theory Into Practice, 41*(2), 93-101.

Schoenfeld, A.H. (1983). Episodes and executive decisions in mathematical problem solving. In R. Lesh & M. Landau (Eds). *Acquisition of mathematics concepts and processes* (pp. 345-395). Orlando, FL: Academic Press.

Pausch, R. (2008). *The last lecture.* London: Hodder & Stoughton Ltd.

Pelletierri, J. (2000). Negotiation in cyberspace: The role of chatting in the development of grammatical competence. In M. Warschauer & R.G. Kern (Eds.), *Network-based language teaching: Concepts and practice* (pp. 59-86). Cambridge, Eng.: Cambridge University Press.

Pennycook, A. (1990). Critical pedagogy and second language education system. *System, 18*(3): 303-14.

Pennycook, A. (1997). Cultural alternatives and autonomy. In P. Benson & P. Voller (Eds.), *Autonomy and independence in language learning* (pp. 35-53). London: Longman.

Pennycook, A. (1998). *English and the discourses of colonialism.* London: Routledge.

Pennycook, A. (1999). Introduction: Critical approaches to TESOL. *TESOL Quarterly, 33*(3), 329-348.

Pennycook, A. (2001). *Critical applied linguistics*. Mahwah, NJ: Lawrence Erlbaum Associates.

Peters, R.S., Woods, J., & Dray, W.H. (1973). Aims of education—a conceptual inquiry. In R.S. Peters (Ed.), *The Philosophy of Education* (pp. 11-57). London: Oxford University Press.

Phalet, K., & Lens, W. (1995). Achievement motivation and group loyalty among Turkish and Belgian youngsters. *Advances in Motivation and Achievement, 9,* 31-72.

Phillipson, R. (1992). *Linguistic imperialism.* Oxford: Oxford University Press.

Pica, T. (1994). Review article—Research on negotiation: What does it reveal about second-language learning conditions, processes, and outcomes? *Language Learning, 44,* 493-527.

Pring, R. (2000). *Philosophy of educational research* (2nd ed). London: Continuum.

Ragaini, T. (2000). Turbine's Asheron's Call. *Game Developer:* 54-66.

Rasekh, Z.E., & Ranjbary, R. (2003). *Metacognitive Strategy Training for Vocabulary Learning. TESL-EJ, 7*(2). Retrieved from http://tesl-ej.org/ej26/a5.html

Reader's Digest (2011, May). The cheating epidemic; condensed from "The Shadow Scholar," *The Chronicle Review/The Chronicle of Higher Education,* November 12, 2010. Retrieved from http://chronicle.com/article/The-Shadow-Scholar/125329/

Richard-Amato, P. & Snow, M.A. (1992) *The multicultural classroom.* Addison-Wesley: Reading, Massachusetts.

Richards, K. (2003). *Qualitative inquiry in TESOL.* New York, NY: Palgrave Macmillan.

Rogoff, B. (1991). Guidance and participation in spatial planning. In L.B. Resnick, J.M. Levine, & S.B. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 349-364). Washington, D.C.: American Psychological Association.

Sabieh, C. (2009, June). Enhancing the educational environment through learning technologies: Only a question of curriculum? *TESOL Arabia Perspectives,16*(2), 11-17. Retrieved from www.tesolarabia.org

Sagor, R. (1992). *How to conduct collaborative action research.* Alexandria, VA: Association for Supervision and Curriculum Development.

Savery, J.R. (2002). Faculty and student perceptions of technology integration in teaching. *The Journal of Interactive Online Learning, 1*(2), 1-16. Retrieved from www.ncolr.org

Saville-Troike, M. (1984). What *really* matters in second language learning for academic achievement? *TESOL Quarterly, 18,* 199-219.

Sawanda, T. (1997). Developing lesson plans. In J. Becker & S. Shimada (Eds.), *The open-ended approach: A new proposal for teaching mathematics* (pp. 23-35). Reston, VA: National Council of Teachers of Mathematics.

Schwandt, T. (1994). Constructivist, interpretivist approaches to human inquiry. In N.K. Denzin & Y.S. Lincoln, *Handbook of qualitative research* (pp. 118-137). Thousand Oaks, CA: Sage.

Semali, L., Stambach, A. (1997). Cultural Identity in an African Context: Indigenous education and curriculum in East Africa. *Folklore Forum* 28:1. (pp.3-27).

Shaw, K. (2006). Muslim education in the Gulf States and Saudi Arabia: Selected issues. In R. Griffin (Ed.) *Education in the Muslim world: Different perspectives* (pp. 41-54). Oxford: Symposium Books.

Simpson, J. 2002. Computer-mediated communication. *ELT Journal, 56*(4): 414-415.

Skehan, P. (1989). Language learning strategies (Chapter 5). *Individual differences in second-language learning* (pp. 73-99). London: Edward Arnold.

Skehan, P. (1996) Second language acquisition research and task-based instruction. In J. Willis & D. Willis (Eds.), *Challenge and change in language teaching* (pp. 17-30). Oxford: Macmillan Heinemann.

Skehan, P. (1998). *A cognitive approach to language learning.* Oxford: Oxford University Press.

