The Effect of Technology-enhanced Classroom in Middle School Education

Ramadan Eyyam

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Prof. Dr. Elvan Yılmaz
Director

I certify that this dissertation satisfies the requirements as a thesis for the degree of Doctor of Philosophy in Educational Sciences.

Prof. Dr. Serdar Erkan
Chair, Department of Educational Sciences

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Doctor of Philosophy in Educational Sciences.

Assoc. Prof. Dr. Hüseyin Yaratan
Supervisor

Examining Committee

1. Prof. Dr. Yücel Gelişli
2. Prof. Dr. Mehmet Taşpınar
3. Prof. Dr. Hüseyin Uzunboylu
4. Assoc. Prof. Dr. Oğuz Serin
5. Assoc. Prof. Dr. Hüseyin Yaratan

ABSTRACT

The education system in North Cyprus is changing continuously in an effort to bring standards up to par with developed nations. The new system designed in 2005 is still not used effectively in most of the schools in North Cyprus. Educational technology, viewed as an inseparable part of education, has also been introduced into the new North Cyprus education system although the implementation of technology has not occurred as planned. The present study's objective, therefore, is to investigate how technology use affects student progress. For this purpose, in the present study the experiment was conducted in technology-enhanced classroom. Furthermore, the effect of technology-enhanced classroom was examined with respect to gender and the multiple intelligence (MI) profiles of students.

A private school in the Famagusta district was chosen and the progress of all 82 seventh grade students (34 female and 48 male) was observed in two subjects, English and Mathematics. In each part of this experimental study, students were divided into treatment and control groups using the cross-implementation experimental method. The study lasted 40 contact hours for each subject. In treatment groups for both Mathematics and English, lessons were held in technology-enhanced classroom whereas in control groups no technology was implemented, in other words, traditional instruction was maintained.

The results indicate that in English lessons, technology-enhanced classroom did not make a significant difference whereas it did seem to improve students' performance in Mathematics lessons, even though the difference was not statistically significant. Also, no statistically significant differences were found with regard to the gender of students. On the other hand, when the MI profiles of students were taken into consideration, the results revealed that the kinesthetic, verbal, and logical intelligences of students were predictors of their success in Mathematics lessons in technology-enhanced classroom. The study also reveals that students had positive opinions on technology use as did English teachers whereas Mathematics teachers felt rather negative towards the implementation of technology.

Although the literature indicates that technology use affects classroom instruction positively, some research has yielded similar results to those of the present study, where technology-enhanced classroom was found not to be effective. This suggests that the research should be repeated on a longitudinal basis in order to obtain more reliable results which could contribute to the education system in North Cyprus.

Keywords: instructional technology, cross-implementation experimental method, English, Mathematics, opinions on technology use, secondary education, instructional design

ÖZ

Kuzey Kıbrıs eğitim sistemi, gelişmiş ülkelerle aynı düzeye ulaşma çabası ile sürekli değişim içindedir. 2005 yılında düzenlenmiş olan yeni sistem, halen Kuzey Kıbrıs'taki okulların çoğunda etkili bir biçimde uygulanamamaktadır. Eğitimin ayrılmaz bir parçası olarak kabul edilen öğretim teknolojileri de Kuzey Kıbrıs'ın yeni eğitim sistemine dahil edilmiştir ancak teknolojinin uygulanması planlandığı gibi gerçekleşmemiştir. İşbu araştırmanın amacı teknolojinin öğrencilerin başarısını nasıl etkilediğini incelemektir. Bu nedenle bu çalışmadaki deney, teknoloji destekli sınıfta gerçekleştirilmiştir. Teknoloji destekli sınıfın olası etkisi, öğrencilerin cinsiyeti ve çoklu zeka profillerine bağlı olarak da incelenmiştir.

Araştırma için Gazimağusa ilçesinde özel bir okul seçilmiş ve tüm yedinci sınıf öğrencilerinin (34 kız ve 48 erkek olmak üzere toplam 82) İngilizce ve matematik derslerindeki gelişimi izlenmiştir. Bu deney araştırmanın her iki bölümünde, öğrenciler, *çapraz-uygulama deneysel yöntemi* kapsamında deneysel ve kontrol olmak üzere iki gruba ayrılmıştır. Deney, her bir ders için 40 ders saati sürmüştür. Hem Matematik hem İngilizce derslerinde deney gruplarında teknoloji destekli sınıflarda eğitim verilirken, kontrol gruplarında herhangi bir teknoloji kullanılmamış, başka bir deyişle dersler geleneksel öğretim yöntemleriyle yürütülmüştür.

Sonuçlar; teknoloji destekli sınıfın İngilizce dersinde önemli bir farka yol açmazken Matematik dersinde öğrencilerin başarısını olumlu yönde etkilediği, ancak farkın istatistiksel olarak anlamlı olmadığını göstermiştir. Öğrencilerin cinsiyeti açısından da istatistiksel olarak anlamlı farklar elde edilmemiştir. Diğer yandan, öğrencilerin çoklu zeka profilleri göz önüne alındığında, öğrencilerin kinestetik, sözel, ve mantıksal zekalarının, teknoloji destekli sınıfta matematik derslerindeki başarılarını öngörmeyi sağlayan birer etmen oldukları görülmüştür. Araştırmanın sonuçları ayrıca, öğrencilerin ve İngilizce öğretmenlerinin teknoloji kullanımı konusunda olumlu görüşleri olduğunu ortaya koyarken, matematik öğretmenlerinin teknoloji uygulamalarına karşı olumsuz görüşleri olduğunu göstermiştir.

Bu alandaki yayınlar teknoloji kullanmının sınıf içi öğretimi üzerinde olumlu etkileri olduğunu gösterse de, birtakım araştırmalarda işbu araştırmanın sonuçlarına benzer biçimde, teknoloji destekli sınıfın etkili olmadığı yolunda sonuçlar elde edilmiştir. Bu durum, araştırmanın uzun vadeli bir biçimde tekrarlanarak Kuzey Kıbrıs eğitim sistemine katkıda bulunacak biçimde daha güvenilir sonuçlar elde edilmesi gerektiğine işaret etmektedir.

Anahtar sözcükler: öğretim teknolojileri, çapraz-uygulama deneysel yöntemi, İngilizce, matematik, teknoloji kullanımı üzerine görüşler, orta öğretim, öğretme tasarımı

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INTRODUCTION

In the developed world, technology has become an important part of daily life and has thereby lead to corresponding changes in education. A large number of teachers and school administrators believe that using technology in the classroom is beneficial (Frei, Gammill & Irons, 2007; Whitehead, Jensen & Boschee, 2003; Kelly, 2002, Norton & Wiburg, 2003; Kagan & Kagan, 1998; Armstrong, 2003a), thus technology has been used in classes for more than a century since chalkboards were also means of technology (Dudeney & Hockly, 2007; Norton & Wiburg, 2003; McKenzie, 2005; Picciano, 2006). However, it has been observed that technology has not been widely adopted in schools in the Turkish Republic of Northern Cyprus (TRNC) even in the year 2014 and the question 'why' has not yet been answered, although there have been some attempts (Tenekeci, 2011; Yaratan & Kural, 2010; Hürsen & Çeker, 2011). Thus, the idea of conducting an experimental study emerged in order to investigate the benefits of implementing technology in TRNC classrooms.

1.1 Background of the Study

National education in the Turkish Republic of Northern Cyprus (TRNC) is based on a central system under the direction and supervision of the Ministry of National Education (MNE). The educational system is governed by laws and all educational organizations and schools are under the scrutiny of the Ministry. The Turkish Cypriot National Education System is based on a centrally prescribed curriculum prepared by the Ministry. In the latest MNE Brochure (2005, p. 6) under the main heading 'The

Objectives of the New Education System' and the subheading 'The Primary Objectives of Education', it can be clearly seen that the MNE governs and controls the whole education system in North Cyprus.

The National Education System was last examined in 2005 during the 4th National Education Council Meeting, where it was decided that major modifications would be required in order for the system to meet the current and future needs of the society, as explained in the MNE Brochure (2005) under the heading 'The Need to Restructure the Education System':

> The Turkish Cypriot education system has to be restructured to allow:
>
> 1. the Turkish Cypriot community to acquire its rightful place among other societies in the information age;
> 2. the Turkish Cypriot community to develop in social, cultural, and economic areas;
> 3. equal opportunities in education;
> 4. life-long learning;
> 5. openness to innovations in education;
> 6. student-centered learning (p. 4[1]).

This new system defines ideal learners as:

> individuals who are well adapted to the information age, with a developed ability to think, understand, and solve problems, a profound sense of personal responsibility; who have acquired a variety of skills; who are attached to democratic values, open to change and to new ideas, deeply conscious of their

[1] MNE Brochure. (2005). Translated from Turkish to English by the author.

own culture and able to interpret different cultures, capable of contributing to contemporary civilization and to generate knowledge and technology; and can aptly use computer technology (p. 6[1]).

The Vision and Mission of the New Education System were carefully modernized; thus, the emphasis put on learners increased due to the ever-growing importance of technology in the current era and the new generation's exposure to it. The general structure of the new system is defined in the MNE Brochure (2005) as follows:

> In order to fulfill its determined objectives, the Turkish Cypriot Education System has been restructured along a consistent and continuous sequence of 14 academic years preceding higher education, as detailed below. Thus, the new education system consists of three main stages, namely, 'Basic Education,' 'High School Education,' and 'Higher Education.'
>
> **1. Basic Education:**
>
> **a) Pre-school period:** Nursery School (4 to 5 years of age) and Kindergarten (5 to 6 years of age). Basic Education starts at the Preschool level and continues through the last year of Secondary School. Compulsory Basic Education starts at the Kindergarten level.
>
> **b) Primary School period:** Comprises grades 1 to 5. The age range is between 6 to 7 to 10 to 11 years of age.
>
> **c) Secondary School period:** Comprises grades 6 to 9. The age range is between 10 to 11 to 14 to 15 years of age.
>
> **2. High School Education:** Comprises grades 10 to 12 or 10 to 13. This period lasts 3 or 4 years, depending on the program (curriculum).

[1] MNE Brochure. (2005). Translated from Turkish to English by the author.

3. Higher Education: Comprises the years following High School Education (for the tabled version of this system, see Table 1 in Appendix A) (p. 8[1]).

The attempts of the TRNC Ministry to bring the system up to advanced standards have not been limited to changes in the general structure. In order to realize a learning environment where all students in a classroom benefit from instruction and learn as much as possible, other aspects were also taken into account. First of all, the various needs and expectations of students were considered as well as the diversity among students in other ways. These differences can be learning styles, learning pace, background knowledge, learning experience, level of motivation, ability to understand, age, needs and interests, and socio-economic status (which comprises family income, whether or not they are an only child, whether or not they have their own room and/or computer, the education of their parents, and so forth). By taking all these differences into account, a bridge might be constructed to reach individual students as stated in item 6 of the New Approach to Programs: "Instruction is to focus on individual differences among learners rather than being based on the average learner profile" (p. 6[1]).

In order to bring standards up to the current level and implement innovations from education systems around the world, it is also essential to employ the various tools stated in "New Approach to Programs" and in "Principles of the Basic Educational Program" in the MNE Brochure (2005), such as learner-centered, cooperative and constructivist learning approaches; technology (e.g., portable computers, mobile phones, interactive boards, smartboards) in the classroom; considering individual differences; encouraging conceptual and reallife based learning; and helping students

[1] MNE Brochure. (2005). Translated from Turkish to English by the author.

become creative and skilled. In addition to these necessities, the real needs of the society, what is expected in the future, and the place the society aims for in the world should all be taken into consideration in order to offer a better education to students who are the future members of the society. In addition, elements from contemporary systems around the world should be implemented. Moreover, teachers should be trained and supplied with the necessary skills, information, aids, and equipment needed to provide a better education.

Conway (1997) summarizes the points mentioned above and states the following:

> In order to succeed in the twenty-first century, schools must graduate students who are prepared to be life-long learners. This challenge necessitates a pedagogical shift from transmitting a body of expected knowledge that is largely memorized to one that is largely process-oriented (p. 1).

She further mentions that the concept of multiple intelligences comes into play at this point (1997). Considering learners' differences and the importance of the process, Howard Gardner's theory suggests opportunities to help students in a more appropriate way, through their own way of learning. The Theory of Multiple Intelligences, put forward by Howard Gardner in 1983, consists of nine different abilities or types of intelligences every person has, namely, verbal-linguistic, logical-mathematical, musical-rhythmic, visual-spatial, bodily-kinesthetic, interpersonal, intrapersonal, naturalist, and existential (McKenzie, 2005). Gardner believes that standard IQ tests cannot measure people's real capacities as the tests are uniform and are not adaptable to society, time, personal differences, and so forth (Lever-Duffy, McDonald & Mizell, 2005).

> According to Gardner's theory, every individual possesses some degree of each of the intelligences he details but one or more of the intelligences dominates. If any one of the intelligences is of significant capacity, the result is a prodigy in that area. Gardner's view equally recognizes the unique abilities of Mozart (musical intelligence), Frank Lloyd Wright (spatial intelligence), and Babe Ruth (bodily-kinesthetic intelligence), whereas standard IQ tests might recognize only Albert Einstein (logical mathematical intelligence) and William Shakespeare (linguistic intelligence) (Lever-Duffy et al., 2005, pp. 21-22).

Using the concept of multiple intelligences helps teachers plan their instruction and use one or more of the other intelligences in addition to the more commonly recognized ones, verbal-linguistic and logical-mathematical, to actualize the learning of students (Kagan & Kagan, 1998). In this way, students can use the different intelligences they possess and benefit more from instruction and be more successful than when taught in the classical way (Armstrong, 2000). Conway (1997) postulates that:

> Giving students a chance to share a wide variety of kinds of intelligence adds to their confidence and belief in themselves as intelligent and competent learners, that no matter what the task, they will be able to learn to do it (p. 1).

For a better, more effective education, in addition to considering the multiple intelligences of students, technology use in education also helps teachers overcome various classroom challenges more easily. The literature states that relevant technology use in class has a positive influence on student achievement and success as technology and the teaching-learning process work hand in hand to facilitate the effective transfer of knowledge (Smaldino, Russell, Heinich, & Molenda, 2005; Johnson, Maddox, & Liu, 2000; Picciano, 2006; Barron, Ivers, Lilavois & Wells, 2006; Stewart, Schifter & Selverian, 2010). Technology helps people and makes many aspects of their life effortless. For instance, almost any desired information can be directly acquired whenever needed. Technology like computers, the Internet, mobile phones, digital cameras, DVDs, and so on can be used to disseminate, grasp, or preserve information rapidly and effortlessly. In addition, instructional technologies increase communication and interactivity (Picciano, 2006; Stewart et al., 2010; Schacter & Fagnano, 1999; Ivers, 2009; Norton & Wiburg, 2003). The literature indicates that instructional technology guarantees solutions to many instructional challenges (Smaldino et al., 2005; Jonassen, Howland, Moore & Marra, 2003; Whitehead et al., 2003; Holleis, Schmidt, Drewes, Atterer & Dollinger, 2010; Schacter, 1999; Pitler, Hubbell, Kuhn & Malenoski, 2007; Barron et al., 2006). For instance, technology-enhanced classroom helps instructors supply instant feedback, initiate student learning and teamwork, and assist synergy. It also allows for personalized learning preference and resilience (Norton & Sprague, 2001; Hefzallah, 2004; Cennamo, Ross & Ertmer, 2010). The benefits of technology-enhanced classroom to students are not few, as Bitter and Pierson (2005) state: “A recent meta-analysis demonstrated that students using technology had modest but positive gains in learning outcomes over those students who used no technology” (p. 107). Likewise, Bates and Poole (2003) suggest that “technology does not reduce the need for imaginative, creative thinking about teaching and learning; indeed, it increases the need. Technology opens up a vast range of opportunities for the imaginative, creative teaching…” (p. 178).

McKenzie (2005) additionally mentions that "because instructional technologies tend to be hands-on, they have proven to be very useful in classroom instruction" (p. 34). He concludes, "Technology can completely change the way that instruction is delivered to students" (p. 34). Being only aware of the aspects of technology mentioned above is not sufficient for effective and efficient instruction. Knowing how to use technology effectively and appropriately in the classroom and how to integrate it into the teaching-learning process is also essential (Barron et al., 2006). At this point it is logical to go further and talk about the importance of choosing the best type of technology for instruction as the use of appropriate educational tools can profoundly affect and enhance instruction (Ivers, 2009; Smaldino et al., 2005). Thus, technology should be used consciously and be supplemented with other tools and approaches. McKenzie (2005) states that "the first step in using technology effectively in the classroom is to apply our knowledge of different technologies to Gardner's model. The intelligences a technology stimulates are determined by the context in which the technology is used for instruction" (p. 35). In other words, instructional technology and multiple intelligences should be used hand in hand so as to provide compound benefits to both teachers and students. In other words, if both students' different intelligences and the integration of technology into instruction are taken into account, students' gain may be optimized. Moreover, teachers should be familiar with the multiple intelligence profile as well as the dominant intelligence of each student, as well as with a variety of teaching methods, learning styles, and so forth in order to make lessons as beneficial as possible for each individual student.

1.2 Statement of the Problem

During the reform, the curriculum designers took the student-centered approach as the basis of the TRNC Education System (MNE Brochure, 2005, p. 4) because of the rationale behind it. Student-centeredness has emerged from the theory of

Constructivism which claims that student engagement with meaningful learning is a result of experiential learning (Smaldino et al., 2005). Students take the initiative in their own learning process and construct their knowledge based on how they relate new information with past experiences (Reiser & Dempsey, 2007; Bitter & Pierson, 2005). Students need to understand the world in order to build such a relationship and understanding the world can be "facilitated by appropriate learning activities and a good learning environment" (Grabe & Grabe, 2007, p. 54).

The approach that the TRNC Education System aims to apply, learner-centeredness, "focuses on student learning and what students do to achieve this" (Harden & Crosby, 2000, p. 335). Some scholars emphasize that learner activity, learners' experience, process, and competence are central in learner-centeredness. Some other important characteristics of this approach are "learner's personal needs, preferences, interests, and competencies; as a consequence, learners have the sense of being known, respected, challenged, and supported while learning" (McCombs & Whistler, 1997, p. 33).

Students are responsible for their own learning in student-centered design and they can decide how they learn better by using different means of instruction (Pitler et al., 2007). As Howard Gardner (1983) introduced in his Theory of Multiple Intelligences, every person is unique and the best means of instruction varies from person to person. Therefore, we need to consider differences in the learning styles of students as well (Kornhaber, Fierros and Veenema, 2004; Jonassen and Grabowski, 1993; Kagan & Kagan, 1998; Gardner, 1991). To summarize, students have different learning styles and strategies, technology-enhanced classrooms improves students' learning, and students' multiple intelligences reflect the diversity of students. When these factors are emphasized, instruction will reach its aim and learning will be accomplished more easily and quickly (Clyde & Delohery, 2005).

As implied above, traditional materials are generally designed for the two most popular intelligence types, verbal-linguistic intelligence and logical-mathematical intelligence. As a result, students who have other dominating intelligences face problems while learning and they need to spend more time and effort in order to acquire the information presented to them. Integrating technology into instruction and using it appropriately can meet the needs of such students.

In the literature, it is mentioned that *learner-centered strategies* are important and should be employed in education. In addition, it is stated that the *diverse needs of students* should be considered and *students' higher order skills and creativity* should be developed (Trotter, 1997; Jonassen, Howland, Marra, & Crismond, 2008; Stewart et al., 2010; Ivers, 2009; Hefzallah, 2004; Whitehead et al., 2003; Reich & Daccord, 2008). To achieve these objectives, technology should be implemented in classrooms and multiple intelligence profile of the students should be examined. In this way, teaching becomes more meaningful and efficient (Jonassen et al., 2003; Zhao, Frank and Ellefson, 2006; Egbert, 2007; Tomei, 2005; Jonassen et al., 2008; Johnson, Maddox, & Liu, 2000; Norton & Sprague, 2001).

When the new formal educational perspective and the basics of the new formal education program are examined, it can be stated that they are open to discussion as well as investigation. Regarding the definitions of the concepts mentioned above, the MNE claims that the curriculum for basic education is student-centered. However, when examined, the curriculum as implemented by teachers is generally not student-centered (“21. Yüzyılın Öğretmeni”, 2013; Zeki, 2013; Ekizoğlu & Uzunboylu, 2006).

In today’s schools in North Cyprus, students are educated in a system based on rote-learning (Cankoy, 2010; “21. Yüzyılın Öğretmeni”, 2013; Öngün, 2012; Yalvaç, 2012, Öztürkler, 2014, Zeki, 2013; Cankoy & Tut, 2005; Çağıltay & Bichelmeyer, 2000), whether the schools are governmental or private. Many of the suggestions about the Multiple Intelligences Theory, the use of technology, and student-centered education mentioned earlier are not implemented in the majority of TRNC schools. The new program proposed by the MNE has been misunderstood by the school administrators or teachers and thus there has been no implementation either, although the program seems appropriate, clear, and understandable on paper.

The main reason for this failure to implement the reforms could be that the ministry forced the new program to be carried out without preparing the necessary groundwork to build it on; or it could be that the majority of teachers do not believe in it; or not enough information and/or training was provided to the actual people who are to put the system into practice (Kelley, 1994; Sandholtz, Ringstaff & Dwyer, 1997; Cuban, 1986). Moreover, sufficient equipment (overhead projectors, data projectors, computers, TV, video or DVD, realia, interactive boards, smartboards, the Internet, and so forth) that will constitute the infrastructure for this new perspective was not provided to the schools. Most of the schools do not already have the infrastructure to accommodate even some of the items mentioned above and the MNE does not have the budget to supply everything to all schools throughout the country – the TRNC Budget, 2012. According to interviews conducted with experts in the Department of Common Services in Education, not enough in-service training has been offered to the teachers for them to integrate technology appropriately into classrooms. Perhaps the important reason for the failure to implement the new program is that there are no written national standards for integrating instructional technology into schools. Even basic educational media are not available in most of the schools in North Cyprus, and teachers are therefore not using technology as an aid in their lessons in many schools (Yaratan & Kural, 2010).

If it is believed that the new educational system is worth attempting despite all the factors which prevent it from being applied effectively, the constraints mentioned above have to be considered first. More importantly, the new applications and how students are currently perceived by the teachers need to be questioned in the new, student-centered system.

1.3 Purpose of the Study

It is assumed that students enrolled in the TRNC Basic Education System still cannot get the utmost benefit from the present education system. Therefore, the present study will examine whether technology-enhanced classroom aids students' learning despite their various dominant intelligences and learning styles. For this purpose, a very comprehensive investigation and inquiry is going to be utilized to verify whether and in what ways students benefit from technology-enhanced classroom.

The following research questions were derived from the problems in the current situation of middle schools in North Cyprus:

1. How does technology-enhanced classroom affect 7th grade students' achievement
    a. in English lessons?
    b. in Mathematics lessons?

2. How does the effect of technology-enhanced classroom on 7th grade students' achievement differ with respect to gender
    a. in English lessons?
    b. in Mathematics lessons?
3. How does technology-enhanced classroom affect 7th grade
    a. male students' achievement in English lessons?
    b. female students' achievement in English lessons?
    c. male students' achievement in Mathematics lessons?
    d. female students' achievement in Mathematics lessons?
4. How is the effect of technology-enhanced classroom on 7th grade students' achievement after controlling for multiple intelligences profile of students
    a. in English lessons?
    b. in Mathematics lessons?
5. How do 7th grade students perceive technology-enhanced classroom
    a. in English lessons?
    b. in Mathematics lessons?
6. How do teachers perceive technology-enhanced classroom
    a. in English lessons?
    b. in Mathematics lessons?

1.4 Significance of the Study

At present, technology is used in education extensively in most developed countries. They experience the benefits and contributions of using different media in the teaching-learning process. As it is claimed that using technology in instruction enhances students' learning capabilities and motivation, it is important to integrate technology into the TRNC Education System as well. As mentioned in previous sections, the present situation in the TRNC, especially in basic education, is not promising in terms of technology use. It is essential to follow new developments and applications in every aspect of the teaching-learning process in order to bring standards to current levels and benefit from the opportunities they offer in the current technology era. Moreover, studies that have been done on the investigation of technology-enhanced classroom have yielded mainly positive results.

This being the case, the study aims at investigating whether the integration of technology in class motivates students to learn better and whether it makes them develop positive attitudes towards learning in North Cyprus context. In other words, this research targets at looking for similarities in technology-enhanced classroom with the other countries around the world.

Education systems around the world vary from one country to another, and sometimes even from one district to another. In the TRNC, the literacy level is almost 100% and nearly 98% of the citizens have a university level degree, which indicates the importance given to education. Therefore, the utmost care should be taken to provide the best education possible to the young people of the country. The researcher himself and his colleagues, as educators, observed that the situation was not promising at the time the present research project was planned. There was very limited technology integration in classrooms and, worst of all, no budget for purchasing technological tools, although the government was motivated to supply such equipment to all schools. Also, teachers were not willing to integrate technology into their teaching. Therefore, this study aims to educate and motivate teachers and show them the realities of technology integration so that they will be convinced of the necessity to use technology in education and overcome their fears of using it. As it is stated in a number of studies, technology-enhanced classroom both motivates students and has a positive effect on the teaching-learning process.

1.5 Definition of Terms

- **Instructional Technology:** "The theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning" (Seels & Richey, 1994, p. 9).
- **Theory of Multiple Intelligences:** the pluralistic view of intelligence that was first mentioned by Howard Gardner with seven different aspects of intellectual capability with the subsequent addition of two other aspects. These are verbal-linguistic, logical-mathematical, visual-spatial, interpersonal, intrapersonal, bodily-kinesthetic, musical-rhythmic, naturalistic, and existential intelligences.
- **Use of Technology:** The use of data projector, computer, flashcards, handouts, and PowerPoint slides in treatment groups.
- **Technology-enhanced Classroom:** The learning environment where technology is implemented to support instruction.
- **Achievement:** The progress in achievement of students between their pre-test and post-test results.
- **Cross-Implementation Method:** An experimental study method where the experiment is divided into two stages. The subjects in the control group in the first stage of the experiment become the members of the treatment group in the second stage. Likewise, the participants in the treatment group in the first stage become members of the control group in the latter stage. In this way, all participants are involved in both the treatment and control group, which results in having identical control and treatment groups in the experimental study.

1.6 Assumptions

For the first and second stages of the experiment the topics chosen were very close to one another in terms of understanding, type of intelligences and skills required for learning. Expert opinion for the similarity of the two topics used in the experiment was positive in the way that the two topics used were accepted as similar. Thus, it is assumed that the change of the topic used in the first and second stages of the experiment did not have any effect on the results obtained. Hence, it is assumed that the results were not affected by any variables except the method used for instruction.

1.7 Limitations

This study is limited to

- the academic year 2009-2010,
- a private college called Eastern Mediterranean College in the District of Famagusta,
- seventh grade students,
- two school subjects, English and Mathematics,
- student achievement,
- teacher opinions, and
- student perceptions.

Chapter 2

REVIEW OF THE LITERATURE

The present chapter focuses on the three areas, instructional technology, the Theory of Multiple Intelligences, and instructional design, which form the theoretical basis of the study. The definition, historical development, and types of educational technology, how instructional technology is perceived around the world, the importance and both the positive and negative effects of using instructional technology in education, the details of the Theory of Multiple Intelligences and its implications for education, the nine types of intelligence and the importance of identifying students' MI profile, the meaning of instructional design, how to design instruction, how to design syllabi, how to design courses, and how these three major areas relate with others will be covered in detail.

2.1 Educational or Instructional Technology

Both terms 'educational technology' and 'instructional technology' have been used in professional magazines, journals, and books throughout the modern history of education but a single satisfying definition has yet to be presented. Even the origins of the terms are not clear. In 1948, W. W. Charters, a radio instruction pioneer, made the earliest known reference and an audiovisual expert, James Finn, first mentioned the idea in 1963 (Roblyer, 2006). Since then, many scholars and experts have made attempts at definitions.

Even in the first definition in 1970, instructional technology was not considered as just a device or material. Muffoletto (1994) highlights this view, stating that

“Technology … is not a collection of machines and devices, but a way of acting” (p. 25). Egbert further emphasizes that the concept should not be too narrowly limited to computers and mobile devices but at the same time not be too general either (2007).

Historically, the field has been called both ‘educational technology’ and ‘instructional technology’. Those who prefer ‘instructional technology’ make two points, the first being that the term is more appropriate for describing the function of technology and second, that ‘educational’ commonly implies a school or educational setting. Knirk and Gustafson (1986) assert that ‘instructional’ relates primarily to teaching and learning, while ‘educational’ is too broad, encompassing all aspects of education.

Those who prefer the term ‘educational technology’ argue that since instruction is considered by many as a *part* of education, the term helps maintain a broader focus for the field (AECT, 1977). In their view, ‘educational’ refers to learning in many environments, including home, school, work, while the term ‘instructional’ connotes only school environments. It seems that both groups have used the same rationale to justify the use of different terms. There are also those who have used the terms interchangeably for many years as noted by Finn in 1965, nearly five decades ago.

The term ‘educational technology’ is generally preferred in England and Canada while ‘instructional technology’ is more widely used in the United States. Since 1977, the distinctions between these terms have disappeared. Currently, both terms are used to describe “the application of technological processes and tools which can be used to solve problems of instruction and learning” (Seels & Richey (1994) as cited in Newby, Stepich, Lehman, and Russell, 2006, p. 15).

Currently, there is less emphasis on problems encountered in all aspects of education and more emphasis on problems related specifically to the effect of incidental or intentional instruction on learning. It would therefore be difficult to describe 'instructional technology' and 'technology in education' as of 'educational technology' and both terms are used interchangeably by most professionals in the field.

> Because the term 'Instructional Technology' (a) is more commonly used today in the United States, (b) encompasses many practice settings, (c) describes more precisely the function of technology in education, and (d) allows for an emphasis on both instruction and learning in the same definitional sentence, the term 'Instructional Technology' is used in the 1994 definition, but the two terms are considered synonymous (Seels & Richey, 1994, p. 5).

The terms have often been equated with each other and seldom differentiated. For instance, Roblyer defines educational technology as "a combination of the processes and tools involved in addressing educational needs and problems, with an emphasis on applying the most current tools: computers and other electronic technologies" and instructional technology as "the subset of educational technology that deals directly with teaching and learning applications (as opposed to educational administrative applications)" (2006, p. 9).

Similarly, Hefzallah points out that instructional technology is strictly connected to educational technology. He then defines educational technology as "a technology of the mind, which may or may not use hardware or a highly technical teaching strategy to achieve the stated goals of education” (2004, p. 13). Battista defines ‘instructional technology’ as the:

> … systematic way of designing, carrying out, and evaluating the total process of learning and teaching in terms of specific objectives, based on research in human learning and communication, and employing a combination of human and nonhuman resources to bring about more effective instruction (1978, p. 477).

According to Smaldino et al. (2005), in *Instructional Technology and Media for Learning*, “instructional technology and media provide ... the tools to engage students in learning… Such tools offer powerful possibilities for improving learning” (p. 5). They conclude, “When technology refers to processes to enhance learning, we will call them *instructional systems*” (p. 21). Instructional technology examines available technologies to determine the most appropriate tools for the achievement of the desired objectives (Hefzallah, 2004). Thus, it deals with the characteristics of each technological tool, the purpose it is used for, with whom it can be used, and under what circumstances.

‘Educational technology’ often refers to products such as computers, mp4 players, and robots whereas the term ‘instructional technology’ is more specifically used for instructional tools like computers, distance learning hardware, and the Internet. Smaldino et al. (2005) define a process which enhances learning as an instructional system which “consists of a set of interrelated components that work together, efficiently and reliably, within a particular framework to provide learning activities necessary to accomplish a learning goal” (p. 21).

The concept of instructional technology is periodically updated, each change resulting in a shift of direction in the field. Particularly after the 1980s, dramatic changes in teaching and technology caused a reexamination process (Seels & Richey, 1994). Seels and Richey identified the following assumptions for their updated definition of instructional technology:

- Instructional technology has evolved from a movement to a field and profession. Since a profession is concerned with a knowledge base, the 1994 definition must identify and emphasize Instructional Technology as a field of *study* as well as practice. In contrast, the 1977 definition placed more emphasis on practitioner roles."
- "A revised definition of the field should encompass those areas of concern to practitioners and scholars. These areas are the domains of the field."
- *"Both* process and product are of vital importance to the field and need to be reflected in the definition."
- "Subtleties not clearly understood or recognized by the typical Instructional Technology professional should be removed from the definition and its more extended explanation" (1994, pp. 2-3).

The preferred, most comprehensive definition thus comes from Seels and Richey; "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning (1994, p. 9).

2.1.1 Types of Instructional Technology

Teachers can make instruction more effective and efficient by selecting different kinds of instructional technologies depending on their objectives and purposes (Johnson, Maddox, & Liu, 2000).

Sarıçoban (2006) divides such tools into two categories: technical and non-technical. He refers to projected visual and audio-visual materials as well as to non-projected audio materials with the term ‘technicals’, and to pictures, flashcards, charts, puzzles, and so forth with the term ‘non-technicals’. Real objects and people, visual materials for projection, audio, audio-visual, printed, and display materials, computers, the Internet, dioramas, teleconferencing, and distant learning are all covered under these two categories.

Newby et al. (2006) differentiate between tangible high-technological hardware such as computers and instructional media such as overhead transparencies and videotapes; and other tools such as methods, techniques, and activities used while planning, implementing, and evaluating effective learning experiences.

Picciano (2006) takes a different approach, dividing technological applications into two categories: administrative and instructional. Administrative technologies support the administrative functions of an area or school whereas instructional technologies support teaching and learning activities that are designed to be used mainly by teachers, students, and school-related workers such as school librarians.

2.1.2 Historical Development of Instructional Technology

Technology integration into instruction is not a new development (Dudeney & Hockly, 2007). Technologies which mediate student-teacher interactions, called media in education, have been present in educational settings for nearly two centuries, long before their electronic and digital transformation (Stewart et al., 2010). One of the first, appearing in classrooms in the late 1830s, was the slate board (Stewart et al., 2010). Radio broadcasting has been used since the 1950s; tape recorders, television, videos, and laboratories since the 1960s; computer-based materials since the 1980s; and the Internet and web-based tools since 1990s (Dudeney & Hockly, 2007; Norton & Wiburg, 2003). For most of history, technology in education consisted mainly of written media such as books, pen and paper, and blackboards and chalk for purposes of information access, learning, and communication. Since the late 20th century, however, print media are increasingly being replaced by electronic media such as word processing, e-mail, video, CD-ROMs, DVDs, multimedia, and the Internet for the same purposes (Picciano, 2006).

Thus, modern technology has been an integral part of instruction for nearly 200 years and new developments are constantly being brought into the classroom to improve the teaching and learning process (Stewart et al., 2010).

2.1.3 Importance of Using Instructional Technology in Education

As technology plays an increasingly important role in various aspects of life (Norton & Wiburg, 2003), "the integration of technology into school curricula is no longer a luxury; it is a means of survival in a future that will be driven and supported by technology (Barron et al., 2006).

The reforms and the involvement of technology in education have caused the emergence of innovative approaches to teaching. However, technology use has been somewhat neglected while designing certain new programs and technology integration has consequently been limited or even negligibly small (Morrison & Lowther, 2005).

Students in this technological era have different needs and goals than students used to have (Jonassen et al., 2008). If their experiences with technology in the real world are ignored in schools, this could lead them to consider instruction as irrelevant (Norton & Wiburg, 2003; Whitehead et al., 2003). Jonassen et al. (2008) also claim that if this discrepancy is not recognized, the way in which students perceive, value, and use technology, a fundamental aspect of today's instruction, will be ignored and students will face inappropriate, uninteresting, even meaningless learning experiences. In addition, students have better opportunities for success when they are offered instruction in a variety of formats (Gardner, 1983).

"Without technology in the classroom, can our young people get the twenty-first century education they deserve?" (Gura & Percy, 2005, p. 5) since new technologies have become an integral part of youngsters' lives (Grabe & Grabe, 2007; Dudeney & Hockly, 2007). Many examples of new technology such as blogs, mobile phones, mp4 players, digital cameras, and social networking sites influence children and teenagers outside school as much as they affect adult lifestyles (Jonassen et al., 2008; Holleis et al., 2010; Dudeney & Hockly, 2007) while still being trapped among traditional tools and media at school.

Increasingly, integrating technology into instruction has become a major aim in many schools while planning instructional applications (Picciano, 2006). However, technology has to be integrated effectively in order to create new kinds of learning experiences (Cennamo et al., 2010). The verb 'integrate' means "to combine two or more things to make a whole; when we integrate technologies into instruction, we make them an integral part of the teaching and learning process” (Cennamo et al., 2010, p. 17). Consequently, technology integration needs to be adjusted in a number of ways, including the resources used, the roles teachers and students perform, and the nature of the instructional activities (Cennamo et al., 2010).

Considering technology integration alone is not sufficient to achieve successful instruction because “new learning environments require changes in the role of the teacher in the classroom” (Wentworth & Earle, 2003, p. 86), particularly in the sense that technology has created increasingly interactive learning environments (Smaldino et al., 2005) so that instruction complemented by technology has become more student-centered, more collaborative, more active, and more problem-based.

Because of the implementation of technology in class, teachers and textbooks are no longer the only sources of knowledge. Teachers have become facilitators who can benefit more from technology when they have a better understanding of how learning occurs. Thus they need to be able to choose the best technological tools for their students (Smaldino et al., 2005).

The majority of researchers seem to agree on the importance of technology integration but few practitioners appear to know how to proceed. Real integration is only possible through changes which would affect “classroom organization, instructional delivery, teacher-student relationships, lesson design, and evaluation” (Johnson, Maddox, & Liu, 2000, p. 4). When defining the role of technology in instruction, “discussion and identifying an overall philosophy of learning is appropriate” (Picciano, 2006, p. 90). Teachers and administrators have their own approaches to teaching and learning, developed from their studies and experiences. Nevertheless, when using instructional technology, a philosophical framework should also be taken into account (Picciano, 2006).

The biggest challenge is the appropriate integration of technology throughout the curriculum for effective use (Barron et al., 2006) because technology is only a tool for instruction; in other words, technology cannot improve learning and thinking by itself (Stewart et al., 2010). Technology having become a tool of choice for communication, accessing information, and learning about the world, it is essential to integrate technology "with an educational vision or plan that attempts to help individuals to understand the world" (Picciano, 2006, p. 5).

Technology integration into the curriculum is not a simple task but a difficult and complex process (Norton & Sprague, 2001; Johnson, Maddox, & Liu, 2000). Although teachers tend to use the existing simple, durable, flexible, and responsive curricula in educational practice (Norton & Sprague, 2001), they need to remember that while simply adding technology into education is easy, the more crucial part is to redesign the learning environment and the relationship between students and teachers as well as reshaping the curriculum (November, 2010).

"Under no circumstances should technology be used just for the sake of using technology" (Hefzallah, 2004, p. 13). Instead, systematic changes should be addressed for successful technology application (Johnson, Maddox, & Liu, 2000) and the main focus should always be education (Hefzallah, 2004). Certain necessary conditions have to be fulfilled in order to create effective learning environments through the effective use of technology, as listed in *National Educational*

Technology Standards for Students: Connecting Curriculum and Technology (ISTE, 2000):

- Vision with support and proactive leadership from the education system
- Educators skilled in the use of technology for learning
- Content standards and curriculum resources
- Student-centered approaches to learning
- Assessment of the effectiveness of technology for learning
- Access to contemporary technologies, software, and telecommunications networks
- Technical assistance for maintaining and using technology resources
- Community partners who provide expertise, support, and real-life interactions
- Ongoing financial support for sustained technology use
- Policies and standards supporting new learning environments (p. 4).

The initial step for student engagement of students is neither the teacher nor technology integration; rather, the focus needs to be on student learning (Jonassen, 2006). Enhancing learning through technology can be achieved by students' use of word processing, spreadsheets, electronic encyclopedias, the Internet, and so forth, within curricular areas (Picciano, 2006).

Technology can also be a tool for the delivery of instructional opportunities to match the background of students and pace of their learning. While dealing with certain assignments, students can be involved in using computers or multimedia so that they acquire specific knowledge and skills. The primary function of integrated technologies is to provide students with knowledge of specific subject matters (Tomei, 2005). Whereas technological tools were used simply as a means of delivery to communicate messages and learning mainly occurred through teachers, technology has today become an enabling tool for teaching within an effective educational setting (Tomei, 2005). Furthermore, the new technology, mainly telecommunication tools and computers, have resulted in a new concept, new literacies, which means that in order to be an educated person in today's technology era, people need to possess certain technological skills (Hefzallah, 2004).

When technology is used as an engager and facilitator of thinking, instead of a mere vehicle of delivery, it can enhance meaningful learning (Jonassen et al., 2003). Both teachers and students are consequently required to be involved in continuous learning, which necessitates that several dimensions of instruction, namely, the curriculum, pedagogy, assessment, technology, and the culture of learning to be taken into consideration (Wiske, Franz & Breit, 2005).

The understanding of learning and educational practices has recently been improved (Makitalo-Siegl, Zottmann, Kaplan, & Fischer, 2010; Holleis et al., 2010). Technological developments which can be used in the classroom to enhance and support learning have become more rapid and these developments provide opportunities for the active participation of both students and teachers (Cennamo et al., 2010). Unfortunately, many classrooms today do not welcome this innovative understanding even though especially the new technologies have a great potential to change the ways of teaching and learning (Makitalo-Siegl et al., 2010).

Furthermore, Jonassen et al. (2008) postulate that technology use would be neither meaningful nor productive if applied within traditional teaching methods only. Jonassen et al. (2003) state that technology cannot teach students; rather, learners have to use technology to teach themselves and others. “Meaningful learning will result when technologies engage learners in: knowledge construction, not reproduction; conversation, not reception; articulation, not repetition; collaboration, not competition; reflection, not prescription” (p. 15).

Teachers open the door to innovations and hold the key to students’ understanding. Thus, they need to realize that they play an important role (Dudeney & Hockly, 2007) and they can make a difference (Milrad, Spector, & Davidsen, 2003) in students’ lives. As changes need additional effort and time, and are sometimes scary, teachers may be unwilling to use technology even with sufficient training (Dudeney & Hockly, 2007; Reksten, 2000, Barron et al., 2006). However, perceived problems like “limited time, pressure to cover the mandated curriculum, problems with classroom management, scarce resources, and teachers’ feelings of isolation” (Sandholtz et al., 1997, p. 3) can be reduced, if not eliminated, when the traditional classroom environment is modified to include technology (Kelley, 1994; Sandholtz et al., 1997; Cuban, 1986).

Physical settings and the comfort zone of teachers and parents are the biggest barriers to the effective use of technology in classrooms (Whitehead et al., 2003). Teachers may fear change or lack understanding of the importance of technology use. Thus, while integrating technology into classrooms, it is essential to pay attention to teachers and make them become familiar with its appropriate use (Ivers, 2009) so that they may realize the benefits of technology use in class both for their own and for their students' needs (Stewart et al., 2010; Ivers, 2009; Hefzallah, 2004).

