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Table of Contents

AN EXPLORATORY STUDY OF ENGLISH LANGUAGE TEACHERS' BELIEFS, ASSUMPTIONS, AND KNOWLEDGE ABOUT LEARNER-CENTEREDNESS

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ABSTRACT
The purpose of this comparative case study was to explore English language teachers' beliefs, assumptions and knowledge about learner-centeredness and to see how they implement learner-centeredness in their classrooms. The study was conducted at one public and one private primary school in Istanbul. Focus group interviews were held in each school with thirteen teachers of English and then individual interviews and observations were carried out with four volunteer teachers being 2 from the public primary school during the spring semester, 2004-2005. The four participant teachers were observed in their classrooms ten times along with before- and after-class observation reflections facilitated by the researcher. These observations were accompanied by document analysis. Data from the interviews were inductively analyzed. The findings indicated that public school EFL teachers had limited knowledge to implement learner-centeredness whereas private teachers did not.
Key words: learner-centeredness, belief, innovation

ÖZ
Bu karşılaştırmalı olgu incelemesinin amacı İngilizce öğretmenlerinin öğrenen-odaklılık ile ilgili inanç, düşünce ve bilgilerini araştırmak ve öğrenen odaklılığını derslerinde nasıl uyguladıklarını görmektir. Araştırma İstanbul'da bir tane devlet, bir tane özel ilköğretim okulunda yürütülmüştür. Her okulda öğretmenlerle odak kümeleri oluşturulmuş, kendileriyle teker teker görüşmeler yapılmış ve özel ilköğretimde çalışan 2 ve devlet ilköğretim okulunda görev yapmakta olan 2 öğretmen olmak üzere toplam 4 gönüllü öğretmen 2004- 2005 Bahar yarıyılı boyunca gözlemlenmiştir. Katılan dört öğretmenle yapılan 10'ar gözlemin her birinin öncesinde ve sonrasında bu öğretmenlerin görüşleri alınmıştır. Bu gözlemler belge çözümlemesiyle işlenmiş, görüşmeler tümevarımsal olarak çözümlenmiştir. Araştırma sonuçları devlet ilköğretim okulunda çalışan İngilizce öğretmenlerinin öğrenen-odaklılığı konusunda bilgi eksikliğine sahip olduklarını göstermiştir. Özel ilköğretim okulu öğretmenleri içinse bu durum söz konusu değildir.
Anahtar sözcükler: öğrenen-odaklılığı, inanç, yenilik

INTRODUCTION

Today, there is a new wave of effort to define effective teaching in Turkish education. This requires a reestablishment of the curriculum and the starting point is primary education. Innovations brought about by MONE reflect constructivist principles such as improvement of pedagogical skills, creating environments conducive to learning while deemphasizing transmission of theoretical knowledge and enhancing the interaction between education faculties and the schools where prospective teachers observe classrooms and practice teaching. The programs further consider the education standards of the EU countries (www.meb.gov.tr/indexeng.htm).

One of the targets in the 7th five year plan of the government is rearranging and reorganizing curricular programs, teaching methods and techniques, and education-training equipment materials in accord with international standards. A major premise of the new trend in education in Turkey is that pupils should be actively involved in their own learning and in the construction and development of knowledge and ideas. It is also proposed that more attention should be paid to the individual learning needs of different students so that variations in student learning styles, speeds and abilities can be better catered to. Since improvement of basic education is one of the objectives of the ministry, the programs of certain courses have been renewed on the basis of constructivist and learner-centered principals. These courses include Turkish grades 1 to 5, Mathematics grades 1 to 5, Social Sciences for grades 4 to 5, Social Sciences for grades 1 to 3, and lastly Science and Technology including grades 4 and 5. Restructuring the curriculum will be extended to sixth, seventh and eight grades (http://programlar.meb.gov.tr/index/giris_index.htm). Even though the English program at primary level has not been renewed yet, it is on the way. The basic principle underlying the improvement of the English program is learner-centeredness.

A major premise of the new trend in education in Turkey is that pupils should be actively involved in their own learning and in the construction and development of knowledge and ideas. It is also proposed that more attention should be paid to the individual learning needs of different students so that variations in student learning styles, speeds and abilities can be better catered for. However, the most prevalent methods of teaching in Turkish contexts focus on rote memorization (Yıldırım 2000, pp.1-2). Conventional foreign language instruction is

usually oriented around the teacher, textbook, and individual work in class. The teachers are the source of knowledge and take all the responsibilities in the classrooms. Students are considered passive learners who wait for the teachers to take in knowledge and information.