Solomon, J., & Rhodes, N. (1995). *Conceptualizing academic language*. University of California, Santa Cruz: National Center for Research on Cultural Diversity and Second Language Learning.

Somekh, B. (1995). The contribution of action research to development in social endeavours: A position paper on action research methodology. *British Educational Research Journal, 21*(3), 339-355.

Son, J.B. (2007). Learner experiences in Web-based language learning. *Computer-assisted language learning, 20*(1), 21-36.

Sorrentino, R.M. (1996). The role of conscious thought in a theory of motivation and cognition: The uncertainty orientation paradigm. In P. M. Gollwitzer & J.A. Bargh (Eds.), *The psychology of action: Linking cognition and motivation to behavior* (pp. 619-644). New York, NY: Guilford Press.

Spanos, G. (1992). ESL math and science for high school students: Two case studies. *Third National Research Symposium on Limited English Proficient Student Issues.* Retrieved from https://www.msu.edu/~nguyenl1/ESLmath2.html

Spivak, G. (1993). *Outside in the teaching machine.* New York, NY: Routledge.

Stage, F.K., & Kloosterman, P. (1995). Gender, beliefs and achievement in remedial college-level mathematics. *Journal of Higher Education, 66*(3), 294-311.

Stenhouse, L. 1975. *An introduction to curriculum research and development.* London: Heinemann.

Stepp-Greany, J. (2002). Student perceptions on language learning in a technological environment: Implications for the new millennium. *Language Learning & Technology, 6*(1), 165-180.

Swain, M. (1985). Communicative competence: Some roles of comprehensible input and comprehensible output in its development. In S. Gass & Madden, C. (Eds.), *Input in Second Language Acquisition* (pp. 235-256). New York, NY: Newbury House.

Swan, M. (2011, April 1). Relocated teachers' old jobs advertised. *The National.* Retrieved from http://www.thenational.ae/news/uae-news/relocated-teachers-old-jobs-advertised

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches.* Thousand Oaks, CA: Sage Publications.

Tharp, R.R., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in social context.* Cambridge, Eng.: Cambridge University Press.

Tuksinvarajarn, A., & Todd, R.W. (2009). The E-pet: Enhancing motivation in e-portfolios. *English Teaching Forum, 47*(1), 22-25.

Twigg, C.A. (2004). Using asynchronous learning in redesign: Reaching and retaining the at-risk student. *Journal of Asynchronous Learning Networks, 8*(1), 2-12.

Umpstead, B. (2008). Michigan targets 'Millennials' with i-Tunes content for learning. *e School News, 11,* 31. Retrieved from www.eschoolnews.com

Ushioda, E. (1996). *Learner autonomy 5: The role of motivation*. Dublin: Authentik.

Ushioda, E. & Dörnyei, Z. (2009). *Motivation, language identities and the L2 self: A theoretical overview.* New York, NY: Cambridge University Press.

Von Glasersfeld, E. (1989). Cognition, construction of knowledge, and teaching. *Synthese, 80*(1), 121-140.

Walker, R. (1985). *Doing research: A handbook for teachers*. London: Methuen.

Weiner, B. 1984. Principles for a theory of student motivation and their application within an attritional framework. In R. Ames & C. Ames (Eds.). *Research on motivation in education: Student motivation*. Vol. 1 (pp. 15-38). San Diego, CA: Academic Press.

West, C. (1992). Identity: A matter of life and death. *October,* 61, 20-23; reprinted in *Prophetic Reflections* (1993), pp. 163-168.

Widdowson, H. (1987). The roles of teacher and learner. *ELT Journal, 39,* 253-261.

Wiersma, A. (2008). A study of teaching methods of high school history teachers. *The social studies, 99*(3), p. 111-116.

Williams, J. (1998). *Don't they know it's Friday?* London: Motivate Publishing.

Williams, M., & Burden, R.L. (1997). *Psychology for language teachers: A social constructivist approach*. Cambridge: C.U.P.

Williamson, M. (2004). *The Gift of Change.* London: Harper Collins Publishers.

Willis, D., & Willis, J. (Eds.) (1996). *Challenge and change in language teaching.* Oxford, Eng.: Macmillan Heinemann.

Winter, R. (1996). Some principles and procedures for the conduct of action research. In O. Zuber-Skerritt (Ed.), *New directions in action research* (pp. 13-27). London, Eng.: Falmer.

Yassin, S., Tek, O.E., Alimon, H. Baharom, S. Ying, L.Y. (2010). *Teaching Science through English: Engaging pupils cognitively.* International CLIL research journal, Vol 1 (3) 2010. Retrieved from http://www.icrj.eu/13-744.

Zhang, Y. (2005). An experiment on mathematics pedagogy: Traditional method versus computer-assisted instruction. *ERIC Digest.* Available at: http://www.eric.ed.gov:80/PDFS/ED490695.pdf

Zuber-Skerritt, O. (1996). Emancipatory action research for organizational change and management development. In O. Zuber-Skerritt (Ed.), *New directions in action research* (pp. 83-104). London: Falmer.