Another crucial factor, often neglected when integrating instructional technology, is the training of teachers (Dudeney & Hockly, 2007). Teachers are needed to be sufficiently skilled technologically to be able to integrate technology into their classrooms effectively (Barron et al., 2006). It is unfortunate when teachers are not provided with training in the use of technology and remain "less skilled and knowledgeable than their students when it comes to using current technology" (Dudeney & Hockly, 2007, p. 5).

Simply offering workshops and technology-integrated classrooms is not always adequate in convincing teachers to apply these new skills, however. A vision of technology in the teaching-learning process is more important and hence, follow-up and support is also necessary for teachers to feel more comfortable and confident in using technology in the classroom (Ivers, 2009). The effectiveness of technology use is dependent on each teacher's ability to plan, manage, and assess their teaching. The process has to take into account available resources, whether the technology promotes and supports desired outcomes, and its appropriateness for the students based on their background and learner objectives (Ivers, 2009).

Technology use can also change teachers' beliefs and practices. As Zhao et al. (2006) state, when teachers change their pedagogical beliefs to take advantage of technology, this often leads to meaningful learning because the views of teachers on the role of technology depend on their beliefs about how people learn (Smaldino et al., 2005). Many teachers may have a negative attitude towards technology as a result of "a lack of confidence, a lack of facilities or a lack of training, resulting in an inability to see the benefit of using technologies in the classroom" (Dudeney & Hockly, 2007, p. 9).

In addition to students' own use of technology, technology can be employed by teachers to enhance student learning by incorporating technology in classroom presentations and other teaching activities through the use of large-screen monitors, computers, videos, and other multimedia applications (Picciano, 2006). Simply introducing technology, even the latest, into the classroom is not sufficient for the planning of instruction. Instead, closely relating the needs of students and the focus of the curriculum with technology is essential (Whitehead et al., 2003). The efficient use of technology in education is twofold, namely, restructuring the school curriculum and training the teachers (Hefzallah, 2004). "Practitioners need to know and understand that for technology to be used as a tool, the curriculum must be organized around concept-based instruction, ready for effective technology integration" (Recksten, 2000, p. 6). Other factors limiting technology integration can be an outdated curriculum and lack of understanding of how technology can be integrated into instruction, even more than the lack of equipment (Hefzallah, 2004). One of the biggest drawbacks of bringing technology into classrooms is the fact that a number of nations continuously "pour money into educational technology programs" (November, 2010, p. 1) but does the increase in student achievement justify the expense? To illustrate the problem, November describes a cartoon published in the *Wall Street Journal*: "a student reaching as high as he could to use chalk on a blackboard ... standing on a computer to reach higher – not a very flattering image" (2010, p. 1). If technology is used as a stepladder in the traditional way of instruction and nothing else changes except the addition of technology, this naturally draws the attention of opponents to technology integration. However, the proper application of technology can affect students and their learning positively.

Technology can also be used in instructional situations for supplemental support. Research has confirmed that when teachers introduce technology, carefully relating it to learning objectives, the appropriate use of technology in instruction can enhance and promote learning, but teachers are the key to its effectiveness (Smaldino et al., 2005). For meaningful learning to take place, students have to learn *with* technologies, not *from* them (Jonassen et al., 2003) as technology use makes students think and reason in "causal, analogical, expressive, experiential and problem-solving" ways (Jonassen et al., 2003, pp. 8-10). Thus, the way technology is perceived in schools should "change from technology-as-teacher to technology-as-partner in the learning process" (Jonassen et al., 2003, p. 7).

Teachers need to know how to select and employ technological tools for students to achieve a deeper understanding. Thus, they need to be able to identify various technologies, that is to say, to know what the technological tools offer for learning and what effective uses can be achieved in practice. Secondly, they need a practical portfolio of technologies, in other words "a repertoire of learning technologies" that can engage student learning and that are used "in teaching, in a setting where those technologies are stable, reliable, and well-supported" (McCrory, 2006, p. 160).

The crucial knowledge for teachers is not more technical literacy, but the knowledge of curriculum-based technologies which work well in the teaching and learning process (McCrory, 2006). In other words, teachers need to develop the skills to "translate technological potentials into solutions to pedagogical problems that are very local and deeply situated in teachers' own contexts" (Zhao et al., 2006, p. 163). Even when teachers have general knowledge of technology, they need to apply it in such a way that specific technologies can be used in their classrooms (McCrory, 2006) because the power of technology lies in its uses only. Teachers with such skills are sufficiently equipped to decide when to use what technology and when not to use it (Zhao et al., 2006).

Cuban (2001) and Grabe and Grabe (2007) agree that the technological resources available in education are not being used properly. However, through the appropriate integration of technology, a variety of materials can be chosen as long as teachers have learned how to use technology in class to enrich and supplement their methods (Hefzallah, 2004) as teachers need to connect technology with the curriculum in order to enhance student achievement (Whitehead et al., 2003). As mentioned earlier, despite the many examples of its significant effect on learning and teaching, technology alone is not sufficient for learning (Holleis et al., 2010). Certain researchers therefore question the direct relationship between technology implementation and increase in student achievement whereas Whitehead et al. (2003) mention several examples of schools that indicate the successful application of technology.

Research on technology integration into education has shown that it does have a positive influence on student learning, understanding, exploration, achievement, collaboration, and motivation when implemented in the classroom (Schacter, 1999; Pitler et al., 2007; Barron et al., 2006; Whitehead et al., 2003). The only condition for such success is the clear expression of learning goals before implementation (Pitler et al., 2007). Reksten (2000), on the other hand, identifies the critical prerequisite for successful technology implementation as the preparation of teachers and other members of the school community since neglect at this stage results in resistance by teachers. She also highlights the importance of having a workable, practical, and effective action plan for successful technology integration. When it refers to student expectations and outcomes, such an action plan would lead to the achievement of the desired learning outcomes.

Another important factor is how the curriculum is connected to students' technology skills (Reksten, 2000). A well-known study on technology, Apple Classrooms of Tomorrow (ACOT), has found that the use of computers in classrooms is not sufficient for enhanced learning. Instead, the integration of the technology into the curriculum is essential.

Meanwhile, Mellon (1999) claims that teachers are to blame when technology is integrated but students do not learn, whereas when technologies are either poorly integrated or few in number and students do not learn, then the lack of resources is to blame. In the two scenarios, however, the common factor – the students – is ignored. If students are not sufficiently motivated to learn, the number and quality of the resources and how well they are integrated has little or no effect. Thus, while integrating technology into the curriculum, appropriate activities are needed to ensure that students are engaged and learn 'despite' themselves (Stewart et al., 2010).

Furthermore, technology can play various instructional roles and it is important to distinguish between technology *as* a subject matter and the use of technology to enable learning *of* a subject matter (Whitehead et al., 2003). Students need to apply technologies flexibly into their learning instead of being directly instructed by technology (Grabe & Grabe, 2007). The discussion here is explained by Smaldino et al. (2005): “Learning involves the selection, arrangement, and delivery of information in an appropriate environment and the way learners interact with that information” (p. 6).

A major obstacle to the creative use of technology in class is staff development (Whitehead et al., 2003) and, as November (2010) pointed out, new technologies are too numerous with respect to the time and opportunities teachers have to familiarize themselves with them. Students are both willing and fast learners of technology so teachers need to acquire new skills before their students (November, 2010). On the other hand, teachers do not need to have many technical skills; rather, what they need is the ability to manage the different technologies in the classroom (November, 2010). In the use of technology, teachers can ask their students for help, which leads to feasible, fast and inexpensive solutions as well as more involved and conscious students managing their own learning (November, 2010).

For optimal integration of technology, Cennamo et al. (2010) point out that teachers need to be able to identify which technological tools are needed, specify how they will be used, and use them appropriately, as well as enable students to use them in learning. The researchers also highlight that “The main aim of technology integration in education is the inclusion of relevant technologies as integral and natural contributors to the entire educational process” (p. 10). Technology can be limited in itself but when it is employed in skillful hands, it can “open new possibilities and enrich learning regardless of grade levels” (Picciano, 2006, p. 57). Ivers (2009) also contributes to this discussion by stating the main purpose of technology integration:

> To empower students and to create a twenty-first-century learning environment where students learn core subjects, twenty-first-century themes (global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; and health literacy), and twenty-first-century skills (learning and innovation; information, media, and technology; and life and career) (p. 2).

Developing a sense of ownership can also help teachers successfully apply technology in the classroom (Whitehead et al., 2003). Knowing how to use technology is not sufficient for the effective integration of technology, but rather knowing "what and how to teach and how students can learn most effectively in today's world" (Wiske et al., 2005, p. 3) becomes more important for educational practices to reach teaching objectives. As Jonassen (2006) points out, "Technologies have the potential to enhance, expand, and amplify learning if we reconceptualize the ways that they are used" (p. 8).

2.1.4 Effects of Instructional Technology in Education

McKenzie (2005) suggests that "instructional technologies were developed to simplify real-world applications for humankind, and they can also bring those real-world applications into the classroom for students" (p. 34). He states that one of the earliest technologies that were used was the chalkboard, and then came overhead projectors, both of which provided teachers with opportunities to present materials to the whole class by writing on reusable surfaces.

Egbert (2007) points out the common belief about what instructional technology provides. The integration of technology serves only one purpose, which is for teachers to make a difference in their students' lives and make instruction be seen as useful, meaningful, enjoyable, and interesting as they "discover ways to do what they already do more efficiently, more effectively, more interestingly, or in new and innovative ways (p. 3).

The main reasons for applying technology in classrooms have been summarized in *Methods of Evaluating Educational Technology: Research Methods for Educational Technology* (Heinecke and Blasi (eds.), 2001) are as follows:

1. To meet existing requirements more efficiently
2. To address learning goals that cannot be met in other ways
3. For adaptive approaches to the acquisition of knowledge and skills (pp. 78-79).

Holleis et al. (2010) state that innovative technologies can create a better environment for learning, and instruction can be more focused on students with less effort on the part of teachers. Especially new technologies like multimedia programs allow increased interaction between students and learning materials (Hefzallah, 2004). Another advantage of these learning technologies is that teachers can design interactive learning environments to foster education equality as these environments are flexible and rich in resources and provide exciting and appropriate learning experiences to all students, whether they are slow or fast learners (Hefzallah, 2004). In other words, instructional technologies can provide all students equal opportunities to learn according to their needs, paces, abilities, and learning styles (Hefzallah, 2004).

The revolution caused by the emergence of digital technologies in education has allowed education to evolve further (Gura & Percy, 2005) because technology supports collaborative, active, constructive, intentional, reflective, conversational, and conceptualized learning (Norton & Sprague, 2001). Technological tools are also employed to provide efficient learning (Norton & Sprague, 2001). For instance, software such as word- processing programs, search engines, and slide presentation tools can be used to present academic subject matters in a more interesting and effective way.

Furthermore, technology integration promotes meaningful learning (Tomei, 2005) in ways that were not possible with traditional educational tools (Wiske et al., 2005; Hefzallah, 2004; Cennamo et al., 2010). Students become more active in their involvement in learning and expand their personal understanding (Tomei, 2005) as new technologies support "interaction, dynamic displays, multiple and linked representations, interactive models and simulations, networked communication, hyperlinked text, multimedia, and the storage and retrieval of multiply categorized information" (Wiske et al., 2005, p. 28). They also structure flexible, interactive, interdisciplinary, and up-to-date learning environments which are essential for effective learning (Hefzallah, 2004).

The main focus should be on how technology is used to promote skills like critical thinking, problem solving, communication, collaboration, and global literacy (Stewart et al., 2010; Schacter & Fagnano, 1999; Ivers, 2009; Norton & Wiburg, 2003). Additionally, teachers need to raise their expectations as students learn to take responsibility for their own learning (November, 2010). Technology can help both teachers and students to "gather and learn new information; collaborate and learn from others; manipulate, organize, and evaluate information; and create products" (Ivers, 2009, p. 15).

Kent (2008) has summarized the benefits of technology in education from four different perspectives:

> *Students*: concise and focused; interactive and engaging; relatable and reproducible; quick reviews; instant feedback.
>
> *Teachers*: lesson efficiency; decreased prep time; instant assessment and feedback; information and creativity; worldwide collaboration; improves communication; assessment and organization.
>
> *Parents*: constant feedback; communication; visible curriculum; at-home learning.
>
> *School community*: increased efficiency; increased connectivity; increased transparency; interactive and dynamic community (pp. 14-17).

Instructional technology is employed to transform learning and teaching practices in many different but significant ways. Technology use in the classroom supports cooperative learning, encourages peer teaching, and allows room for learner diversity, increased motivation, and performance as well as positive attitudes toward learning (Ivers, 2009). Thanks to the technological tools and the opportunities they provide, educators and teachers can evaluate and reconstruct their educational practices (Gibson, 1977; Turvey, 1992). Technology can also be an essential tool for classroom management (Frei, Gammill & Irons, 2007) as teachers can prepare their classrooms more quickly. In addition, research indicates that technology use can be beneficial for teachers in terms of lesson preparation in many ways (Frei, Gammill & Irons, 2007; Whitehead et al., 2003).

Technology also supplements published materials such as textbooks and teacher resource books (Dudeney & Hockly, 2007). The flexibility that technology provides teachers ensures that they have multiple opportunities for the integration of new materials even when the resources are limited (Cennamo et al., 2010). In short, educational technologies are the main support for teachers to help them "create collaborative social contexts for learning in ways not previously possible" (Wiske et al., 2005, p. 3).

When technology is made a part of educational practice, teachers experience certain advantages such as the completion of complex tasks; spending more time on assignments: greater student enthusiasm, motivation, and confidence in their learning; being able to access information from around the world; high self-esteem: lower dropout rates; and enhanced student achievement (Norton & Sprague, 2001; Whitehead et al., 2003).

With respect to professional productivity, technology assists instructors and administrators for functions such as record-keeping (student attendance, grades, library loans, etc.), budgeting, communication and collaboration among educators, research, and planning, as well as classroom instruction more easily, quickly, and effectively (Barron et al., 2006; Tomei, 2005; Frei, Gammill & Irons, 2007). It also empowers teachers to share experiences and challenges with colleagues both within the school and around the world (Cennamo et al., 2010). Thus, the two biggest advantages of technology integration for teachers are that it assists them in instructional and administrative tasks and makes classroom management easier (Ivers, 2009; Whitehead et al., 2003). Research has also indicated the following:

> The ability to teach with technology encompasses a much broader set of cognitive and psychological qualities, including: teachers' knowledge of technology as a solution to their problems; teachers' beliefs about and attitude toward technology, especially with regard to its compatibility with existing practices and potential for improving student learning; teachers' knowledge about and perception of enabling conditions; and teachers' social capital – their access to assistance from others (Zhao et al., 2006, p. 161).

Technology can easily fit in with teachers' instructional plans. It further provides a natural extension of their individual approaches, rather than an addition or even an alternative (Grabe & Grabe, 2007). Even though it can sometimes cause frustration, the integration of technology into the classroom helps teachers achieve desired instructional outcomes and it may show itself to be both manageable and rewarding (Clyde & Delohery, 2005).

Today technology helps teachers do what they do every day much more easily and quickly by providing "intuitive, reliable, ready for prime time tools" (Clyde & Delohery, 2005, p. 11). In other words, instructional technology changes how teachers do what they do as well as how students do what they do (Milrad et al., 2003; Dudeney & Hockly, 2007) as it serves the diversity of learners in how they learn differently in different situations. Another benefit of technology for teachers is that it can provide a wider variety of activities so that they can vary instruction and reach more students (Pitler et al., 2007), which is essential as students have varying interests, learning styles, readiness levels, and so forth.

Instructional technology encourages teachers to develop their teaching approaches, engage students better, activate learning, assess outcomes, and provide quality feedback promptly (Naidu, 2003; Pitler et al., 2007). Technological tools such as computers give instant feedback, let students learn at their own pace, do not judge learners, and pay no attention to the frequency and quantity of mistakes (November, 2010).

Technology is best put to use when teaching is minimized and learning is optimized (Reich & Daccord, 2008). When students create the final product and the teacher becomes only a facilitator or a guide, this fosters creativity and increases student motivation (Reich & Daccord, 2008). Students can learn more and in a deeper way with the appropriate use of technology (Cennamo et al., 2010; Whitehead et al., 2003). Another benefit is that students have greater control over their own learning which is a result of the shift from teacher-centered to student-centered classrooms.

Students today have access to many tools used by professionals in their workplace, such as applications used in the arts, history, Mathematics, and science (Cennamo et al., 2010). Technology integration also helps students develop knowledge and appreciation of the rich resources around them (Hefzallah, 2004). When they become familiar with these resources and how to use them, they acquire the basic skills of self-learning, which is one of the most important objectives of 21^{st}-century education (Hefzallah, 2004). Also, information learned in this way is more permanent than information memorized from textbooks (Hefzallah, 2004).

According to *National Educational Technology Standards for Teachers: Preparing Teachers to Use Technology*, technology helps students become "capable information technology users; information seekers, analyzers, and evaluators; problem solvers and decision makers; creative and effective users of productivity tools; communicators, collaborators, publishers, and producers; and informed, responsible, and contributing citizens" (Kelly, 2002, p. 4). Norton and Wiburg add that "technologies can assist in helping students to make decisions, model the results of scientific investigations, provide scenarios for family living, experiment with the dimensions of art, solve real problems, and participate in a variety of human communities" (2003, p. 11). Grabe and Grabe add their support, stating that technologies "emphasize technology-facilitated classroom activities [which] engage the thinking, decision-making, problem-solving, and reasoning behaviors of students" in an active learning environment (2007, p. 23).

Trotter lists the positive benefits of technology when the curriculum, technology, and learning environment are related to each other:

- Improve problem solving skills significantly
- Enhance the quality and quantity of writing processes and content
- Facilitate independent work, teamwork, and collaborative inquiry
- Increase performance in basic skills learning, especially in math and reading
- Widen the scope of instructional opportunities
- Increase mastery of vocational and workplace skills
- Promote higher student retention rates
- Encourage higher-order thinking skills (organizing, analyzing, and communicating complex information)

- Serve students with special needs effectively and efficiently (1997, p. 8).

Technology benefits language learners, and all students in general, regardless of age, general ability, physical or mental disabilities (Ivers, 2009), and is especially useful for at-risk – weaker – students and students who need special care such as the gifted and students with learning disabilities and physical challenges (Pitler et al., 2007; Ivers, 2009; November, 2010).

When students get the opportunity to use technology for investigation, they can create meaningful and rich learning experiences (Jonassen et al., 2008) because "technology can provide the means for active, authentic learning through investigation both in the classroom and in the field" (Jonassen et al., 2008, p. 14). An added benefit of using visual technology in classrooms is to help students build mental representations by presenting words and images which enhance and promote learning (Mayer, 2005).

Using different forms of technology appropriately in the classroom can make students more successful (Whitehead et al., 2003). Research indicates that technology can enhance student achievement in the following ways:

- Increases performance
- Improves learning attitude and confidence
- Provides essential instructional opportunities
- Increases student collaboration
- Increases mastery of vocational skills
- Emphasizes problem solving

- ➢ Improves writing skills
- ➢ Provides instant feedback
- ➢ Creates immediate adjustment of task difficulty
- ➢ Provides access for students to advanced or enriched programs (Cradler, 1995).

2.1.5 Constructivism

Constructivism which refers to the concept where knowledge is constructed, rather than transmitted is based on experiences. Interactions with others, visual and experiential connections and flexibility in showing competence enhance learning and understanding. The impact of prior experience and the interpretation of individuals of these experiences lead to personal understandings and interpretations. Hence, "there are many ways to structure the world, and there are many meanings or perspectives for any event or concept" (Duffy & Jonassen, 1992). The basic principles of constructivism are summarized by Amarin and Ghishan (2013) as follows:

- Learning is an active process,
- Learning is an adaptive activity,
- Learning is situated in the context in which it occurs,
- Knowledge is not innate, passively absorbed, or invented but constructed by the learner,
- All knowledge is personal and idiosyncratic,
- All knowledge is socially constructed,
- Learning is essentially a process of making sense of the world,
- Experience and prior understanding play a role in learning,
- Social interaction plays a role in learning, and

- Effective learning requires meaningful, open-ended, challenging problems for the learner to solve (p. 55).

Environment also has an impact in shaping the meaning so experience is critical to people's understanding and ability to structure a personal meaning to ideas. Motivation, cooperative learning and real-life applications are the key elements for learning in constructivism as Brown, Collins and Duguid (1989) underline situating cognitive experiences in authentic activities. Furthermore, Robinson, Molenda and Rezabek (2008) emphasize that "facilitating learning puts the emphasis on the learners and their interests and abilities (or disabilities) (p. 17). Consequently, "there is no ultimate, shared reality, but rather, reality that is the outcome of constructive processes" (Duffy & Jonassen, 1992, p. 5).

Constructivism relies on the notion that students "can only interpret information in the context of their own experiences, and what they interpret will, to some extent, be individualistic" (Jonassen, 1992, p. 139). Students construct their own learning and knowledge so the learning environment and activities should be designed to provide what is needed. A bridge must be constructed between the prior knowledge of students and what they are expected to learn (Gagnon & Callay, 2006). Student-centred and meaningful learning is essential in constructivism. In other words, teachers help students "construct meaningful and conceptually functional representations of the external world" (Jonassen, 1992, p. 139).

2.1.6 Technology-enhanced Classroom Aiding Constructivism

Instruction at schools has been reshaped after the emergence of technologies as the instructional technologies changed the ways of teaching and learning (Diem, 2000). Thus, constructivist approach has become more valid with the use of technology in education in order to enhance active and meaningful learning (Ayas, 2006; Doolittle & Hicks, 2003; Windschitl, 2002). Instructional technology enhances learning by giving the students the chance to control their learning so it is possible to say that it is based on user-centred design (Molenda & Robinson, 2008).

Technological developments have a massive impact on education. The instructional technology, which is basicly the integrated technology into teaching-learning process, has changed the role of both teachers and students. Teachers who were the authority and controllers in the past have become facilitators and they guide students while students construct their own knowledge. Students who were only passive listeners in the past have become active participants and take the control of their learning. Nowadays students are able to learn whenever and wherever they want at their own pace and in their own style. This notion is also supported by the constructivist approach. Hence, the combination of these two crucial elements fit well in the classroom (Amarin & Ghishan, 2013).

Instructional technology is also very effective in achieving the goals and learning objectives. Moreover, instructional technology provides the opportunity for alternative pedagogical models that result in the construction of new knowledge. However, it should not be forgotten that using technology in class is never enough to guarantee quality education, instead how technology is used should be focused and this can be achieved in constructivism as Juniu (2006) pointed out "according to constructivist theory, various technologies may be used to promote learning" (p. 69).

2.2 Theory of Multiple Intelligences

Traditional teaching from kindergarten to post-graduate has always credited two main intelligence types, the linguistic and the mathematical (Chapman, 1993).

Students who have a developed ability in at least one of these two intelligence types have been considered as intelligent whereas students with less developed mathematical or linguistic abilities have often been labeled as not intelligent, sometimes even retarded. After many years of research, in 1983, a Harvard professor, Howard Gardner, proposed a theory he called the “Theory of Multiple Intelligences,” which had the effect of a bomb in the area of education. Based on the principles of this theory, each and every child is intelligent in at least one way.

2.2.1 What is the Theory of Multiple Intelligences (MI)?

Education in today’s world is not about how smart you are but how you are smart (Armstrong, 2003a), a popular notion since the publication of Howard Gardner’s groundbreaking book, *Frames of Mind* (1983), where he put forward his Theory of Multiple Intelligences, stating that there are many ways to be smart (Campbell, Campbell & Dickinson, 2004).

The concept of intelligence has been examined since Aristotle and later, Cicero first used the Latin meaning of this word. Many scholars and thinkers have investigated intelligence and formulated various definitions of the concept. Stenberg, Starddat, Sten, Wechsler, Spearman, Hernstein, Murray, Vygotsky, Ibn-i Sina, Binet and Simon, Thurstone, Ceci, Guilford, Thorndike, Galton, Catell, Piaget, Goleman, and Gardner, among others, spent many years and much effort on the mysteries of intelligence. Intelligence has been claimed as a singular concept by some of these scholars whereas others have attributed it plural meanings.

The great number of attempts and the variety of the definitions of intelligence proposed by scholars and academicians over the course history shows that intelligence is not an easy concept to define. Each definition is a consequence of a different approach or theory. In the area of education, the results of these attempts are more valuable than the studies themselves. Although intelligence was always explained with one factor in each of these attempts, the factors have since then been multiplied (Armstrong, 2003a). For instance, only verbal and mathematical abilities used to be taken into consideration but the notion that intelligence is determined by just these two aspects is no longer accepted and a pluralistic view of intelligence with different intelligence types has been adopted.

Centuries of discussion, research, and claims culminated in Howard Gardner's revolutionary definition of intelligence with seven different types of intelligence (Kagan & Kagan, 1998). Gardner indicates that his Theory of Multiple Intelligences "challenges the classical view of intelligence that most of us have absorbed explicitly or implicitly" (Gardner, 1983, p. 5). Gardner and his colleagues worked on the meaning and definition of intelligence in their 'Project Zero' (Armstrong, 1999) where they first examined the traditional meaning of intelligence and later investigated the various cognitive capacities of individuals (Viens & Kallenbach, 2004).

Adopting a psychometric perspective, Gardner (1983) and his co-workers came to the conclusion that human capacity is like a deep sea and individuals have a number of different abilities based on their work with a variety of individuals including so-called 'normal' children, gifted children, prodigies, idiot savants, autistic children, children with learning disabilities, and children with partial brain damage (Armstrong, 1999; Kagan & Kagan, 1998). They found that the strength of a person's in abilities one area can neither explain nor predict their strength or weakness in another; in other words, the cognitive profiles of the various groups of subjects could not be explained by traditional views of intelligence (Chapman, 1993; Viens & Kallenbach, 2004). He therefore put an ‘s’ at the end of the term ‘intelligence’ and the Theory of Multiple Intelligences emerged in 1983.

Drawing from cognitive science, developmental psychology, and neuroscience, the Theory of Multiple Intelligences postulates that each intelligence consists of separate skills or abilities (Viens & Kallenbach, 2004; Kagan & Kagan, 1998). In *Frames of Mind*, Gardner defines intelligence in a completely novel way as “the ability to solve problems or to create products that are valued within one or more cultural settings” (1983, p. 60) and identified seven different types of intelligence: verbal-linguistic, logical-mathematical, visual-spatial, interpersonal, intrapersonal, bodily-kinesthetic, and musical-rhythmic. As he proceeded with further studies, he added naturalistic intelligence in 1999 and existential intelligence in 2009, thus bringing the total to nine types.

Gardner suggests that biological and cultural factors have a strong effect on shaping intelligences (Baum, Viens, & Slatin, 2005). Armstrong (1999) mentions that three major factors and the interaction among them determine whether each intelligence develops. An individual’s *biological legacy* includes genetically inherited factors, gender, and possible injuries to the brain before, during, or after birth. For instance, if during pregnancy the mother drinks, smokes, or uses drugs, the child's nervous system may be damaged, impairing the development of some or all intelligence types (Çırakoğlu, 2003; Modiri, 2009). *Personal life history* includes experiences with family members, teachers, friends, relatives, peers, in other words, all the people around an individual, who positively or negatively impact the development of the person’s intelligences. For example, a person brought up in a rural area has a better chance to improve his/her naturalistic intelligence than someone brought up in an urban environment. Finally, the *cultural and historical background* is described as the time and place an individual is born and brought up as well as the nature and state of cultural and historical developments and changes in different domains in his/her society.

Gardner further posits that personal experiences affect the development of an individual's intelligences and these experiences can be either crystallizing or paralyzing. *Crystallizing experiences* "are the turning points in the development of a person's talents and abilities… They are the sparks that light an intelligence and start its development toward maturity" (Armstrong, 2000, p. 18). In contrast, *paralyzing experiences* are those "that shut down intelligences… They are often filled with shame, guilt, fear, anger, and other negative emotions that prevent our intelligences from growing and thriving" (Armstrong, 2000, p. 18).

A number of other factors stimulate or hold back the development of intelligence types (Armstrong, 2000). One factor is *access to resources and mentors* which means having or lacking opportunities in an environment to improve an intelligence type, no matter how much potential the person has. For example, a child from a poor family might not be able to afford a musical instrument and thus his/her musical intelligence is less likely to develop fully (Armstrong, 2000). Another factor is *historical-cultural factors*. Intelligences valued in the society where the individual lives tend to be developed more while others are ignored even though individuals have great potential in those. If mathematical intelligence is emphasized in schools, the naturalistic intelligence of the students, for instance, is more likely to be neglected (Armstrong, 2000). *Geographic factors* favor the intelligences that are more useful in that particular location so they become more developed. For instance, a child whose parents do sports and motivate him/her to do the same has more opportunity to develop his/her bodily-kinesthetic intelligence than a child whose parents discourage him/her from doing any kind of sports (Armstrong, 2000). *Familial factors* include the desires and plans of the family, especially parents, who guide or manage an individual's abilities and interests. For example, if a child who wants to be musician has parents who want him/her to become a lawyer, s/he may not have a chance develop his/her musical intelligence as the family promotes verbal-linguistic intelligence instead (Armstrong, 2000). The last category of factors is *situational* and depends on the setting where an individual is born and raised. For example, an individual raised in a big family and/or who has a big family to look after might not be able to develop his/her interpersonal intelligence unless s/he naturally has this ability (Armstrong, 2000).

Thus, the Theory of Multiple Intelligences details a number of factors which affect the development of intelligences (Kagan & Kagan, 1998), from heredity to the family and from geography to the culture at large. Various intelligences can therefore flourish where convenient settings and opportunities are provided (Gardner, 1993). Certain potential intelligences are present at birth, as determined by heredity and the conditions of pregnancy. Various aspects of the environment determine the factors which affect the development of these intelligences (Wilkens, 2006) since individuals need rich stimulants to take advantage of their potential and improve their abilities (Gardner, 1993, Armstrong, 2000, Emig, 1997). However, intelligences should not be considered as a sum of pluses and minuses. When one type of intelligence improves, another is not necessarily held back. Instead, individuals from different environments often give importance to – and consequently use – a combination of different types of intelligences (Gardner, 2004).

The Theory of Multiple Intelligences changed the categorization of people as either ‘smart’ or ‘not smart’, in the traditional perspective on intelligence. Gardner (1991) treats intelligence as a complex concept which cannot be explained with a single factor and is something wider and richer. In his view, individuals are to be considered intelligent when they create a product or use problem-solving skills to find an effective solution to a problem in their daily or professional life as opposed to the emphasis on mathematical and/or verbal abilities when defining a person as smart. Gardner has pluralized the meanings and functions of intelligences, leading the way to a multiplicity of ways to be considered intelligent (Chapman, 1993; Kagan & Kagan, 1998). Quantity was important in the past whereas the path to becoming intelligent is given closer consideration today. That is why the question has recently changed from “How intelligent are students?” to “How are students intelligent?” (Armstrong, 2000).

Over the course of history, a great change has occurred in the understanding of intelligence, especially since the emergence of the Theory of Multiple Intelligences (Kagan & Kagan, 1998; Viens & Kallenbach, 2004). Whereas intelligence was used to classify students based on it being singular and constant, today intelligence is seen as a plural and changeable set of capabilities which can be developed. It was believed that intelligence was pre-determined from birth and could be measured with short-answer tests. The Theory of Multiple Intelligences challenged this view with a complex concept which can be neither predicted nor measured with numbers (Silver, Strong, & Perini, 2000).

Howard Gardner's pioneering theory was summarized with four main points by Armstrong to emphasize the rationale behind the Theory of Multiple Intelligences:

a) Each person possesses all eight intelligences.
b) Most people can develop each intelligence to an adequate level of competency.
c) Intelligences usually work together in complex ways.
d) There are many ways to be intelligent within each category." (2000, pp. 8-9)

In addition to the four basic claims of the theory, certain characteristics have been mentioned by a number of researchers, educators, and scholars since Gardner put forth his theory (Kagan & Kagan, 1998). The most significant one concerns learner diversity in that each person has a unique profile of multiple intelligences because the combination of intelligences in every individual is different (Campbell & Campbell, 1999; Saban, 2001; Stefanakis, 2002). These dynamic intelligences also follow idiosyncratic developmental paths (Viens & Kallenbach, 2004). The intelligences are dynamic because they can be identified and developed, are teachable and changeable, and they interact with each other (Baum et al., 2005; Silver et al., 2000) as more than one intelligence at a time is employed to solve problems (Silver et al., 2000; Yavuz, 2005).

In the literature on intelligence and human development, it can be observed that earlier scientific theories actually all support the Theory of Multiple Intelligences (Vural, 2004; Yavuz, 2005; Şan & Güleryüz, 2004; Saban, 2001). The reason is the existence of a distinctive set of (eight) criteria (see below) which clarify the relative autonomy of each intelligence type (Armstrong, 2003a). Furthermore, the development of each intelligence should be judged on its own as each can be used separately because each has special systems for memory, attention, understanding, and problem-solving (Viens & Kallenbach, 2004; Vural, 2004). In addition, it is important to state that although each intelligence works separately (Armstrong, 1999), they also work as a whole in a harmony (Saban, 2001; Baum et al., 2005).

As mentioned earlier, there is more than one way to be intelligent (Kagan & Kagan, 1998). Every individual can be highly developed in certain intelligences, modestly developed in others, and relatively underdeveloped in the rest (Dedeoğlu, 2006). However, there are no standards in one specific intelligence for the person to be considered intelligent in general (Silver et al., 2000). For instance, an individual who has developed bodily-kinesthetic intelligence as a good swimmer is not necessarily a good basketball player as well. Similarly, when a person is good at theater, s/he may not be good at sports even though his/her bodily-kinesthetic intelligence is developed (Yavuz, 2005; Şan & Güleryüz, 2004).

The characteristics of the Theory of Multiple Intelligences reveal that the rationale behind this theory mainly focuses on individual differences. Thus, treating everyone equally, evaluating them with same criteria, and teaching them in only one way would be both unjust and ineffective. This notion may be the main reason why Gardner’s theory resonated with so many and was adopted into education (Kagan & Kagan, 1998).

Despite some criticisms, the Theory of Multiple Intelligences is still considered to be valid and effective based on the rich research background of the theory. Gardner assesses skills, talents, or mental abilities on the basis of eight criteria derived from a variety of disciplines:

> I came up with a set of eight criteria which were not dependent on results of a paper and pencil test. Rather, I looked at criteria from neurology, which brain regions mediate particular skills; anthropology, which abilities have been valued in different cultures across history and pre-history; special populations such as prodigies, savants and individuals with learning disabilities. All these individuals have jagged intellectual profiles, ones not easily explained if one believes in a single 'general intelligence'. Ultimately I came up with a list of eight intelligences (as cited in Dedeoğlu, 2006, p. 18).

These requirements – a few are sufficient, not all have to be met – have become a part of the theory and are listed as follows:

1- Potential isolation by brain damage
2- The existence of savants, prodigies, and other exceptional individuals
3- A distinctive developmental history and a definable set of expert *end-state* performances
4- An evolutionary history and evolutionary plausibility
5- Support from psychometric findings
6- Support from experimental psychological tasks
7- An identifiable core operation or set of operations
8- Susceptibility to encoding in a symbol system (Gardner, 1983, p. 62).

Based on his comprehensive definition of intelligence and the eight criteria, Gardner has defined nine intelligence types so far (Kagan & Kagan, 1998).

2.2.1.1 Verbal-Linguistic Intelligence

Verbal-linguistic intelligence refers to the ability to use words for a wide variety of purposes like instructions, word games, foreign languages, spelling, discussion, humor, grammar, debates, persuasion, poetry, public speech, creative writing, reading, storytelling, metaphors, similes, abstract reasoning, and prose writing (Armstrong, 2003a; Lazear, 2003; Silver et al., 2000). This ability, which includes having highly-developed auditory skills (Coan, 2006) and sometimes even excelling in foreign languages (McKenzie, 2005), is one of the most valued types of intelligence in schools (Armstrong, 2003a) as it is most closely related to the traditional method of instruction and teachers usually have well-developed verbal-linguistic intelligence themselves (Coan, 2006). This group of people "has a strong awareness of the varying functions of language, or more specifically, its power to stimulate emotions" (Chapman, 1993, p. 3) and they tend to learn best while reading, listening, speaking, or writing (Armstrong, 2003a).

2.2.1.2 Logical-Mathematical Intelligence

Logical-mathematical intelligence is the other ability that has been overemphasized in education (Lazear, 2003; Coan, 2006). This intelligence refers to the abilities of calculation, thinking critically, discovering patterns, seeing connections between separate pieces of information, establishing cause-and-effect relationships, and sequencing (Silver et al., 2000; Coan, 2006) as well as Mathematics, logic, inductive reasoning, and problem-solving (Lazear, 2003; Chapman, 1993; McKenzie, 2005). People with high logical-mathematical intelligence like riddles, brainteasers, creating and solving codes, doing experiments, and dealing with computers (Armstrong, 2003a).

2.2.1.3 Visual-Spatial Intelligence

Visual-spatial intelligence is the ability to perceive, create, and re-create pictures and images, both externally and internally, pretend, pay attention to details, and represent ideas with graphs, charts, maps, and tables (McKenzie, 2005; Silver et al., 2000; Lazear, 2003). Visually intelligent people like visual arts, architecture, costumes, and visual puzzles (Armstrong, 2003a; Chapman, 1993) and have a well-developed sense of direction and location, in other words, navigation (Coan, 2006; Lazear, 2003).

2.2.1.4 Musical-Rhythmic Intelligence

People with highly-developed musical-rhythmic intelligence are able to produce melodies, rhythms, and patterns in sounds (Armstrong, 2003a; McKenzie, 2005). They like to keep tempo, analyze musical forms and environmental sounds, listen to music, attend concerts, sing, hum, and whistle, and may play musical instruments (Silver et al., 2000; Lazear, 2003; Armstrong, 2003a). This intelligence means understanding, appreciating, and forming ideas with music (Chapman, 1993).

2.2.1.5 Bodily-Kinesthetic Intelligence

Bodily-kinesthetic intelligence is used to describe abilities related to physical activities and one's self body (Chapman, 1993; Silver et al., 2000). This intelligence is related to playing games and sports, dancing, doing crafts, repairing and building models, creating something new, and using one's body to express emotions (Lazear, 2003; Armstrong, 2003a). These people tend to learn best while doing, acting, moving, and touching (Coan, 2006; McKenzie, 2005).

2.2.1.6 Interpersonal Intelligence

Interpersonal intelligence means being naturally social, friendly, and outgoing, that is, with little or no effort. People with a developed interpersonal intelligence tend to work well with others and communicate effectively with them verbally or non-verbally (Lazear, 2003; Armstrong, 2003a). In addition, they are sensitive to others' moods, feelings, fears, expectations, intentions, motivation, temperament, attitudes, and desires (Chapman, 1993), in other words, they feel empathy with others (Silver et al., 2000; Lazear, 2003) so they learn best when they can relate problems to other people, while interacting and cooperating (Coan, 2006).

2.2.1.7 Intrapersonal Intelligence

Intrapersonal intelligence concerns one's own feelings, values, and attitudes (Armstrong, 2003a; Coan, 2006) and involves knowing one's own feelings, range of emotions, and thinking processes (Lazear, 2003). People with intrapersonal intelligence tend to be independent and self-directed, so they often prefer working alone (Chapman, 1993). Their self-understanding is also more developed as they can form realistic goals and conceptions of themselves (Silver et al., 2000).

2.2.1.8 Naturalist Intelligence

Naturalist intelligence is the eighth intelligence type, added by Gardner in 1999, and refers to the ability to notice patterns, features, anomalies, and hierarchies; to recognize, classify, and categorize objects and living things; and to cook (Armstrong, 2003a; Lazear, 2003); as well as to appreciate and understand the environment (McKenzie, 2005; Silver et al., 2000; Chapman, 1993).

2.2.1.9 Existential Intelligence

Gardner waited until he was able to show evidence that existential intelligence meets his set of criteria and finally announced that his 8½th intelligence can be considered as a separate type in 2009 at the 1st International Conference of Living Theorists: Howard Gardner – held in Burdur, Turkey. Gardner first defined it in 1999 as a "concern with ultimate issues" (p. 60), the ability to see oneself in the big picture. Existentially intelligent people have the ability to question and define values, understand processes, search for meaning, summarizing, synthesizing (McKenzie, 2005), and viewing daily life experiences from a limitless point of view (Kagan & Kagan, 1998).

Gardner emphasizes that his theory is only the beginning and human intelligence is not limited to the classification he suggests (Gardner, 2006; Kagan & Kagan, 1998). Both he and other experts in this field suggest that there are still more intelligence types such as "humor, creativity, cooking, spirituality, morality, sexuality, intuition, olfactory capacities (sense of smell), extrasensory perception, memory, wisdom, mechanical ability, common sense, and street smarts" (Armstrong, 1999, p. 255). Another reason why Gardner's Theory of Multiple Intelligences has been so popular since it was introduced in 1983 is perhaps that he "has left room for the potential future expansion of his theory" (Armstrong, 1999, p. 255).

2.2.2 Implications of the Theory of Multiple Intelligences in Education

Human intelligence was long measured by a short-answer test called 'IQ (Intelligence Quotient) Test' which mainly focused on verbal and mathematical abilities and evaluation and predictions of achievement and failure were made on the basis of the results of this test. This traditional view of intelligence limited what education can offer to students as education systems around the world had been established on linguistic and mathematical abilities (Kagan & Kagan, 1998; Armstrong, 1999). This belief has recently changed and the pluralistic view of intelligence has been gaining acceptance in the field of education since Gardner's Theory of Multiple Intelligences was put forth, shifting the focus from IQ scores with a numerical label to a profile of multiple intelligences and how these can be identified and improved (Baum et al., 2005).

The traditional paradigm of instruction has been challenged by Gardner's theory and education systems, initially focused on linguistic and/or logical abilities only, began fostering multiple intelligences through opportunities for more than one way of learning (Kagan & Kagan, 1998). This shift in emphasis challenges teachers to improve themselves, find new ways of instruction (Bellanca, Chapman, & Swartz, 1997), and become more creative in order to better address multiple intelligences (Zweirs, 2004; Baum et al., 2005). More and more students can now benefit from instruction and better learning is achieved in schools (Hoerr, 2000) as "Gardner's theory provides a framework for a metamorphosis of education at all levels of learning" (Chapman, 1993, p. 9).

Each individual possesses a variety of abilities which are impossible to describe with one-dimensional intelligence and teachers are required to help students discover their interests and abilities, develop them, and employ them when facing problems (Chapman, 1993; Kagan & Kagan, 1998). Most existing education systems are mainly based on the assumption that everyone can learn the same things in the same way so one method or approach is sufficient to achieve instruction. However, all people do not have the same interests and abilities, nor do they learn in the same way. In Gardner's (1999) words, "We are not all the same, we do not all have the same kinds of minds, and education works most effectively for most individuals if… human differences are taken seriously" (p. 208). Learning through their strengths can be a powerful way of instruction which results not in under-achieving students, but in confident children who believe in their abilities (Arnold, 2007).