Transferring the theory of *learner-centered* teaching into actual practice is the challenge faced by classroom teachers and educational administrators. Such transfer begins with practitioners having a clear understanding of the various underpinnings of the concept – the principles that form the prerequisite foundation. According to Prawat (1992), teachers are viewed as important agents of change in the reform effort; however teachers are also viewed as major obstacles to change because of their adherence to outmoded forms of instruction that emphasize factual and procedural knowledge. Therefore, the purpose of this study is to explore the current beliefs, assumptions, and knowledge (BAK) of English language teachers about learner-centeredness and to see how they implement learner-centered instruction.

REVIEW OF LITERATURE

Introduction

Currently, there is increasing recognition that the beliefs individuals hold are the best indicators of the decisions they make during the course of everyday life (Bandura, 1986). Pajares (1992, p. 307) argues that the investigation of teachers' beliefs "should be a focus of educational research and can inform educational practice in ways that prevailing research agendas have not and cannot". Educational researchers trying to understand the nature of teaching and learning in classrooms have usefully exploited this focus on belief systems. The research of Jakubowski and Tobin (1991) suggests that teachers' metaphors and beliefs not only influence what teachers do in the classroom, but that changes in these same metaphors and beliefs can result in changes in their practices.

A belief can be defined as a representation of the information someone holds about an object, or a "person's understanding of himself and his environment" (Fishbein and Ajzen, 1975, p.131). This object can "be a person, a group of people, an institution, a behavior, a policy, an event, etc., and the associated attribute may be any object, trait, property, quality, characteristic, outcome, or event" (Fishbein and Ajzen, 1975, p.12).

Teacher Beliefs and Educational Innovations

There is an area where research on teacher beliefs can potentially be relevant, that is, the field of educational innovations. In many past educational innovations, the teacher was seen as the executor and implementer of innovations that were devised by others. Teachers were supposed to implement these innovations in accordance with the intentions of the developers as much as possible.

There is a growing consensus that educational innovations are doomed to fail if the emphasis remains on developing specific skills, without taking into account the teachers' cognitions, including their beliefs, intentions, and attitudes (Trigwell, Prosser, & Taylor, 1994). Many innovations are considered impractical by the teachers concerned because, for instance, they are unrelated to familiar routines (leading to strong feelings of uncertainty and insecurity), do not fit in with their own perceptions of the domain, or conflict with the existing school culture (Brown and McIntyre, 1993; Carlgren and Lindblad, 1991). This does not mean that the knowledge and beliefs of teachers should be the standard, but it certainly means that they must be the starting point for any successful intervention or innovation. To identify their authentic beliefs with respect to the basic ideas behind the innovation, a thorough investigation into the knowledge of the teachers themselves is required.

If the innovation is incompatible with teachers' existing attitudes, resistance to change is likely to occur (Waugh and Punch, 1987). There are a number of recent reviews of largely unsuccessful attempts to implement learner-centered curricula amongst teachers whose background and experience tends towards more traditional teacher-centered methods. In some form of this occurrence has been documented in South Korea (Li, 1998) and Greece (Karavas-Doukas, 1995).

Learner-centeredness

Recently, in the field of second/foreign language education there has been a shift in focus from the teacher to the learner, from exclusive focus on how to improve teaching to an inclusive concern for how individual learners go through their learning. Very briefly, there are two reasons of this shift: the goals of language learning as well as insights into language and into the process of language learning have changed (Gremmo and Riley, 1995). Learner-centeredness is not a theory about teaching, but rather a theory about learning. Each individual decides what is important and what is relevant to construct a meaningful concept.

Nunan (2000, p.11) emphasizes the importance of learner-centered classrooms and defines learner-centered classrooms as the places where "key decisions about what will be taught, how it will be taught, when it will be taught, and how it will be accessed will be made with reference to the learner" .

In a learner-centered curriculum, information about learners from learners is used to answer when and how to teach what. Nunan (2000) elaborates several stages of negotiating a learner-centered curriculum; making instructional goals clear to learners; allowing learners to create their own goals, encouraging learners to use the second language (L2) outside the classroom; raising awareness of learning processes; helping learners identify their own preferred styles and strategies; encouraging learners to become teachers; encouraging learners to become researchers. The learner-centered curriculum also describes well how to promote learner autonomy as an educational goal at an institutional level.