In most classes, students have a different background, socio-economic status, culture, interests, ways of understanding, highly developed intelligences, and so on (Hoerr,

2000) and each of these factors affect their learning (Kagan & Kagan, 1998). The dimensions each individual brings to the classroom make them unique and the best instruction caters to these students in a way that will be useful to them (Silver et al., 2000; Lazear, 1999). Armstrong (2003b) describes diversity among students as follows: "Each one of us is like a different song made up of those eight [currently nine] notes. When you use all of your intelligences as much as you can – in your own unique way – you will fill the world with a marvelous tune that nobody else can make!" (p. 48). Education best serves its objectives when it provides students with appropriate settings and opportunities to compose their song, as Kornhaber et al. (2004) formulate it: "Education is most likely to be successful if it pays attention to the individual differences in the course of fashioning curriculum pedagogy and assessment" (p. 2).

A major benefit of taking learners' diversity into account and identifying their profiles is that students learn more about themselves (Campbell et al., 2004), which in turn leads to self-actualization and taking responsibility for their own lives and learning (Bellanca et al., 1997). Equipped with information about themselves, their self-understanding and self-esteem would be nurtured (Bowen, Hawkins, & King, 1997; Chapman, 1993). When they become aware of their own multiple intelligence profile, they can work on improving each of their intelligences either consciously or unconsciously (Kagan & Kagan, 1998), possibly assisted by their parents (Hoerr, 2000). The involvement of parents and families can even be more beneficial since they can help students improve their intelligences easily and quickly (Armstrong, 1999) and they can be made aware of the fact that children cannot be evaluated by exam scores alone (Chen, Moran & Gardner, 2009). Additionally, the Theory of Multiple Intelligences provides teachers with a vision to understand their own unique profile and how this affects their teaching styles so that they can take care to plan classroom instruction with a diverse range of activities to develop students' different intelligence types, rather than their own preferred style (Campbell & Campbell, 1999; Kagan & Kagan, 1998).

Another benefit of implementing the theory in education is that teachers can counteract paralyzing experiences (Armstrong, 2000). If the abilities of students are discovered and they are provided with the appropriate support, their experiences become crystallizing whereas if their abilities are ignored and even despised, experiences can become paralyzing (Temiz, 2007). Students with crystallizing experiences have the opportunity to develop their multiple intelligences; on the other hand, students with paralyzing experiences cannot even identify the intelligences they can develop.

Gardner's theory also supports a new understanding in education, namely equality of opportunities – chances in education (Kagan & Kagan, 1998). The theory broadens the meaning of this concept to include opportunities at the optimum level to improve individual abilities, interests, potentials, and intelligences (Saban, 2000). Through the consideration of various approaches in education, students are able to improve their intelligences and even choose a career appropriate to their own highly developed intelligences (Yılmaz & Fer, 2003).

2.2.3 Importance of Students' MI Profile in Education

After recent changes and developments in education, the understanding of the learning process has also evolved. In the past, educators strongly believed that all students could learn the same things in the same way. However, some students were successful if they were able change their learning style so as to be more compatible with their teachers' teaching style or if their dominant intelligence type was nurtured in class (Kagan & Kagan, 1998). Those who could not adapt to the traditional methods of instruction would be labelled as stupid or simply unsuccessful. This kind of perception has changed in today's educational world with the new perspective on intelligence (Kagan & Kagan, 1998).

One of the most important responsibilities of teachers is to find ways to help students learn something which is difficult for them (Bowen et al., 1997). Teachers who choose to take advantage of the Theory of Multiple Intelligences strive to answer the question, "How can I help my students learn?" by identifying their dominant intelligence types (Wilkens, 20066), so that they can discover which students learn in what ways. Thus, the areas each student has difficulty with are recognized and students can be helped to learn and become more successful since detecting their dominant intelligence types helps teachers choose more appropriate classroom activities for them (Kagan & Kagan, 1998). Gardner points out that "People learn and utilize knowledge in many different ways. The differences in learners challenge an educational system that assumes that everyone can learn the same materials in the same way" (1991, p. 12).

Education could be more meaningful for more students as long as the subjects are presented in more than one or two ways (Chen et al., 2009; Baum et al., 2005; Lazear, 2000; Kagan & Kagan, 1998; Gardner, 1991). It is also crucially important not to focus only on certain intelligences and neglect the other types once the students' more developed intelligences have been identified. Teachers need to nurture the less developed intelligence types as well (Yavuz, 2005) because even though each individual has the potential to improve all nine types of intelligence, they have a tendency towards certain intelligences since childhood and by school age, these types have already been developed more than others (Campbell & Campbell, 1999; Silver et al., 2000).

With respect to the identification of intelligences, Gardner highlights a great danger, namely, that it will not be helpful to identify highly developed intelligences alone (Hoerr, 2000). The risk is that the remaining intelligences may be neglected even though weaknesses are as important as strengths (Chen et al., 2009). He additionally mentions that early identification of both highly developed and underdeveloped intelligences is vital in order to develop them all (Gardner, 2006; Lazear, 2000). In this context, it should be mentioned that developing one intelligence does not mean poorer development of others (Kagan & Kagan, 1998).

Including all nine types of intelligence in lessons is not neither logical nor a part of the aspirations of the Theory of Multiple Intelligences (Griswold, 2006; Baum et al., 2005). Gardner simply advocates that each subject can be taught in more than one way and using creativity, teachers can apply some of these paths to each lesson for improved learning and understanding (Hoerr, 2000; Armstrong, 2000). Thus, the identification of the MI profile of students is vital: "As long as the learning profiles of the learners are identified and the curriculum, the materials and the ways of teaching are adapted to them, there will be harmony between the way of teaching and learning" (Dedeoğlu, 2006, p. 46).

Gardner draws particular attention to the fact that developing nine different tests for each type is inconvenient (Gardner, 2006). He is against the measurement of multiple intelligences unless it aims at identifying students' background in a subject or at determining how to help them, as intelligence is so complex that it cannot be measured by intelligence tests. Administering such tests is not harmful, unless it is an end rather than a means to an end. In other words, he is concerned that MI profiles will not be used to develop students and the job will be considered complete once the profiles have been identified (Gardner, 2006). Learning the profile of students is beneficial, almost a prerequisite, but only as long as it is merely a tool in helping students learn in their own way.

2.3 Instructional Design

The roots of instructional theory go back to the beginning of the 19^{th} century with two theorists, John Dewey and Edward Thorndike. Dewey conceived of instructional design as the development of a link between learning theory and educational practice. Ralph Tyler similarly stated the need for such a connection. In Reigeluth's summary: "instructional design is this linking science – a body of knowledge that prescribes instructional actions to optimize desired instructional outcomes, such as achievement and effect" (1983, p. 5).

Behaviorism can be considered as the origin of the contemporary theory of instruction and the first widely adopted definition of instructional theory came from B. F. Skinner.

> Small, incremental steps sequenced to link information in a logical order; active learner participation in responding to instructional stimuli with immediate feedback as a positive reinforcer. Learner progress based on successful attainment of defined behavioral objectives (Skinner, 1954, p. 88).

In the 1950s, the development of instructional system design (ISD) first emerged for the analysis of tasks and content, as this approach was then related to “theories of automation and the concept of systems as a complex interrelationship of components, flow and control of information, thorough analysis of a task, and careful planning and decision making” (Tennyson, 2005, p. 220). In an attempt to develop the ideal theory, the characteristics of a teacher, the procedures of classification and evaluation, and the means of modification in testing were specified with a view to designing instructional programs where most students would be able to achieve what was specified in behavioral objectives.

In the 1960s, programmed instruction was the major trend in the design of instruction but research done towards the end of the decade and in the 1970s revealed that the materials were not effective because students found them uninteresting. Programmed instruction was based on a few general behavioral principles of learning which were applied to all people no matter how old or where they were but the underlying principles stated by Skinner were found to be untrue. More importantly, research results on behavioral principles like rewards, feedback, sequencing, and objectives in the learning process contradicted the findings of previous studies (Tennyson, 2005). Theorists like Bruner, Gagné, and Reigeluth developed sets of rules to link conditions, instructional methods, and learning outcomes and this led a light to define the features of instructional theories.

Robert Gagné was a significant contributor to the development of instructional theory in the 1960s. Other psychologists had also made major contributions. In contrast to the behavioral paradigm, among those who suggested a cognitive-based paradigm were David Ausubel whose theory was on progressive differentiation, Jerome Bruner who suggested revising ideas in more complex ways (Tennyson, 2005).

Beginning with Bruner in 1964, instructional researchers moved from the behavioral paradigm (stimulus-response-reinforcement) to the cognitive, thus changing the definition of instructional design and shifting the focus to theories of learning and to developing models which link the theories with the design of instruction. Gagné's *Conditions of Learning* was a groundbreaking work in the history of instructional design and still guides theorists and professionals within the conditions-of-learning framework (Ragan & Smith, 1996). In the middle of the 1970s, Gagné and Briggs defined a set of essential steps for instructional system development: "The system must be designed for the individual, it should include immediate and long-range phases, it should substantially affect individual development, and it must be based on knowledge of how people learn" (Tennyson, 2005, p. 224). According to Gagné and Briggs (1979), outcomes of instructional theory are divided in five categories, namely, verbal information, intellectual skills, cognitive strategies, motor skills, and attitudes.

Merrill, another prescriptive instructional design theorist after Gagné, developed the component display theory to improve instructional quality. Merrill and his colleagues also worked on and tried to develop a taxonomy of instructional presentation types used to convey messages and ask questions. Merrill (1997) in particular, stresses separating performance levels and content types, which he believes, provides the extension of a classification system of outcomes.

In summary, ISD is the process of creating instructional systems. In a broader sense, although ISD is systematic and scientific, creativity is also an essential requirement to identify and solve instructional problems.

2.3.1 Meaning of Instructional Design

Instruction rather than teaching should be the focus of education since instruction *includes* teaching (Gagné, Wager, Golas, & Keller, 2005). Instruction can be defined as "a whole range of activities the teacher uses to engage the students" (2005, p. 2). Teachers or trainers can best help students learn when instruction is implemented in the teaching-learning process and the principles of instructional design are considered. However, it is neither possible nor logical to identify a single, best model of instructional design. The understanding of designers, the events that affect learning, and the way instruction is structured are three components that make instructional design models differ from each other.

Gagné and his co-authors (2005) postulated six basic assumptions in the process of design:

1) Instructional design must be focused on the process of learning rather than on the process of teaching. Learning must be intentional instead of incidental. Carefully setting instructional objectives and learning outcomes affects the design process directly.
2) Many factors such as students' determination, time allowed, and the aptitude of both students and teachers affect learning as it is a complex process (Carroll, 1963, as stated in Gagné et al., 2005, p. 3).
3) All instructional design models can be applied at many levels as long as the fundamental principles are kept the same.

4) The understanding of how learning occurs is the concept behind the designing process. Involvement of the learners in the process is crucial.
5) Instructional design is a process that includes sub-processes which are related, plural, and recognizable.
6) The design of learning activities and materials is based on the manner of instruction and learning conditions appropriate to the desired outcomes. Various learning outcomes can be achieved through various types of instruction.

Gagné (1985) defines learning as “a process that leads to a change in a learner’s disposition and capabilities that can be reflected in behavior” (as cited in Gagné et al., 2005, p. 3). He also mentions learning situations which cause changes in learning capabilities either externally or internally. Instruction must therefore take into account both external and internal factors, although internal factors are more important as they affect learning more. Furthermore, the design of instruction should consider both the external and internal conditions of learning, which vary depending on the type of desired learning outcomes.

An instructional system, as defined by Gagné et al. (2005), is the organization of resources and procedures that enable learning and the focus of such a system can vary from students to technical training. The systematic planning of instruction uses “various forms of information, data, and theoretical principles as input at each stage” within “a process of stating goals, selecting or developing instructional interventions, and using feedback from learners to improve the instruction” (Gagné et al., 2005, p.

12). Even though there is not a single best design, certain specific steps have to be followed:

1. Determine the purposes of instruction.
2. Goals of instruction may be translated into a framework for a curriculum and for the individual courses contained in it.
3. The course objectives are then analyzed and major units of instruction are identified.
4. The determination of types of capabilities to be learned, and the inference of necessary learning conditions for them, makes it possible to plan the sequences of lessons.
5. Lessons are further broken down into events and/or learning activities.
6. The additional element required for completion of instructional design is a set of procedures for assessment of what students have learned.
7. The design of lessons and courses, with their accompanying techniques of assessing learning outcomes, makes possible the planning of entire systems.
8. Finally, attention must be paid to evaluation of the instructional effort (Gagné et al., 2005, pp. 13-14).

Instructional design theory, in short, aims to answer two essential questions: “What methods should be used in the design of instruction and when should each be used?” (Reigeluth, 1987, pp. 1-2).

Instructional design is concerned with understanding, improving, and applying methods of instruction. Its objective is to determine the optimal method of instruction in order to yield the desired outcomes in terms of student knowledge and skills (Reigeluth, 1983; 1987). Learning about instructional design is necessary because both the educational and intellectual needs of students should be met (Reigeluth, 1983).

Teachers may not be able to dedicate sufficient time and effort to each student as a whole person due to ineffective methods of instruction. Thus, the more effective instructional resources are, the freer teachers would be to focus on students in different ways, emotionally, socially, psychologically, and morally (Reigeluth, 1983). As technology in particular and societies in general change, education becomes increasingly important, leading to a growing need for more effective, efficient, interesting, and appealing methods of instruction (Reigeluth, 1983; 1987).

Methods of instruction have been examined to identify their basic components and a number of prescriptions have been formulated and confirmed. However, these isolated prescriptions do not consider all the components that should be included in instruction. Teachers, textbook writers, and any other instructional developers need comprehensive and integrated prescriptions to be provided by prescriptive instructional theories (Reigeluth, 1987).

The design of syllabi, on the other hand, is an issue mainly concerned with the selection and grading of content, not the learning tasks or activities (Nunan, 1988). In this sense, teachers are the main consumers of syllabi designed by others because they try to "implement the plans of applied linguists, government agencies, and so on" (Nunan, 1988, p. 7).

2.3.2 Learner Differences

Not all students learn in the same way or at the same pace. Consequently, it is not possible to state one method as the best for all learners. Since not every lesson can be beneficial for all students, "matching learners up with appropriate lessons and methodologies is important" (Alessi & Trollip, 2001, p. 30). Jonassen and Grabowski explain why some students can learn easily whereas others have difficulties learning the same material as follows:

> (…) student learning traits differ, because the thinking process differs depending on what the student is trying to learn. Individuals vary in their aptitudes for learning, their willingness to learn, and the styles or preferences for how they learn if they choose to. These differences impact the learning process for each student. That is, these learner traits determine to some degree if and how well any individual is able to learn. Second, the outcomes of learning require that students think in different ways. Third, learner traits interact with learning outcomes and the thinking requirements entailed by them. Different learners will have varying aptitudes for different learning outcomes (1993, p. 3).

Jonassen and Grabowski (1993) also listed varying learner traits, namely, intellectual aptitudes for learning, cognitive controls and cognitive styles, learning styles, personalities, and prior knowledge, in this order. On the other hand, Alessi and Trollip (2001) mentioned motivation as the most important learner difference, that is to say, what interests one student may bore another. Different motivators such as rewards (e.g. money, free time, grades), praise, arousing curiosity, and using fantasy can be used as reinforcement for different students. In order not to overuse any motivational techniques, a variety should be provided. Therefore, students' responses to motivators should be observed and assessed and the choices modified accordingly (Alessi & Trollip, 2001). Two other differences mentioned by educational researchers are students learning styles and cognitive styles.

2.3.3 Learning Objectives

Objectives are "what educators intend students to learn as a result of instruction" (Anderson, Krathwohl, & Bloom, 2001, p. 23). They vary from explicit to implicit and from highly global to very specific. They are important in identifying the intended cognitive outcomes, to determine effective instructional activities, and to design appropriate assessment tasks. The most commonly used model of educational objectives is the work of Tyler (1949).

Krathwohl and Payne (1971) categorize objectives under three headings: global, educational, and instructional. Global objectives are broadly identified and include a number of more specific objectives. As such, global objectives are not suitable to plan classroom activities, assessment procedures, or the evaluation of student performance. Educational objectives are preferred for classroom instruction as they are more specific. There is the need for very specific objectives, called 'instructional objectives'. The purpose here is "to focus teaching and testing on narrow, day-to-day slices of learning in fairly specific content areas" (Anderson et al., 2001, p. 16).

2.3.4 Bloom's Taxonomy

Many theorists have focused on the notion that learning varies from one individual to another and classified learning under three main domains, cognitive, affective, and psychomotor (Reigeluth, 1999). Bloom defines the cognitive domain as that which "deals with the recall or recognition of knowledge and the development of understandings and intellectual abilities and skills" (Reigeluth, 1999, p. 52). Many theorists such as Ausubel (1968), Anderson (1983), Merrill (1983), Gagné (1985), and Reigeluth (1999) have suggested various similar taxonomies of cognitive learning. Bloom (1956) developed a taxonomy which is known worldwide and used as a standard to identify and categorize educational objectives in the cognitive domain (Reigeluth, 1999; Jonassen & Grabowski, 1993).

According to Bloom's Taxonomy, the main types of learning occur under six headings in order from lower level (easier) to higher level (more difficult) skills:

> *Knowledge*: Students working at this level can remember and recall information ranging from concrete to abstract.
>
> *Comprehension*: At the comprehension level, students are able to understand and make use of something being communicated. Bloom felt that this level was the major emphasis of schools and colleges. In this level, students can translate, interpret, and extrapolate the communication.
>
> *Application*: Students can apply appropriate concepts or abstractions to a problem or situation even when not prompted to do so.
>
> *Analysis*: Students can break down the material into its parts and define the relationships between the parts.
>
> *Synthesis*: Students create a product, combining parts from previous experience and new material to create a whole.
>
> *Evaluation*: Students make judgments about the value of materials, ideas, and so forth (Reigeluth, 1999, p. 52).

2.3.5 Gagné's Nine Events of Instruction

Gagné first formulated his theory of instruction in the 1960s but continued to develop it over more than two decades (Reigeluth, 1987). Being a very comprehensive attempt to combine theories of learning and of instruction, it has had a significant effect in education (Reigeluth, 1987). This instructional theory encompasses all three domains in Bloom's Taxonomy – cognitive, affective and psychomotor – and prescribes methods for verbal teaching, intellectual skills, and cognitive strategies within the cognitive domain (Reigeluth, 1987).

Gagné's theory of instruction includes the selection and sequencing of content. First, the desired objective is determined and the learning prerequisites that have not yet been achieved are identified; the sequence can then be taught (Reigeluth, 1987). There is also a hierarchical sequence from the easier/simple component skills to more difficult/complex component skills.

In Gagné's (1985) view, the processes of learning are activated internally. In other words, the outcome of one process is the input of another. However, certain other external factors, which he calls 'events of instruction', support the internal act of learning.

> If all of the events of instruction were each presented in the order that they are shown, it would represent one form of instructional strategy. However, these events of instruction do not have to be presented in this order, nor do all the events need to be included for every lesson (Gagné et al., 2005, p. 194).

The process of learning is a continuous act and some stages can be very rapid whereas some happen slowly. Each of the nine events might also represent one or more learning activities (what students do) and/or instructional activities (what teachers do). The nine events of instruction proposed by Gagné are as follows:

1. *Gaining attention*: Various kinds of activities are employed to gain the learner's attention.
2. *Informing the learner of the objective*: Presenting students with learning objectives communicates an expectation of the knowledge and/or skills they are expected to perform.
3. *Stimulating recall of prerequisite learned capabilities*: Much of new learning (some might say all) is building on what we already know.
4. *Presenting the stimulus material*: The stimuli to be displayed (or communicated) to the learner are those involved in the performance that reflects the learning.
5. *Providing learning guidance*: The essence of learning guidance is to provide support for learners in making connections between what they know and what learn, in this event they establish a context for it.
6. *Eliciting performance*: Presumably, having had sufficient learning guidance, the learners will now be at the point where the actual integral integrating event of learning takes place.
7. *Providing feedback about performance correctness*: There should be feedback confirming the correctness or degree of correctness of the learner's performance.
8. *Assessing the performance*: The immediate indication that the desired learning has occurred is provided when the appropriate performance is elicited.
9. *Enhancing retention and transfer*: When information or knowledge is to be recalled, the existence of the meaningful context in which the material has been learned appears to offer the best assurance that the information can be reinstated (Gagné et al., 2005, pp. 195-201).

2.4 Related Research

With respect to research on the use of technology, computers are the first tools that come to mind. Some researchers have examined them in terms of students' competency in computer use. One remarkable study on this aspect, conducted by Bain, Hess, Jones, and Berelowitz (1999) and titled 'Gender Differences and Computer Competency: The Effects of a High Access Computer Program on the Computer Competence of Young Women,' examined the effects of a secondary school technology immersion program (with laptop computers) on the technological competency of 30 randomly selected male and 30 female 9th and 10th grade students. Data collection was carried out through a questionnaire and a computer competency test. Bain et al. conclude that "improved access when embedded within a meaningful curriculum context can improve the technological competence of all students" (p. 8).

Kumtepe (2006) considered computers as educational tools in his study titled 'The Effects of Computers on Kindergarten Children's Social Skills.' The sample consisted of 12,929 children whose social skills were measured through the Social Skills Rating System using data from ECLS-K (Early Childhood Longitudinal Study – Kindergarten). The relationship between social skills and three main variables of children's computer use in kindergarten was examined. Kumtepe found that computers had positive effects on kindergarten children's social skills and the more proficient the children were at using a computer, the better their social skills were and the fewer behavioral problems they exhibited.

Stellwagen (1999), in his study 'How Effective are Classroom Computer Minilabs,' investigated whether computer technology integration affected student success, taking into account a number of factors such as students' ability levels, gender, learning styles, attitudes toward computer use, research quality, classroom efficiency, performance scores, teacher attitudes, and the configuration of the computer labs. He found that students did use computers both in the classroom and in other settings such as the special education room, and group experiments were found to be the most productive way to use the minilabs.

In another study, 'When Each One Has One: The Influences on Teaching Strategies and Student Achievement of Using Laptops in the Classroom,' Lowther, Ross, and Morrison (2003) investigated whether students achieved differently in classrooms with laptops. The experimental groups in laptop classrooms and the control groups with five or six desktop computers in computer-integrated classrooms were divided into three grade levels: six in grade 5 (three laptop and three control), nine in grade 6 (six laptop and three control), and six in grade 7 (three laptop and three control). The students with laptops were found to be more attentive and interested in learning, used the laptop as a learning tool more frequently, and improved their writing and research skills to a higher degree than those in the control groups. The researchers also observe that students' problem-solving skills were improved by research and project-oriented tasks.

In her 2001 study, Watson wanted to identify 'Key Factors Affecting Conceptual Gains from CAL Materials,' factors such as biographical characteristics, features of CAL (Computer-Assisted Learning) packages, and methods of integrating CAL into the curriculum. She used a quasi-experimental design with over 120 freshman students who used CAL materials on Introductory Genetics as an integral part of their course. Quantitative and qualitative data from student records as well as pre-test and post-test results were used to determine the level of conceptual gain achieved through the use of the CAL package. The results of the study show that the students made significant conceptual gains from using the CAL package and applied them to the practical laboratory sessions.

As regards instructional technology tools, research has shifted focus onto the investigation of multimedia. For instance, in ‘Using Multimedia to Enhance Problem-Based Learning in Elementary School,’ Zumbach, Kumpf, and Koch (2004) studied children in an experimental class equipped with multimedia computers with sound capabilities and found that they demonstrated higher intrinsic motivation and acquired more declarative knowledge than the children who received traditional lecture-based instruction. The researchers conclude that “by combining technology with an adequate instructional method, it is possible to replace parts of traditional lecture with meaningful self-directed learning” (p. 35).

Gatlin-Watts and Kordsmeier (1999) conducted another study on multimedia, entitled ‘Multimedia as an Instructional Tool: Perceptions of College Department Chairs’, where they investigated the perceptions and practices of AACSB (Association to Advance Collegiate Schools of Business) chairs on integrating multimedia into the curriculum. Of the 655 questionnaires they mailed to chairs of AACSB schools, only 170 were returned (26%). The questions were grouped under three areas – software/facilities, knowledge, and administrative. The respondents reported they supported multimedia use as instructional tools in class. They believed time and resources should be provided for the development of instructional design using multimedia and that communication between levels and state-of-the-art instruction should be provided by continuously upgrading multimedia software and hardware.

In addition to research on computer and multimedia, a number of studies have been conducted on Internet use. For instance, in a study entitled ‘An Examination of Alternative Instructional Methods,’ Brewer (2004) investigated the advantages and disadvantages of alternative delivery formats in one regional university to identify student attitudes toward different course delivery formats. Senior students were given questionnaires by the instructors of six Internet courses, eight interactive television courses, three correspondence courses, and one public radio station course. The results indicate a need to develop business courses using alternative formats and students were willing to learn via the Internet.

Hill and Hannafin (1997), in ‘Cognitive Strategies and Learning from the World Wide Web’, attempted to identify the strategies used by adult learners in open-ended hypermedia information systems, to understand how individual learning goals were pursued using the World Wide Web, and to suggest methods of use in open-learning environments. Fifteen volunteers, current and prospective educators signed up for a university level technology-for-educators course were interviewed and given questionnaires to collect data. The results show “a variety of strategies are used by learners, self-reported knowledge appears to affect the strategies used and perceptions of disorientation and perceived self-efficacy influence the strategies used” (p. 56).

Kuzu, Akbulut, and Şahin (2007) did an interesting study entitled ‘Application of Multimedia Design Principles to Visuals Used in Course-Books: An Evaluation Tool’ where they examined visuals used in textbooks for appropriateness in terms of the Cognitive Theory of Multimedia Learning, to help textbook writers create better visuals and to evaluate certain current textbooks in order to prepare a distinct record of the current materials. They prepared evaluation principles and operational definitions regarding these principles, obtained expert opinions on the content, construct, and face validity of the instrument, and tried to maintain the internal consistency reliability of the instrument. They conclude:

> The instrument developed within the present study brings a new dimension to course book evaluation in terms of the evaluation of visuals. The instrument can be used to evaluate course books in terms of their concordance with the multimedia learning principles based on the Cognitive Theory of Multimedia Learning. Besides, the tool can be used to design new books that are congruous with the cognitive theory (p. 13).

Rakes, Flowers, Casey, and Santana (1999) investigated technology use from a different perspective. In 'An Analysis of Instructional Technology Use and Constructivist Behaviors in K-12 Teachers,' they attempted to determine the extent to which technology-using teachers report the use of constructivist instructional practices and the degree to which teachers and students use instructional technology as a component of the customary curriculum. K-12 teachers with Internet access were chosen randomly and two different survey instruments were applied. Rakes et al. concluded that:

> This study provides some evidence that the use of technology may provide a tool that facilitates constructivist behaviors in classroom teachers. The results showed striking generational differences among teachers with those having 0-15 years of experience having significantly higher constructivist scores than those with over 15 years of teaching experience (p. 9).

In another noteworthy study, Koolstra and Beentjes (1999) examined a different perception of technology use. In their study entitled ‘Children’s Vocabulary Acquisition in a Foreign Language through Watching Subtitled Television Programs at Home,’ they hypothesized that subtitled television programs offer a rich resource for foreign language acquisition. They examined whether 246 randomly selected children (125 boys and 121 girls) in grades 4 and 6 learned English words through watching a 15-minute long documentary about grizzly bears in English. The results indicated that vocabulary acquisition and recognition of English words were highest when the film was shown with Dutch subtitles, indicating that these Dutch students incidentally acquired vocabulary in a foreign language in the course of watching a subtitled television program.

Another study by Daud and Husin (2004), entitled ‘Developing Critical Thinking Skills in Computer Aided Extended Reading Classes’, examined whether there is a significant difference between students who analyzed certain specific words in a text manually and those who were given a concordancer to analyze the same words. A treatment and a control group (21 and 19 students, respectively) with a pre-test and a post-test participated in this quasi-experimental study. The treatment group used a computer concordancer while analyzing *Othello* whereas the chalk-and-talk method was used with the control group, all intermediate level undergraduate students at the International Islamic University in Malaysia. A significant difference was noted between the treatment and control groups in terms of the students’ ability to express inductive and deductive reasoning, to judge the credibility of assertions, and to identify assumptions in arguments, confirming that the use of a concordancer enhances students’ critical thinking skills.

Dreyer and Nel (2003) also investigated reading skills through technology use in their study entitled ‘Teaching Reading Strategies and Reading Comprehension within a Technology-Enhanced Learning Environment’, where they examined the format and structure of the strategic reading instruction sections of the English for Professional Purposes course recommended within a technology-enhanced environment using a quasi-experimental research design with non-randomized experiment and control groups. They administered a reading strategies questionnaire, the TOEFL test, and two reading comprehension tests. to all first-year English as a Second Language (ESL) students (n=131) taking an English for Professional Purposes course. The results suggested that students benefit from strategic reading instruction offered in a technology-enhanced learning environment.

Eryaman (2007) conducted research on ‘Examining the Characteristics of Literacy Practices in a Technology-Rich Sixth Grade Classroom’. He investigated new patterns of literacy which appear within the classroom from three theoretical perspectives – oppositional, utilitarian, and transactional. The objective was to understand how technological innovations change the understanding of ‘literacy’ and ‘being literate’, and what educators may encounter as classrooms become technologically richer. The participants were the principal of the school, one science teacher, and one female and five male 6th grade students. The results of this simultaneously inductive and deductive study show that the diversity and complexity of the characteristics of literacy practices cannot be identified by a single approach or methodology. Eryaman also came to the following conclusion:

> Providing the technology for schools serving at-risk students is just the tip of the iceberg. At the school level, a major implementation problem is failure to

> provide the teachers with adequate professional development in technology. Teachers need support not just for learning to use new technologies but also for acquiring skills in designing and implementing high-quality, culturally relevant student-centered instruction (p. 38).

'A Comparison of Calculator Use in Eighth-Grade Mathematics Classrooms in the United States, Japan, and Portugal: Results from the Third International Mathematics and Science Study', done by Tarr, Uekawa, Mittag, and Lennex (2000), investigated major trends in and perceptions of the use of calculators in middle schools. Data on how often calculators were used and the ways in which they were used were obtained from the Third International Mathematics and Science Study (TIMSS). Depending on the students who participated in the TIMSS, a score was estimated for each country in the study. The findings revealed that calculator use and accordingly student achievement vary between Japan, the US, and Portugal.

Gömleksiz conducted a study on the 'Use of Educational Technology in English Classes' in 2004 to identify the attitudes and opinions of English teachers towards the use of technology. The sample consisted of 150 English teachers working in 63 elementary schools in Elazığ, Turkey. The first group consisted of 47 English Language Teaching Department graduates and the second group consisted of 103 teachers who had degrees in other disciplines. Gömleksiz found that English Language Teaching Department graduates were more optimistic than those in the second group. Although both groups of teachers agreed that educational technology is very important in the teaching-learning process, the members of the second group were not very eager to use technology in their own classes. The schools where these teachers worked were not well-equipped in terms of technological devices and teachers were not encouraged by the school administration to use technology in their classes.

Although many researchers have focused on the use of technology in classrooms, some have been more interested in the beliefs, attitudes, or perceptions of teachers, students, or both. Czerniak, Lumpe, Haney, and Beck (1999), for instance, examined 'Teachers' Beliefs about Using Educational Technology in the Science Classroom.' They examined the influence of K-12 teachers' beliefs on using educational technology in their classrooms. The first group, 33 purposely selected K-12 teachers from Northwestern Ohio, was asked about their basic beliefs regarding the use of educational technology in the classroom. The second group of teachers consisted of 250 randomly selected K-12 teachers from schools listed in the Ohio School Directory and 250 public school science teachers from the State of Wisconsin Department of Public Instruction. Each teacher was sent the questionnaire twice and a follow-up postcard. In summarizing the results, Czerniak et al. state, "Educators should examine teachers' beliefs before planning classes, workshops, or seminars. Restructuring efforts should consider teachers' concerns about software materials, funding, supplies, time, and support structures" (p. 13).

Judson (2006) similarly studied teachers' beliefs in 'How Teachers Integrate Technology and Their Beliefs about Learning: Is There a Connection?' where he correlated his observations with the teachers' stated beliefs and attitudes. A group of 32 classroom teachers in grades ranging from primary to secondary school volunteered. Judson examined factors such as whether the schools had technology available for integration, whether teachers had taken at least one university course on technology, and whether there were workshops supported by the district related to the use of technology in classrooms. He planned the classroom observations with the teachers in advance and observed each teacher once or twice for a minimum of 30 minutes. He used the Conditions That Support Constructivist Uses of Technology (CSCUT) Survey to measure teachers' beliefs and attitudes. The results led to the conclusion that teachers' beliefs about instruction are not particularly important for the integration of technology into classrooms.

Özad and Kutoğlu (2004) conducted a study entitled 'EFL Students' Use of Technology in Presentations' to examine the ideas and feelings of those students who chose to use technology in order to enhance their presentations. Data was collected through presentation reports filled in by the researchers, classroom observations, and semi-structured interviews. The researchers summarized their most important findings as follows:

> The students who participated in this study showed preference towards using the OHP more than other technological devices. Almost all the students were satisfied with their presentations. Since the majority of them used technology in the class, it could be said that using technology in the presentations makes them feel confident and relaxed. The females feel more confident while using the OHP and the males while using the computers (p. 19).

In 'Technology and Educational Empowerment: Students' Perspectives', Saye (1997) reported on a case study of "student perceptions of technology and its proper role in their schooling" (p. 5) as "part of a larger investigation of the acceptance and use of electronic educational technologies at one secondary boarding school engaged in an effort to infuse technology into its instructional program" (p. 8). Data were collected over a period of more than two years from interviews with teachers, students, and administrators, classroom observations, surveys, and examination of documents. According to the results, "teachers identified and demonstrated four technology goals: efficiency, enrichment, empowerment, and control. The major goals of technology use for students were utilitarian. Technology was perceived as a simplifier. They valued the efficiency, speed, and clarity that educational technology provided" (p. 15).

In a study entitled 'What Makes Teachers Use Technology in the Classroom? Exploring the Factors Affecting Facilitation of Technology with a Korean Sample', Baek, Jung, and Kim (2008) asked 64 (47 females and 17 males) teachers including 38 from elementary and 26 from middle schools why they use technology in their classrooms. A different sample of 199 teachers (138 females, 61 males) including 121 from elementary and 81 from middle schools were then asked to rate the 88 items compiled in the first part on a Likert scale ranging from 1 (not important) to 5 (very important). This results revealed six main factors which influenced teachers' adoption of technology in the classroom: "adapting to external requests and others' expectations, deriving attention, using the basic functions of technology, relieving physical fatigue, class preparation and management, and using the enhanced functions of technology" (p. 9) from the strongest to the weakest. The study also showed that "teachers do not pay much attention to raising the quality of learning when they decide to adopt technology, especially as they are more experienced" (p. 10).

Chanlin, Hong, Horng, Chang, and Chu (2006) were also interested in the factors affecting the use of technology in their research, 'Factors Influencing Technology

Integration in Teaching: a Taiwanese Perspective'. They examined how eight participants integrated technology into creative teaching. These teachers had each won a Createach Award, were from different schools, and taught in various domains. Several data collection techniques, including field notes, interviews, classroom observations (based on video-tape), and audio-tape recordings, were used. In their conclusions, Chanlin et al. state, "Research-based findings reflect that the factors influencing the integration of computer technology with creative teaching are not solely from the teaching environment and personal factors; there are also social factors and curricular factors surrounding teaching and learning issues" (p. 66).

Research in the field of instructional technology has recently shifted to investigating newer devices such as smart phones, laptops, and smartboards, and their applications in class. Researchers are still trying to identify ways to integrate instructional technology efficiently and to educate teachers in the effective use of instructional technology.

In 2013, Kim, Kim, Lee, Spector, and DeMeester conducted a study to examine the relationship between 'Teacher Beliefs and Technology Integration'. The subjects were 22 teachers involved in a four-year professional development project, selected from among the 42 because they were in the classroom most of the time during the project. The technological tools included in this project were laptops, interactive whiteboards, and digital cameras and recorders. The data were collected through the Epistemological Belief Questionnaire, Teaching, Learning and Computing (TLC) Survey, classroom observations, and teacher interviews. The results indicated that "teachers' beliefs about the nature of knowledge and learning, beliefs about effective ways of teaching and technology integration were positively correlated with one another.”

Another study, Teacher Beliefs and Technology Integration Practices: A Critical Relationship, conducted by Ertmer, Ottenbreit-Leftwich, Sadık, Şendurur, and Şendurur in 2012 investigated how teachers’ pedagogical beliefs and practices supported their technology use. The participants were twelve (seven female and five male) K-12 class teachers selected on the basis of their award-winning technology practices and whose professional experience ranged from 2 to 31 years. Through interviews, the correspondence between their classroom practices and their pedagogical beliefs could be ascertained. The results revealed that shortage of resources, lack of administrative support, technology-related problems, and standardized tests were obstacles, even for these award-winning teachers. The participants also viewed their own attitudes and beliefs as facilitators of technology integration while others’ attitudes and beliefs were viewed as being obstacles to technology use. The researchers concluded that technology tools should be explored during the professional development of teachers in order to enable them to use these tools in their professional lives.

In 2012, Wang, Hung, Hsieh. Tsai, and Lin investigated the perception and attitudes of teachers in their use of technology in the classroom in ‘Computer Technology Integration and Multimedia Application for Teacher Professional Development: The Use of Instructional Technology in the Classroom Settings’. A 17-item survey was administered by e-mail or in person to 60 teachers from three different public schools to measure their perceptions. The participants indicated they believed in the importance of education related with technology and stated that they were encouraged to use computer technology but that they needed more support in this area.

In 2011, Rahimi and Yadollahi conducted a study to examine the relationship between Iranian EFL teachers' level of computer anxiety and their use of ICT in English lessons. In the study entitled "Computer anxiety and ICT integration in English classes among Iranian EFL teachers," the participants were 254 randomly selected EFL teachers (139 male and 115 female) working in different schools in one of the metropolitan cities in Iran and their professional experience ranged from less than one year to more than seventeen. The Computer Anxiety Rating Scale, ICT Integration Rating Scale, and a personal information questionnaire were administered. The results indicated a positive correlation between age and level of computer anxiety while no relationship was found between anxiety level, gender, and teaching experience. Moreover, a negative correlation was found between computer anxiety and ICT integration. Lastly, "while ICT integration correlated negatively with age and years of teaching experience, it was not found to be related to gender" (p. 203).

In 2013 Akkoyunlu and Erkan carried out a descriptive study entitled 'A Study on Student and Teacher Views on Technology Use,' describing how 183 fifth, sixth, and seventh grade students (105 male and 78 female) and 36 teachers (20 female and 16 male) viewed technology use in general and smartboards in particular. Two different surveys on a three-point Likert scale were given to the participants, one to the students and the other to the teachers. The results revealed that teachers and students alike believed smartboards to be practical educational solutions which motivate students and make lessons more efficient despite technical problems and more time needed to prepare the materials.

In 2014 O'Bannon and Thomas conducted a study on 'Teacher Perceptions of Using Mobile Phones in the Classroom: Age Matters!' where they examined the effects of age in teacher opinion on using technology in class, with particular emphasis on mobile phones. A quantitative descriptive research method was used and a 50-item questionnaire developed by the researchers was administered to 1095 teachers from 12 schools in two states in the USA. The results revealed that the age of the teachers was an important factor in using technology in class. On the other hand, as regards owning a mobile phone, no significant difference was found between the teachers who were younger than 32 and those between 33 and 49 years of age; however, there was such a difference for teachers who were 50 and above. Moreover, the older teachers were not in favor of owning a smartphone, they were less eager about using their features and found the phones difficult to use.

Research was carried out in 2009 by Özdamlı, Hürsen, and Özçınar in order to find out about the attitudes of teacher candidates from different departments in the Educational Sciences Faculty at Near East University. In 'Teacher Candidates' Attitudes towards the Instructional Technologies' the researchers randomly selected 120 teacher candidates from four different departments. The data was collected on a five-point Likert scale questionnaire prepared by the researchers. The results revealed all participants believed that the use of instructional technologies had positive effects on teaching. A significant difference between genders was detected but no significant difference among the departments.

2.5 Evaluation of the Related Research

In order to prepare students for the future and help them learn how to think, how to learn, and gain different perspectives, technology should be integrated into the classroom, especially as it has a great impact on every aspect of modern living. As Türkmen worded it:

> Today's kids needed today's learning media to become engaged in the learning process. This thought was confirmed by a quote I found in the work of John Dewey, educational philosopher, written more than a century ago. "If we teach today as we taught yesterday, we rob our children of tomorrow" (Dewey, 1916). Technology lets us better serve the diverse learning styles of our students and educate them for a wider range of intelligence (2006, p. 71).

Most scholars today would agree. The National Educational Technology Standards for Teachers and Students, state that:

> to live, learn and work successfully in an increasingly complex and information-rich society, students and teachers must use technology effectively. Within a sound educational setting, technology can enable students to become:
>
> 1. Capable information technology users
> 2. Information seekers, analyzers, and evaluators
> 3. Problem solvers and decision makers
> 4. Creative and effective users of productivity tools
> 5. Communicators, collaborators, publishers, and producers

6. Informed, responsible, and contributing citizens (Kelly (ed.), 2002, p. 4).

The United States of America, as one of the most developed countries in the world, has realized the importance of technology use and integration into education and has therefore established national educational technology standards for both teachers and students. The same should be considered by most countries, including the TRNC. Hawkes and Cambre mention that “technology presents new opportunities for students and teachers that can be organizational, instructional, individual, procedural, and cultural” (2001, p. 1). They add that technology has an impact if learners understand and experience the main purpose of using it. In their view, a major factor to be taken into consideration in schools is to prepare students for a changing world where technology is an unavoidable.

Many different studies have been done on the use of technology, as Schifter and Stewart (2010) mention: “The increased maneuverability, interactivity, visual and aural superiority and availability of the host of rapidly evolving digital, Internet-linked, mobile, and increasingly virtual technologies are already impacting research” (p. 15). Since technology use has long been very popular in instruction, it has kept many researchers busy. Baek et al. (2008) assert that many researchers agree on technology use as an efficient cognitive tool and instructional media. They suggest that “technology can be helpful in classroom settings by encouraging inquiry, helping communication, constructing teaching products, and assisting students’ self-expression” (p. 1). Integrating technology into education enhances teaching, helps students learn how to broaden their perspectives, and provides a better learning environment by bringing the real world into the classroom. In order to have a better understanding of technology implementation in enhancing the teaching-learning process, the impact of technology use in classroom applications has been and is still being investigated as basic media use is viewed as a natural part of instruction in most countries.

In the North Cyprus context, however, the situation quite different because in this small country, a great number of teachers would rather pretend that they are not even aware that such applications are being used in many parts of the world. Therefore, the use of even simple media such as posters, realia, and manipulatives is very limited, not to mention the use of advanced media. Although many countries are now trying to adopt advanced media such as computers, multimedia, hypermedia and so forth into classroom settings, in North Cyprus this is not the issue since even simple media such as posters, realia, and manipulatives are relatively new tools. Consequently, while interest in the world has shifted to the investigation of the use of advanced media, the present study mainly proposes to examine the more basic media in use in one educational setting in North Cyprus.

Chapter 3

METHOD

The present chapter details the research method employed for the study, covering the research design, sampling procedures, and data collection instruments (the Multiple Intelligence Inventory, tests, scale for students, interviews with teachers, and lesson plans for both English and Mathematics), as well as data collection and analysis procedures.

3.1 Research Design

The present study adopts the experimental research design, which is "the most powerful quantitative research method for establishing cause-and-effect relationships between two or more variables" (Gall, Gall & Borg, 2007, p. 379). In its simple form, two groups, a control group and an experimental group, are formed and subjects in one group receive an experimental treatment while the others do not and members of both groups are administered the same pre-test and a post-test (Wiersma & Jurs, 2005; Gall et al., 2007; Johnson & Christansen, 2004) at the beginning and at the end of the experiment.

For the present study, experimental research design was favored. To achieve this, first, certain study groups were assigned to be the treatment group and the others to be the control group. After the first half of the experiment, the control and treatment groups were switched, i.e., the treatment group became the control group and the control group became the treatment group, thus forming two homogenous and identical groups for the two school subjects under scrutiny, English and

Mathematics. Therefore, a total of two pre-tests and two post-tests for each of the two school subjects were administered.

At the beginning of the study, the School Administration insisted on not having any changes in the formation of the groups and the researcher was requested to include all participants in the treatment group in order to avoid possible complaints coming from parents of the students. In other words, the research was directed into a way that all students will be a part of the process in the lessons integrated with technology. As the number of students is not very high, it was also aimed to increase the sample size of the experiment. Last but not least, the only difference became the topics which require quite similar learning abilities and intelligence types when all students were involved in both control and treatment groups. Thus, the design in the study can be called the *cross implementation experimental method*.

3.2 Sampling Procedures

The context of this experimental study is a private middle school established in 1995 in the Famagusta District, formerly the Eastern Mediterranean College, currently called the Eastern Mediterranean Doğa College and which will be referred to as EMC. Its location on the main campus of the Eastern Mediterranean University (EMU) has greatly helped the researcher, himself employed by EMU, for all kinds of control and access in case assistance was required during the experiment. In other words, EMC was selected to conduct the research due to its convenience for the researcher.

As the school is a college and the medium of instruction is English, an entrance exam is administered to select successful and hardworking students. The students whose exam results are at a certain level and above are accepted to study at EMC. Thus, the academic level of the participants in the study is above average and their teachers are also very competent. In other words, both students and teachers are carefully selected for this private school. Furthermore, whereas facilities and opportunities may be limited in state schools, private schools around the country always have better and more facilities and services. Lessons at EMC are held between 8 a.m. and 4 p.m., keeping the time of instruction and the participating teachers constant in the study. These were additional reasons for choosing a private college in which to conduct the experiment.

EMC offers middle school education over three years (grades 6, 7 and 8, aged between 11-14) and high school education over four years (grades 9, 10, 11 and 12, aged starting from 15). Its curriculum has been designed in cooperation with the Office of Middle School Education under the Ministry of National Education (MNE). Each period lasts 40 minutes and students have a one-hour break for lunch at noon. On weekdays, they have eight periods, except for Mondays and Thursdays when they have nine.

At the time of the study, there were 52 academic and 10 managerial staff members for 396 students within the school, where classes consisted of 17 students on average. The targeted population was all 7th grade students. The reason this age was targeted is that the 6th grade is the year students start their middle school education and the 8th grade is the exit level. The 82 students in the 7th grade, all of whom were 13 years old, and of whom 48 were male and 34 female, were involved in the study without making any changes or reassignment of the classes.

Every week, these students have ten periods of English, five periods of Turkish, five periods of Mathematics, four periods of General Science and Technology, two periods of Social Sciences (History and Geography), one period of Cypriot History, one period of Music, one period of Art, two periods of Physical Education, one period of Religion, two periods of ICT (Information and Computer Technology), two periods of World Geography, three periods of either French or German, and one period of Chess. For English lesson, two of the periods are held in labs.

The majority of contact hours consist of languages – mainly English – and Mathematics. In addition, the entrance exams to colleges which are prestigious in North Cyprus are based on language and Mathematics knowledge besides one of them is linguistic and the other is numeric. In addition, the researcher himself can be considered as an expert in the field of English and his supervisor can be accepted as an expert in Mathematics, which provides the opportunity to handle overcome any problems faced more easily. Thus, these two school subjects, English and Mathematics, were chosen to form the control and treatment groups.

For English lesson, students had been streamed and placed in five groups (A to E) of 15 per class on average, according to their English scores on the previous year's Academic Reports, where group A was at the highest level and group E at the lowest. This was the natural arrangement of classes organized by the school administration.

During a meeting with the class teachers and the Head of English Department, the two largest classes out of the five existing classes were unanimously selected as the control group (N=36, of whom 20 male and 16 female) and the remaining three smaller classes were set as the treatment group (N=46, of whom 28 male and 18 female) for the first half of the study. In the second half, the control group became the treatment group and vice versa. For each group, there was a different teacher so there were five English teachers involved in the study, one male and the others female.

For Mathematics, no streaming had been applied by the EMC Administration so the students were placed in groups randomly and four classes were formed. Two of the four classes were chosen randomly as the control group with 41 students (24 male and 17 female), who then became the treatment group in the second half of the study. The other two groups were assigned as the treatment group with the same number and gender distribution of students, and became the control group in the second stage of the research. Two female teachers were assigned to these groups.

Students were not from different socio-economic and socio-cultural backgrounds, thus, the differences were not great as they were all living in the same district of the country. The majority of the parents were lecturers at EMU and the rest were well-educated upper class residents of the Famagusta District because the students at EMC are mostly the children of the academic staff of Eastern Mediterranean University. In addition, EMC provides paid education and the fee at this school is not affordable for everyone.

3.3 Data Collection Instruments

The instruments used in this study to collect data were:

a. a Multiple Intelligence Inventory (MI Inventory) in order to see the multiple intelligence profile of each student;

b. lesson plans particularly designed and prepared for both the control and experimental groups in Mathematics and English lessons (see Appendices G, H, I & J);
c. carefully designed pre-tests and post-tests approved by the subject teachers;
d. technology-enhanced classroom perception scale prepared for the students; and
e. interviews with teachers to gather information about the perceptions of students and opinions of teachers towards technology-enhanced classroom.

3.3.1 Multiple Intelligence Inventory (MI Inventory)

An MI Inventory, constructed by McKenzie in 2005 to identify nine intelligent types (see Table 3.1), was used in order to determine the dominant intelligence type of each student. There were ten items for each intelligence type except for musical intelligence, which had eleven. The intelligence types measured by the inventory (see Appendix B) and the related items are listed in Table 3.1.

Table 3.1. Intelligence Types and Related Items on the MI Inventory

Intelligence Types	**Items**	**No. of items**
Verbal-Linguistic	9, 13, 23, 25, 36, 52, 61, 74, 81, 90	10
Logical-Mathematical	6, 14, 24, 33, 41, 51, 59, 67, 77, 87	10
Visual-Spatial	3, 16, 21, 27, 39, 50, 54, 60, 66, 83	10
Bodily-Kinesthetic	4, 12, 19, 31, 46, 56, 62, 70, 79, 88	10
Interpersonal	7, 17, 26, 44, 53, 58, 71, 73, 82, 91	10
Intrapersonal	10, 18, 35, 37, 42, 48, 57, 64, 76, 85	10
Musical	5, 11, 22, 30, 38, 43, 49, 93, 69, 75, 89	11
Naturalist	1, 15, 28, 29, 40, 47, 55, 68, 80, 86	10
Existentialist	2, 8, 20, 32, 34, 45, 65, 72, 78, 84	10

As the original version of the MI Inventory was in English and the target was mostly Turkish-speaking students, the inventory was translated to Turkish in order to prevent any language-related problems. McKenzie's (2005) MI Inventory was first translated into Turkish by two native speakers of English and the translation was examined by three language experts. Then it was translated back into English by two other native speakers of English to see whether there were any translation problems or meaning gaps caused by translation. After necessary adjustments, the inventory was finalized in a comprehensible and attractive way for face validity purposes.

When the final version of the inventory in Turkish was prepared, it was given to four 7th grade students from a different college. They were asked for feedback regarding the comprehensiveness of items while completing the inventory. Teachers at EMC teaching this level of students were also asked to evaluate the face validity of the final version of the inventory. As a final control, it was given to a Turkish language teacher teaching students of the same age to check the language of the inventory. Certain final amendments were made in accordance with the suggestions of the Turkish language teacher.

Several studies (Çelik, 2012; Hajhashemi & Eng, 2010; Hajhashemi, Ghombavani & Amirkhiz, 2011; Hashemian & Adibpour, 2012; Jokar & Hesabi, 2014; Naseri & Ansari, 2013; Oskooei & Salahshoor, 2014; Rahimi & Qannadzadeh, 2010; Razmjoo, 2008; and Razmjoo, Sahragard & Sadri, 2009) used McKenzie's MI inventory and Cronbach's alpha (α) values obtained from those studies ranged from .69 to .93. Hence, the inventory proved to be reliable and in the pilot study done for this research on 22 students Cronbach's alpha (α) was found to be .89 which implies a very high reliability although the sample used seemed to be small.

The inventory was then piloted with a group of students (22) of the same age in a different college in order to see if the reliability value of the inventory as a whole and the reliability values of each component (intelligence type) fulfill the requirements of the study. The results are given in Tables 3.2 and 3.3.

Table 3.2. Reliability Value of MI Inventory

Scale	No. of items	Cronbach's Alpha
MI Inventory	91	.89

Table 3.3. Reliability Values for MI Inventory Subscales

Subscales	No. of items	Cronbach's Alpha
Logical-Mathematical Intelligence	10	.85
Verbal-Linguistic Intelligence	10	.69
Visual-Spatial Intelligence	10	.77
Bodily-Kinesthetic Intelligence	10	.66
Musical Intelligence	11	.73
Existentialist Intelligence	10	.78
Naturalist Intelligence	10	.80
Interpersonal Intelligence	10	.69
Intrapersonal Intelligence	10	.68

The overall Cronbach's alpha (α), which represents the internal consistency estimate of reliability of the whole inventory, was computed as .89. The Cronbach's alpha (α) value was .85 for logical-mathematical; .69 for verbal-linguistic; .77 for visual-spatial; .66 for bodily-kinesthetic; .73 for musical; .78 for existentialist; .80 for naturalist; .69 for interpersonal; and .68 for intrapersonal intelligence items. The Cronbach's alpha (α) values for the inventory thus indicated that the reliability was good, both overall and for each component.

Permission was secured from the EMC administration and the inventory was administered in its final form to the 7^{th} grade students by the researcher himself during class. Each student's responses were then entered into the Statistical Package for Social Sciences 18 - Predictive Analysis Software (SPSS 18 PASW) for analysis. The reliability analysis results of the inventory are presented in Tables 3.4 and 3.5.

Table 3.4. Final Reliability Value of MI Inventory

Scale	No. of items	Cronbach's Alpha
MI Inventory	91	.91

Table 3.5. Final Reliability Values for MI Inventory Subscales

Subscales	No. of items	Cronbach's Alpha
Logical-Mathematical Intelligence	10	.85
Verbal-Linguistic Intelligence	10	.77
Visual-Spatial Intelligence	10	.77
Bodily-Kinesthetic Intelligence	10	.59
Musical Intelligence	11	.71
Existentialist Intelligence	10	.77
Naturalist Intelligence	10	.78
Interpersonal Intelligence	10	.70
Intrapersonal Intelligence	10	.43

The Cronbach's alpha (α) value, computed for the internal consistency estimate of reliability, was .91 for the whole inventory. For logical-mathematical intelligence items, the Cronbach's alpha (α) value was .85, for both verbal-linguistic and visual-spatial it was .77, for bodily-kinesthetic intelligence it was .59, for musical intelligence it was .71, for existentialist intelligence it was .77, for naturalist intelligence it was .78, for interpersonal intelligence it was .70, and for intrapersonal intelligence it was .43. In other words, the Cronbach's alpha (α) values indicated that the reliability of the inventory as well as of its subscales was good.

3.3.2 Tests

The instruments for this study included two pre-tests and two post-tests for each subject. All tests were prepared with the help of expert opinion. Students were asked to take the pre-tests before the experiment started and the post-tests were administered at the end of the experiment to find out the achievement of students.

3.3.2.1 Tests for English Lesson

The tests for English consisted of thirty multiple-choice items, twenty on vocabulary and ten on language features, all on topics that students were expected to learn over the course of the lessons. For each item there were three distractors in addition to the correct answer. The pre-test was also given at the end of the lessons as a post-test (see Appendices C & N). When groups were swapped, another test covering the new topics was used as the second pre-test and post-test.

After the grammar points and vocabulary items were chosen and approved by the course teachers, the pre-tests and post-tests were prepared by the researcher himself, as he could be considered an expert in English language teaching and writing test items, and subsequently checked by a native speaker of English who had been working as a proofreader in the EMU English Preparatory School to ensure the tests had the same difficulty and complexity level, and the same structure. Sample items used in the pre-tests and post-tests are as follows:

Sample vocabulary item

1. The house next to ours __________ to a very famous politician.

   a) goes   b) moves   c) belongs   d) points

Sample language features item

2. I __________ what you mean now. Thanks for explaining it again.

   a) understand   c) understanding

   b) am understanding   d) to understand

3.3.2.1.1 ITEMAN Analysis of the English Tests

After the students took both the pre-tests and the post-tests, item analysis (ITEMAN) was conducted in order to determine the extent to which items contribute to the reliability of the tests (see Appendix S).

> ITEMAN analyzes test and survey item response data and provides conventional item analysis statistics (e.g., proportion/percentage endorsing

and item-total correlation) for each item in order to assist in determining the extent to which items are contributing to the reliability of a test and which response alternatives are functioning well for each item (Assessment Systems Corporation, 2006).

Table 3.6. ITEMAN Analysis Results for English Tests

	Pre-Test 1	Post-Test 1	Pre-Test 2	Post-Test 2
N (items)	30	30	30	30
N (students)	82	82	82	82
Mean (X)	16.098	20.313	14.892	17.976
Reliability	0.899	0.771	0.826	0.824

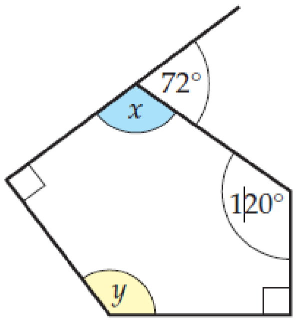
ITEMAN results for the English tests given during the study are presented in Table 3.6 above. All 82 students took both pre-tests and both post-tests. The mean raw score for the Pre-Test 1 was 16.1 out of 30 and the reliability was .90, which is considerably high. When Post-Test 1 was analyzed, the mean raw score was 20.3 out of 30 and the reliability was .77, which is also high. The mean raw score for Pre-Test 2 was 14.9 out of 30 and the reliability was .83. Post-Test 2 results showed that the mean raw score was 18 out of 30 and the reliability of the test was .82. Thus, it is possible to say that the English tests used in the study were considerably reliable.

3.3.2.2 Tests for Mathematics Lesson

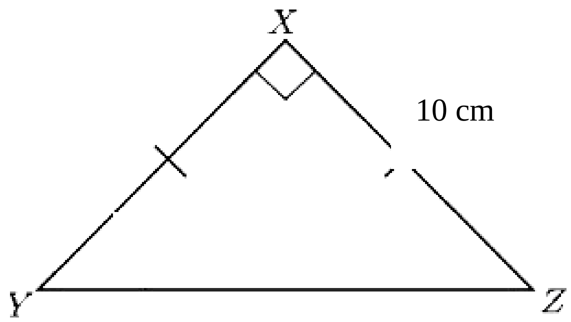
The tests for Mathematics consisted of ten open-ended questions used to assess the competency of students on the geometry topics to be taught. Two pre-tests and post-tests were prepared by the course teachers themselves according to the objectives of the lessons and later approved as being identical in terms of structure and difficulty and complexity level by three mathematicians with several years of experience in teaching Mathematics (see Appendices D & O). In fact, the post-test had the same questions, albeit with minor changes, as the pre-test.

For validity and reliability purposes, the final versions of the tests were checked and approved by the supervisor of the researcher who has expertise in Mathematics. Sample items used in the pre-tests and post-tests are as follows:

1. Find the size of the angle marked by *x*.



2. Find the area of the right-angled triangle below.



3.3.3 Technology-enhanced Classroom Perception Scale (TECPS)

After the treatment period, a Technology-enhanced Classroom Perception Scale (TECPS) (see Appendices P & Q) which was in Turkish was prepared and administered to all students who participated in the study by the usual class teachers. At the end of the two phases of the study in both subjects, students were asked to respond on each item in the scale to indicate their attitudes and preferences towards technology-enhanced classroom.

The scale consisted of eleven items and the students were asked to state their opinions on a three-point scale as ‘Yes’ = 2, ‘Indecisive’ = 1 or ‘No’ = 0. Sample items were as follows:

1. The lessons are fun when the teacher uses a computer and data projector.
2. I participate more when the teacher uses a computer and data projector in the lesson.

A Turkish language teacher teaching at the same age of participants and two professors from the Faculty of Education have been approached for content validity purposes.

3.3.3.1 Factor Analysis of the Technology-enhanced Classroom Perception Scale (TECPS)

The data was analyzed by means of a principal component factor analysis, with direct oblimin rotation. Indicators of factorability were good. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was .90, which is greater than the cut-off value of .70. Furthermore, Barlett’s Test of Sphericity revealed a statistically significant result, χ^2 (55) = 740.03, p = .000 < .05, which showed that the correlation matrix of measured variables was significantly different from an identity matrix; in other words, items were sufficiently correlated to load on the components of the measure.

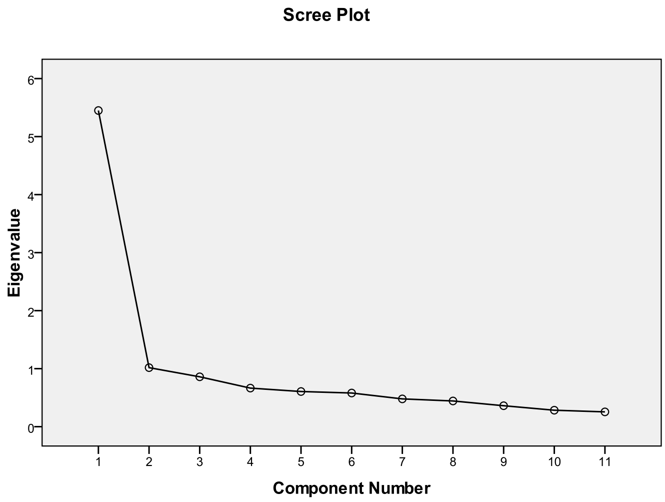


Figure 3.1. Scree Plot for Components of the Measure

The scree plot indicates two components in the sharp descending part of the plot (see Fig. 3.1). The loadings of the items (presented in Table 3.7) show that each item in the scale has high loadings and can be used for the analysis.

Table 3.7 Loadings of Items Representing the One-Factor Scale

	Loadings of Items in the Scale
Item 7	.786
Item 8	.767
Item 4	.760
Item 3	.759
Item 10	.750
Item 9	.711
Item 1	.709
Item 5	.680
Item 11	.616
Item 2	.615
Item 6	.548

The Cronbach's alpha (α) value of the whole scale was computed for the internal consistency estimate of reliability and found to be .90, indicating good reliability.

3.3.4 Standardized Open-Ended Interview with Teachers

Teachers were asked to provide their opinions and information about their experiences during the research. In order to get as many comments as possible from such a small group of respondents, a qualitative interview was prepared "to obtain in-depth information about a participant's thoughts, beliefs, knowledge, reasoning, motivations and feelings about a topic" (Johnson & Christensen, 2004, p. 183).

A total of eight questions were prepared (see Appendix R) in order to examine the opinions of the course teachers in both English and Mathematics. To obtain teachers' feedback on various aspects of technology integration in class, a standardized open-ended interview, was administered. "In the standardized open-ended interview, the questions are all written out, and the interviewer reads the questions exactly as written and in the same order to all interviewees" (Johnson & Christensen, 2004, p. 184). The interview questions had been shown to three experts for content validity (Sanders, 1994). After their approval, a consent form was signed by the teachers, and the interviews could then be conducted. English teachers were interviewed at the end of the treatment in English lessons, and Mathematics teachers at the end of the treatment in Mathematics lessons. The interview questions (see Appendix R) were related to the following aspects of technology-enhanced classroom:

1. the effects of technology-enhanced classroom on teaching,
2. the effects of technology-enhanced classroom on classroom management,
3. the effects of technology-enhanced classroom on learning,
4. reasons for having lessons in technology-enhanced classroom.

3.3.5 Lesson Plans

At the beginning of the academic year, the researcher had a meeting with the class teachers of EMC to negotiate details of the research. As the MNE determines all the programs in primary and middle school education, they are all unchangeable and the research had to follow the requirements of the Ministry. Therefore, the researcher would only be able to organize or rearrange the units to adapt them for maximal use of technology over the 20 hours of instruction during which the units agreed upon with the subject teachers would be covered.

In the preparation period of the research, the class teachers and the head of the English and Mathematics departments affirmed that the topics were totally new for the learners, thus, it was assumed that they had no prior knowledge on the topics. The lesson plans and materials were provided to the class teachers considering Gagné's nine events of instruction (see below) and, if necessary, Bloom's taxonomy. For each subject, each lesson was carefully planned with and without technology according to their specified objectives. The necessary equipment and materials were also provided to the teachers along with the lesson plans.

In order to specify the objectives in both English and Mathematics, the researcher and course teachers decided on the units to be covered over the treatment period. The researcher analyzed the topics and specified the lesson objectives (see Appendices E & F). The written objectives of the lessons were then discussed with the course teachers to reach a consensus.

Robert Gagné emphasizes the use of nine events of instruction to establish the necessary conditions of learning, both internal and external (Petry, Mouton & Reigeluth, 1987). As an internal process, learning is enhanced by events of instruction, which are considered to be external support (Petry et al., 1987). Gagné's nine events of instruction consist of the following:

- *Gaining attention*
- *Informing the learner of the objective*
- *Stimulating recall of prerequisite learned capabilities*
- *Presenting the stimulus material*
- *Providing learning guidance*
- *Eliciting performance*
- *Providing feedback about performance correctness*
- *Assessing the performance*
- *Enhancing retention and transfer*

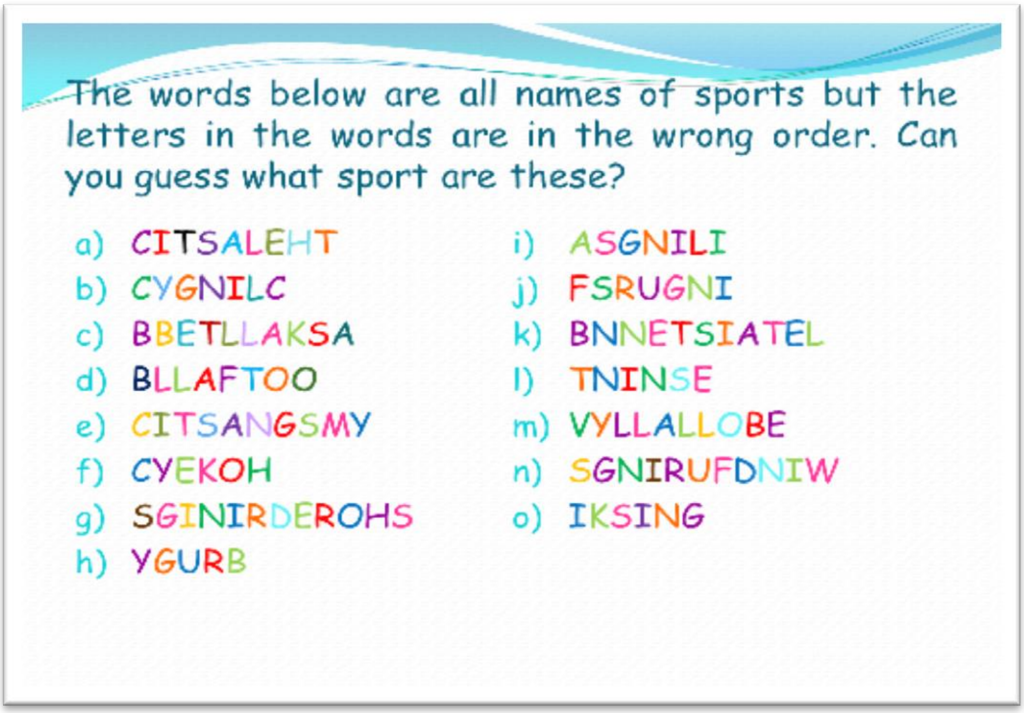
The lesson plans for each lesson were prepared (see Appendices G, H, I & J) by the researcher in accordance with Gagné's nine events of instruction. Before the treatment started, the researcher had meetings with the course teachers and explained the rationale behind the lesson plans, objectives, and the importance of implementing each stage exactly as they were written in the lesson plans. The course teachers were asked to use the lesson plans and specified unit objectives prepared by the researcher as a guide to their lessons and not to make any changes during implementation. They were also asked to note any problems they faced while implementing the lesson plans in order to give feedback to the researcher after the lessons. The researcher also observed some of the lessons presented in both treatment and control groups and class teachers were provided with feedback after the observations, as necessary. In control groups, the class teachers were also instructed to exclude any technology-integrated activities such as listening and role-playing activities. For listening activities, the teachers were requested to read the tapescripts in order to avoid technology use and for role-playing activities, no additional supplies were used.

In the lesson plans for the treatment groups, the materials were prepared prior to instruction and described in detail by the researcher and the teachers were instructed at every step of the course. In contrast, while the control groups were also provided with lesson plans and specified objectives, the teachers were asked to continue presenting their lessons in the traditional way of instruction. For the technology-based materials prepared, the necessary support was given to the course instructors whenever needed. The course instructors for the treatment groups were met before the course started and were shown how to use the necessary technological equipment.

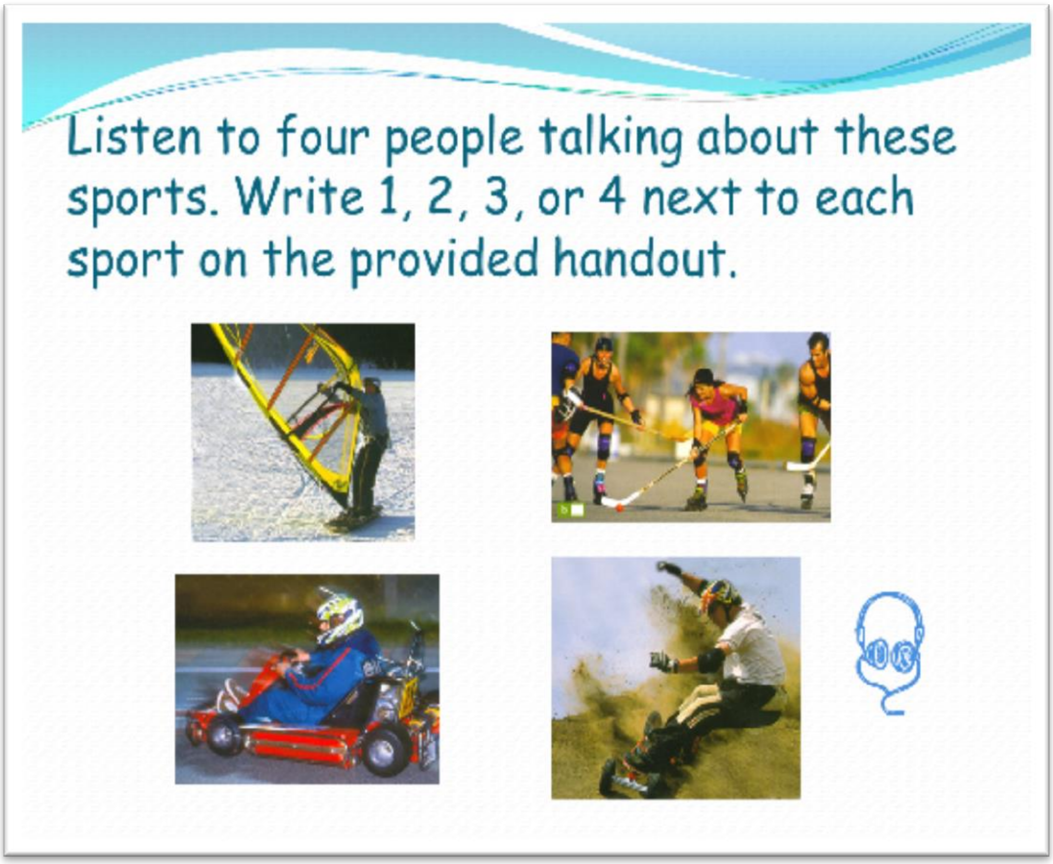
3.3.5.1 Designing Lessons for Technology-enhanced Classroom for English Lesson

For the English lesson, first of all, PowerPoint presentations (see Appendix K) were created for use during the presentation stage of lessons. Handouts and homework sheets were also made available to the subject teachers. Colorful and attractive flashcards, role- playing materials, cardboards, drawings, and posters were also prepared for use in treatment groups (see Appendix L). In the PowerPoint presentations, more colorful, animated, audio-supported, and visually rich materials and texts were chosen. Two examples from Unit 1 are provided below:

Sample 1:



Sample 2:



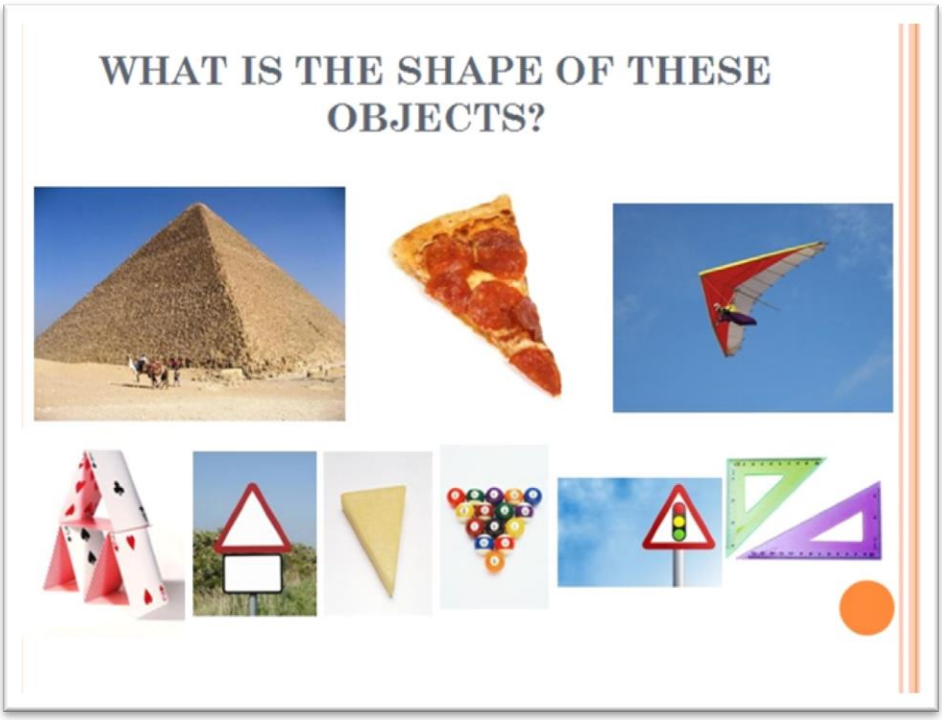
3.3.5.2 Designing Lessons for Technology-enhanced Classroom for Mathematics Lesson

As the researcher is not an expert in Mathematics, he asked for help from a number of experts, an instructor from the Department of Mathematics at EMU and the two Mathematics teachers from EMC involved in the study. They suggested that technology can best be used with shapes, especially in geometry, which was covered in the second term in the Mathematics syllabus. Therefore, the researcher waited for the second half of the academic year when the syllabus pre-determined by the MNE dictated geometry would be taught.

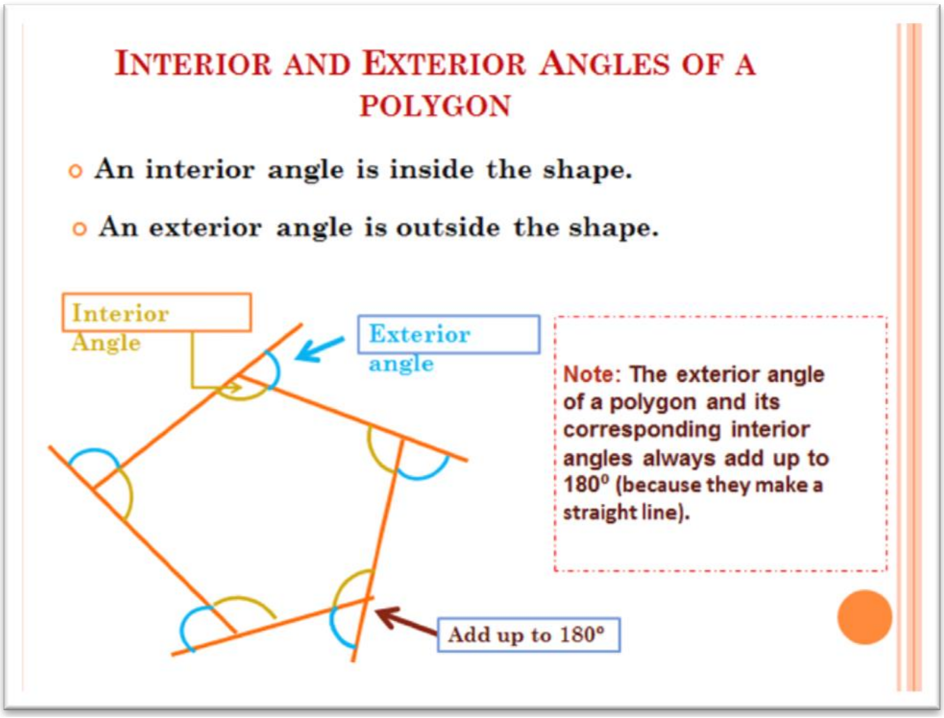
The experts contributed in the preparation of the materials, handouts, cardboards, posters, and PowerPoint presentations. The PowerPoint slides were designed with particular care to ensure students' active participation and enhance their learning (see Appendix M). In addition to the lesson plans and objectives, the materials and necessary technological equipment were provided to the teachers and their questions were answered in advance to ensure that the use of technological aids would be beneficial.

The objectives of the course were clearly specified and the lessons planned according to Gagné's nine events of instruction (Gagné et al., 2005). All the materials needed either in and out of class had been designed and given to the teachers in advance for them to go over with the researcher. Everything was mainly based on visualization and active participation of students which could be considered as the two main advantages of technology implementation. The materials in Mathematics lesson were mainly animated PowerPoint slides that pop up when needed prepared by the researcher and three slides have been provided below as examples:

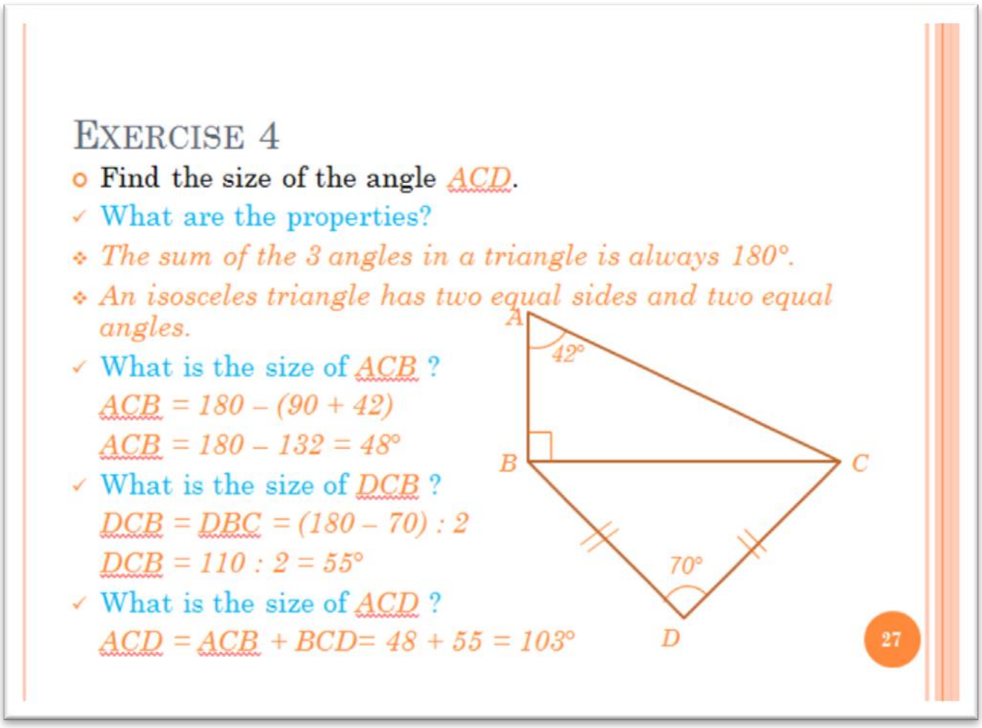
Sample 1:



Sample 2:



Sample 3:



3.4 Data Collection Procedures

As this study aims to find out whether any differences emerge when students are instructed in a traditional way as compared to when instructional technology is used, technology-enhanced classroom was preferred in the experimental groups whereas traditional instruction with no technology resumed in the control groups. For this study, one of the language lessons, English, and one of the core subjects, Mathematics, had been chosen to be used at EMC in Famagusta, North Cyprus. For the control groups in English lessons, the textbook was used for instruction and even for the activities where technological equipment is required; in other words, technology was eliminated in order to provide technology-free instruction. On the other hand, for Mathematics lessons, the teachers' lecture notes were only used for instruction in control groups. That is to say that teacher-centred, technology-free lessons were held in control groups in both subjects without including any means of technology.

The usual teachers of these courses implemented the instruction with technology due to the policy of both the MNE and the EMC Administration stating that only the school instructors can be the authority in class. English lessons were conducted by English teachers who graduated from an English Language Teaching Department and Mathematics lessons were held by Mathematics teachers who were graduates of a Mathematics Teaching Department. Regarding their qualifications and years of experience, they all had a similar background and certifications so it is possible to say that they all were at the same level of expertise in teaching.

During the preparation of the tests, measurement and evaluation experts and class teachers at this level contributed to improve the validity and reliability of these tests. The researcher himself can be considered as an expert in his field as he has been teaching English for more than 19 years and has a number of qualifications, including a Master's Degree in English Language Teaching, and experience in testing and curriculum design, thus, not much contribution was needed for the English language tests. For the Mathematics tests, on the other hand, an expert who has taught Mathematics for several decades at high school was consulted. In addition, two measurement and evaluation experts were consulted for the reliability and validity of both English and Mathematics tests.

Before the research was conducted, the MNE and the EMC Administration were visited in order to provide the required documentation for the implementation of the experiment and to obtain the necessary permission. Formal permission from the Ministry was given to the EMC Administration and the Headmaster gave verbal permission to the researcher.

There are departments for both subjects, English and Mathematics, at the EMC. The heads of departments of these subject areas are responsible for timetables, exam schedules, and the implementation of the syllabi. During the preparation process of the experiment, several meetings were held where lesson plans, materials, handouts, and slides were prepared in consensus with the heads of the English and Mathematics departments. In order to ensure the smooth running of the experiment, the researcher visited the school and observed both treatment and control groups and, whenever necessary, provided feedback to the class teachers.

For the English lesson, the textbook was 'Objective PET' by Louise Hashemi and Barbara Thomas (2008) and the accompanying Student Workbook as a supplement. It had been agreed that any topic in the textbook was appropriate and would be included in the experiment. Since technology can be easily implemented in teaching any topic in a language course, the first three units in the textbook were chosen to be used in the experiment.

On the other hand, for the Mathematics lesson, there existed handouts previously prepared by the course teachers according to the syllabus designed by the MNE. These handouts were provided to the researcher for the design of the lessons. The head of the Mathematics department suggested that technology could be implemented best in the geometry lessons which covered triangles, quadrilaterals, and polygons. Thus, the experiment was implemented towards the end of the year when this topic in the syllabus would be studied. Consequently, the research started at the beginning of the fall semester and was completed towards the end of the spring semester.

After the selection of the topics in each course, the objectives of these topics were specified and lesson plans were designed accordingly. In this process, Gagne's nine events (gaining attention, informing learners of the objective, stimulating recall of prior learning, presenting the stimulus, providing learning guidance, eliciting performance, providing feedback, assessing performance, and enhancing retention and transfer) were considered as the principal model for the design. Meanwhile, the MI Inventory was administered to both treatment and control group students in order to determine the dominant intelligence of each student. The gender of each student was also recorded to track any differences in the effectiveness of technology-enhanced classroom in relation to gender.

For the lessons of the treatment group, the materials and handouts were designed using Microsoft PowerPoint in a more authentic, colorful, and interactive way with the help of slides with animations, the rationale being that technology integration makes students more motivated and more involved through their active participation, thus enhancing student understanding of the subject areas. For the control group, a traditional teaching method from the textbooks was implemented. All of the materials, handouts, slides, lesson plans, objectives, and tests had been prepared before instruction and instructors had been provided with the necessary technical equipment and documentation.

Students had eight hours of English lesson in the classroom per week and two hours in the language laboratory, i.e., ten hours of exposure. Students had been streamed and placed in one of five classes according to their exam results. There were five teachers teaching English to these classes and four of them were female and one was male. The first half of the experiment in English lasted 20 contact hours. Then the groups were swapped and the control groups became the treatment groups and vice versa. The second half of the experiment ended when the second set of 20 contact hours was completed.

At the beginning of the experiment a pre-test was given to all five groups in English. At the end of the first half of the experiment, the same test was administered as the post-test to all groups again. After both stages of the experiment were completed, a scale prepared by the researcher was given to all of the students in order to see their attitudes towards technology-enhanced classroom in English lesson. At the same time, teachers were asked to contribute their opinions about and experiences in integrating technology into instruction.

Students had five hours of Mathematics lessons per week. There was no streaming and the students were placed in four different classes, two classes with one of the teachers being the treatment group and the other two classes with the other teacher being the control group. The first half of the experiment lasted 20 contact hours and the following 20 lessons were the second half of the experiment after the groups were exchanged.

At the beginning of the experiment a pre-test was given to all four groups in Mathematics. At the end of the first half of the experiment, just like for English lesson, the same test was administered as the post-test. The tests had been prepared by the class teachers under the supervision of three field experts. Then the second pre-test was administered and the second part of the experiment started. At the end of the second half of the treatment, the second post-test, which had been used as the second pre-test, was administered.

In addition, the Technology-enhanced Classroom Perception Scale was also administered to collect data about the perceptions of the students. Furthermore, the teachers were interviewed in order to get information about their opinions, which is the qualitative part of the study as it relies "primarily on the collection of qualitative data" (Johnson & Christansen, 2004, p. 359) to add depth, clarity, and more meaning to the study (Denzin & Lincoln, 2000; Creswell, 1998). Interviews were chosen as the data collection method in this part of the study to examine the opinions of teachers by using a standardized open-ended interview consisting of eight questions.

In a nutshell, the design of the experiment which is called cross-implementation experimental method has been developed for this study. The steps of this design can be summarized and shown in the figures below (Figures 3.2 and 3.3).