One important implication of learner-centeredness for instruction is that teachers, rather than delivering already organized and interpreted subject material to students, need to guide students to create their own understandings. They accomplish this by utilizing students' backgrounds of understanding, cooperative learning, authentic learning problems, and active student engagement in the learning process. Withall (1975, p.261) conceptualized the role of teacher as one of facilitator: "The primary role and purpose of any teacher in any classroom is to help learners learn, inquire, problem-solve, and cope with their own emotional needs and tensions, as well as with the needs of those around them".

Learner-centered teaching has also been called meaning-making, progressive, constructivist, students-centered, andragogy, holistic, and focused on process as opposed to content (Grubb et al., 1999; Karabell, 1998). It has also been referred to as active learning since students must participate in creating knowledge rather than being passive recipients of content. In addition, the teacher serves as a guide to students rather than the source of all authority and knowledge. In the learner-centered teaching environment, learning becomes primary with the actual content of the course becoming secondary (Cranton, 1998). The teacher is more concerned with the development of higher order intellectual and cognitive skill among students. They focus more on empowering learners and making them more autonomous and self-directed learners (Cranton, 1998).

RESEARCH DESIGN

This case study was conducted at one public and one private primary school in Istanbul. Multiple methods of data collection were used so that the researcher could determine initial stated beliefs and gain a more in depth understanding of what beliefs, assumptions, and knowledge English language teachers hold. Focus groups were held in each school with the teachers of English. The focus group served as a vehicle for holding guided discussions among the teachers working in the English Department of the selected schools. Focus groups both in state and private primary school met once at the beginning of the data collection procedure. Seven teachers at the private primary school six teachers at the public primary schools engaged in focus groups once and this was followed by individual interviews with four volunteer teachers; two teachers at the public primary and two in the private primary school . In addition, during the spring semester the four participant teachers were observed individually in their classrooms ten times along with before- and after-class reflections facilitated by the researcher. Pre- and post-observation reflections were used after the observations. All the interviews were semi-structured in nature.

Data from transcriptions of focus group interactions, teachers' responses to the interviews, before- and after-class reflections, and field notes from classroom observations and the documents were inductively analyzed. It is a common belief that people are more likely to open up and reveal their true feelings and thoughts when using the language they are comfortable with. Therefore, all the interviews in this research were audio taped and conducted in Turkish, the national language of Turkey. All the audio-taped data were transcribed and translated into English soon after each interview. These transcriptions were first reviewed using Glaser and Strauss's (1967) and Strauss's (1987) constant comparative method to create categories in the domains that were tapped by the interviews. The interviews were first analyzed individually for each teacher.

During the final analysis, the researcher conducted a cross case analysis between the four participating teachers to find "thematic connections within and among the participants and their settings." (Siedman, 1991, p.102). The cross-case analysis allowed the researcher to draw conclusions and find answers to research questions.

CONCLUSIONS AND IMPLICATIONS

Teachers' Understanding of "Learner-centeredness"

The salient themes that emerged from the focus group discussions and individual interviews mainly illustrated that public school teachers and private school teachers approached the concept of learner-centeredness

differently. Even though public school teachers first expressed it as learning by doing, their interpretation of learner-centeredness was simply a description of presentation practice production methodology which lacked its production component. They mainly understood learner-centeredness as making the students active by engaging them in grammar focused exercises. In private school teachers focused on the importance of learners in defining their understanding of learner-centeredness. They defined it as learning by doing. The activities they implemented in the classrooms indicated what they understood by learning by doing. They basically understood a learning environment in which the students were active by producing projects, working in groups and by being given chances to speak in the lessons.

Public school teachers' definition of learner-centeredness was similar to the definition of teacher-centeredness in the literature. In the literature, teacher-centered instruction is defined as the activity in which the information is moved or transmitted to and into the learner (Duffy & Cunnigham, 1996). In the foreign language classroom, the teacher has traditionally been seen as the director of classroom exchanges, the authority and transmitter of knowledge doing most of the talking, with learner' speech being limited both in terms of quantity and quality (Long & Porter, 1985). It was obvious that there was a misunderstanding of the concept by the teachers.

The main focus in the private school teachers' definition of learner-centeredness was learners. Their definition of learner-centeredness was along similar lines with Freire (1970) who supports a libertarian form of education, where the learner is the focus and the teachers and learners are partners. The teachers in the private school engaged collaboration among students having the belief that this would facilitate students' learning (Kauchak & Eggen, 1998).They tended to favor more group work than individualized work (Robyler & Edwards, 2000) . The students were considered to be active in a learner-centered environment by the teachers as put forward by Tudor (1996).