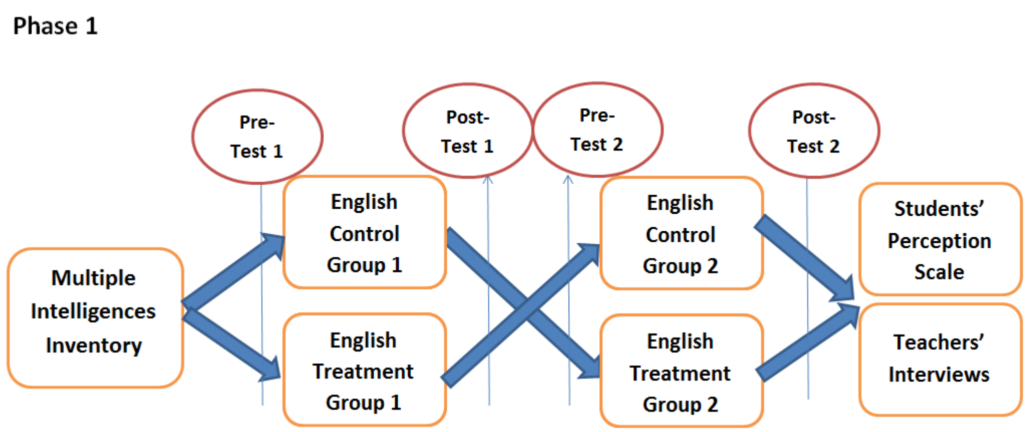


Figure 3.2. Phase 1 of the Cross-Implementation Experimental Method

Phase 2

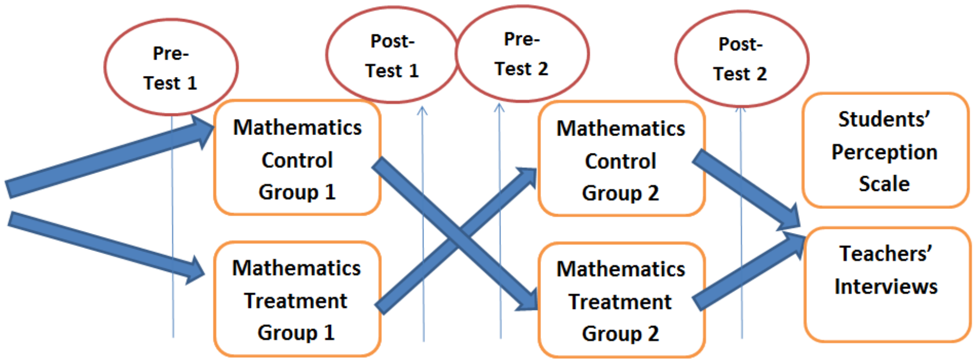


Figure 3.3. Phase 2 of the Cross-Implementation Experimental Method

3.5 Data Analysis Procedures

SPSS 18 (PASW) was used to analyze the data collected in the present study. After the students had completed the MI Inventory, the data was entered into SPSS and multiple intelligence profiles of students were drawn in order to find out each student's dominant intelligence. The data obtained from the TECPS, administered to elicit student perceptions on technology-enhanced classroom were also analyzed. A factor analysis was done "to identify factors that statistically explain the variation and co-variation among measures" (Green & Salkind, 2005, p. 312).

Within the process of factor analysis, principal component analysis which "is the default method of factor extraction used by SPSS" (George & Mallery, 2001, p. 242) was used. In addition, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) which "is a measure of whether your distribution of values is adequate for conducting factor analysis" (George & Mallery, 2001, p. 242) and Barlett's Test of Sphericity, which is "a measure of the multivariate normality of your set of distributions" (George & Mallery, 2001, p. 242) were conducted. Meanwhile, Eigenvalue, which means "the proportion of variance explained by each factor" (George & Mallery, 2001, p. 243) was also calculated.

At the end of the factor analysis procedure, the loading of the each item in the TECPS as well as the students' responses were analyzed to find out their perceptions towards technology-enhanced classroom. Also, the students' pre-test and post-test results in English and Mathematics were entered into SPSS and the achievement scores for English and Mathematics were computed. A paired samples t-test was conducted for evaluating the difference in the achievement of students with and without technology-enhanced classroom.

In order to answer the research questions, several statistical analyses were conducted. First of all, after the achievement scores of students were obtained, the paired samples t-test was conducted to "determine whether two means are significantly different from one another" (Brace, Kemp & Snelgar, 2009, p. 127). Differences in achievement with respect to gender were examined using the independent samples t-test, which is used to "evaluate the differences between the means of two independent groups" (Green & Salkind, 2005, p. 167). Further, a paired-samples *t*-test was to analyze the effect of technology-enhanced classroom on male and female students separately.

Later, in order to decide whether the multiple intelligence profiles of students could be used as predictors of their achievement with or without technology-enhanced classroom in both English and Mathematics lessons, the multiple regression method was applied. Multiple regression is "a statistical technique that allows us to predict someone's score on one variable on the basis of their scores on several other variables" (Brace et al., 2009, p. 265). Student responses on the TECPS were analyzed and the frequencies for each item were obtained using descriptive statistics. Finally, the data collected by interviewing both English and Mathematics teachers in order to obtain detailed information on their opinions on technology-enhanced classroom were analyzed by applying the content analysis which is a technique of thematic analysis (Miles & Huberman, 1994; Marshall & Rossman, 2006) to their responses of the standardized open-ended interview. All of the responses were transcribed and examined thoroughly in order to determine concepts driven from the interview questions. These concepts were given alphanumerical codes, which were generalized with frequencies. A colleague who was involved in some parts of the study and familiar with qualitative research coding was kind enough to code the transcripts of the teachers' responses. This colleague's coding was compared to the first coding, done by the researcher, and checked for any discrepancies. As 90% inter-coder reliability was obtained, no modifications were needed for consistency (Miles & Huberman, 1994) since, as Krippendorff (2004) and Morrissey (1974) stated, two or more separate coders are needed for more than 90% of inter-coder agreement.

Chapter 4

FINDINGS

This chapter presents the analysis of the data gathered during the experiment in the same order as the research questions presented in Chapter 1.

4.1 Analysis Results for Research Question 1

The objective of Research Question 1, “How does technology-enhanced classroom affect 7th grade students’ achievement in English and Mathematics lessons?” is to investigate the effects of technology-enhanced classroom on student achievement. As analysis for both English and Mathematics is required to answer the research question, the analysis will be presented for English and Mathematics separately.

For the examination of Research Question 1, *t*-test analysis was used as the “t-test evaluates whether the mean value of the test variable for one group differs significantly from the mean value of the test variable for the second group” (Green & Salkind, 2005, p. 167). This research question aimed to determine whether the results of the group in technology-enhanced classroom differ significantly from the group where technology was not implmented.

4.1.1 Testing the Assumptions for English Lesson

Before starting to answer the research questions of the study, the data were checked against the assumptions given by Green and Salkind (2005), namely, (1) achievement scores are normally distributed in the population, (2) the cases represent a random sample from the population, and (3) the achievement scores are independent of each other. Therefore, before applying the paired-samples *t*-test, the data for English were checked for the distribution of normality and the homogeneity of variances.

For testing the assumptions of normal distribution, the histograms of achievement scores were plotted and the One-Sample Kolmogorov-Smirnov test, which "evaluates whether the data on a quantitative variable are normally distributed" (Green & Salkind, 2005, p. 365), was conducted. The histograms of the achievement scores with and without technology-enhanced classroom for English lesson are shown in Figure 4.1 with normal distribution line. The histograms have the general bell shapes indicating a normal distribution of the data.

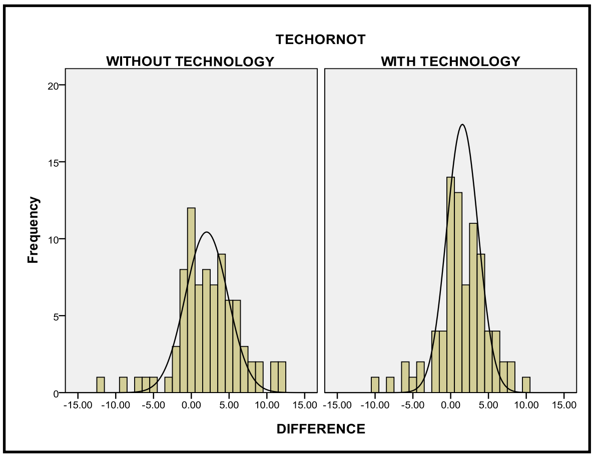


Figure 4.1. Distributions of Achievement Scores for English Lesson During Without Technology and With Technology Periods

The results of the One-Sample Kolmogorov-Smirnov test for both 'with technology achievement scores' and 'without technology achievement scores' (p=.057 and p=.249, respectively) in English lesson showed that the data were indeed normal, thus allowing for the use of different parametric tests. The results of One-Sample Kolmogorov-Smirnov Test of achievement scores of English lesson are given in Table 4.1.

Table 4.1. One-Sample Kolmogorov-Smirnov Test for English Lesson

		Achievement with Technology	**Achievement without Technology**
N		82	82
Normal Parameters[a,b]	Mean	1.524	2.301
	s	3.472	4.282
Most Extreme Differences	Absolute	.147	.112
	Positive	.079	.069
	Negative	-.147	-.112
Kolmogorov-Smirnov Z		1.335	1.020
Asymp. Sig. (2-tailed)		.057	.249

a. Test distribution is normal.
b. Calculated from data.

When the results (see Table 4.2) derived from the diagnostic test for homogeneity of variance are examined, since the probability associated with Levene's test (.105) is greater than the level of significance, it is concluded that the variance is homogenous.

Table 4.2. Test of Homogeneity of Variances for English Lesson

Levene's test	**df1**	**df2**	**Sig.**
2.665	1	163	.105

4.1.2 Analysis Results for Research Question 1 in English Lesson

The results for the lessons held with technology and without technology were analyzed through a paired-samples *t*-test, defined as a procedure which "evaluates whether the mean of the differences between these two variables is significantly different from zero" (Green & Salkind, 2005, p. 161). As "related *t*-test ascertains whether the mean score of one measure is statistically significantly different from the mean on another measure" (Howitt & Cramer, 2008, p. 105), it was used to assess whether the achievement of students in technology-enhanced classroom was better than in classes without technology use. The results, given in Tables 4.3 and 4.4, indicate that the mean of achievement scores of the lessons held without technology (M = 2.33, SD = 4.3) was greater than the mean of achievement scores of the lessons held with technology (M = 1.52, SD = 3.5) although not significantly greater (*t* (82) = -1.25, p > .05).

Table 4.3. Descriptive Statistics for English Lesson

	Mean	N	s	SEM
Achievement with Technology	1.524	82	3.472	.383
Achievement without Technology	2.329	82	4.301	.475

Table 4.4. Paired Samples *t*-test for English Lesson

	Paired Differences				
	Mean	**s**	***t***	**df**	**Sig. (2-tailed)**
Achievement scores with Technology minus Achievement scores without Technology	-.805	5.849	-1.246	81	.216

4.1.3 Testing the Assumptions for Mathematics Lesson

Before applying the paired-samples *t*-test for Mathematics lesson, the data for Mathematics were checked for the distribution of normality and the homogeneity of variances in order to check whether the data met the relevant assumptions.

The histograms of the progress scores with and without technology for Mathematics lesson are shown in Figure 4.2 with normal distribution line. The general bell shapes can be detected in these histograms, supporting the assumption of normal distribution of the data. As stated by Howitt & Cramer (2008), “The related t-test works at its optimum if the distribution of the differences between two sets of scores is approximately bell shaped (that is, if there is a normal distribution)” (p. 105).

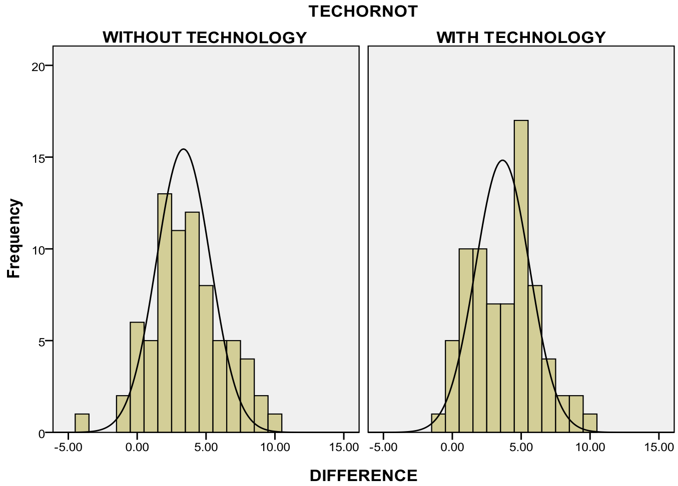


Figure 4.2. Distributions of Progress Scores for Mathematics Lesson During Without Technology and With Technology Periods

The One-Sample Kolmogorov-Smirnov test was conducted in order to test whether the progress scores for Mathematics lesson with and without technology were normally distributed and the results are given in Table 4.5. The results for both 'with technology progress scores' and 'without technology progress scores' (p=.311 and p=.439, respectively) show that the data were indeed normal, allowing for the use of different parametric tests.

Table 4.5. One-Sample Kolmogorov-Smirnov Test for Mathematics Lesson

		Progress with Technology	**Progress without Technology**
N		74	75
Normal Parameters[a,b]	Mean	3.730	3.553
	s	2.441	2.667
Most Extreme Differences	Absolute	.112	.100
	Positive	.112	.100
	Negative	-.104	-.067
Kolmogorov-Smirnov Z		.964	.867
Asymp. Sig. (2-tailed)		.311	.439

a. Test distribution is normal.
b. Calculated from data.

The results of the test of homogeneity of variances for Mathematics lesson are presented in Table 4.6. Since the probability associated with Levene's test (.738) is greater than the level of significance, it can be concluded that the variance is homogenous.

Table 4.6. Test of Homogeneity of Variances for Mathematics Lesson

Levene's test	df1	df2	Sig.
.113	1	147	.738

4.1.4 Analysis Results for Research Question 1 in Mathematics Lesson

Like in English lesson, the students in the study attended Mathematics lesson held both with and without technology, thus, a paired-samples *t*-test was carried out to evaluate whether the progress of students in technology-enhanced classroom was statistically different from when not using technology. The results, given in Tables 4.7 and 4.8, indicate that the mean of progress scores of the lessons held with technology (M = 3.73, SD = 2.5) was greater than the mean of progress scores of the lessons held without technology (M = 3.46, SD = 2.6), although it was not significant (t (66) = .748, p > .05).

Table 4.7. Descriptive Statistics for Mathematics Lesson

	Mean	N	s	SEM
Progress with Technology	3.731	67	2.473	.302
Progress without Technology	3.455	67	2.619	.320

Table 4.8. Paired Samples *t*-Test for Mathematics Lesson

	Paired Differences				
	Mean	s	*t*	df	Sig. (2-tailed)
Progress scores with Technology minus Progress scores without Technology	.276	3.020	.748	66	.457

4.2 Analysis Results for Research Question 2

Research Question 2, "How does the effect of technology-enhanced classroom on 7th grade students' progress differ with respect to gender in English and Mathematics lessons?" aimed to check whether gender was a factor in the effect of technology-enhanced classroom. As analysis for both English and Mathematics is necessary to answer the research question, the analysis will be presented separately for English and Mathematics lessons.

4.2.1 Analysis Results for Research Question 2 in English Lesson

An independent samples *t*-test was performed to estimate whether the students' progress differs with respect to gender in technology-enhanced classroom in English lesson (see Tables 4.9 and 4.10). The results showed that the mean of progress scores of the male students (M = 1.74, SD = 3.7) was greater than the mean of progress scores of female students (M = 1.23, SD = 3.2) although it was not significant (t (80) = .66, $p > .05$). Levene's test yielded $p=.197 > .05$.

Table 4.9. Descriptive Statistics Results for English Lesson

GENDER	N	Mean	s	SEM
MALE	47	1.744	3.698	.539
FEMALE	35	1.228	3.172	.536

Table 4.10. Independent Samples *t*-Test Results for Differences in Student Progress with Respect to Gender in English Lesson

		Levene's Test		*t*-test for Equality of Means				
		F	Sig.	*t*	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
Diff.*	Equal variances assumed	1.694	.197	.663	80	.509	.516	.778
	Equal variances not assumed			.679	78.334	.499	.516	.761

* progress in scores

4.2.2 Analysis Results for Research Question 2 in Mathematics Lesson

In order to estimate if there was a gender difference in Mathematics lesson in technology-enhanced classroom, an independent sample t-test was performed. The results, presented in tables 4.11 and 4.12, indicate that the mean of progress scores of female students (M = 3.88, SD = 2.8) was greater than the mean of progress scores of the male students (M = 3.72, SD = 2.2) but the results were not statistically significant, t (69) = -.270, p > .05.

Table 4.11. Independent Sample Statistics for Gender in Mathematics Lesson

GENDER	N	Mean	s	SEM
MALE	45	3.722	2.230	.332
FEMALE	26	3.885	2.769	.543

Table 4.12. Independent Sample *t*-Test for Gender in Mathematics Lesson

		Levene's Test		*t*-test for Equality of Means				
		F	Sig.	*t*	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.
Diff.*	Equal variances assumed	1.552	.217	-.270	69	.788	-.162	.601
	Equal variances not assumed			-.255	43.757	.800	-.162	.637

* progress in scores

4.3 Analysis Results for Research Question 3

The objective of Research Question 3, "How does technology-enhanced classroom affect 7th grade male and female students' progress in English and Mathematics lessons?" aimed to check whether the effect of technology-enhanced classroom differs with respect to the gender of students. As analysis for both English and Mathematics is necessary to answer the research question, the analysis will be presented separately for English and Mathematics.

4.3.1 Analysis Results for Research Question 3 in English Lesson

Research Question 3 was designed to analyze the effect of technology-enhanced classroom on male and female students separately.

4.3.1.1 Analysis Results for Research Question 3 for Male Students in English Lesson

A paired-samples *t*-test was performed to estimate whether the progress of male students in technology-enhanced classroom was greater than their progress when not using technology. The results (see Tables 4.13 and 4.14) indicate that the mean of progress scores of the lessons held without technology (M = 2.04, SD = 4.2) was greater than the mean of progress scores of those held with technology (M = 1.75, SD = 3.7) although it was not statistically significant (t (47) = -.336, $p > .05$).

Table 4.13. Paired Samples Statistics for Male Students in English Lesson

	Mean	**N**	**s**	**SEM**
Progress with Technology	1.745	47	3.698	.539
Progress without Technology	2.043	47	4.227	.617

Table 4.14. Paired Samples *t*-Test for Male Students in English Lesson

	Paired Differences				
	Mean	s	*t*	df	Sig. (2-tailed)
Progress scores with Technology minus Progress scores without Technology	-.298	6.079	-.336	46	.738

4.3.1.2 Analysis Results for Research Question 3 for Female Students in English Lesson

Tables 4.15 and 4.16 show the results of the paired-samples *t*-test conducted to assess whether the progress of female students in technology-enhanced classroom was greater than their progress when not using technology. The results indicate that the mean of progress scores of the lessons held without technology (M = 2.71, SD = 4.4) was greater than the mean of progress scores of those held with technology (M = 1.23, SD = 3.2) although it was not statistically significant (t (34) = .122, $p > .05$).

Table 4.15. Paired Samples Statistics for Female Students in English Lesson

	Mean	**N**	**s**	**SEM**
Progress with Technology	1.229	35	3.172	.536
Progress without Technology	2.714	35	4.430	.749

Table 4.16. Paired Samples *t*-Test for Female Students in English Lesson

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	s	SEM	Lower	Upper	*t*	df	Sig. (2-tailed)
Progress with Technology minus Progress without Technology	-1.486	5.538	.936	-3.388	.417	-1.587	34	.122

4.3.2 Analysis Results for Research Question 3 in Mathematics Lesson

In this section, the effects of technology-enhanced classroom on the progress of male and female students are analyzed separately as the research question is investigating whether gender makes a difference with regard to students' progress.

4.3.2.1 Analysis Results for Research Question 3 for Male Students in Mathematics Lesson

A paired-samples *t*-test was performed to estimate whether the progress of male students in technology-enhanced classroom was greater than when not using technology in Mathematics lesson. The results, presented in tables 4.17 and 4.18, indicate that the mean of progress scores of the lessons held with technology (M = 3.78, SD = 2.3) was greater than the mean of progress scores of the lessons held without technology (M = 3.15, SD = 3.7) although it was not statistically significant (t (38) = .172, p > .05).

Table 4.17. Paired Samples Statistics for Male Students in Mathematics Lesson

	Mean	**N**	**s**	**SEM**
Progress with Technology	3.782	39	2.250	.360
Progress without Technology	3.154	39	2.656	.425

Table 4.18. Paired Samples Test for Male Students in Mathematics Lesson

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	s	SEM	Lower	Upper	*t*	df	Sig. (2-tailed)
Progress with Technology minus Progress without Technology	.628	2.816	.451	-.285	1.541	1.393	38	.172

4.3.2.2 Analysis Results for Research Question 3 for Female Students in Mathematics Lesson

Tables 4.19 and 4.20 show the results of the paired-samples *t*-test conducted to evaluate whether the progress of female students in technology-enhanced classroom was greater than when not using technology in Mathematics lesson. The results indicate that the mean of progress scores for the lessons held without technology (M = 4.02, SD = 2.5) was greater than the mean of progress scores for those held with technology (M = 3.88, SD = 2.8) although it was not statistically significant (t (25) = .840, $p > .05$).

Table 4.19. Paired Samples Statistics for Female Students in Mathematics Lesson

	Mean	**N**	**s**	**SEM**
Progress with Technology	3.885	26	2.769	.543
Progress without Technology	4.019	26	2.536	.497

Table 4.20. Paired Samples Test for Female Students in Mathematics Lesson

	Paired Differences		*t*	df	Sig. (2-tailed)
	Mean	s			
Progress scores with Technology minus Progress scores without Technology	-.135	3.369	-.204	25	.840

4.4 Analysis Results for Research Question 4

The objective of Research Question 4, "How is the effect of technology-enhanced classroom on 7th grade students' progress after controlling for multiple intelligences profile of students in English lesson and Mathematics lesson?", was to find out the effect of technology-enhanced classroom when the different dominant intelligences of students are taken into account. Student progress after lessons in technology-enhanced classroom as compared to when it was not used, was analyzed through the linear stepwise regression analysis with respect to the multiple intelligences of the participants as determined through the MII. By using stepwise regression, the effect of the multiple intelligences of participants on their progress during lessons was controlled and adjusted progress scores were tested to find out whether or not technology-enhanced classroom had an effect on the progress of students. The same analysis was done for both English and Mathematics lessons and the results are presented in two different sections below.

Before the regression analysis, a bivariate correlation analysis was conducted to find correlations between the study variables for English and Mathematics lessons separately. The variables which were significantly correlated to the other variables of the study were included in the regression analysis.

Table 4.21 Bivariate Correlations among Study Variables for English Lesson

	1	2	3	4	5	6	7	8	9	10	11
1. TECH OR NOT	1										
2. NATURALIST	.000	1									
3. EXISTENTIALIST	.000	.690**	1								
4. VISUAL	.000	.654**	.649**	1							
5. KINESTHETIC	.000	.620**	.636**	.656**	1						
6. MUSICAL	.000	.590**	.653**	.652**	.650**	1					
7. LOGICAL	.000	.690**	.717**	.656**	.494**	.580**	1				
8. INTERPERSONAL	.000	.466**	.555**	.454**	.528**	.559**	.410**	1			
9. VERBAL	.000	.610**	.638**	.644**	.599**	.760**	.647**	.527**	1		
10. INTRAPERSONAL	.000	.628**	.695**	.509**	.484**	.551**	.560**	.481**	.567**	1	
11. DIFFERENCE	-.100	.081	.054	-.012	.095	.022	.052	.133	.030	.025	1

**. Correlation is significant at the 0.01 level (2-tailed).

As it can be seen in Table 4.21, no statistically significant correlations among study variables were found. Hence, no regression model was formed for English lesson.

Table 4.22 Bivariate Correlations among Study Variables for Mathematics Lesson

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1. NATURALIST	1										
2. EXISTENTIALIST	.680**	1									
3. VISUAL	.657**	.619**	1								
4. KINESTHETIC	.625**	.638**	.662**	1							
5. MUSICAL	.583**	.655**	.629**	.650**	1						
6. LOGICAL	.699**	.702**	.664**	.511**	.571**	1					
7. INTERPERSONAL	.474**	.538**	.463**	.541**	.553**	.417**	1				
8. VERBAL	.623**	.612**	.660**	.622**	.741**	.649**	.532**	1			
9. INTRAPERSONAL	.624**	.697**	.500**	.482**	.548**	.559**	.479**	.567**	1		
10. DIFFERENCE	.081	.040	.077	-.102	.131	.199*	.015	.176*	.062	1	
11. TECH OR NOT	.000	.000	.000	.000	.000	.000	.000	.000	.000	.035	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The data in Table 4.22 show statistically significant correlations among the three of the study variables, namely, kinesthetic, verbal, and logical intelligences. No correlation was found among the other study variables. Hence, the three types of intelligences mentioned above were included as study variables in the linear stepwise regression analysis for Mathematics lesson and the regression model was formed as shown in Figure 4.3.

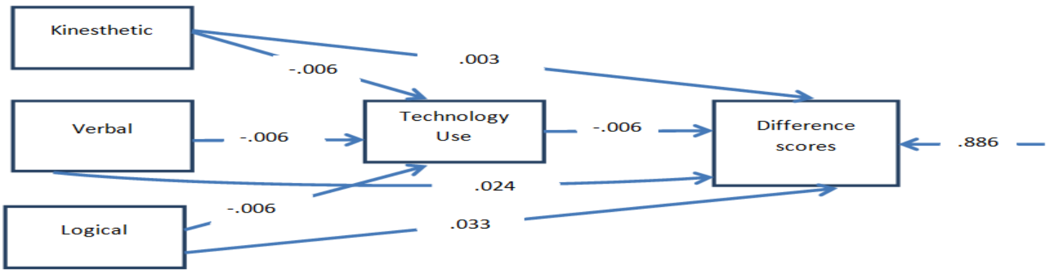


Figure 4.3 Regression Model for Mathematics Lesson

A linear regression analysis was conducted to predict the progress scores, i.e., the progress of students, due to technology implementation in class after controlling for the kinesthetic, verbal, and logical intelligences of the students. The results are provided in Table 4.23 which also shows the dependent variable as progress scores. The kinesthetic, verbal, and logical intelligences were included as the first set of predictors and the second predictor was technology-enhanced classroom, considered as a dummy variable. With regard to the multicollinearity problem, it is possible to state that VIF (variance inflation factor) values for all independent variables are less than 5 (see Table 4.23). Thus, for the regression analysis, multicollinearity was not to be considered as a problem.

Table 4.23 Regression Analysis Results for Predicting Progress Scores

	Adjusted R^2	**df**	**F**	**Standardized Coefficients (Beta)**	***t***	**P**	**VIF**
Regression	.114	3	7.149			.000	
Residual		140					
Total		143					
Constant				3.836	2.492	.014	
Kinesthetic Int.				-.391	-3.791	.000	1.714
Verbal Int.				.287	2.486	.014	2.157
Logical Int.				.213	2.053	.042	1.735
Tech.-enhanced Classroom				.046	.579	.563	1.001

Predictors: (Constant), Kinesthetic Intelligence, Verbal Intelligence, Logical Intelligence, Technology-enhanced Classroom
Dependent Variable: Progress Scores

The results of the linear stepwise regression analysis show that kinesthetic, verbal, and logical intelligences represent a significant proportion of variability in progress scores, R^2= .114, F(3, 140)= 7.149, p=.00<.05. Hence, the regression model for Mathematics lesson could be considered as significant, and except for technology-enhanced classroom t(143)= .579, p=.563>.05, all of the predictor variables – kinesthetic intelligence t(143)= -3.791, p=.000<.05, verbal intelligence t(143)= 2.486, p=.014<.05, and logical intelligence t(143)= 2.053, p=.042<.05 – have contributed significantly to the following regression equation for progress scores:

Progress scores = 3.836 + (-.391) (kinesthetic) + (.213) (verbal) + (.287) (logical)

As can be seen from the equation, verbal and logical intelligences are good predictors of progress scores whereas kinesthetic intelligence is a negative predictor of progress. In other words, the greater their kinesthetic intelligence, the less students' progress.

4.5 Analysis Results for Research Question 5

Research Question 5, "How do 7th grade students perceive technology-enhanced classroom in English lesson and in Mathematics lesson?" aimed to examine how technology-enhanced classroom was perceived by the students who took part in the study.

The Technology-enhanced Classroom Perception Scale (TECPS) was administered after the implementation of each part of the experiment, and the students gave separate feedback for English and Mathematics.

4.5.1 Analysis Results for Research Question 5 in English Lesson

The factor analysis results for the TECPS were given in Chapter 3. Before analyzing the results, the one-sample *t*-test was conducted on the scale scores to evaluate whether their mean was significantly different from ‘2’ (‘indecisive’).

The results are given in Table 4.24. With alpha set at .05, the mean was significantly different from 2 and t (71) = 9.31, p=.000.

Table 4.24. One-Sample *t*-Test for English Lesson

	Test Value = 2					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ATTITUDES	**9.314**	**71**	**.000**	**.453**	**.356**	**.550**

The results for English lesson (see Table 4.25) reveal that 81.9% of the students believed that the lessons where computers and data projectors were used were more fun and 75% liked these lessons more. In addition, 72.2% stated that they preferred such lessons and 65.3% said they participated more. Further, 62.5% of the students considered the lessons in technology-enhanced classroom as being more useful and 55.6% felt that they learned the material more easily. Similarly, 54.2% claimed they learned more when their teacher used a computer and data projector in English lesson and half of the participants (50%) found such lessons very useful. Similarly, 44.4% thought that they were more successful and 38.9% believed they learned difficult topics more easily when a computer and data projector were used. 30.6% said their teachers took care of them more in the lessons in technology-enhanced classroom.

Table 4.25. Frequency Values for TECPS in English Lesson

	Yes (%)	Indecisive (%)	No (%)
Item 2	81.9	11.1	6.9
Item 1	75.0	19.4	5.6
Item 11	72.2	16.7	11.1
Item 3	65.3	25.0	9.7
Item 10	62.5	29.2	8.3
Item 8	55.6	34.7	9.7
Item 7	54.2	34.7	11.1
Item 4	50.0	38.9	11.1
Item 5	44.4	47.2	8.3
Item 9	38.9	44.4	16.7
Item 6	30.6	36.1	33.3

4.5.2 Analysis Results for Research Question 5 in Mathematics Lesson

The TECPS was also given to the students after the Mathematics lesson. Before analyzing the results, the one-sample *t*-test was conducted on the scores to evaluate whether their mean was significantly different from '2' ('indecisive').

The results are given in Table 4.26. With alpha set at .05, the mean yielded by the one sample *t*-test was not significantly different from 2 and t (78) = 1.22, p=.23.

Table 4.26. One-Sample *t*-Test for Mathematics Lesson

	Test Value = 2					
		f	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ATTITUDES	**1.222**	**78**	**.225**	**.088**	**-.051**	**.215**

The frequency results obtained for Mathematics lesson are presented in Table 4.27. Of the total number of participants, 62% believed that the lessons were more fun when the teacher used a computer and data projector and 58.2% thought they liked such lessons more. In addition, 48.1% stated they were more successful in the lessons where a computer and data projector were used. 43% of them preferred the lessons where a computer and data projector were used. Less than half (41.8%) felt that they learned more easily during such lessons and 38% that they participated more. The same percentage of students (38%) believed that they learned more in such lessons. Almost a third (32.9%) found the lessons where the teacher used a computer and data projector very useful, while 31.6% believed that such lessons are more useful. Around a quarter of students felt that they learned difficult topics easily in such lessons (26.6%). and that their teachers take care of them more in technology-enhanced classrooms during the lessons (24.1%).

Table 4.27. Frequency Values in Mathematics Lesson

	Yes (%)	Indecisive (%)	No (%)
Item 2	62.0	21.5	16.5
Item 1	58.2	21.5	20.3
Item 5	48.1	25.3	26.6
Item 8	41.8	30.4	27.8
Item 11	43.0	17.7	39.2
Item 3	38.0	31.6	30.4
Item 7	38.0	29.1	32.9
Item 4	32.9	31.6	35.4
Item 10	31.6	30.4	38.0
Item 9	26.6	29.1	44.3
Item 6	24.1	32.9	43.0

4.6 Analysis Results for Research Question 6

Teacher responses were collected after the implementation of the experiment via a standardized open-ended interview prepared by the researcher. The objective of the interview was to obtain feedback on teachers' opinions of the effects of technology-enhanced classroom on their teaching, on classroom management, on students' learning, and on reasons for having lessons in technology-enhanced classroom. As Miles and Huberman (1994) recommend, content analysis was implemented on the responses of both English and Mathematics teachers in line with the *category-based data display approach*.

Teacher responses are discussed under two subheadings in order to answer the research question "How do teachers perceive technology-enhanced classroom in English and Mathematics lessons?"

4.6.1 Teachers' Opinions of Technology-enhanced Classroom in English Lesson

The five English teachers who participated in the study were interviewed at the end of the experiment and their responses were subjected to content analysis.

4.6.1.1 Effects on Teaching

With respect to the effects of technology-enhanced classroom on teaching, all participants (100%) agreed that technology implementation brings positive effects while 40% listed certain negative effects as well. The positive effects were increasing the pace of lessons (T1), enriching teaching (T5), and having more productive lessons, the latter stated by 60% of the teachers. Examples are given in the excerpts below.

Excerpt for the pace of lesson:

T1: "It is effective in some ways, like the pace of the lessons was faster but for some students the lessons were boring."

Excerpt for enriching teaching:

T5: "Usually using instructional technology was effective for many reasons. First of all, using instructional technology in class created more colourful, auditory, vivid, and authentic lessons. The students were more eager to participate and they were more interested and attentive in class."

Excerpt for having productive lessons:

T4: "If teacher uses them well, technology increases the productivity."

Among the 40% of teachers who mentioned the drawbacks of technology-enhanced classroom in class, T4 stated that productivity is affected negatively even though the other 60% had stated increased productivity as a benefit. According to the teacher, the reason was technical problems due to the lack of built-in systems. T2 said that lesson planning was affected negatively in technology-enhanced classroom. Examples are given in excerpts below.

Excerpt for decreased productivity of lessons:

T4: "As we don't have built-in systems in our classes, teachers waste some of their teaching time setting up the equipment, which affects the productivity of the lessons."

Excerpt for the planning of lessons:

T2: "The activities sometimes took longer than planned."

4.6.1.2 Effects on Classroom Management

Regarding the effects of technology-enhanced classroom on classroom management, only 20% of the participants had a positive opinion, namely, "When the topics were visualized with technological tools the learning environment became more enjoyable and participative."

On the other hand, all of the teachers mentioned that technology-enhanced classroom in class had negative effects on classroom management for a variety of reasons. While 20% stated that the preparation time for activities had become longer, another 20% mentioned that technology integration affected sitting arrangement negatively, and the remaining 60% that it results in a waste of teaching time as the classrooms were not equipped with built-in systems and teachers had to set up the equipment at the beginning of each class. Examples are given in the excerpts below.

Excerpt for longer preparation period for activities:

T2: "As we had limited time in lessons, setting up the equipment was another problem."

Excerpt for seating arrangement:

T4: "As we don't have built-in systems in our classes, teachers waste some teaching time in setting up the equipment which affects the productivity of the lessons. It also affects the sitting arrangement of students."

Excerpt for waste of time:

T5: "I faced some difficulties like wasting time and classroom management while setting up the equipment."

4.6.1.3 Effects on Learning

All of the English teachers stated that technology-enhanced classroom has positive effects on learning through increased interest, longer attention span, greater enthusiasm, motivation, participation, comprehension, performance, communication and interaction, permanent learning, and pace of students' learning in addition to being fun and enjoyable. For instance, 80% of the teachers stated that technology implementation increases student participation in class, 60% said that it attracts the interest of students and increases comprehension as well as enthusiasm and motivation, and 40% that technology-enhanced classroom extends the attention span of students. Only 20% of teachers mentioned that technology-enhanced classroom has a positive effect on learning which is increasing the pace of students' learning, performance, communication and interaction, or permanent learning. Finally, only 20% of the teachers stated that the lessons are fun and enjoyable in technology-enhanced classroom. Examples of these opinions are given in excerpts below.

Excerpt for increased interest:

T2: "Of course they were effective, especially as they increased the interest of weaker students towards lessons because visuals were more important for these students."

Excerpt for greater comprehension:

T4: "As the language used was simple and comprehensible, everything was understood well."

Excerpt for longer attention span:

T3: "Although technology helped to widen the attention span of students, some of them got bored while doing some exercises below their levels."

Excerpt for greater enthusiasm and motivation:

T5: "The lessons were more productive in terms of participation and motivation of students."

Excerpt for increasing participation:

T2: "The participation of students was really high, even among the naughty ones."

Excerpt for improving performance:

T1: "I saw in their performances in the follow-up activities that they understood what had been covered."

Excerpt for improving communication and interaction:

T5: “Moreover, there was better communication and interaction among students in group work activities.”

Excerpt for permanent learning:

T4: “Eventually, I believe that thanks to simple and attractive presentations, learning was permanent.”

Excerpt for ‘fun and enjoyable’:

T5: “I haven’t witnessed any negative ideas or attitudes. Students enjoyed themselves a lot.”

Excerpt for increasing the pace of students’ learning:

T3: “As visual and audio materials were used a lot, the understanding level and pace of students’ learning increased.”

Disadvantages of technology-enhanced classroom on learning were mentioned by 60% of the teachers as boredom and decreased participation. For example, T4 stated that in technology-enhanced classroom, student participation tended to decrease towards the end of the treatment period. In addition, 60% of the teachers said that students got bored when technology was used extensively. Examples are given in excerpts below.

Excerpt for decreased participation:

T4: “Usually participation was high... However, as the students got bored there was a decrease in their participation levels towards the end of the experiment.”

Excerpt for boredom:

T1: “In some lessons they did like it a lot, but when it became a routine, signs of boredom were observed.”

4.6.1.4 Reasons for Having Lessons in Technology-enhanced Classroom

Of the five respondents, 60% stated reasons for having lessons in technology-enhanced classroom. They all stated positive attitudes as they found technology-enhanced classroom beneficial. For instance, T3 said that technology implementation in class is inevitable and T4 stated that it can save time and should be used periodically. T5, in the same way, focused on the increase in student participation and added that students had become more eager to participate and more interested in technology-enhanced classroom. Excerpts are given below.

Excerpt for ‘inevitable’:

T3: “Using technology in class is inevitable because today’s students are the ‘Net Generation’ and their attention span becomes shorter so we need technological tools to help us.”

Excerpt for ‘use with moderation’:

T4: “I believe it is a good method as it attracts students’ interest but I believe it should be used periodically since students may get bored with it.”

Excerpt for ‘saving time’:

T4: “Technological tools were advantageous because the teacher saved time by not having to write anything on the board but instead just projecting. Also, if the printouts of the slides had been given to students, they might have used them as revision.”

Excerpt for increased participation:

T5: “There was some increase in the participation of students. Even weak ones started to participate more due to the interest and importance they gave to the technology.”

Excerpt for making students more eager and participative:

T5: “Usually using instructional technology was effective for many reasons. First of all, using instructional technology in class created more colourful, auditory, vivid, and authentic lessons. The students were more eager to participate and they were more interested and attentive in class.”

4.6.2 Teachers’ Opinions of Technology-enhanced Classroom in Mathematics Lesson

In order to answer this question, the two Mathematics teachers who participated in the study were interviewed at the end of the experiment and content analysis was implemented on their responses.

4.6.2.1 Effects on Classroom Management

With respect to the effects of technology-enhanced classroom on classroom management, one of the teachers (50%) mentioned a drawback:

Excerpt for the waste of time:

T2: “It didn’t work for Mathematics, it was a waste of time.”

4.6.2.2 Effects on Learning

Both Mathematics teachers stated positive effects of technology, specifically that it increased the interest of students, resulting in higher participation. Excerpts are given below.

Excerpt for increased interest:

T1: “On the other hand, students with lower grades were more interested in the lessons.”

Excerpt for increased participation:

T1: “Some students’ participation increased.”

On the other hand, one teacher (50%) stated that good students might get lower grades and have negative reactions when technology was used extensively. Excerpts are given below.

Excerpt for decreasing grades:

T1: “It is not an effective method for Mathematics lesson; most of our better students obtained lower grades when instructional technology tools were used in the lessons.”

Excerpt for negative reactions:

T1: “Students with better grades showed negative reaction.”

4.6.2.3 Reasons for (not) Having Lessons in Technology-enhanced Classroom

Power cuts were mentioned by one Mathematics teacher as a reason for not having lessons in technology-enhanced classroom.

Excerpt for 'power cuts':

T2: "Power cuts and technical problems."

In a nutshell, teachers' impressions can be categorized under four sections as teaching, learning, classroom management, and reasons for having lessons in technology-enhanced classroom.

Chapter 5

CONCLUSION

The previous chapters introduced the study, reviewed the literature, gave details of related research, explained the research methodology, and analysis. This chapter will summarize of the whole study and present conclusions and discussions, pedagogical implications, limitations, and suggestions for further research.

5.1 Summary

An examination of current education systems around the world immediately reveals that developed countries have already started integrating technology into education and instructional technology is widely used in classroom because it is believed to affect students' progress positively. The present study therefore focuses on technology integration in education in the Turkish Republic of Northern Cyprus through six research questions.

First, the study examined the overall effect of technology-enhanced classroom on seventh grade students' progress in English and Mathematics lessons in a private school in the District of Famagusta. It was found that in English lessons the mean of progress scores for lessons held without technology was greater than the mean of progress scores for lessons held with technology; however, the difference was not significant. This means there was no statistically significant difference between the treatment and control groups in English lessons. Similarly, although the mean of progress scores for Mathematics lessons held with technology was greater than the mean of progress scores for lessons held without technology, again, the difference was not significant. In other words, there was no statistically significant difference between the treatment and control groups in Mathematics lessons either.

Second, the study examined the effect of technology-enhanced classroom on seventh grade students' progress with respect to gender, and found that the mean of progress scores for the male students was greater than the mean of progress scores for female students in English lessons. Once again, the difference was negligible. Similarly, although this time the mean of progress scores for female students was greater, again the results were not statistically significant. Overall, these results indicate there was no difference between the effect of technology integration on the progress of female and male students.

Third, the study examined the effect of technology-enhanced classroom on seventh grade male and female students' progress in English and Mathematics lessons. The mean of progress scores for lessons held without technology was found to be greater than the mean of progress scores for lessons held with technology for male students in English. On the other hand, in Mathematics lessons, the results for male students showed that the mean of progress scores for lessons held with technology was greater than the mean of progress scores for lessons held without technology. For female students, however, the mean of progress scores for lessons held without technology was greater than the mean of progress scores for those held with technology in both English and Mathematics lessons. In all four cases, the differences were not statistically significant.

Fourth, the study analyzed the effect of technology-enhanced classroom on their progress in English and Mathematics lessons, after controlling for students' multiple intelligence profiles. The bivariate correlation analysis yielded no significant correlation in English lesson so no regression model was formed. On the other hand, three intelligence types – kinesthetic, verbal, and logical – were found to have statistically significant correlations in Mathematics lessons. These intelligences and technology-enhanced classroom were therefore identified as predictors of students' progress scores. After the linear stepwise regression analysis, the equation for progress scores was formulated as follows:

Progress scores of students = 3.836 + (-.391) (kinesthetic) + (.213) (verbal) + (.287) (logical)

Fifth, the study investigated the perceptions of students on technology-enhanced classroom in English and Mathematics lessons by using Technology-enhanced Classroom Perception Scale (TECPS) prepared by the researcher. The one sample *t*-test found a significant difference in the perceptions of students towards the use of technology in English lessons with alpha set at .05. However, in Mathematics lessons, no statistically significant difference was found with regard to students' perceptions.