Teachers' BAK about their Role in Creating Learner-centeredness

Teachers in the public school viewed themselves as correctors and guides in creating learner-centeredness. Besides, they believed that they had a role of "presenter" who presents the topics. The roles they assigned themselves are in harmony with their understanding of learner-centeredness. Since they believed that students were active during worksheet practice, their role as a presenter can be considered as a natural outcome of this process. The teachers in the private schools viewed themselves as guides, facilitators, and leaders. They believed that they had to help students in their learning process. According to them learning was a difficult process and their task was to facilitate this difficult process.

The teachers in the public school generally viewed themselves as guides and facilitators but they believed that their most important role was being a "teller" and "presenter" and "corrector" which simply signaled their role as deliverer of content knowledge (Duffy & Cunnigham, 1996; Prawat, 1992, 2000).

The teachers in the private school defined their roles as "facilitator", "guide" and "leader" and "problem solver". This role was supported by (Cohen, 1994). Additionally, new roles for teachers include helpers, facilitators, advisors and guides (Oxford, 1990; Wenden and Rubin, 1987).

The way four teachers defined learner-centeredness and the way they implemented learner-centeredness was consistent, which indicated that teachers' beliefs were reflected in their actions, decisions, and classroom practices (Pajares, 1992; Richardson 1996).

Teachers' Implementation of their Understanding of Learner-centeredness

Observation data analysis revealed that the teachers in the public school implemented learner-centeredness the way they defined it. They presented the lesson and the students did the rest in the form of answering questions given in the handouts. They acted mainly as correctors throughout the observations observed. The activities were in the classrooms were organized as whole class activities directed by the teachers. As they mentioned in the interviews they were the providers of knowledge. English was only used during the greetings and while the students were answering the question. The students did not have a chance either to talk English or listen to their teachers talk English.

The data gathered from classroom observations of two teachers in the private school revealed that teachers employed a variety of activities in the classroom to promote students participation into the lesson. Only in the lessons when the teachers had to check students' homework, there was a lack of learner-learner relationship. In these lessons teachers acted as a resource of knowledge. By bringing different language materials to the classrooms, teachers tried to make the lessons enjoyable as much as they could and thus they encouraged the students to discover concepts themselves. The materials the teachers used certainly affected the teachers' implementation of learner-centeredness.

Implications

From the findings of the study, four major implications can be drawn. The first implication is that schools must provide more support to teachers in shifting their classrooms to learner-centered instruction. The second implication for practice is that in-service training programs should be designed on the basis of a needs assessment of teachers. It is important for the ministry to provide opportunities for teachers to participate in formal training and workshops where they would be presented with a framework of instruction based on a learner-centered approach to instruction. Teachers may not have the background to initiate and maintain to choose activities consistent with learner-centered practices. Therefore, there is also a need to articulate clear learner-centered principles for pre- and in-service programs for teacher education.

Fullan (2001) suggests that teachers need more time, training, and on-going support to shift their classroom for an innovation to succeed. The in-service programs and training should provide on-going practices accompanied by support, feedback, and reflection while allowing teachers to make a smooth transition from transmitter of knowledge to a facilitator of learner's construction. If the goal of learning reform is to change teachers from teacher-centered to learner-centered teachers, they should have enough chances to be trained and to observe an actual learner-centered class at elementary level in real life situations.

Finally, another major implication of this study is focused on the issue of educational reform. It is clear that there is a gap between the belief systems of many of the teachers in this study and many recent instructional and assessment initiatives. Clearly, these new initiatives involve more than a shift in practices; they also involve the adoption of a fundamentally different paradigmatic belief system. Successful implementation of these new initiatives must give clearer attention to teachers' existing belief systems and understandings.

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TÜRKÇE ÖZET

GİRİŞ

Bugün gelişmekte olan pek çok ülkede eğitimde yeniden yapılanmaya gidilmektedir. Gelişmekte olan bir ülke olarak Türkiye'de de eğitimin her kademesinde reformların gerçekleştirilmesi kaçınılmazdır. Özellikle de Türkiye'nin Avrupa Birliği üyeliği adaylığına bağlı olarak son on yılda ülkede önemli eğitim reformları yapılmıştır. Hükümetin 7. ve 8. Beş Yıllık Kalkınma Planları'nda; 21. yüzyılda Türk toplumunun profili, düşünme, algılama ve problem çözme yeteneği gelişmiş, bilgiyi yaratıcı bir şekilde kullanabilen, bilgi çağı kimliğine uygun, bilim ve teknoloji üretimine yatkın, kendini tanımaktan ve açıklamaktan korkmayan bireyler şeklinde belirtilmiştir.Ders programlarının yeniden düzenlenmesinde en önemli ilke öğrencilerin kendi öğrenmelerine etkin biçimde katılmalarıdır. Özellikle temel eğitimin iyileştirilmesi Milli Eğitim Bakanlığı'nın en önemli amaçlarından biridir. Bu nedenle öğrenen-odaklılık ilkelerine bağlı olarak ilköğretim derslerinin programları yenilenmiştir. İlköğretim düzeyinde İngilizce öğretiminde de değişiklikler yapılacaktır. İngilizce programında yapılacak yenilikler İngilizce öğretiminde öğrenen-odaklı yaklaşımın kullanılmasını içermektedir. Öğrenen-odaklı eğitim yaklaşımının temel hedefi öğrenciyi merkeze alarak; birey olarak kendisinin ve sistemin ihtiyaç duyduğu değişim sürecini başlatmaktır.

Bu karşılaştırmalı olgu çözümlemesi çalışması İngilizce öğretmenlerinin öğrenen odaklılığı ile ilgili inanç,görüş ve bilgilerini araştırmayı amaçlamaktadır. Öğretmen inançları ve yeniliklerle ilgili yapılan araştırmalar öğretmenlerin inançları ve sınıf içi uygulamalarının yeniliklerle uyumlu olduğu takdirde, yeniliklerin başarıyla gerçekleştirileceğini göstermiştir.

ARAŞTIRMA DESENİ

Bu araştırma nitel veri toplama yöntemlerini ve çözümlemelerini içermektedir. Araştırma 2004-2005 öğretim yılının bahar döneminde İstanbul ilinde gerçekleştirilmiştir. Çalışmanın örneklemini bir devlet ilköğretim okulu

ve bir özel ilköğretim okulunda görev yapan İngilizce öğretmenleri oluşturmuştur. Devlet ilköğretim okulunda çalışan 5, özel ilköğretim okulunda çalışan 8 öğretmenle odak kümeleri oluşturulmuş, kendileriyle ortalama bir buçuk saat süren görüşmeler yapılmıştır. Bu görüşmeler ses kayıt cihazına kaydedilmiş ve daha sonra çeviri yazıları araştırmacı tarafından yapılmıştır. Bu odak kümelerini 4 gönüllü öğretmenle yapılan kapsamlı görüşmeler ve sınıf içi gözlemleri izlemiştir. Bu gözlemler belge çözümlemesiyle işlenmiş, görüşmeler ve ders-öncesi ve ders-sonrası görüş alımlarından elde edilen veriler tümevarımsal olarak çözümlenmiştir. Görüşmeler sırasında toplanan nitel veriler içerik analizi kullanılarak çözümlenmiştir.

SONUÇLAR VE TARTIŞMA

Odak kümeleri görüşmeleri ve bireysel görüşmelerden elde edilen bulgular devlet ilköğretim okulunda çalışan öğretmenlerle, özel ilköğretim okulunda çalışan öğretmenlerin öğrenen-odaklılığına farklı biçimde yaklaştıklarını göstermiştir. Her ne kadar hem devlet ve özel okul öğretmenleri öğrenen-odaklılığını yaparak öğrenme olarak tanımlamış olsalar da çalışma ilerledikçe, devlet okulu öğretmenlerinin yaparak öğrenmeden anladıklarının öğrencilerin tümce düzeyinde dilbilgisi-odaklı alıştırmaları yapmaları olduğu anlaşılmıştır. Öğrencilerin ders içi etkinlikleri öğretmenler tarafından hazırlanan çalışma yapraklarındaki alıştırmalara doğru yanıtlar vermelerini içermektedir. Devlet okulundaki öğretmenlerin öğrenen-odaklı eğitim tanımları öğretmen-odaklı yaklaşım tanımına uymaktadır. Devlet okulunda çalışan her iki öğretmen de öğrenen odaklılığını öğretmenin dersi sunması ve öğrencilerin alıştırmaları yapması biçiminde anlamakta ve uygulamaktadır.