The students' frequency results were also examined for both lessons. For English lessons, more than half of the students stated that lessons where a computer and data projector were used were more useful, they participated more and learned more. They consequently preferred such lessons. Almost half of the students also mentioned that they learned more easily in lessons with technology integration and these lessons were very useful. Almost half of the students also said that they were not sure whether technology-enhanced classroom made them more successful or helped them learn difficult topics easily. Lastly, one third stated that they had more fun in lessons in technology-enhanced classroom, a third stated they did not have more fun, and the last third said they were not sure.

For Mathematics lessons the frequencies were similar to those for English lessons. More than half of the students stated that lessons integrated with technology were more fun and, unlike for English, more than half of the students believed they were more successful in such lessons. Although almost half of the students stated a preference for lessons with technology, one fourth were not sure and one fourth expressed a negative attitude. Students were again divided into three groups when asked whether they learned more and more easily with technology-enhanced classroom and whether such lessons were more useful. Some stated positive opinions, some negative, and some were not sure, although the distribution was not even in this case. Students were divided equally in their opinions on whether lessons with technology were useful and whether they learned difficult topics more easily in these lessons. Interestingly, they were either positive or negative on whether they learned more in Mathematics lessons in technology-enhanced classroom. On the other hand, more than 40% said they did not learn more in these lessons, which were not fun either, but almost one third of the students were either positive or not sure about the latter two items.

Finally, the study investigated the opinions of teachers on technology-enhanced classroom in English and Mathematics lessons. The seven teachers who participated in the study mentioned that technology implementation in class has both positive and negative effects on teaching, learning, and classroom management.

The positive effects on teaching were increasing the pace of lesson, enriching teaching, and increased productivity whereas the negative ones were reduced productivity and planning difficulties. The positive effects on learning mentioned were increased student interest, longer attention span, enthusiasm (motivation), participation, understanding (comprehension), performance, pace of lesson, communication and interaction as well as permanent learning and enjoyable lessons. The negative effects on learning were boredom, negative reaction, decreasing grades, and reduced participation towards the end of the treatment.

With regard to classroom management, the teachers stated that technology implementation has certain positive effects, namely, encouraging student participation and lessons being perceived as enjoyable. Longer activities, waste of class time, and seating arrangement were the negative effects mentioned. They also stated reasons both for and against technology-enhanced classroom. Reasons for the lessons held in technology-enhanced classroom were saving time, being contemporary and inevitable, increasing participation, and making students more eager and involved, whereas the reason to avoid technology-enhanced classroom was the possibility of power cuts.

5.2 Conclusions Drawn from the Study

This section presents the conclusions and discussions derived from the results of the current study analyzed in Chapter 4 and the literature reviewed in Chapter 2 on the basis of the research questions stated in Chapter 1 and the methodology detailed in Chapter 3.

The first research question examines the effect of technology-enhanced classroom on seventh grade students' progress in English and Mathematics lessons. Based on the results, it seems that technology-enhanced classroom has no effect on seventh grade students' progress in either English or Mathematics lessons as no statistically significant differences were found between the means of students' scores.

There may, however, be a number of explanations for these results, the main one being the limited length of the experiment. Neither the teachers nor the students had experienced any such lessons before. Hence, it may be the case that the experiment ended before they developed a taste for lessons where technology is used or otherwise adapt themselves to them.

Another explanation may be the medium of instruction in the school. This might have affected particularly English lessons and helped students acquire more English than anticipated before the experiment was conducted.

In addition, especially in Mathematics lessons, it seems that technology was not used efficiently or appropriately by the teachers. The analysis of their opinions clearly reflects this lack of involvement, which affected the study results negatively. Research conducted by Parisi (2003) showed that 75% of teachers in technology-enhanced classrooms in their lessons do not know how to integrate technology effectively and 60% do not feel confident with it. A number of researchers also state that the appropriate use of technology does lead to better understanding (Ranasinghe & Leisher, 2009; MacKinnon, 2002; Goodmann, 2001; Ertmer et al., 2012; Yang & Chen, 2007). In the current study, a computer and data projector were selected as the main technological tools to use Microsoft PowerPoint, which is the choice of the majority of instructors (Parisi, 2003; Plumm, 2008). Thus, the lack of readiness on the part of the teachers may be another factor to explain the less than significant differences in the results (Koehler & Mishra, 2009; Tondeur, van Braak, Sang, Voogt, Fisser & Ottenbreit-Leftwich, 2011).

Even though some research supports the notion that significant differences are not found as the age of students increases (Plumm, 2008), a number of scholars or researchers postulate that technology use can nevertheless be effective in education (Ranasinghe & Leisher, 2009; Baek et al., 2008; Parisi, 2003). Baek et al. (2008) stress that the results of a study might not necessarily confirm a theory since these "are not theory-based but based on real-world contexts" (p. 232). The present research, too, was conducted in a real-world context and the results may therefore be different than expected when looking at the literature, which is the case for some of the results in this study.

With regard to the second research question, which focuses on the effect of technology-enhanced classroom on students' progress with respect to gender in English and Mathematics lessons, no statistically significant results were obtained, which can be explained by the technological era participants live in. Students are 'digital natives' who have become familiar with technology already soon after birth (Prensky, 2001; Padilla-Meléndez, del Aguila-Obra, & Garrido-Moreno, 2013) and they learn to use many technological tools themselves very easily at a very young age, regardless of their gender. Thus, the results obtained in the present study are by no means surprising.

Although it was first assumed that male students would be better with technology based on some literature (Özdamlı et al., 2009), no significant difference was expected in favour of males, and the results of the experiment are believed to be valid and meaningful. In fact, the related literature includes contradictory research results on gender (Padilla-Meléndez et al., 2013; Whitley, 1997; Papastergiou, & Solomonidou, 2005; Huffman, Whetten, & Huffman, 2013; Ray, Sormunen, & Harris, 1999; Coffin & MacIntyre, 1999; Colley, Gale, & Harris, 1994; Compton, Burkett, & Burkett, 2003; He & Freeman, 2010; McGeown, Goodwin, Henderson, & Wright, 2011). It is thus possible to conclude that students of today have become so familiar with technology that gender differences are no longer an aspect to be examined with respect to the effect of technology implementation in classes.

As regards the effects of technology-enhanced classroom on seventh grade male and female students' progress in English and Mathematics lessons, no statistically significant differences were obtained. This result can be ascribed to several negative factors. Although students in the technological era are tech-savvy, the students in the present study had never been exposed to technology integrated lessons. Thus, no difference was found when male and female students' progress scores were compared for lessons where technology was used and those where it was not.

Based on the literature, it was assumed female students in lessons in technology-enhanced classroom would progress less than those in control groups and males' progress in treatment groups would be greater (Özdamlı et al., 2009) because female students are thought to have less experience with technology than males (Plumm, 2008). Another assumption that led to this research question was the notion, also claimed by Plumm (2008), that girls tend to be less interested in technology than boys. However, the present study revealed that the progress of females remained the same whether technology was used or not, similar to the study by Rahimi and Yadollahi (2011).

The research additionally sought an answer to the question, “How is the effect of technology-enhanced classroom after controlling for multiple intelligences profile of students’ progress in English and Mathematics lessons?” In English lessons, no effect of either technology-enhanced classroom or intelligence types was found. It is generally accepted that language learning is different from learning in other subjects and 2 + 2 does not always equal 4 in languages. In addition, because the medium of instruction is English at the school where the experiment was conducted, students acquire the target language unconsciously. Some language can be acquired as a result of any type of interaction, even by watching a film or listening to a song in the target language. Therefore, the conclusion that neither multiple intelligences nor technology-enhanced classroom has an effect on the progress of seventh grade students in English lessons should not come as a surprise.

On the other hand, in Mathematics lessons, three intelligence types – logical-mathematical, verbal-linguistic, and bodily-kinesthetic – as the first predictors and technology-enhanced classroom as an additional predictor have been found to be effective on students’ progress. In Mathematics, the learning process is quite different from the process in learning languages. This subject often has to be taught by someone else and there are strict rules and formulas to find a single solution. By definition, the logical-mathematical intelligence is the crucial type students need to develop for success in Mathematics. Similarly, as shapes, formulas, lines, and drawings are involved in geometry, bodily-kinesthetic intelligence is also needed. The experiments conducted required the students to cut shapes, make geometrical shapes, with their bodies, hands.

At first, verbal-linguistic intelligence might not seem to be connected to Mathematics as this type of intelligence is mainly related to language and has a clearer link with English lessons. However, the situation is different in North Cyprus where, through traditional, teacher-centered instruction, students are dependent on what their teachers say in class. Hence, students are encouraged to be passive learners who listen to their teacher and digest the information conveyed. Therefore, verbal-linguistic intelligence is also a reasonable predictor of students' achievement. This result is also related to the rationale behind the fourth research question. Not being exposed to technology integration in classes, students in North Cyprus are usually passive learners, which results in memorization and rote-learning (Cankoy, 2010; "21. Yüzyılın Öğretmeni", 2013; Öngün, 2012; Yalvaç, 2012; Öztürkler, 2014; Zeki, 2013; Cankoy & Tut, 2005; Çağıltay & Bichelmeyer,2000).

The perceptions of seventh grade students on technology-enhanced classroom in English and Mathematics lessons were also examined in this study. In English lessons, the perceptions of students were found to be positive whereas they were undecided in Mathematics lessons. The reasons for these results may include the various types of teaching aids used in English lessons such as flashcards, pictures, animations, colorful texts in different fonts, videos, and listening materials, that is to say, lessons rich in visual and auditory stimuli (Ranasinghe & Leisher, 2009; Parisi, 2003).

Students' perceptions were also quite positive. Hence, students enjoyed these lessons and participated more as they thought the technology integrated lessons were useful and effective. They stated they felt they were learning because they could also see the evidence by actively participating and being involved in the learning process. The students were not sure whether technology integration can ease the learning of difficult topics and make teachers show more interest in them.

Another reason for students' positive attitude is that when what these children of the technological era have in their daily lives is brought into the classroom and integrated into their lessons, they naturally like it (Wang et al., 2012; Bransford, Brown, & Cocking, 2000; Baek et al., 2008). In other words, this is what they expect (Baek et al., 2008). When students feel that learning occurs, then the school becomes a venue for education, not a place of meaningless rote-learning.

In the Mathematics lessons, however, students could not decide whether they had a positive or negative attitude towards technology-enhanced classroom. Technology integration was both new to them and quite intensive, which they were not accustomed to. Setting the experiment at the end of the academic year may have been another factor negatively affecting students' perceptions. When the perceptions, aptitude, and readiness of teachers are added to the list (Inan & Lowther, 2010), students' attitudes cannot really be expected to be positive. Nevertheless, they were still not negative but only undecided.

It is interesting that even though students generally could not decide whether the effect of technology-enhanced classroom was good or bad, their answers revealed that the majority believe they are more successful when technology was implemented. Although due to certain restrictions, colorful and attractive PowerPoint slides were the only technological tools used in Mathematics lessons, students still stated that they found these lessons more enjoyable, similarly to other study results (Ranasinghe & Leisher, 2009; Parisi, 2003). In fact, the results were mostly undecided since for the majority of the items in the attitude scale for Mathematics lessons, one third of the students stated positive, one third negative, and one third indecisive attitudes. This might be due to the time constraint mentioned previously. If students had had the chance to get used to technology implementation, their attitudes might have become positive, as they did for English lessons.

Lastly, the opinions of teachers on technology-enhanced classroom in English and Mathematics lessons were investigated as the qualitative part of the study. According to the results, English teachers tend to have positive attitudes in general whereas Mathematics teachers have negative attitudes towards technology-enhanced classroom. With regard to the effects of technology-enhanced classroom on teaching, teachers made very positive comments on the increase in the pace of lessons, having productive lessons, and richer teaching opportunities. Due to technical problems which have also been mentioned in the literature (Parisi, 2003; Baek et al., 2008; Pelgrum, 2001; Schrum, 1995; Mehlinger & Powers, 2002), lesson planning and productivity can also be negatively affected by technology-enhanced classroom. The biggest challenge that technology implementation brings is the necessity for teachers to change their teaching approach (Reksten, 2000) since teaching this way is very different from traditional instruction.

Similarly, the effects of technology on learning were perceived as being very positive by the teachers who said that it really increases a number of desirable characteristics, similarly to findings in the literature (Li & Ma, 2010; Peng, 2006; Parisi, 2003; Ranasinghe & Leisher, 2009; Bransford et al., 2000; Arthur, 1991; Coffin & MacIntyre, 1999). However, in contrast to the literature, the current study also found that students got bored, which led to decreasing participation towards the end of lessons in technology-enhanced classroom. Furthermore, particularly in Mathematics classes, teachers pointed out that certain students developed a negative reaction to technology which, in turn, led to a decrease in their grades. Yet, the teachers had negative attitudes themselves, a situation which was reflected in class and affected students' perceptions, too.

When classroom management was considered, the majority of the teachers said that classroom management was a problem. Technology boosts individual learning. Each student has his/her own pace. This leads to a chaos in the classroom. As mentioned earlier, teaching in technology-enhanced classroom is quite different and once teachers become accustomed to it (Inan & Lowther, 2010), they can feel confident in terms of classroom management. Therefore, it seems that the participants in this study felt they had lost control of their classes as the atmosphere changed. Furthermore, similar to the study done by Akkoyunlu and Erkan (2013) at times they faced technical problems while setting up the technological equipment, which wasted valuable lesson time.

Reasons for having lessons in technology-enhanced classroom were also investigated. It was found that teachers think technology integration is inevitable, which is significant when the literature is considered. Dudeney and Hockly (2007), Norton and Wiburg (2003), McKenzie (2005), and Picciano (2006) state that since various forms of technology have been implemented in classrooms for over a century, the trend is felt as a necessity so people sometimes use it for the sake of using it. Both school administrators and teachers should therefore be careful to use the appropriate kind of technology and to do so effectively (Ertmer et al., 2012).

Similar to other research in the literature, the results of the present study also support this notion.

At the beginning of both stages of the experiment, the teachers of both subjects were informally interviewed and then formally trained on how to integrate the technology involved in the research. During the treatment period, observations were made by the researcher in order to ensure the smooth running of the experiment. Teachers were formally interviewed at the end of the experiment to gather data on how they perceive technology-enhanced classroom and it was found that especially Mathematics teachers felt quite negative. As this was not anticipated, it is unfortunate that no measures could be taken in advance of the experiment. Teacher beliefs about and attitudes towards technology-enhanced classroom play an important role as has been observed by many researchers investigating teachers' opinions (Chen, 2008; Lumpe & Chambers, 2001; Lim & Chai, 2008; Jimoyiannisa & Komisb, 2007; Inan & Lowther, 2010).

5.3 Pedagogical Implications

Instructional technology has long played an important role in and has had positive effects on teaching. Both the literature and this study – the results may not be statistically significant but traces can be observed when the results are examined closely and the responses of the teachers and students are considered – reveal that technology integration into education is essential (Kagan & Kagan, 1998; Armstrong, 2003a; Frei, Gammill & Irons, 2007; Whitehead et al., 2003; Kelly, 2002, Inan & Lowther, 2010; Norton & Wiburg, 2003). When technology is integrated into the classroom, students have the opportunity to see more colorful, attractive, authentic materials and become more motivated. This, in turn, can increase their success rate in an environment which promotes permanent learning (Akkoyunlu & Erkan, 2013; Ertmer et al., 2012).

As discussed earlier, the study reveals that students' attitude toward lessons with technology is quite positive and that technology increases student motivation. However, the length of the study was too limited to see the real effect of technology integration on student success. It could be argued that the success rate of students would have increased in the long run. The Ministry of National Education (MNE) should therefore be sensitive to the issue and consider having technology-enhanced classrooms in schools, providing the necessary equipment as well.

If the equipment is provided and classrooms in the TRNC have access to technological devices, Internet access, and other facilities, students in this country would not fall behind students of developed countries. Built-in systems were not available in the classrooms at the Eastern Mediterranean College (EMC) at the time of the research. This needs to change and a modern technological infrastructure should be put in place in all classes in every school (Ringstaff & Kelley, 2002; Inan & Lowther, 2010; Norris, Sullivan, Poirot, & Soloway, 2003; Hohlfeld, Ritzhaupt, Barron & Kemker, 2008).

The MNE could support the same kind of experiment but as a longitudinal study. For instance, a pilot school could be selected where the experiment is conducted for one year, another school where traditional instruction remained in place could serve as the control group, and the results could then be compared. The present experiment could be seen as a miniature of that study and the results of the proposed study could also be compared with the current study.

Students and teachers should have the opportunity to reach all kinds of information rapidly and easily. Moreover, teachers and students should be given opportunities to use all types of instructional technology whenever needed. Accessing information as quickly as possible and being able to use it is an essential and indispensable feature in today’s world. Equal opportunity perspective states that schools should have the technological infrastructure. Therefore, it is strongly recommended that the MNE examine the results of this and other related studies in order to determine a road map for the future of education in the TRNC so as to provide the country with a better, more contemporary education system where graduates will be well-equipped and strong enough to compete with graduates from other countries, especially developed ones. If a country wants to carve a place for itself in today’s world and compete with other countries, it is necessary for the authorities to integrate technology into their education programs. The world is changing so rapidly that even ‘one second’ is crucial. Now is the time to move forward with firm steps, not looking back but with the power to foresee the future.

Frequent in-service training programs are suggested as “the need to have teacher education programs that help teachers use the new tools became important” (Wentworth & Earle, 2003, p. 86). The role of teachers in the classroom also needs to change in pace with innovations and new learning environments. As Wentworth and Earle (2003) explain, “Teacher education programs began to address the need to use different models of instruction, including lessons that are more learner-centered. Pre-service teachers were encouraged to become more of a facilitator and guide in the classroom” (p. 87).

5.4 Difficulties Faced During Experiment

The study was conducted in a private school in North Cyprus, thus limiting it to one type of school. Although the researcher would have liked to conduct the experiment in different schools, for bureaucratic reasons it was not possible at the time of the experiment. The EMC was the only school where the administration gave the researcher permission to conduct such an experimental study. Although the education system in North Cyprus sees both private and public schools as equal, certain differences do exist between private and public schools, and thus the choice of venue was indeed a limitation in this study. One of these differences is that the medium of instruction is English in schools like the EMC. The profile of students in such schools can also be different from the student profile in public schools as private schools are usually attended by very successful students and students from upper class families.

At the beginning of the study, demographic information gathered about both English and Mathematics teachers indicated that they all had similar backgrounds, experiences, and qualifications. They all seemed quite similar on paper but towards the end of the experiment, their perceptions – particularly Mathematics teachers', which had a great part to play in the success of the experiment – were found to be quite negative. This limitation in affected the results negatively.

Another factor that may have affected the results was the bureaucracy allowing the researcher only three units to conduct the experiment. Although the lessons were prepared in detail and implemented with care, the instruction period was too short to allow both students and teachers to become accustomed to working with technology in the classroom. Neither students nor teachers had any previous experience using technology in the classroom. The results should, however, not be ignored for being limited to a short period of time as the same experiment over a longer period would likely have yielded different results.

It is unfortunate that conducting experiments in schools in North Cyprus is not easy. Getting permission on paper from the MNE is not sufficient; the attitudes of head masters, the teachers' union, and the teachers themselves can be barriers a researcher has to overcome. In the case of the present study, for instance, the school administration insisted on determining the topics that would be included in the study, namely, the first three units in the textbook for English lessons and three geometry topics (triangles, quadrilaterals, and other polygons) to be taught towards the end of the year for Mathematics. The researcher was not allowed to contribute to the selection of the topics, thus bringing a further limitation to the study.

5.5 Suggestions for Further Research

It is suggested that the research can be repeated in a public school where the medium of instruction is Turkish and student profiles vary more widely along the socio-economic status of families. The research can be conducted in all schools around the country in order to get more, and more valid data.

Based on this researcher's experience, any researcher working with other teachers should administer an attitude scale prior the experiment in order to identify their opinions on the experiment as these would affect the success of the treatment. The present study could be repeated with teachers whose opinions are positive towards technology-enhanced classroom. In addition, in-service training sessions and workshops should be offered frequently in order to help teachers improve themselves and develop a vision regarding technology-enhanced classroom.

Repeating the present study over a longer period of time has already been suggested. If it were conducted over one semester or one academic year, for instance, more valid results would be obtained. Although this study did indeed yield certain valid results, major changes cannot be expected to occur in such a short time.

In the present study the EMC administration had selected three consecutive units in each subject. In order to minimize the negative effects of conducting the experiment, the administration and the heads of department worked closely with the researcher. The topics could be more varied in a future study and the experiment could be conducted at different times during the academic year. The results could then be compared with those of the present research.

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APPENDICES

Appendix A: The Structure of Present Educational System in Northern Cyprus

<table>
<tr><td rowspan="3">Higher Education</td><td rowspan="3">Age
18-19</td><td colspan="5">Doctorate</td><td rowspan="3"></td></tr>
<tr><td colspan="5">Graduate</td></tr>
<tr><td colspan="5">Undergraduate</td></tr>
<tr><td>High School Education</td><td>17-18
16-17
15-16</td><td>Fine Arts High School</td><td>College
Anatolian High School</td><td>Multi-programmed Modern High Schools</td><td>Modern Occupational Technical High Schools</td><td>Apprenticeship Education</td><td rowspan="5">Private Education</td></tr>
<tr><td rowspan="3">Compulsory Basic Education</td><td>14-15
13-14
12-13
11-12</td><td colspan="5">Basic Education
Secondary School</td></tr>
<tr><td>10-11
9-10
8-9
7-8
6-7</td><td colspan="5">Basic Education
Primary School</td></tr>
<tr><td>5-6</td><td colspan="5" rowspan="2">Kindergarten
Basic Education
Pre-school
Nursery School</td></tr>
<tr><td></td><td>4-5</td></tr>
</table>

(MNE Brochure 2005, p.9[1]).

Appendix B: MI Inventory

Çoklu Zeka Araştırması

İsim:

Açıklama: Aşağıdaki cümleleri okuyarak size en uygun olanı işaretleyiniz.

1.	Eşyalarımı gruplandırmayı	**Çok Severim**	**Severim**	**Az Severim**	**Sevemem**	**Hiç Sevmem**
2.	**Hayat hakkında düşünmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
3.	**Birşeyleri kafamda canlandırmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
4.	**Ellerimi kullanarak iş yapmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
5.	**Belli bir düzenin oluşmasını sağlayan kuralı bulmak için çalışmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
6.	**Düzenli olmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
7.	**Arkadaş(lar)ımla çalışmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
8.	**Olaylara bir bütün olarak bakmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
9.	**Yeni bir dil öğrenmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
10.	**Haklı çıkmayı (olmayı)**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem

11.	**Doğadaki sesleri dinlemeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
12.	**Etrafta dolaşmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
13.	**Anlamsız kelimeler uydurmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
14.	**Kurallara uymayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
15.	**Doğayı korumayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
16.	**Salon dekore etmeyi (süslemeyi)**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
17.	**İnternette sohbet etmeyi (chat yapmayı)**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
18.	**Bir olay / şey hakkında güçlü hislerim olmasını**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
19.	**Spor yapmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
20.	**Dinle ilgili bilgileri öğrenmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
21.	**Sanatla uğraşmayı (resim, boyama, vs.)**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
22.	**Müziğin ritmine uygun hareket etmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem

23.	**Hikaye yazmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
24.	**Problem çözmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
25.	**Kelime bulmacalarını çözmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
26.	**Bir takımın elemanı olmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
27.	**Harita çizmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
28.	**Doğada yürüyüş yapmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
29.	**Kamp yapmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
30.	**Müzik aleti çalmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
31.	**İşaret dilini kullanmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
32.	**Sanatla ilgili bilgiler öğrenmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
33.	**Herşeyimi temiz ve düzenli tutmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
34.	**Değişik ülkelerle ilgili bilgi almayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem

35.	**Adil olmayı (hakça davranmayı)**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
36.	**Günlük tutmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
37.	**Yanlış birşey gördüğümde müdahale etmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
38.	**Kafiyeli kelimeler kullanmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
39.	**Tiyatro izlemeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
40.	**Bahçede çalışmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
41.	**Matematik problemerini çözmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
42.	**İyi bir arkadaş olmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
43.	**Müzik dinlemeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
44.	**Telefonda konuşmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
45.	**Evren hakkında düşünmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
46.	**Egzersiz yapmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem

47.	**Doğayla içiçe olmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
48.	**Yaptığım işlerle ilgili kendimi iyi hissetmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
49.	**Şarkıların sözlerini hatırlamayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
50.	**Şekil ve tablo çizmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
51.	**Zamanımı planlamayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
52.	**Değişik konularla ilgili tartışmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
53.	**Arkadaş(lar)ımla iyi geçinmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
54.	**Yapboz birleştirmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
55.	**Şekil ve tablolardan anlam çıkarmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
56.	**El işleriyle uğraşmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
57.	**Fakirlere yardım etmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
58.	**Diğer insanlarla birlikte olmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem

59.	**Bilmeceleri cevaplamayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
60.	**Video izlemeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
61.	**Mektup / e-mail yazmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
62.	**Dans etmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
63.	**Gürültülü ortamda çalışmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
64.	**Yalnız çalışmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
65.	**Yıldız ve gezegenleri gözlemlemeyi (seyretmeyi, bakmayı)**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
66.	**Hayal gücümü kullanmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
67.	**Bir olayı önceden tahmin etmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
68.	**Hayvanlar hakkında bilgi edinmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
69.	**Her türlü müziği dinlemeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
70.	**El aletleri (tornavida, çekiç, pense, vs.) kullanmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem

71.	**Kulüplere üye olmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
72.	**Dünya sorunlarını tartışmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
73.	**Lider olmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
74.	**Kalabalık önünde konuşma yapmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
75.	**Uygun adım yürümeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
76.	**Birşeyi neden yapmam gerektiğini bilmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
77.	**Herşeyi düzenli tutmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
78.	**Fikirleri özetlemeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
79.	**Birşeyler inşa etmeyi (kumdan kale, legolarla bina, araç, vs.)**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
80.	**Çöplerin geri dönüştürülmesini**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
81.	**Not tutmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
82.	**Diğer insanlarla birlikte iş yapmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem

83.	**Kafamda plan yapmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
84.	**Diğer gezegenlerde yaşam var mı diye düşünmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
85.	**Bana adil (hakça) davranılmasını**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
86.	**Hayvanat bahçesine gitmeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
87.	**Yapacağım şeyleri liste halinde yazmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
88.	**Sessiz sinema oynamayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
89.	**Hikaye dinlemeyi**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
90.	**Kitap okumayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem
91.	**Diğer insanların arasında olmayı**	Çok Severim	Severim	Az Severim	Sevemem	Hiç Sevmem

Appendix C: Sample Pre-Test for English

EMC 7th Form   Pre-Test 2   English Quiz

Name & Surname:___________________________

Vocabulary

Instruction: Read the questions carefully and choose (mark) the best alternative.

1. **What kind of _________ do you prefer when you go on a holiday? The quality of the place that you will stay in is important.**

a) adventure   b) accommodation   c) information   d) performance

2. **I am living in a ________ on the second floor.**

a) field   b) show   c) flat   d) stage

3. **I am _______ to seeing my girlfriend. I miss her very much.**

a) getting on with   b) getting up   c) looking forward   d)looking around

4. **I really do not understand punks' __________. I find it unbelievable.**

a) lifestyle   b) instrument   c) servants   d) object

5. **Last week I went to a doctor who is a _________ on stomach diseases.**

a) specialist   b) psychologist   c) professional   d) individual

6. **I would like to get your ________ on this issue. It is very important for me.**

a) goods   b) case   c) interval   d) opinion

7. **Police managed to get the ________ of the murderer from the eye witnesses.**

a) reservation   b) description   c) advice   d) interests

8. **I have to ______ my room with my brother because our house is not big.**

a) split   b) divide   c) share   d) complain

9. **The house next to ours _______ to a very famous politician.**

a) goes   b) moves   c) belongs   d) points

10. **Ayse is very ________, she can do whatever she wants. No one tells her what to do.**

a) independent   b) traditional   c) stupid   d) fantastic

11. Because Ali didn't study enough, he _______ won't be able to pass all his examinations.

a) immediately b) personally c) usually d) probably

12. My father is a very famous ________. He always manages to get the most important news.

a) hairdresser b) journalist c) clerk d) artist

13. I always _______ to drink fruit juice instead of coke.

a) mend b) design c) prefer d) like

14. You should always prefer to walk on the ________ not in the road.

a) pavement b) rails c) grass d) rocks

15. It is not always easy for Hasan to _________. He is quite shy.

a) book tickets b) look forward to c) wake up d) make friends

16. If you are young and if you have a good physical appearance, then you can wear a short ______ . Also, I believe it really suits some girls.

a) trousers b) skirt c) shirt d) suit

17. You should change your ______ as soon as possible, it looks damaged, otherwise you may face with a car accident.

a) gun b) tyre c) plug d) sink

18. When you go to buy something, sometimes the _________ treats you very rudely so you feel humiliated.

a) shop assistant b) librarian c) clerk d) model

19. It doesn't matter whether you are new or experienced; when you are looking for a job they always want some kind of ________.

a) family tree b) central heating c) coastal area d)work experience

20. I tried to _______ my chair yesterday but I couldn't; so, in the end, I had to find a carpenter.

a) sell b) cut c) mend d) book

Language Features

Instruction: Read the questions carefully and choose (mark) the best alternative.

21. It is not easy to _______ to go to a private college as they require a lot of money.

a) believe b) enjoy c) think d) decide

22. When my father _________ home, he always finds me ___________ the dishes.

a) come / washing b) comes / washing

c) comes / wash d) come / was wash

23. I ______ with my mother and we _______ tea in our garden.

a) am / are having b) be / have

c) am / having d) be / have

24. Ali: "Where are you going?"

Hasan: "I _______ to the cinema with Ayse." "I hope we _____ a very good time."

a) am going / are b) go / have c) am going / have d) go / are

25. Ayse: " Do you ______ at school in the afternoons?"

a) staying b) stay c) to stay d) stay to

26. I ________ that there will be an agreement in Cyprus soon.

a) believing b) am believing c) believe d) to believe

27. Do not ________ to invite Ayse to your party otherwise she will be a real headache.

a) forget b) believe c) talk d) hate

28. A: What are you doing?

B: I ________ about what to buy for my girlfriend's birthday.

a) thinking b) think c) to think d) am thinking

29. I _____ watching horror films, but I can't stand love stories.

a) am loving b) love c) love to d) loving

30. I ________ what you mean now. Thanks for explaining it again.

a) understand b) understanding

c) am understanding d) understand to

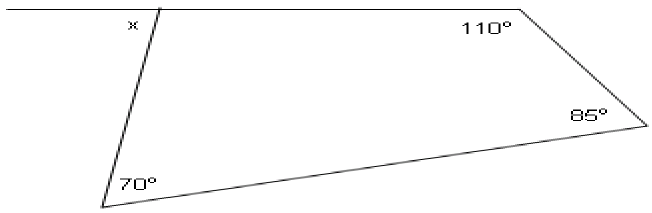
Appendix D: Sample Pre-Test for Mathematics

EASTERN MEDITERRANEAN COLLEGE
GRADE 7- MATHEMATICS
Pre-Test

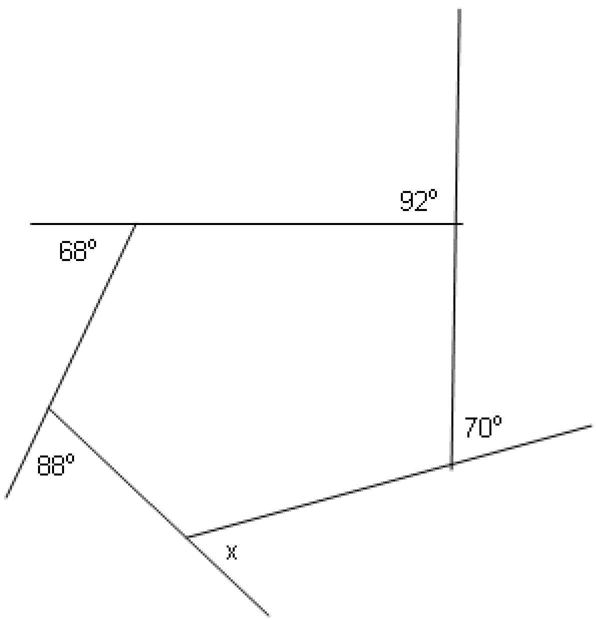
Name and Surname: **Class:**

1) Find the size of the angles marked by *x*.

a)



b)



2) A heptagon is a 7-sided polygon. Find

a) the **sum of the interior angles** of a heptagon

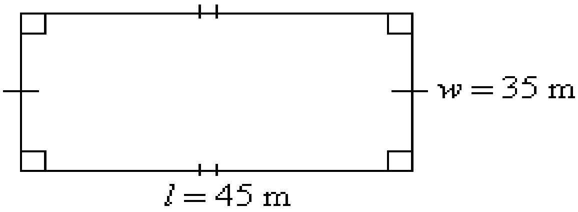
b) the **sum of the external angles** of a heptagon

c) the size of **each interior angle** of a regular heptagon

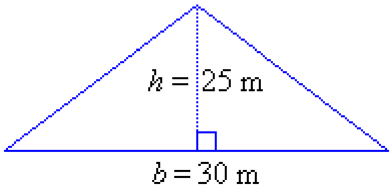
d) the size of each exterior angle of a regular heptagon

3) **How many sides** does a regular polygon have if it has an interior angle of 160^0?

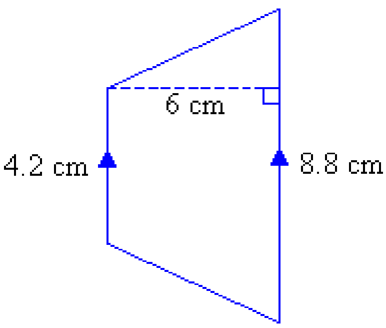
4) Find the perimeter of a rectangular field of length 45m and width 35m.



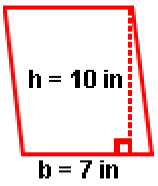
5) Find the area of the triangle below.



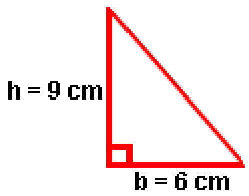
6) Find the area of the following trapezium.



7) Find **the area** of a parallelogram with a base of 7 inches and a height of 10 inches.



8) Find **the area** of a right triangle with a base of 6 centimeters and a height of 9 centimeters.



Appendix E: English Lessons Objectives

Unit 1 A question of sport

p.10

1.1

1. Given the letters of the sports in mixed order, students will be able to put them in the correct order and match them with the given pictures.
2. Students will be able to state their opinions which sports they like doing, playing or watching and if not what they do or watch instead.
3. Students will be able to work with a partner in order to match the given equipment names with the given sports.
4. Students will be able to categorize clothes, equipment and people that take part in the sport that he/she enjoys on a “word tree”.

p.11

1.2

1. Students will be able to identify unusual sports by looking at given photographs.
2. Students will be able to match the given photos of unusual sports with the people they hear on the tape.
3. Students will be able to answer given questions about unusual sports by listening to the text.
4. By listening to the tape students will be able to identify adjectives which describe the feelings of the speakers related to the sports they describe.

p.12

1.3

1. Students will be able to write sentences by using “It’s a kind of …” structure.

1.4

1. Students will be able to rewrite sentences using the given frequency adverbs.
2. Students will be able to ask and answer personal questions by using frequency adverbs in short answer forms.
3. Students will be able to express their own preferences either positive or negative for given prompts.

4. Students will be able to write true sentences about themselves using the given frequency adverbs

1.6

1. Students will be able to work with a partner to write sentences about (preferably unusual) sport or hobby.
2. Students will be able to work with different partners to ask questions in order to guess what their sport / hobby is and answer their questions in short answers.

p.13

1.7

1. Students will be able to create a poster of a sportsman or woman they admire by answering the given questions to describe him or her.

p.14 Exam Folder 1 Reading Part 1

1. Students will be able to identify the different text types (e-mail, postcard, post-it note, telephone message and notice) by looking at the given texts.
2. Students will be able to check if their guesses are correct by reading them.
3. Students will be able to practice how it is possible to elicit correct information in a given text.
4. Students will be able to read the texts to choose the best sentence that describes each text.

p.15 Exam Folder 1 Speaking Part 1

1. Students will be able to ask some personal questions using given prompts.
2. Students will be able to answer personal questions using given texts.
3. Students will be able to work with a partner ask and answer personal questions to each other in a given role.
4. Students will be able to answer some personal questions about themselves.
5. Students will be able to work with a partner to ask and answer personal questions about themselves.
6. Students will be able to write a paragraph to give personal information.

Unit 2 The Meeting Place

p.16

2.1

1. Examining the given identity cards, students will be able to talk about the physical appearance of different people.
2. Students will be able to identify the names of people on the given ID cards through listening to the two different conversations.
3. In a given role, students will be able to work with a partner to describe themselves to each other.
4. Students will be able to write a short description about themselves.
   a. Students will be able to guess who the description belongs to by reading the written texts.
5. Students will be able to write a description paragraph about a person that they admire by using the provided prompts.
   a. Students will be able to guess who the description belongs to by reading the written texts.

p.17

2.2

1. Students will be able to read the given advertisements for categorizing them as ‘accommodation’, ‘travel’ and ‘contacts’.
2. Students will be able to read the given advertisements for finding specific information related to some questions with ‘who’.
3. Students will be able to discuss if they want to meet any of the people from the advertisements by stating their reasons.

p.18

2.3

1. With a partner students will be able to answer the given questionnaire to learn what kind of people they are.

2.4

1. Students will be able to fill in the blanks with ‘would like’, ‘like’ or ‘have got’ in a given dialogue.

2.5

1. Students will be able to write a specific notice about accommodation, travel or contacts and describe what kind of people they are and what they want.

p.19

2.7

1. Students will be able to write four things that they would like doing in their free time.
2. Students will be able to ask questions to each other about what they like to find out a person that they would like to go out with.

2.8

1. Students will be able to match a handwriting specialist's opinions with the handwritings given and then discuss if they agree with her or not.
2. Students will be able to discuss how handwritings can reflect personal information about a person by looking at some their classmates' handwritings.

p. 20 Exam Folder 2 Speaking Part 3

1. Students will be able to discuss what a person does every day.
2. Students will be able to identify the differences between the words they hear from the given sentences.
3. Students will be able to correct the expressions while listening to a person. (3 &4)
4. Students will be able to discuss what a person does every day by looking at the given pictures. (5)
5. Students will be able to listen to a talk about the daily routine of a person to fill in the gaps in the provided text.

p. 21 Writing Folder Writing Parts 1, 2 and 3

1. Students will be able to practice different punctuation rules by answering the given questions related to punctuation.
2. Students will be able to identify the difference between *the student's books* and *the students' books.*
3. Students will be able to correct the "apostrophe" and "capital letter" mistakes in the given sentences.
4. Students will be able to correct the punctuation mistakes in a given note.

UNIT 3 What's your job?

p.22

3.1

1. Students will be able to identify the jobs of people through listening to them.
2. Students will be able to express what people do to name their jobs.
3. Students will be able to identify what the people are doing in the provided photographs.
4. Students will be able to discuss if they want to do any of jobs mentioned with reasons.

p.23

3.2

1. Students will be able to tell what people are doing and identify their jobs by looking at the given picture.
2. Students will be able to identify what the job of the person on the phone is and who he is talking to by listening to the conversation.
3. By listening to the conversation on the phone, students will be able to name the people's jobs in the mentioned order.

3.3

1. Students will be able to fill in the blanks with the correct form of the provided verbs by looking at the given picture.
2. Students will be able to work in groups of tree to ask and answer questions in present simple and continuous tenses.
3. Students will be able to work in groups of tree to write questions and answers by using the given prompts and exchange them within the group.

p.24

3.4

1. Students will be able to distinguish the use of present tense and present continuous tense by writing sentences about a person with the given prompts.
2. Students will be able to fill in the gaps with the correct tense form of the given verbs in a box in a given conversation.
3. Students will be able to listen for checking their own answers.

4. Students will be able to discuss whether school students do work experience in their own country and if they would like to do it.
5. Students will be able to identify the mistakes about the use of state verbs in the given sentences for correcting them.

p.25

3.6

1. Students will be able to revise the question forms, short answers and the different uses of the two tenses with a miming activity.

3.7

1. Students will be able to revise the affirmative and negative forms of present continuous tense by differentiating two resembling pictures.

p. 26 Exam Folder 3 Speaking Part 3

1. Students will be able to match the questions with their answers by looking at the given picture.
2. Students will be able to answer the given questions by looking at the given picture.
3. Students will be able to remember the types of questions asked to describe a person in a given picture.

p. 27 Writing Folder Writing Parts 1, 2 and 3

4. Students will be able to talk about the given photographs by answering the necessary question types used to describe a person in a given photo.
    a. Students will be able to listen for specific information through checking the answers of given questions.

Reading Part 5

1. Students will be able to choose the best alternative for the questions written for a given picture.
2. Students will be able to choose the best alternative for the questions written for a given picture.