Özel okul öğretmenleri ise öğrenen-odaklı eğitimin tanımında öğrenen üzerinde durmuşlardır. Öğrenen-odaklılığını yaparak, yaşayarak öğrenme olarak tanımlamışlar ve sınıf içi etkinlikleri olarak da proje çalışmaları ve grup çalışmaları gösterilmiştir. Özellikle bir öğretmen öğrencilerin daha çok söz aldıkları ve kendilerini sözlü olarak ifade ettikleri bir sınıf ortamının öğrenen-odaklı olduğunu vurgulamıştır. Bu öğretmene göre öğrenciler sınıf içinde ne kadar çok söz alırsa ders o kadar öğrenen-odaklı olacaktır. Devlet ilköğretim okulunda çalışan öğretmenler öğrenen-odaklılığını yaratmadaki rollerini düzeltici ve rehber olarak tanımlamışlardır. Aynı zamanda konuyu sunan kişidirler. Kendileri için biçtikleri roller yine kendi öğrenen-odaklı eğitim anlayışlarıyla uyumludur. Devlet okulu öğretmenlerinden biri kendini öğrencilerin hatalarını düzelten kişi olarak tanımlamaktadır. Bu öğretmene göre öğrencilerin sürekli olarak hatalarının düzeltilmesi gerekmektedir.

Özel okul öğretmenleri kendilerini rehber, kolaylaştırıcı ve lider olarak görmektedirler. Öğrencilere öğrenme süreci sırasında yardımcı olmaları gerektiğinin üzerinde durmuşlardır. Öğrenme zaten yeterince zor bir süreçtir ve öğretmenin rolü bu süreci öğrenciler açısından mümkün olduğunca kolaylaştırmaktır.

AN INNOVATIVE APPROACH ON HOLISTIC ANALYSIS OF INTERVIEW DATA: THE CASE OF IOWA STATE UNIVERSITY'S SIMULTANEOUS RENEWAL OF TEACHER EDUCATION

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ABSTRACT
In this study, we discuss the use of generative evaluation as an innovative approach in the analysis of qualitative interview data for evaluating simultaneous renewal of Iowa State University's PT3 grant. Goodlad's (1994) simultaneous renewal framework forms the basis of our argument. We focused on the CREATER+ model designed to explain the complexities of understanding simultaneous renewal in this multifaceted university/K-12 partnership.

OVERVIEW: GOALS
TechCo (Technology Collaborators for Simultaneous Renewal), Iowa State University's (ISU) Preparing Tomorrow's Teachers to Use Technology (PT3) implementation grant project is aimed at developing systemic change in K-12 schools and teacher education programs through simultaneous renewal. A working definition of educational renewal is an ongoing process of self-examination, reflection, and change (Rafferty, 2003). In this regard the project is focused on renewing teacher education programs through the extensive and effective use and integration of technology in student-centered learning environments. John Goodlad's (1994) theory of *simultaneous renewal* and *constructivist theor*y in learning and teaching provide the two major frameworks of TechCo.

In order to accomplish project goals, TechCo works collaboratively with many partners: university partners including Curriculum and Instruction Department, Center for Technology in Learning and Teaching (CTLT) and the College of Engineering; three elementary schools from the Des Moines area including students, teachers, principals, pre-service, and in-service teachers, as well as technology coordinators together form the K-12 partners; The Area Education Agency (AEA) an outside educational organization partner and Apple computer as the business partner. Together, these partners form an interconnected consortium needed for simultaneous renewal. In order to accomplish simultaneous renewal in these organizations the research team focused on gathering and analyzing data by engaging all partners in the evaluation process.

"Engagement of all Stakeholders in the Evaluation Process: Generative Evaluation"
The progress of the TechCo project has been evaluated formatively based on the surveys for both pre-service and in-service teachers during the first two years of the project. Two major surveys, Survey of the Use and Integration of Computer-Related Technology and Cultural Diversity Awareness Inventory have been conducted for teachers in this regard and at the end of the 3-year period the same surveys were used to collect additional data.

The three years of extensive studies in both K-12 schools and at ISU called for an innovative and complex approach for conducting TechCo evaluation. To do this, the evaluation team adopted several techniques from many models including the CREATER Model of Havelock and Zlotolow (1995), the Vision 2020 Model or WorkSpan/LINC Model, and European experiences in the renewal of teacher education programs in the use of technology. Some elements of the Concerns Based Adoption Model by (Hall, George and Rutleford, 1979) were also used. The final framework derived from this eclectic approach and the application of change models to the process of evaluation resulted in the 'generative evaluation' (Davis & Kemis, 2002). Using CREATER and other models in-depth structured interviews were conducted with all leaders.

These leaders included Dean of the COE, project leaders in the COE, principals and technology coordinators in the elementary schools. Other qualitative data resources comprising (student artifacts, written documents such as syllabi, yearly reports, videotapes, pictures, etc.) were also utilized as a result of this new approach.

The evaluation team called this new approach "*Generative Evaluation*" since the data gathered from the field showed its' value for the change in the institutions as an important byproduct. This innovative generative evaluation technique is a key overarching strategy within TechCo and the partnerships and inter-project collaboration. There is merit in using this approach to evaluation because it can "guide leaders and change agents on their pathway to the future". It was created to answer the need to develop an appropriate methodology that could be applied to inform a holistic perspective in complex systems (Davis, Kemis, & Johnson, 2003, p.2).

METHODS

In the analysis of structured interview data of TechCo, it was mainly to be utilized from two data analysis techniques: analytic induction and hermeneutical analysis.

Analytic Induction (interpreting based on change models)

This technique is based on the examination of facts, situations, phenomena and events of the study and then develops the hypothesis, which explains these conditions.

If the initial hypotheses do not match with the field studied, then it must be revised. This process continues until reaching the full explanation of situations. Ratcliff (2000b) describes this point saying that analytic induction is "inductive, rather than deductive, reasoning is involved, allowing for modification of concepts and relationships between concepts which occur throughout the process of doing research, with the goal of most accurately representing the reality of the situation." And so this methodology refers to several steps in data analysis in order to "move from raw data to proposed answers and solutions" (Willis et al., 2003).

TechCo's evaluation team is using a wide range of data collection sources such as interviews (both structured and focus groups), surveys, document analysis, etc., to collect rich data leading to triangulation of data sources (Guba & Lincoln, 1995). This has been evident especially in the collection of interview data, which provides the primary data for 'generative evaluation'. Havelock and Zlotolow (1995) original CREATER model was found to be limited in terms of explaining the 'renewal' phase of systemic change, because it yielded no information about the processes and interactions during the renewal process. Therefore, Bosserman's (1998) model of institutional change was adopted in order to bridge this gap with the formal structures of organizations. Bosserman's model of institutional change was utilized to understand the interviewee's general understanding of the changes required for renewal in the specific organization. Researchers using Bosserman's model of institutional change are encouraged to think in terms of formal (wider environment) and informal structures (immediate environments) in which people operate and interact (Davis, Kemis, & Johnson, 2003). Other models are also used where appropriate (See Ellsworth for a survey of change models, 2002).

These three models have been applied to create a unique approach for the study and the project team called it 'generative analysis' (Thompson, Schmidt and Davis, 2003). In the data analysis process, this approach can be considered as the main hypothesis of the project by shedding light on the understanding of systemic change. After transcribing the interview protocols, these transcribed data have been coded around the elements of the CREATER+ model. Even though there is an extensive amount of data gained during the three-year period, it has been reduced and summarized using the seven elements of the CREATER+ model in order to get a clearer understanding of the change process and simultaneous renewal within TechCo. Based on the volume and type of data achieved through this process a hermeneutical analysis was deemed appropriate for shedding light on the context of this evaluation

Hermeneutical Analysis (understanding in the context)

By nature, hermeneutical analysis is an interpretive approach as it emphasizes the importance of the views of participants based on their experiences and their standpoint. One implication of this methodology is the idea of 'hermeneutic circles', which is explained by Klein and Meyers (1998) cited in Willis et al., (2003).

> The idea of hermeneutic circles suggests that we come to understand a complex whole from preconceptions about the meanings of its' parts and their interrelationships…the movement of understanding is constantly from the whole to the part and back to the whole. Our task is to extend in concentric circles in unity of the understood meaning.

The TechCo evaluation team adopted a more interpretivist approach using hermeneutical analysis because the data contains information from one university and four different schools, which demand local explanations of facts and events. For instance, the four schools studied have very different characteristics in terms of administrative support, teacher attitudes, and priorities in the use of technology, etc. The initial examination of the interview data shows this very clearly. Within TechCo's project, the situated understanding is important as well as understanding multiple perspectives of various stakeholders. Thus, using hermeneutical techniques when describing different school settings, different school experiences as well as the different stories of K-12 people and ISU faculty (Technology scholars (faculty); cohort student experiences; student artifacts; etc.) was a holistic approach to this phenomenon understudy.