Appendix F: Mathematics Lessons Objectives

p. 104
At the end of the lesson the students will be able to;
- recognize different types of polygons,
- differentiate polygons from other shapes,
- describe how a polygon is formed.

pp. 105 & 107
At the end of the lesson the students will be able to;
- define an interior angle,
- define an exterior angle,
- calculate the sum of interior angles of a polygon by using the given formula

pp. 107 – 108
At the end of the lesson the students will be able to;
- explain the properties of a regular polygon,
- recognize regular polygons,
- calculate the sum of interior angles of a regular polygon by using the given formula
- calculate an interior angle of a regular polygon by using the given formula

p. 109
At the end of the lesson the students will be able to;
- calculate the sum of exterior angles of a regular polygon by using the given formula
- calculate an exterior angles of a regular polygon by using the given formula
- solve the given problems using the formula

p. 110
At the end of the lesson the students will be able to;
- define what an irregular polygon is
- recognize different type of irregular polygons
- answer the given questions

p. 111
At the end of the lesson the students will be able to;
- define a quadrilateral
- know the sum of the interior angles of a quadrilateral
- know the sum of the exterior angles of a quadrilateral
- recognize different types of quadrilateral
- name different types of quadrilateral

pp. 111 – 113
At the end of the lesson the students will be able to;
- define what a rectangle is
- define what a rhombus is
- define what a square is
- define what a parallelogram is
- define what a trapezium (trapezoid) is
- define what a kite is

pp. 113 – 114
At the end of the lesson the students will be able to;
- define what a perimeter is
- calculate the perimeter of a square

• calculate the perimeter of a rectangle • calculate the perimeter of a triangle
p. 114 **At the end of the lesson the students will be able to;** • recall how they calculate the area of a square • recall how they calculate the area of a rectangle • recall how they calculate the area of a triangle
pp. 115 – 117 **At the end of the lesson the students will be able to;** • learn how the area of a trapezium is calculated • learn how the area of a rhombus is calculated • learn how the area of a parallelogram is calculate • practice to calculate the areas of different types of quadrilaterals
p. 119 **At the end of the lesson the students will be able to;** • define a triangle • recognize line segments of a triangle • recognize the symbols related to drawing of triangles • define what 'vertex' is
pp. 120 – 121 **At the end of the lesson the students will be able to;** • understand different properties of a triangle • realize the sum of the 3 angles is always 180^0 • realize the sum of an interior angle and its adjacent exterior angles is always 180^0 • learn how exterior angle theorem works
pp. 121 – 122 **At the end of the lesson the students will be able to;** • classify different types of triangle • learn how isosceles triangle is formed • learn how equilateral triangle is formed • learn how scalene triangle is formed
pp. 122 – 123 **At the end of the lesson the students will be able to;** • differentiate triangle types • practice different properties of triangles by answering the given questions
pp. 124 – 125 **At the end of the lesson the students will be able to;** • learn how right angled triangle is formed • learn how acute triangle is formed • learn how obtuse triangle is formed • classify triangles according to the size of their angles
pp. 125 – 126 **At the end of the lesson the students will be able to;** • define the base of a triangle • define the altitude of a triangle • learn how to find the altitude of an obtuse triangle • understand how the lines meet in one point

pp. 126 – 127 **At the end of the lesson the students will be able to;** • understand the relation between the sides and the angles of triangles • understand how the biggest angle of a triangle is opposite the biggest side • understand how the middle size angle of a triangle is opposite the middle side • understand how the smallest angle of a triangle is opposite the smallest side
p. 127 **At the end of the lesson the students will be able to;** • learn how right angled triangles formed • differentiate different types of right angled triangles • understand properties of different types of right angled triangles
pp. 128 – 129 **At the end of the lesson the students will be able to;** • understand what ‘hypotenuse’ is • learn the formula to calculate hypotenuse • practice to calculate hypotenuse of different triangles
pp. 129 – 131 **At the end of the lesson the students will be able to;** • learn to calculate the area of a triangle by using the given formula • practice to calculate the areas of different triangles

Appendix G: Sample Lesson Plan for English Control Group

English - Lesson Plan 1 (Page 10)   Control Group

Objective(s):

1. Given the letters of the sports in mixed order, students will be able to put them in the correct order and match them with the given pictures.
2. Students will be able to state their opinions which sports they like doing, playing or watching and if not what they do or watch instead.
3. Students will be able to work with a partner in order to match the given equipment names with the given sports.
4. Students will be able to categorize clothes, equipment and people that take part in the sport that he/she enjoys on a "word tree".

Time: 40 minutes

Materials: course book p. 10, board

Introduction:

- Talk about the sports that students like and ask them why.
- Present different words related with sports and tell the students that at the end of the lesson they will be able to categorize these words.

1.

- Have students match the pictures of sports with their names written in scrambled form.

2.

- Ask students to find out which sports the equipment go with.
- Check students' answers to provide feedback.

3.

- Write a name of sport on board.
- Ask students to tell as many words as they can, related to the sport written on the board and note them on board.
- Draw a representation of tree on board.

- Ask students to categorize the written words as ‘equipment’, ‘people’ and clothes and place them into the branches of the tree.
- Check students’ answers to provide feedback.
- Ask students to form their own ‘word trees’ for three different sports that they choose.
    - Ask them to draw a ‘word tree’ into their notebooks.
    - Ask them to write in categories the words that are related with the sport they wrote.
    - Have students exchange their notebooks with their partners to check it and also add any more information they have.
    - Ask them to draw another ‘word tree’ into their partner’s notebooks and fill it with new information.

Appendix H: Sample Lesson Plan for English Treatment Group
English - Lesson Plan 1 (Page 10) Treatment Group

Objective(s):

1. Showing the letters of the sports written in wrong order, students will be able to find the names of the sports
2. Students will be able to match the sports with the shown short films on the computer.
3. Showing PowerPoint slides students will be able to state their opinions which sports they like doing, playing or watching and if not what they do or watch instead.
4. Students will be able to work with a partner in order to find the name of the given photos on the flashcards of the equipment of sports and, then, match them with the given sports.
5. Students will be able to stick the word drawn from the word bag on a word tree about some sports in order to categorize clothes, equipment and people that take part in the sports.

Time: 40 minutes

Materials: power point slides, videos, flashcards, colored cardboards

Introduction:

- Talk about the sports that students like and ask them why.
- Present different words related with sports and tell the students that at the end of the lesson they will be able to categorize these words.

1.

- Have students write the names of sports using the words written in wrong order.
- Have them watch the short videos to identify different sports.

2.

- Have students work in groups of four.
- Give students an envelope with photos of equipment which are used in different sports.
- Ask students to match the equipment with the related sport.
- Have them speak up their answers.

3.

- Show the ‘word tree’ for football as a power point slide show.
- Explain students how the related words are categorized as ‘equipment’, ‘people’ and ‘clothes on the branches of the tree.
- Ask students to form their own ‘word trees’ for a different sport that they choose in their groups of tree.
    - Ask students to draw a ‘word tree’ of a sport onto their cardboards.
    - Ask them to write ‘people’, ‘clothes’ and ‘equipment’ related with the sport onto the branches of tree in their groups.
    - Have students stick their cardboards onto the walls of the room for others to check.

Appendix I: Sample Lesson Plan for Mathematics Control Group

Mathematics - Lesson Plan 1 (POLYGONS – Part 1)

Control Group

Objectives:

1. Students will be able to define what polygon is.
2. Students will be able to understand what line segment is.
3. Students will be able to understand what closed figure is.
4. Students will be able to tell the name of each polygon (triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, Nonagon, Decagon).
5. Students will be able to tell how many sides each polygon (triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, Nonagon, Decagon) has.

Time: 40 minutes

Materials: Handout

Introduction

- Tell students to read the title of the handout: "Polygons"
- Tell them that the topic of the lesson is "Polygons" and ask them what they know about polygons.
- Elicit answers from students.

Step 1

- Have students read the definition of a polygon.
- Ask students if they know the meanings of the words (closed figure, line segment, line segment intersects).
- Ask students look at the illustration and tell what they understand.

Step 2 – Triangle

- Ask students look at the figure of a triangle.

- Ask them count the number of sides of a triangle and ask them what the figure can be called.
- Tell them that it's called a triangle.
- Make sure students count the sides of a triangle and tell that it has three sides.

Step 3 – Quadrilateral

- Ask students look at the figure of a quadrilateral.
- Ask them count the number of sides of a quadrilateral and ask them what the figure can be called.
- Tell them that it's called a quadrilateral.
- Make sure students count the sides of a quadrilateral and tell that it has four sides.

Step 4 – Pentagon

- Ask students look at the figure of a pentagon.
- Ask them count the number of sides of a pentagon and ask them what the figure can be called.
- Tell them that it's called a pentagon.
- Make sure students count the sides of a pentagon and tell that it has five sides.

Step 5 – Hexagon

- Ask students look at the figure of a hexagon.
- Ask them count the number of sides of a hexagon and ask them what the figure can be called.
- Tell them that it's called a hexagon.
- Make sure students count the sides of a hexagon and tell that it has six sides.

Step 5 – Heptagon

- Ask students look at the figure of a heptagon.
- Ask them count the number of sides of a heptagon and ask them what the figure can be called.
- Tell them that it's called a heptagon.

- Make sure students count the sides of a heptagon and tell that it has seven sides.

Step 6 – Octagon

- Ask students look at the figure of an octagon.
- Ask them count the number of sides of an octagon and ask them what the figure can be called.
- Tell them that it's called an octagon.
- Make sure students count the sides of an octagon and tell that it has eight sides.

Step 7 – Nonagon

- Ask students look at the figure of a nonagon.
- Ask them count the number of sides of a nonagon and ask them what the figure can be called.
- Tell them that it's called a nonagon.
- Make sure students count the sides of a nonagon and tell that it has nine sides.

Step 8 – Decagon

- Ask students look at the figure of a decagon.
- Ask them count the number of sides of a decagon and ask them what the figure can be called.
- Tell them that it's called a decagon.
- Make sure students count the sides of a decagon and tell that it has ten sides.

Appendix J: Sample Lesson Plan for Mathematics Treatment Group
Mathematics Lesson Plan 1 (POLYGONS Part-1)

Treatment Group

Objectives:

1. Students will be able to define what polygon is.
2. Students will be able to understand what line segment is.
3. Students will be able to understand what closed figure is.
4. Students will be able to tell the name of each polygon (triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, Nonagon, Decagon).
5. Students will be able to tell how many sides each polygon (triangle, quadrilateral, pentagon, hexagon, heptagon, octagon, Nonagon, Decagon) has.

Time: 40 minutes

Materials: PowerPoint Slides

Introduction – Slide 1

- Show students the title of the slide: "Polygons"
- Tell them that the topic of the lesson is "Polygons" and ask them what they know about polygons.
- Elicit answers from students.

Step 1 (Slide 2)

- Show students the definition of a polygon.
- Ask students if they know the meanings of the words (closed figure, line segment, line segment intersects) written in red and let them speculate.
- Show them each illustration step by step and ask them guess each figure before showing the title if each illustration.

Step 2 (Slide 3 – Slide 8) - Triangle

- Show students slides one by one and ask them tell the number of lines after each slide.

- When triangle form appears ask students what it is called and try to elicit the answer from students first.
- Give the answer: ‘It’s a triangle’
- Show a triangle figure again and make students tell how many sides it has and what it is called.

Step 3 (Slide 9 – Slide 14) - Quadrilateral

- Show students the slides one by one and ask them tell the number of lines after each slide.
- When a quadrilateral form appears ask students what it is called and try to elicit the answer from students first.
- Give the answer: ‘It’s a quadrilateral’.
- Show a quadrilateral figure again and make students tell how many sides it has and what it is called.

Step 4 (Slide 15 – Slide 21) – Pentagon

- Show students slides one by one and ask them tell the number of lines after each slide.
- When a pentagon form appears ask students what it is called and try to elicit the answer from students first.
- Give the answer: ‘It’s a pentagon’.
- Show a pentagon figure again and make students tell how many sides it has and what it is called.

Step 5 (Slide 22 – Slide 29) – Hexagon

- Show students slides one by one and ask them tell the number of lines after each slide.
- When a hexagon form appears ask students what it is called and try to elicit the answer from students first.
- Give the answer: ‘It’s a hexagon’.
- Show a hexagon figure again and make students tell how many sides it has and what it is called.

Step 5 (Slide 30 – Slide 38) – Heptagon

- Show students slides one by one and ask them tell the number of lines after each slide.
- When a heptagon form appears ask students what it is called and try to elicit the answer from students first.
- Give the answer: ‘It’s a heptagon’.
- Show a heptagon figure again and make students tell how many sides it has and what it is called.

Step 6 (Slide 39 – Slide 48) – Octagon

- Show students slides one by one and ask them tell the number of lines after each slide.
- When an octagon form appears ask students what it is called and try to elicit the answer from students first.
- Give the answer: ‘It’s called octagon’.
- Show an octagon figure again and make students tell how many sides it has and what it is called.

Step 7 (Slide 49 – Slide 59) – Nonagon

- Show students slides one by one and ask them tell the number of lines after each slide.
- When a nonagon form appears ask students what it is called and try to elicit the answer from students first.
- Give the answer: ‘It’s called nonagon’.
- Show a nonagon figure again and make students tell how many sides it has and what it is called.

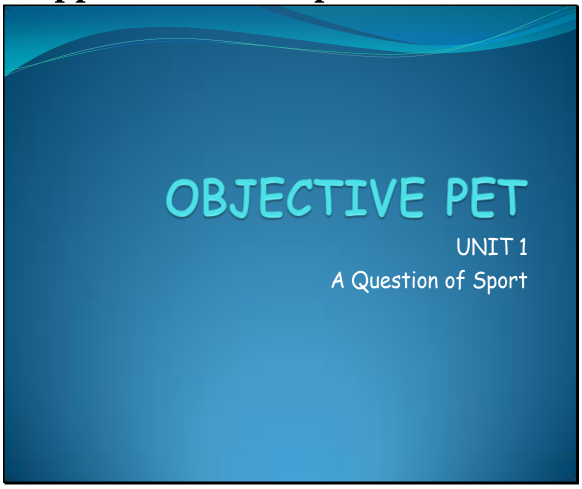
Step 8 (Slide 60– Slide 71) – Decagon

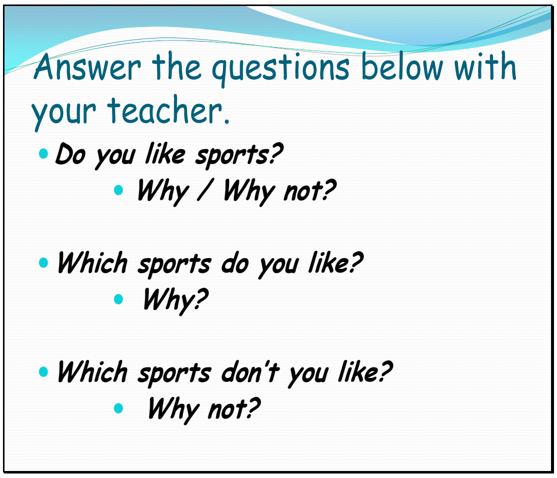
- Show students slides one by one and ask them tell the number of lines after each slide.
- When a decagon form appears ask students what it is called and try to elicit the answer from students first.
- Give the answer: ‘It’s called decagon’.
- Show a decagon figure again and make students tell how many sides it has and what it is called.

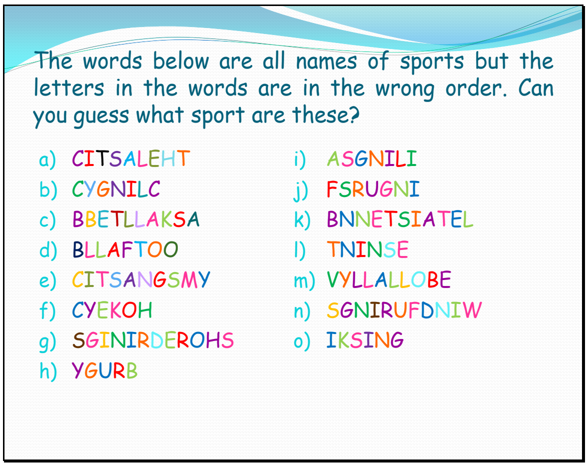
Step 8 (Slide 72 – Slide 73) – Exercise

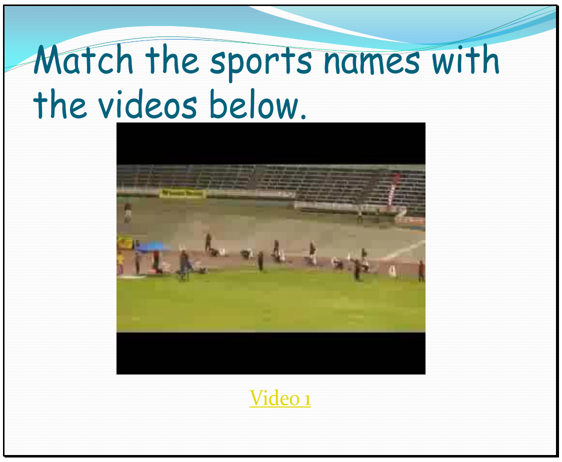
- Ask students look at each figures and count the sides of them in order to give the names.
- Show the figures one by one.
- After showing each figure ask them tell the names. Before showing the answer, elicit the answers from the students.

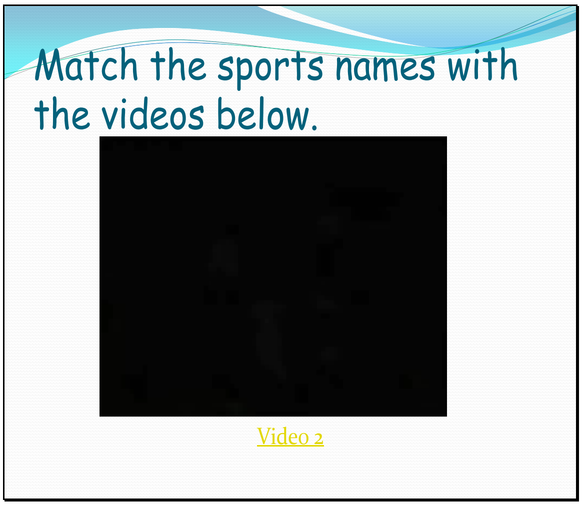
Appendix K: Sample PowerPoint Slides for English Lesson











Match the sports names with the videos below.

Video 4

Match the sports names with the videos below.

Video 5

Match the sports names with the videos below.

Video 6

Match the sports names with the videos below.

Video 7

Match the sports names with the videos below.

Video 10

Match the sports names with the videos below.

Video 11

Match the sports names with the videos below.

Video 12

Match the sports names with the videos below.

Video 13

Match the sports names with the videos below.

Video 14

Match the sports names with the videos below.

Video 15

Answer the questions below.

- Which sports do you like playing or doing?
- Which sports do you like watching?
- Does anyone in the class not like sports?
- What does s/he do or watch instead?

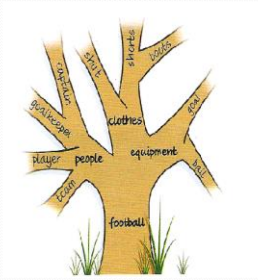
Work in groups of four. Find the name of the equipment of sports on each card. Then, match them with the sports.

- **Basket** - *basketball*
- **Board** - *surfing, windsurfing*
- **Net** - *football, hockey, table tennis, tennis, volleyball*
- **Skis** - *skiing*
- **Bat** - *table tennis*

Work in groups of four. Find the name of the equipment of sports on each card. Then, match them with the sports.

- **Boat** - *sailing*
- **Racket** - *tennis*
- **Stick** - *hockey*
- **Bike** - *cycling*
- **Helmet** - *cycling*
- **Sail** - *sailing, windsurfing*

The Word Tree for **Football**



- Draw a word tree of a sport and write the people, clothes, and equipment of the sport on the branches. Use the cardboards that your teacher gives you.

Look at these pictures of unusual sports. Can you guess which sports these are?

Look at these pictures of unusual sports. Can you guess which sports these are?

Look at these pictures of unusual sports. Can you guess which sports these are?

Look at these pictures of unusual sports. Can you guess which sports these are?

Listen to four people talking about these sports. Write 1, 2, 3, or 4 next to each sport on the provided handout.




Listen to four people talking about these unusual sports and answer these questions.

- **Mountainboarding**

a) *What sometimes happens?*
b) *What do they always wear?*

- **Street Hockey**

c) *What do they use?*
d) *When do they usually play this?*

- **Karting**

e) *How fast can you go indoors?*
f) *What is a kart?*

- **Snowfering**

g) *What do they use?*
h) *Where do they do this?*

Listen to the speakers again and write the adjectives about feelings. Can you add any more words?

- great
- easy
- fun
- dangerous
- wonderful

It's a kind of ...

drink	food	book
flower	animal	vehicle

- What is a cat?
- It is a kind of ...
- It is a kind of animal.

cat	hamburger	bicycle
milk	dictionary	rose

- Ask and answer questions with the words from the boxes.

Check your answers.

- What's a **dictionary**? It's a kind of **book**.
- What's a **hamburger**? It's a kind of **food**.
- What's a **bicycle**? It's a kind of **vehicle**.
- What's **milk**? It's a kind of **drink**.
- What's a **rose**? It's a kind of **flower**.

Answer these questions. Use *It's a kind of...* and the words in the list below.

a) What's a helmet?
   It's a kind of hat.
b) What's a racket?
c) What's windsurfing?
d) What's table tennis?
e) What's rugby?
f) What's a kart?
g) What's snowfering?

tennis	*car*	*windsurfing on the snow*
~~*hat*~~	*bat*	
team game	*surfing on water*	

Adverbs of Frequency

(never, sometimes, often, usually, always)

- What does Hasan do on weekdays?

	Monday	Tuesday	Wednesday	Thursday	Friday
plays basketball	√	x	√	X	√
watches TV	√	X	√	√	√
goes to school	√	√	√	√	√
washes the dishes	x	x	X	X	x
is bored	x	√	X	√	x

- Write sentences about Hasan's activities on weekdays with the adverbs of frequency.

Make correct sentences with the cards that your teacher gives you.

never	sometimes	often
usually	always	

- *Basketball players are often tall.*
- ***Cyclists sometimes go very fast.***
- *Footballers are often very rich.*
- ***Surfers always get wet.***
- *Gymnasts never wear helmets.*
- ***There are usually two people in a tennis match.***
- *Good athletes never smoke.*

Work with a partner. Use the words in the box. Ask and answer questions like these:

- A: *Do you often finish your homework?*
  B: *Yes, always!*
- A: *Does your dad sometimes play tennis?*
  B: *Yes, often.*
- A: *Are you always tidy?*
  B: *No, never!*

Complete these sentences about yourself and other people. Use the words in the box. Use *not* in some sentences.

a) .... *I don't often eat*......... cheese for breakfast.
b) ..*My brother usually plays*.. football after class.
c) .... very tired in the morning.
d) .... a sleep in the afternoon.
e) .... in the spring.
f) .... quiet in English lessons.
g) .... sport on television.

never	sometimes	often
usually	always	

Write true sentences about yourself and other people using the words in the box with your own ideas.

never	sometimes	often
usually	always	

Work with a partner. Watch the videos of different unusual sports or hobbies. Then, choose a sport or hobby and write sentences about it.

Video 103

Work with a partner. Watch the videos of different unusual sports or hobbies. Then, choose a sport or hobby and write sentences about it.

Video 104

Work with a partner. Watch the videos of different unusual sports or hobbies. Then, choose a sport or hobby and write sentences about it.

e.g.

- *You play in a team.*
- *You can do this alone.*
- *You play in the field.*
- *You usually do this in a swimming pool.*

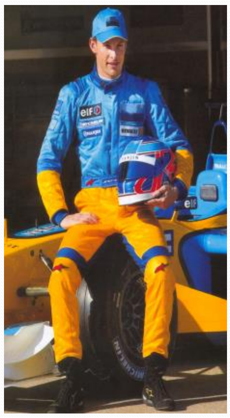
Work with another pair. Don't tell them the name of your sport or hobby. Try to guess their sport or hobby and let them try to guess yours. Ask questions like these:

- *Do you usually do this in summer?*
- *Do you use a kind of board?*
- *Do you always play with friends?*
- *Do you often fall over?*
- *How many people are there in the team?*
- *Is it sometimes dangerous?*

- You can answer : *Yes. / No. / We don't know.*

Make a poster about a sportsman or a sportswoman you admire. Put their picture on it if you can. Write this kind of information on it:

- What sport does s/he play?
- What does s/he usually wear?
- What equipment does s/he use?
- What does s/he often/sometimes/never do?
- How do you feel about this sport?



Appendix L: Sample Flashcard for English Lesson – Treatment Group

Basketball players are often tall

Cyclists sometimes go very fast

Footballers are often very rich

Surfers always get wet

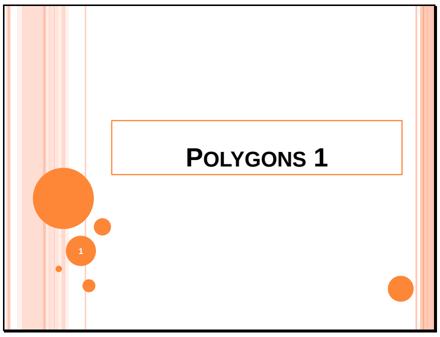
Gymnasts never wear helmets

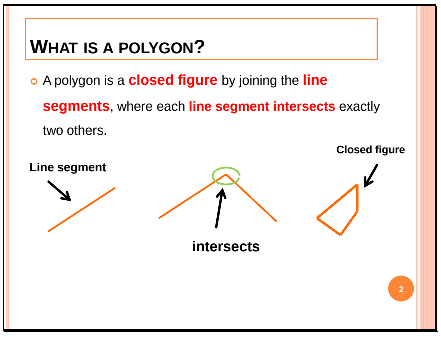
There are usually two people in

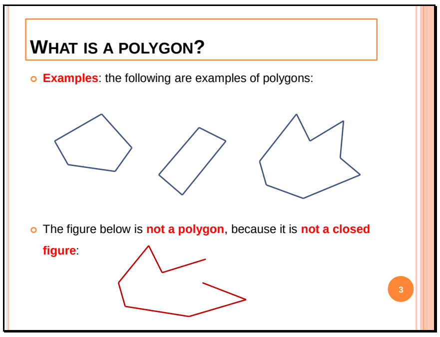
the tennis match

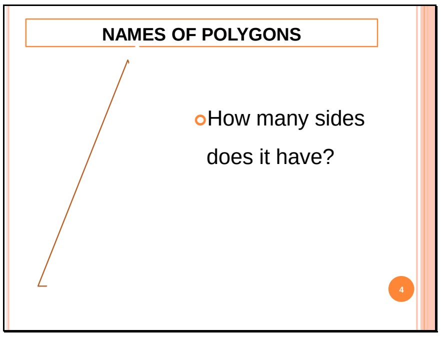
Good athletes never smoke

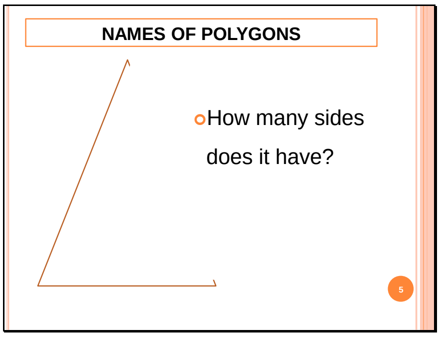
Appendix M: Sample PowerPoint Slides for Mathematics Lesson

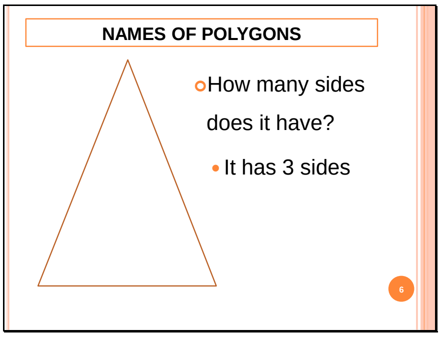


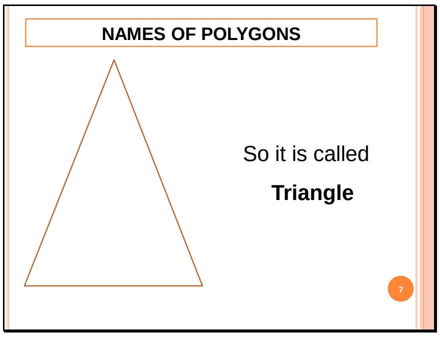


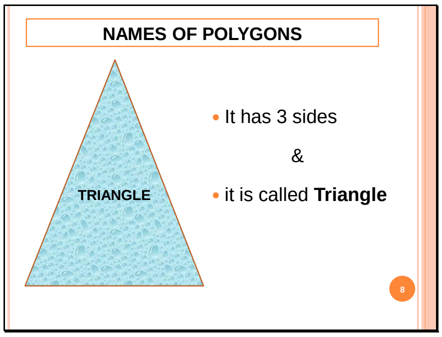


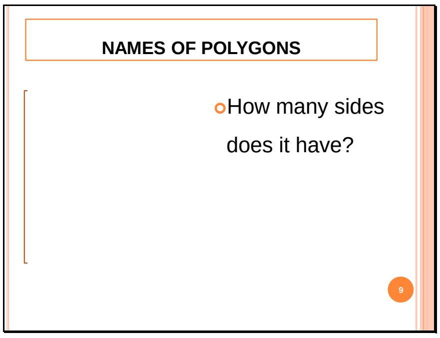


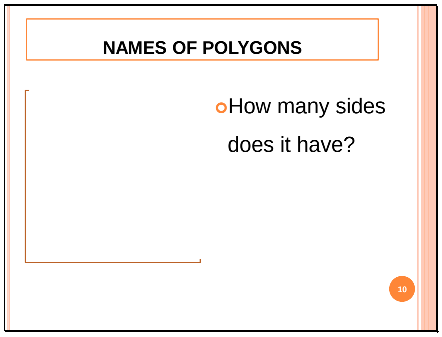





NAMES OF POLYGONS
So it is called
Triangle
7


NAMES OF POLYGONS
TRIANGLE
It has 3 sides
&
it is called Triangle
8


NAMES OF POLYGONS
How many sides
does it have?
9


NAMES OF POLYGONS
How many sides
does it have?
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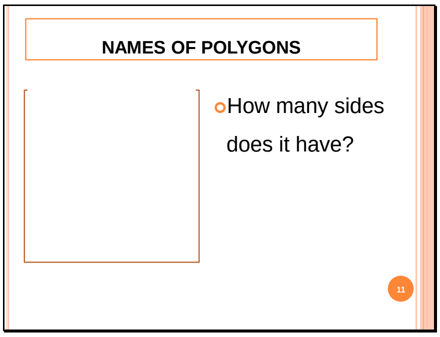
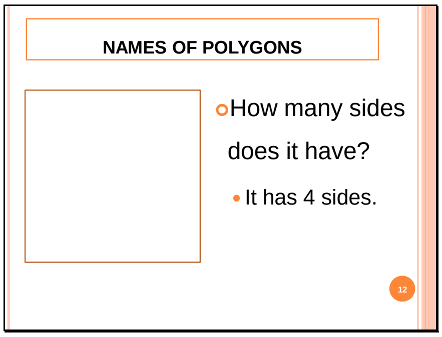
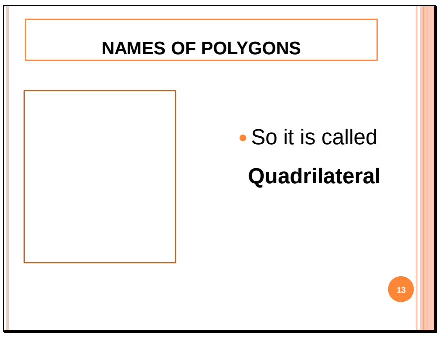
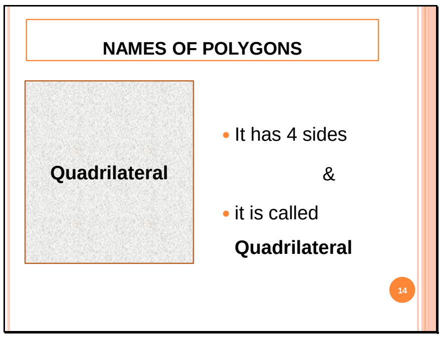
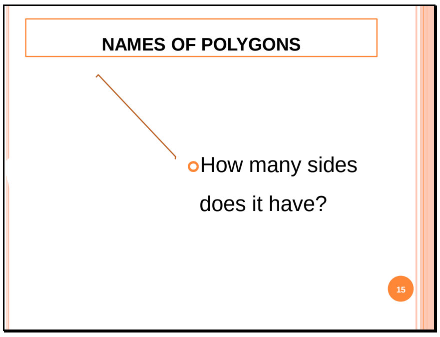
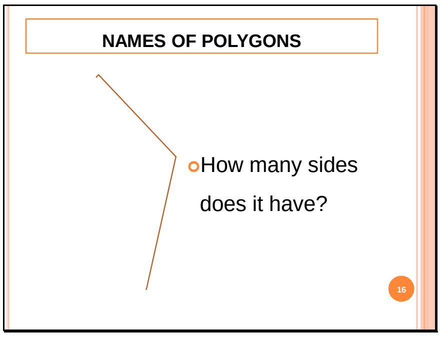

NAMES OF POLYGONS
How many sides
does it have?
11


NAMES OF POLYGONS
How many sides
does it have?
It has 4 sides.
12


NAMES OF POLYGONS
So it is called
Quadrilateral
13


NAMES OF POLYGONS
Quadrilateral
It has 4 sides
&
it is called
Quadrilateral
14


NAMES OF POLYGONS
How many sides does it have?
15


NAMES OF POLYGONS
How many sides does it have?
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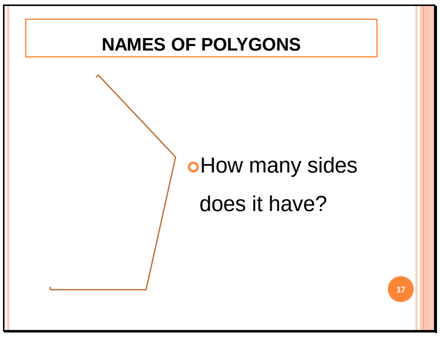
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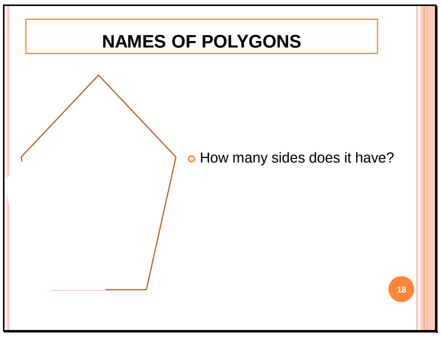
How many sides does it have?
17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How many sides does it have?
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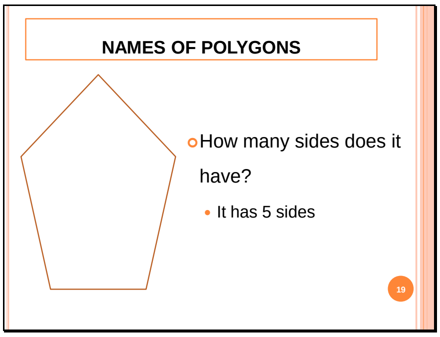
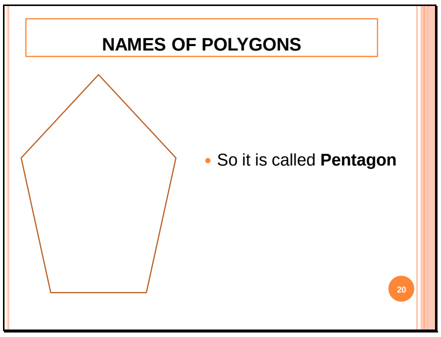
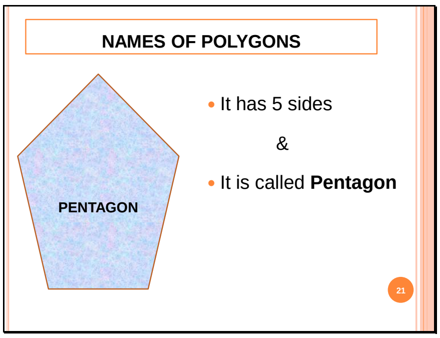
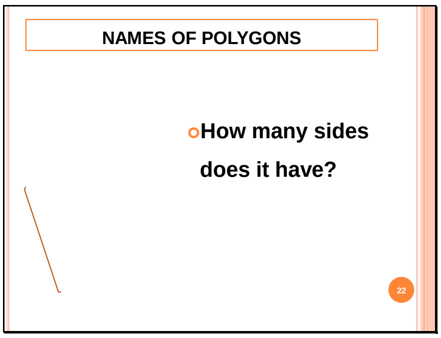

NAMES OF POLYGONS
How many sides does it have?
It has 5 sides
19


NAMES OF POLYGONS
So it is called Pentagon
20


NAMES OF POLYGONS
PENTAGON
It has 5 sides
&
It is called Pentagon
21


NAMES OF POLYGONS
How many sides does it have?
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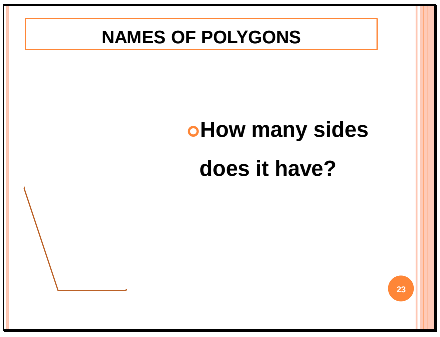
NAMES OF POLYGONS
How many sides does it have?
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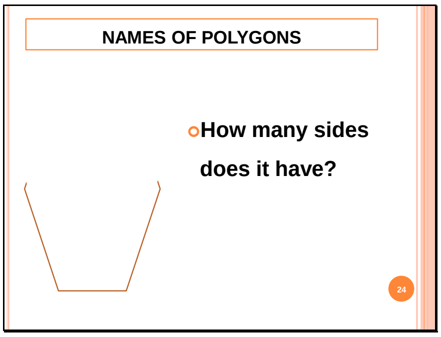
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How many sides does it have?
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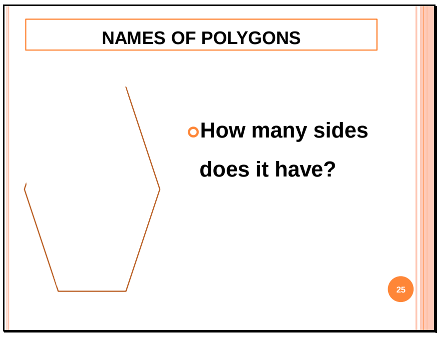
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How many sides does it have?
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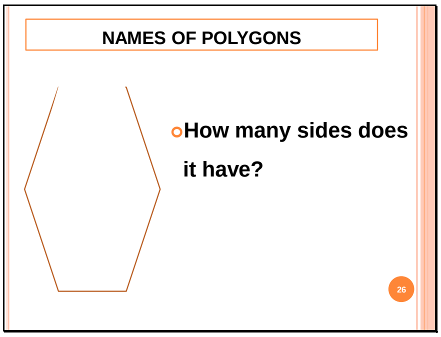
NAMES OF POLYGONS
How many sides does it have?
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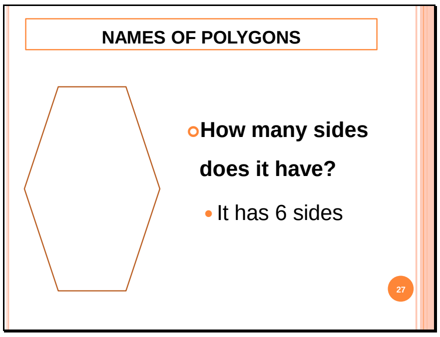
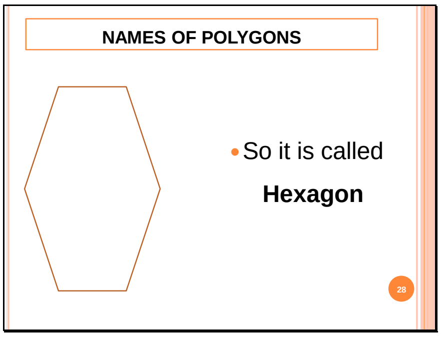
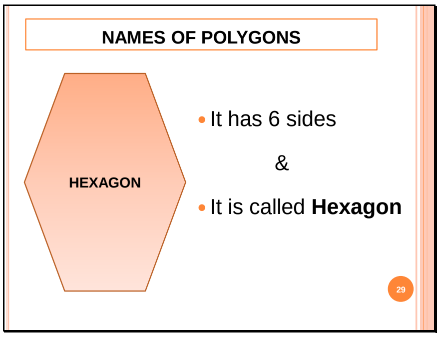
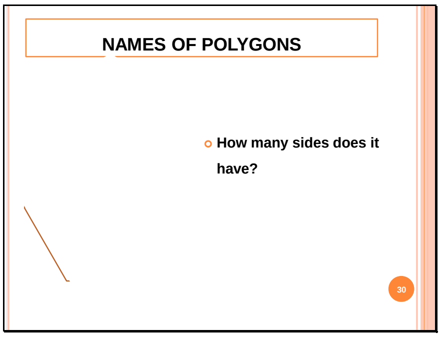

NAMES OF POLYGONS
How many sides does it have?
It has 6 sides
27


NAMES OF POLYGONS
So it is called
Hexagon
28


NAMES OF POLYGONS
HEXAGON
It has 6 sides
&
It is called Hexagon
29


NAMES OF POLYGONS
How many sides does it have?
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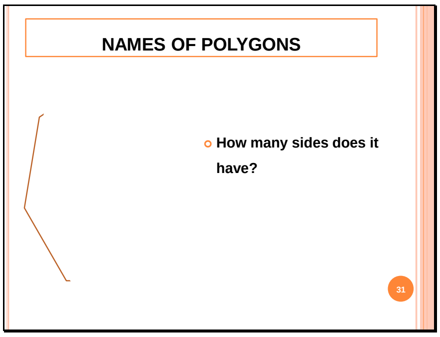
NAMES OF POLYGONS
How many sides does it have?
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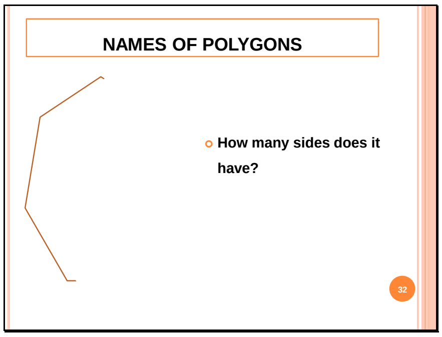
NAMES OF POLYGONS
How many sides does it have?
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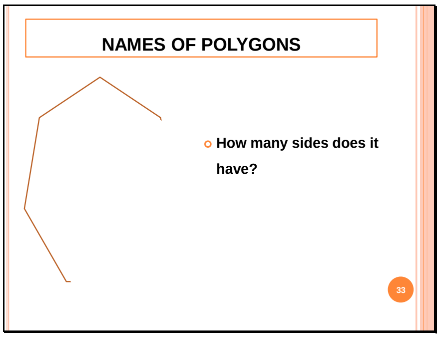
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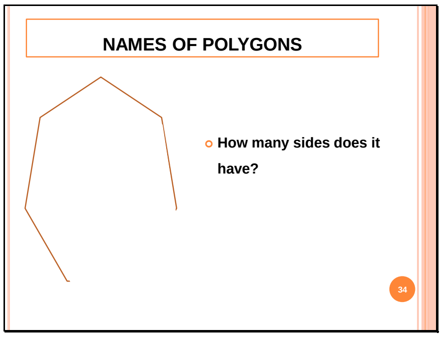
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How many sides does it have?
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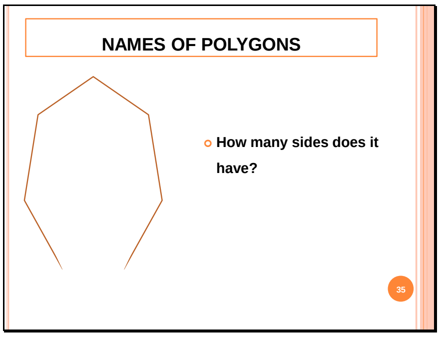
NAMES OF POLYGONS
How many sides does it have?
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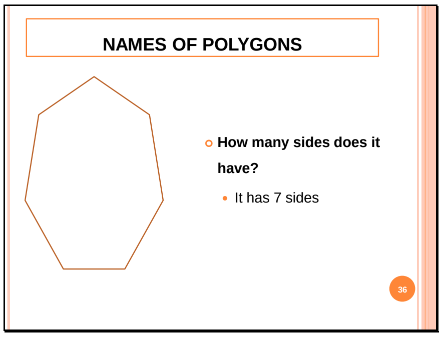
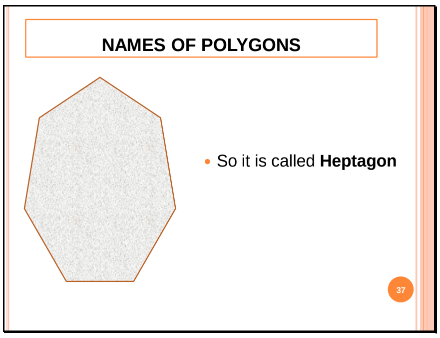
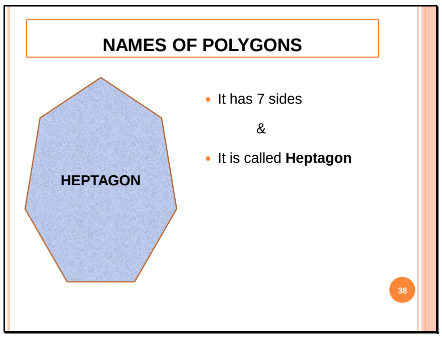
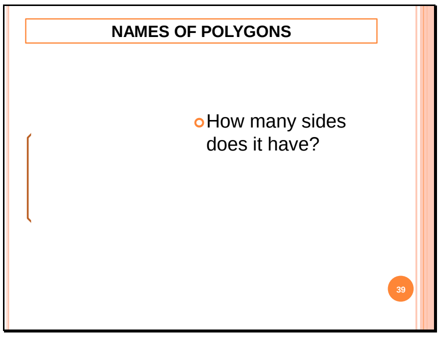

NAMES OF POLYGONS
How many sides does it have?
It has 7 sides
36


NAMES OF POLYGONS
So it is called Heptagon
37


NAMES OF POLYGONS
HEPTAGON
It has 7 sides
&
It is called Heptagon
38


NAMES OF POLYGONS
How many sides does it have?
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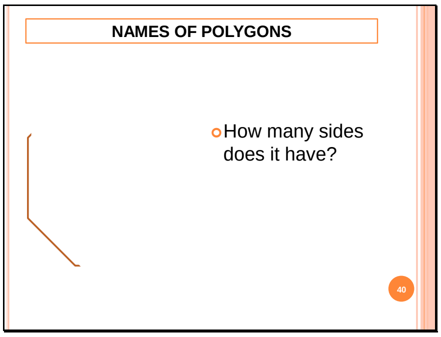
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How many sides does it have?
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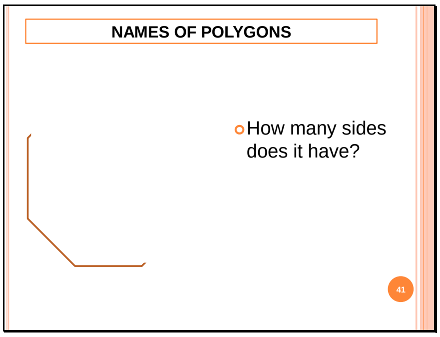
NAMES OF POLYGONS
How many sides does it have?
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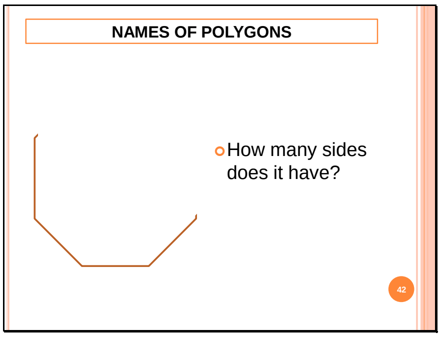
NAMES OF POLYGONS
How many sides does it have?
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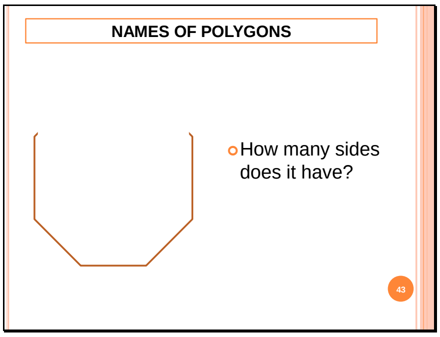
NAMES OF POLYGONS
How many sides does it have?
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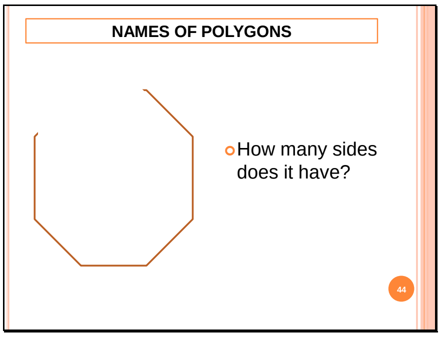
NAMES OF POLYGONS
How many sides does it have?
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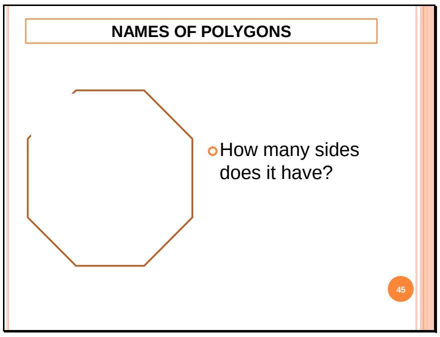
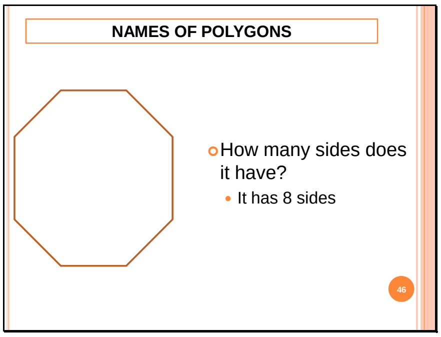
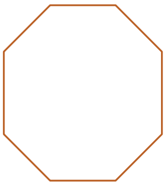

NAMES OF POLYGONS
How many sides does it have?
45


NAMES OF POLYGONS
How many sides does it have?
It has 8 sides
46

NAMES OF POLYGONS



- So it's called **Octagon.**

47

NAMES OF POLYGONS

- It has 8 sides

&

- So it is called **Octagon**

48

NAMES OF POLYGONS

- How many sides does it have?

49

NAMES OF POLYGONS

- How many sides does it have?

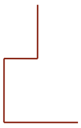
50

NAMES OF POLYGONS

- How many sides does it have?

51

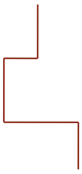
NAMES OF POLYGONS



- How many sides does it have?

52

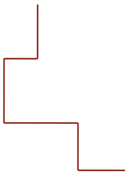
NAMES OF POLYGONS



- How many sides does it have?

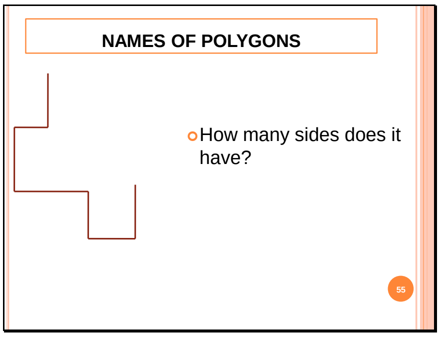
53

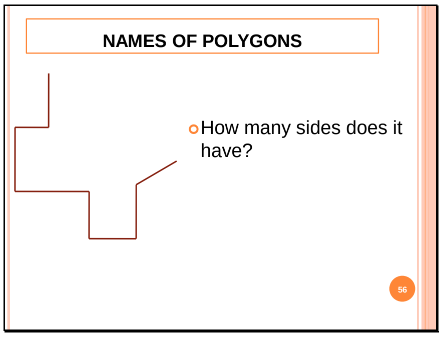
NAMES OF POLYGONS

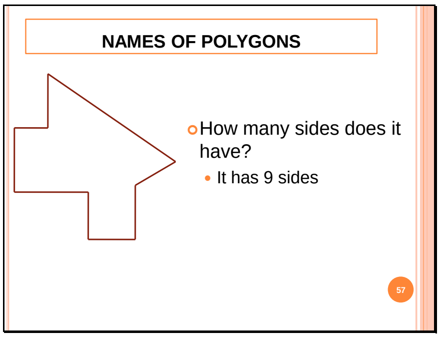


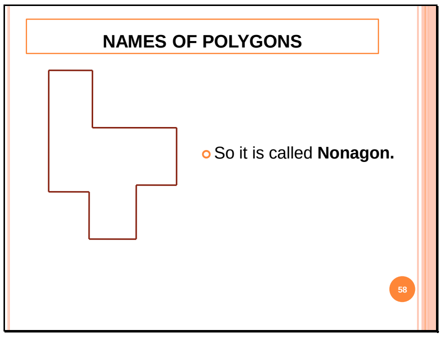
- How many sides does it have?

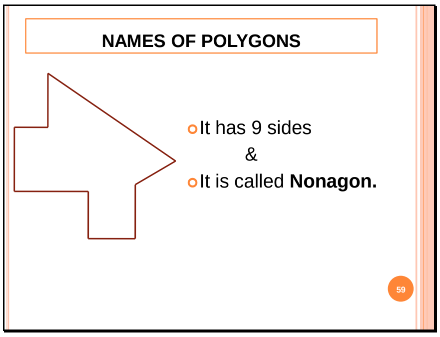
54

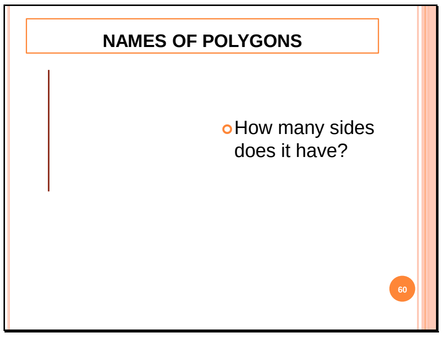

NAMES OF POLYGONS
How many sides does it have?
55

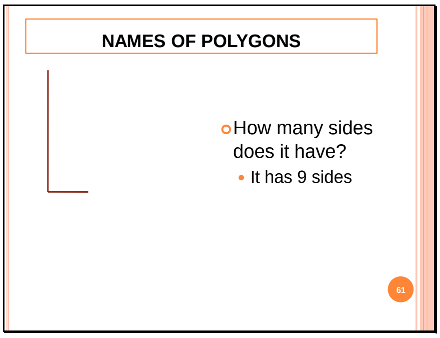

NAMES OF POLYGONS
How many sides does it have?
56

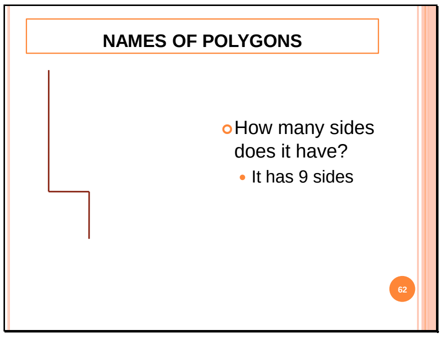

NAMES OF POLYGONS
How many sides does it have?
It has 9 sides
57

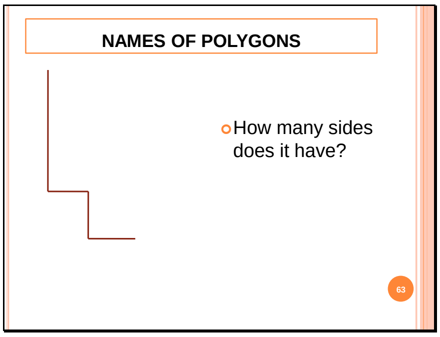

NAMES OF POLYGONS
So it is called **Nonagon.**
58

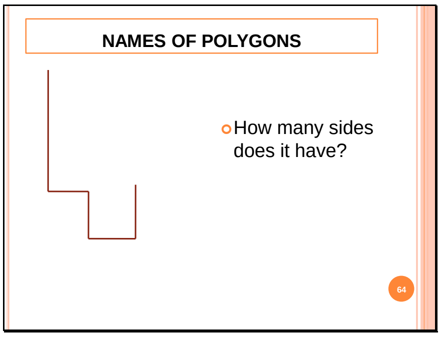

NAMES OF POLYGONS
It has 9 sides
&
It is called **Nonagon.**
59

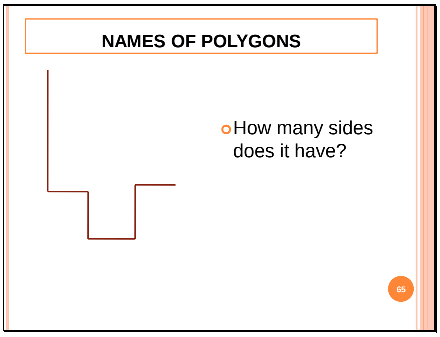

NAMES OF POLYGONS
How many sides does it have?
60

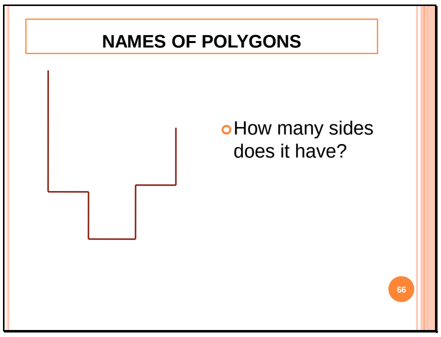

NAMES OF POLYGONS
How many sides does it have?
It has 9 sides
61

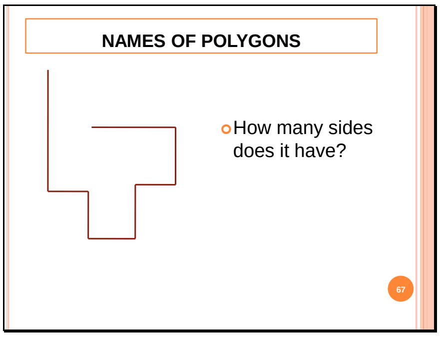

NAMES OF POLYGONS
How many sides does it have?
It has 9 sides
62

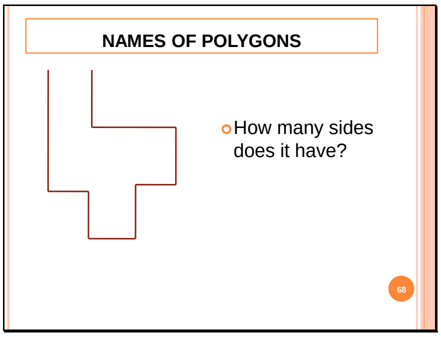

NAMES OF POLYGONS
How many sides does it have?
63

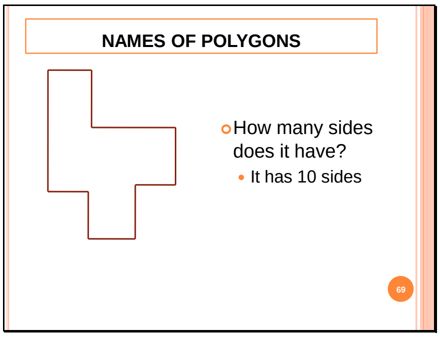

NAMES OF POLYGONS
How many sides does it have?
64

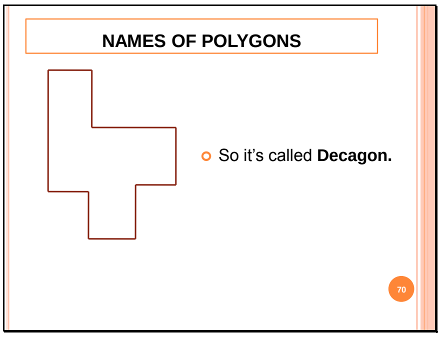

NAMES OF POLYGONS
How many sides does it have?
65

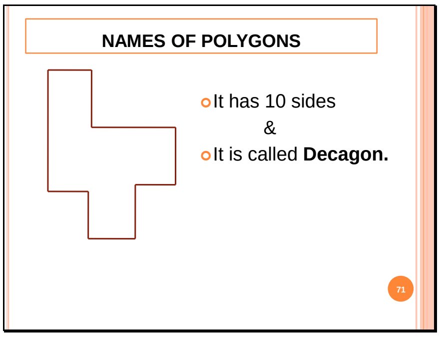

NAMES OF POLYGONS
How many sides does it have?
66

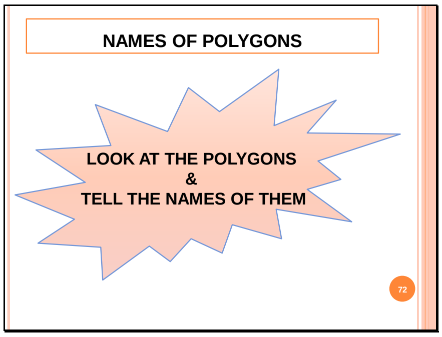

NAMES OF POLYGONS
How many sides does it have?
67

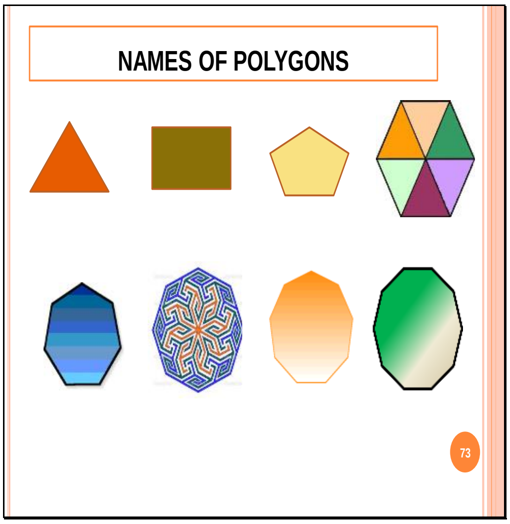

NAMES OF POLYGONS
How many sides does it have?
68

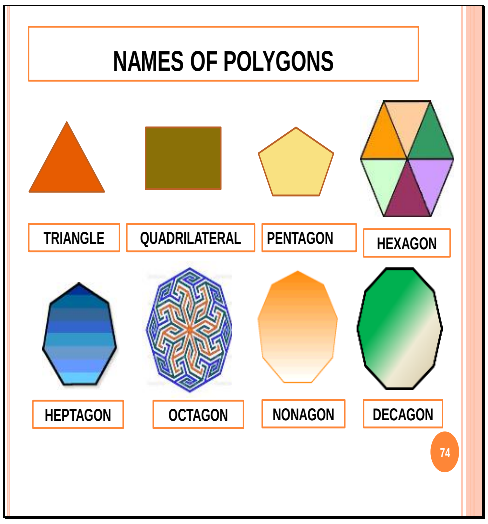

NAMES OF POLYGONS
How many sides does it have?
It has 10 sides
69


NAMES OF POLYGONS
So it's called Decagon.
70


NAMES OF POLYGONS
It has 10 sides
&
It is called Decagon.
71


NAMES OF POLYGONS
LOOK AT THE POLYGONS
&
TELL THE NAMES OF THEM
72


NAMES OF POLYGONS
73


NAMES OF POLYGONS
TRIANGLE
QUADRILATERAL
PENTAGON
HEXAGON
HEPTAGON
OCTAGON
NONAGON
DECAGON
74

Appendix N: Sample Post-Test for English

EMC 7th Form **Post-Test 2** **English Quiz**

Name & Surname:___________________________

Vocabulary

Instruction: Read the questions carefully and choose (mark) the best alternative.

1. **I'm going on holiday with my parents. They arranged the _____________ so we know where we are going to stay.**

a) adventure b) accommodation c) information d) performance

2. **My brother is living in a _________ on the third floor next to ours.**

a) field b) show c) flat d) stage

3. **I am _______ to seeing my girlfriend. I miss her very much.**

a) getting on with b) getting up

c) looking forward d) looking around

4. **People have different _________ in the world. Some of them are punk, some of them are**

a) lifestyles b) instruments c) servants d) objects

5. **Some __________ on cancer are working hard to treat it in the near future.**

a) specialist b) psychologist c) professional d) individual

6. **Hasan is asking for your _________ on this subject. He wants to know what you think about it.**

a) goods b) case c) interval d) opinion

7. **Dedective: What does he look like? We need the _______ of the murderer to find him more quickly.**

a) reservation b) description c) advice d) interests

8. **It is important to _______ your food with others, because there are a lot of hungry people in the world.**

a) split b) divide c) share d) complain

9. **That Blue Porche _______ to my uncle.**

a) goes b) moves c) belongs d) points

10. Turkey is a/an ________ country in the world. It's free to decide on what to do.

a) independent b) traditional c) stupid d) fantastic

11. Ayşe _______ will not come to the party tonight because she must finish her project.

a) immediately b) personally c) usually d) probably

12. Tom: What do you do?

Mark: I'm a/an _______. I prepare news for a newspaper.

a) hairdresser b) journalist c) clerk d) artist

13. Generally I _______ coffee to tea. I like drinking coffee.

a) mend b) design c) prefer d) like

14. We mustn't park on the _______ as they belong to the pedestrians (people who walk).

a) pavement b) rails c) grass d) rocks

15. It is not always easy for Hasan to _________. He is quite shy.

a) book tickets b) look forward to c) wake up d) make friends

16. If you are young and if you have a good physical appearance, then you can wear a short ______ . Also, I believe it really suits some girls.

a) trousers b) skirt c) shirt d) suit

17. You should always check the pressure of your car's _______ when you go to the petrol station.

a) gun b) tyre c) plug d) sink

18. Finding a hard-working _________ to employ in our shop nowadays is not easy.

a) shop assistant b) librarian c) clerk d) model

19. If you want to earn a lot of money you should have at least 10 years ________.

a) family tree b) central heating

c) coastal area d) work experience

20. I tried to ________ my shoes but I couldn't. So, I had to find a shoe repairer.

a) sell b) cut c) mend d) book

Language Features

Instruction: Read the questions carefully and choose (mark) the best alternative

21. I have to _______ as soon as possible whether I tell Mary that I love her or not.

a) believe b) enjoy c) think d) decide

22. When I _________ my car, it always ___________ afterwards.

a) washes / rains b) wash / rains

c) wash / rain d) washes / rain

23. Ahmet : Ali what are you doing?

Ali : I _______ my breakfast.

a) am having b) have c) have to d) having

24. Hasan: What are you doing?

Mehmet: I _______ my room and my mum _________ the meal.

a) clean / prepares b) cleaning / preparing

c) am cleaning / is preparing d) clean / is preparing

25. Ahmet : Where do you ______. In the dormitory or in a house?

Ayse : I am living in the dormitory.

a) staying b) stay c) to stay d) stay to

26. I ________ you will pass all your examinations because you are studying very hard.

a) believing b) am believing c) believe d) to believe

27. Please do not ________ to post my letters today. We haven't got enough time for Christmas.

a) forget b) believe c) think d) stay

28. A: What are you doing?

B: I ________ about what to buy for my girlfriends birthday

a) thinking b) think c) to think d) am thinking

29. I _____ listening to Turkish pop music but my brother does not.

a) am loving b) love c) love to d) loving to

30. Now, I ________ what you mean. You don't need to explain it again.

a) understand b) understanding

c) am understanding d) understand to

Appendix O: Sample Post-Test for Mathematics

EASTERN MEDITERRANEAN COLLEGE

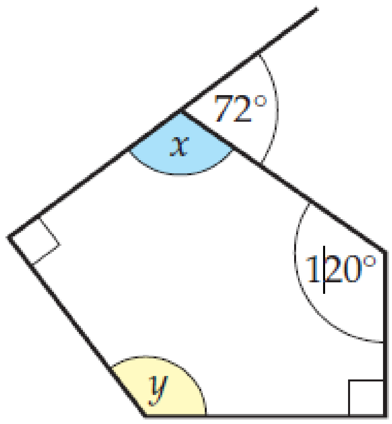
GRADE 7- MATHEMATICS

Post-Test

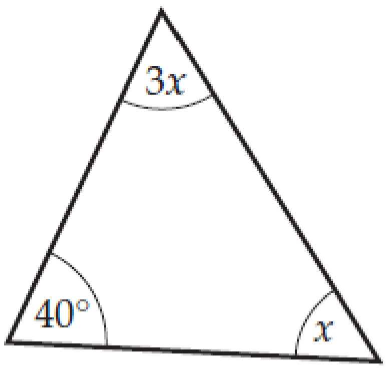
Name and Surname: **Class:**

1) Find the size of the angles marked by *x*.

a)



b)



2) A heptagon is a 8-sided polygon. Find:

a) the **sum of the interior angles** of an octagon

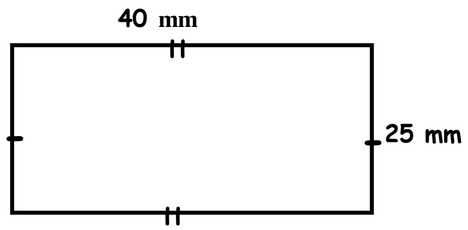
b) the **sum of the external angles** of an octagon

c) the size of **each interior angle** of a regular octagon

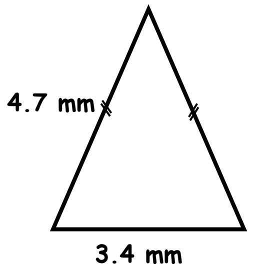
d) the size of **each exterior angle** of a regular octagon

3-) **How many sides** does a regular polygon have if it has an interior angle of 144^0?

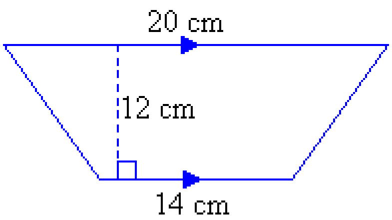
4) Find **the area** of a rectangle below.



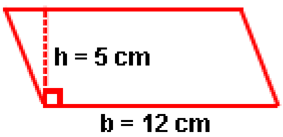
5) Find **the perimeter** of the triangle below.



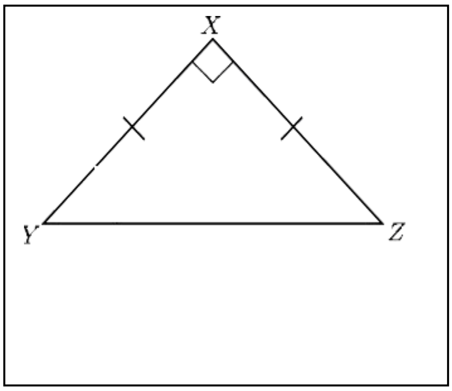
6) Find **the area** of the following trapezium.



7) Find **the area** of a parallelogram with a base of 12 cm and a height of 5 cm.



8-) Find **the area** of a rig triangle with a base and a height of 10 cm.



Appendix P: Teknoloji Destekli Sınıf Görüş Ölçeği (in Turkish)

Öğrenci Anketi

Sevgili Öğrenciler,
Bu araştırmanın amacı sizlerin sınıf içerisinde kullanılan çeşitli teknolojik araçlarla ilgili düşünce ve görüşlerinizi belirlemektir. Bu anketin sonuçları sadece araştırmacı tarafından doktora tezinde kullanılmak amacı ile değerlendirilecek ve bu çalışma harici kullanılmayacaktır. Ankete vereceğiniz yanıtların içten ve doğru olması bu araştırmanın güvenirliliğini artıracak ve araştırılan konunun gerçekçi biçimde tanımlanmasına katkıda bulunacaktır.

Katkılarınızdan dolayı teşekkür ederim.
Ramadan Eyyam **2009 - 2010**

Aşağıdaki cümleleri okuyarak **EVET / KARARSIZIM / HAYIR** seçeneklerinden size en uygun gelen birini ilgili kutuyu **X** koyarak işaretleyiniz.

Öğretmenimin sınıfta bilgisayar ve yansıtıcı kullanarak anlattığı ...	EVET	KARARSIZIM	HAYIR
1. derslerden daha çok hoşlanıyorum.	☐	☐	☐
2. dersler daha eğlenceli geçiyor.	☐	☐	☐
3. derslere daha çok katılıyorum.	☐	☐	☐
4. dersleri çok yararlı buluyorum.	☐	☐	☐
5. derslerde daha başarılı olduğumu düşünüyorum.	☐	☐	☐
6. derslerde öğretmenim benimle daha çok ilgileniyor.	☐	☐	☐
7. derslerde daha çok öğrendiğimi hissediyorum.	☐	☐	☐
8. dersleri daha kolay öğrendiğimi hissediyorum.	☐	☐	☐
9. zor konuları bile daha kolay öğreniyorum.	☐	☐	☐
10. derslerin daha yararlı olduğuna inanıyorum.	☐	☐	☐
11. dersleri tercih ederim.	☐	☐	☐

Appendix Q: Technology-enhanced Classroom Perception Scale (in English)

Student Questionnaire

Dear Students,
The aim of this research is to find out your thoughts and opinions about the technological instruments used during the lessons. The results of this questionnaire will be analyzed and used in the PhD. Dissertation of the researcher and it will not be used anywhere else. Your sincere and true answers given to the questionnire will increase the reliability of it and it will also positively contribute the definition of the researched topic.

Thank you for your contribution.
Ramadan Eyyam **2009 - 2010**

Read the statements and answer chosing from one of the choices **(YES / INDECISIVE / NO)** which most suits you using **X** to fill the box.

When my teacher used computer and projection ……….	YES	INDECISIVE	NO
1. I like the lessons more.	☐	☐	☐
2. The lessons are more fun.	☐	☐	☐
3. I participate more.	☐	☐	☐
4. The lessons are more useful.	☐	☐	☐
5. I think I am more successful in the lessons.	☐	☐	☐
6. In the lessons my teacher takes care of me more.	☐	☐	☐
7. I feel I learn more in the lessons.	☐	☐	☐
8. I feel I learn the lessons more easily.	☐	☐	☐
9. I learn even difficult topics more easily.	☐	☐	☐
10. The lessons are more effective.	☐	☐	☐
11. I prefer the lessons more.	☐	☐	☐

Appendix R: Interview Questions for Teachers

- How effective were the lessons in technology-enhanced classroom?
- How were your students' attitudes towards technology-enhanced classroom?
- What do you think the benefits of technology-enhanced classroom were in class?
- Please specify any difficulties you faced in technology-enhanced classroom.
- How was students' participation level in lessons in technology-enhanced classroom?
- What do you think your students' level of understanding were in lessons in technology-enhanced classroom?
- How productive do you think your lessons were in technology-enhanced classroom?
- What else can you mention about your lessons in technology-enhanced classroom?

Appendix S: Sample ITEMAN Analysis Outputs

```
       Item and Test Analysis Program -- ITEMAN (tm) Version 3.50


Item analysis for data from file C:\ITEMAN\RAMADAN\PRET2.TXT

********************  ANALYSIS SUMMARY INFORMATION
*******************


         Data (Input) File: C:\ITEMAN\RAMADAN\PRET2.TXT
      Analysis Output File: C:\ITEMAN\RAMADAN\PRET2.OUT
         Score Output File: C:\ITEMAN\RAMADAN\PRET2.SCR
           Exceptions File: NONE
    Statistics Output File: NONE

  Scale Definition Codes:  DICHOT = Dichotomous   MPOINT =
Multipoint/Survey


  Scale:           0
               -------
Type of Scale   DICHOT
N of Items          30
N of Examinees      83


                   *****  CONFIGURATION INFORMATION  *****

             Type of Correlations:  Point-Biserial

      Correction for Spuriousness:  NO

                 Ability Grouping:  YES

                Subgroup Analysis:  NO

          Express Endorsements As:  PROPORTIONS

        Score Group Interval Width:  1
```

		Item Statistics			Alternative Statistics					
Seq. No.	Scale -Item	Prop. Correct	Disc. Index	Point Biser.	Alt.	Prop. Endorsing Total	Low	High	Point Biser.	Key
1	0-1	.52	.61	.51	A	.27	.38	.20	-.20	
					B	.52	.13	.73	.51	*
					C	.12	.21	.07	-.18	
					D	.08	.25	.00	-.30	
					Other	.01	.00	.00	-.21	
2	0-2	.75	.47	.45	A	.02	.08	.00	-.20	
					B	.07	.21	.00	-.31	
					C	.75	.50	.97	.45	*
					D	.16	.21	.03	-.24	
					Other	.00	.00	.00		
3	0-3	.25	.06	.15	A	.00	.00	.00		
					B	.20	.33	.17	-.18	
					C	.25	.21	.27	.15	*
					D	.51	.42	.57	.07	
					Other	.04	.00	.00	-.13	
4	0-4	.63	.35	.34	A	.63	.42	.77	.34	*
					B	.14	.17	.17	-.02	
					C	.06	.17	.00	-.32	
					D	.16	.25	.07	-.22	
					Other	.01	.00	.00	-.02	
5	0-5	.18	.14	.19	A	.18	.13	.27	.19	*
					B	.11	.13	.03	-.18	
					C	.66	.71	.63	-.04	
					D	.05	.04	.07	.01	
					Other	.00	.00	.00		

6	0-6	.47	.71	.56	A	.13	.33	.03	-.28	
					B	.22	.42	.03	-.37	
					C	.14	.13	.07	-.10	
					D	.47	.13	.83	.56	*
					Other	.04	.00	.00	.02	
7	0-7	.39	.21	.27	A	.10	.08	.10	.02	
					B	.39	.29	.50	.27	*
					C	.30	.46	.23	-.26	
					D	.14	.13	.10	-.06	
					Other	.07	.00	.00	.01	
8	0-8	.46	.76	.63	A	.16	.38	.00	-.42	
					B	.18	.21	.07	-.18	
					C	.46	.04	.80	.63	*
					D	.16	.33	.10	-.25	
					Other	.05	.00	.00	-.02	
9	0-9	.30	.45	.47	A	.27	.33	.13	-.24	
					B	.28	.33	.20	-.13	
					C	.30	.08	.53	.47	*
					D	.12	.17	.13	-.06	
					Other	.04	.00	.00	-.16	
10	0-10	.25	.46	.43	A	.25	.04	.50	.43	*
					B	.06	.13	.03	-.11	
					C	.34	.54	.10	-.40	
					D	.34	.25	.37	.09	
					Other	.01	.00	.00	-.09	
11	0-11	.31	.52	.55	A	.06	.08	.07	-.08	
					B	.07	.13	.07	-.13	
					C	.54	.67	.27	-.39	

					D	.31	.08	.60		.55	*
					Other	.01	.00	.00	-	.09	
12	0-12	.40	.36	.32	A	.05	.04	.03	-	.06	
					B	.40	.21	.57		.32	*
					C	.23	.29	.23	-	.05	
					D	.31	.46	.17	-	.27	
					Other	.01	.00	.00	-	.02	
13	0-13	.46	.68	.58	A	.04	.08	.00	-	.25	
					B	.07	.17	.00	-	.19	
					C	.46	.13	.80		.58	*
					D	.42	.63	.20	-	.38	
					Other	.01	.00	.00	-	.04	
14	0-14	.41	.57	.50	A	.41	.17	.73		.50	*
					B	.11	.29	.00	-	.40	
					C	.28	.25	.23	-	.07	
					D	.18	.25	.03	-	.20	
					Other	.02	.00	.00	-	.08	
15	0-15	.82	.50	.57	A	.00	.00	.00			
					B	.08	.29	.00	-	.41	
					C	.10	.21	.00	-	.35	
					D	.82	.50	1.00		.57	*
					Other	.00	.00	.00			
16	0-16	.37	.14	.17	A	.22	.25	.23	-	.01	
					B	.37	.29	.43		.17	*
					C	.23	.33	.17	-	.19	
					D	.17	.08	.17		.06	
					Other	.01	.00	.00	-	.21	
17	0-17	.48	.49	.45	A	.23	.42	.17	-	.24	

					B	.48	.21	.70	.45	*	
					C	.16	.17	.10	-.10		
					D	.10	.17	.03	-.24		
					Other	.04	.00	.00	-.08		
18	0-18	.66	.54	.47	A	.66	.29	.83	.47	*	
					B	.07	.13	.03	-.22		
					C	.11	.21	.07	-.18		
					D	.14	.33	.07	-.29		
					Other	.01	.00	.00	-.09		
19	0-19	.57	.34	.33	A	.17	.33	.13	-.23		
					B	.13	.25	.07	-.28		
					C	.11	.08	.13	.09		
					D	.57	.29	.63	.33	*	
					Other	.02	.00	.00	-.07		
20	0-20	.24	-.01	-.02	A	.36	.33	.27	.01		
					B	.35	.33	.50	.07	?	CHECK THE KEY
					C	.24	.21	.20	-.02	*	C was specified, B works better
					D	.05	.13	.03	-.11		
					Other	.00	.00	.00			
21	0-21	.27	.57	.54	A	.20	.08	.20	.09		
					B	.31	.63	.10	-.45		
					C	.19	.25	.10	-.16		
					D	.27	.00	.57	.54	*	
					Other	.02	.00	.00	-.04		
22	0-22	.43	.58	.56	A	.25	.46	.07	-.39		
					B	.43	.13	.70	.56	*	
					C	.27	.25	.23	-.07		
					D	.05	.17	.00	-.37		
					Other	.00	.00	.00			

23	0-23	.72	.24	.24	A	.72	.63	.87	.24	*
					B	.06	.13	.00	-.23	
					C	.17	.25	.10	-.17	
					D	.04	.00	.03	.06	
					Other	.01	.00	.00	-.02	
24	0-24	.61	.57	.52	A	.25	.33	.07	-.32	
					B	.11	.25	.03	-.22	
					C	.61	.33	.90	.52	*
					D	.02	.08	.00	-.29	
					Other	.00	.00	.00		
25	0-25	.81	.23	.23	A	.16	.21	.10	-.10	
					B	.81	.67	.90	.23	*
					C	.01	.04	.00	-.11	
					D	.02	.08	.00	-.29	
					Other	.00	.00	.00		
26	0-26	.53	.47	.39	A	.07	.17	.00	-.32	
					B	.34	.46	.17	-.21	
					C	.53	.33	.80	.39	*
					D	.02	.04	.00	-.09	
					Other	.04	.00	.00	.02	
27	0-27	.63	.50	.44	A	.63	.33	.83	.44	*
					B	.10	.17	.03	-.18	
					C	.23	.33	.13	-.24	
					D	.05	.17	.00	-.27	
					Other	.00	.00	.00		
28	0-28	.61	.68	.55	A	.05	.04	.00	-.14	
					B	.33	.67	.07	-.48	
					C	.01	.04	.00	-.11	
					D	.61	.25	.93	.55	*

					Other	.00	.00	.00		
29	0-29	.82	.22	.28	A	.06	.13	.00	-.28	
					B	.82	.75	.97	.28	*
					C	.12	.13	.03	-.12	
					D	.00	.00	.00		
					Other	.00	.00	.00		
30	0-30	.54	.38	.42	A	.54	.29	.67	.42	*
					B	.08	.17	.03	-.20	
					C	.24	.29	.27	-.12	
					D	.13	.25	.03	-.30	
					Other	.00	.00	.00		

There were 83 examinees in the data file.

Scale Statistics

Scale:	0
N of Items	30
N of Examinees	83
Mean	14.892
Variance	32.386
Std. Dev.	5.691
Skew	0.130
Kurtosis	-0.337
Minimum	2.000
Maximum	29.000
Median	15.000
Alpha	0.826
SEM	2.373
Mean P	0.496
Mean Item-Tot.	0.403
Mean Biserial	0.525
Max Score (Low)	11
N (Low Group)	24
Min Score (High)	18
N (High Group)	30

SCALE # 0 Score Distribution Table

```
 Number      Freq-      Cum
 Correct     uency      Freq     PR    PCT
 -------    -------    ------   ----   ----
     1          0          0      1      0       |
     2          1          1      1      1       |#
     3          0          1      1      0       |
     4          2          3      4      2       |##
     5          0          3      4      0       +
     6          1          4      5      1       |#
     7          4          8     10      5       |#####
     8          6         14     17      7       |#######
     9          3         17     20      4       |####
    10          3         20     24      4       +####
    11          4         24     29      5       |#####
    12          5         29     35      6       |######
    13          4         33     40      5       |#####
    14          4         37     45      5       |#####
    15          8         45     54     10       +##########
    16          5         50     60      6       |######
    17          3         53     64      4       |####
    18         11         64     77     13       |#############
    19          4         68     82      5       |#####
    20          3         71     86      4       +####
    21          1         72     87      1       |#
    22          4         76     92      5       |#####
    23          1         77     93      1       |#
    24          0         77     93      0       |
    25          3         80     96      4       +####
    26          0         80     96      0       |
    27          2         82     99      2       |##
    28          0         82     99      0       |
    29          1         83     99      1       |#
    30          0         83     99      0       +
                                                 |----+----+----+----+-
---+
                                                    5   10   15   20
25
                                                  Percentage of
Examinees
```

Appendix T: Sample Coding Schema

1. **Effects on teaching**
   POSEFONTEACH1 (increase in pace of lesson)
   POSEFONTEACH2 (enrich teaching)
   POSEFONTEACH3 (productive lessons)
   NEGEFONTEACH1 (production)
   NEGEFONTEACH2 (planning)

2. **Effects on classroom management**
   POSEFONCLASSMANG1 (participative)
   POSEFONCLASSMANG2 (enjoyable)
   NEGEFONCLASSMANG1 (longer activities)
   NEGEFONCLASSMANG2 (waste of class / teaching time)
   NEGEFONCLASSMANG3 (seating arrangement)

3. **Effects on learning**
   POSEFONLEARN1 (increase / attract interest)
   POSEFONLEARN2 (increase attention span)
   POSEFONLEARN3 (increase enthusiasm / motivation)
   POSEFONLEARN4 (increase participation)
   POSEFONLEARN5 (increase understanding / comprehension)
   POSEFONLEARN6 (increase performance)
   POSEFONLEARN7 (increase communication / interaction)
   POSEFONLEARN8 (permanent learning)
   POSEFONLEARN9 (fun / enjoyable)
   POSEFONLEARN10 (increase pace of students)
   NEGEFONLEARN1 (boredom)
   NEGEFONLEARN2 (decrease participation towards the end of the lesson)
   NEGEFONLEARN3 (decrease grades)
   NEGEFONLEARN4 (negative reaction)

4. **Reasons for Having Lessons in Technology-enhanced Classroom**
   POSREASUSETECH1 (inevitable)
   POSREASUSETECH2 (periodical)
   POSREASUSETECH3 (save time)
   POSREASUSETECH4 (increase participation)
   POSREASUSETECH5 (make ss more eager and participative)
   NEGREASUSETECH1 (power cut)

Appendix U: Sample Coding Interview Segment

T4: I believe it is a good method as it [attracts students' interest] **POSEFONLEARN1** but I believe it should be used [periodically] **POSREASUSETECH2** since students [may get bored] **NEGEFONLEARN1** with it. I believe different tools and materials should be used with the students at this age.

T5: Usually using educational technology was effective due to many reasons. First of all, using educational technology in class created [more colorful, audio, vivid and authentic lessons] **POSEFONLEARN1** the students were [more eager to participate] **POSREASUSETECH5** and they were [more interested and attentive] **POSREASUSETECH5** in class.

T4: As we don't have built-in systems in our classes, teachers [waste some of their teaching time] **NEGEFONCLASSMANG2** in setting up the equipment which [affects the productivity] **NEGEFONTEACH1** of the lessons. It also affects the [sitting arrangement] **NEGEFONCLASSMANG3** of students.

T4: Usually the [participation was high] **POSEFONLEARN4**. Clear, simple and comprehensible lesson plans [increased the motivation] **POSEFONLEARN3**. However, as the [students got bored] **NEGEFONLEARN1** there was a [decrease in their participation levels towards the end] **NEGEFONLEARN2** of the experiment.