RESULTS

Each structured interview with project leaders has been analyzed using CREATER+ model and aforementioned analysis techniques. One sample interview chart is shown in Figure 1.

After completing the cross-case analysis and member check of the interview results the TechCo research team will write up the results. Since this is an ongoing process, this paper will not focus on overall results of the project. However, preliminary results show that the collaboration between K-12 schools and Iowa State University's teacher education program, through TechCo is renewing educational environments with its emphasis on technology integration and learner centeredness. This is congruent with the tenets of simultaneous renewal.

Simultaneous renewal in general is both multifaceted and fragile requiring sustained, visionary and well-informed leadership (Sherry, 2003). "The development of 'generative evaluation' for simultaneous renewal…in teacher education holds promise for the application of this robust approach that is transferable and applicable to other projects and partnerships" (Davis, Kemis, & Johnson, 2003, p. 16). In this regard, ISU shares its experience and expertise with a very successful faculty development model, human resources such as faculty, staff, and graduate and undergraduate students whereas K-12 schools are involved fully in these efforts with all administrators, teachers, tech support staff and students.

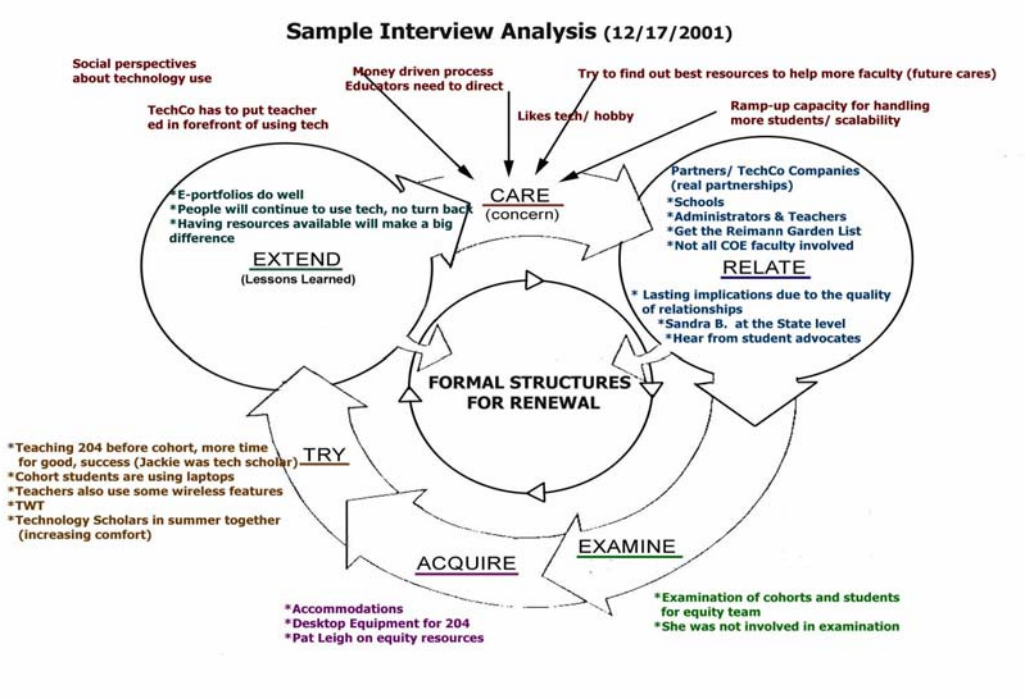

Figure 1. Sample of Interview Analysis (Without the detail of the central circle)

Significance/ Impact

Goodlad's theory of simultaneous renewal is working in practice in ISU's PT3 TechCo initiative, providing rich cases for theoreticians and practitioners. As observed by Goodlad:

> What comes first, good schools or good teacher education programs? The answer is that both must come together. There are not now the thousands of good schools needed for the internships of tens of thousand of future teachers. The long-term solution—unfortunately, there is no quick one—is to renew the two together. There must be a continuous process of educational renewal in which colleges and universities, the traditional producers of teachers, join schools, the recipients of the products, as equal partners in the simultaneous renewal of school and the education of educators (Goodlad, 1994, p. 2).

This project is one of the best examples of integration of technology rich environments into learning and teaching through university/K-12 partnerships. TechCo's team keep disseminate further outcomes and products of these experiences after the analysis and interpretation of the project's data is completed.

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DETAILED REVIEW OF ROGERS' DIFFUSION OF INNOVATIONS THEORY AND EDUCATIONAL TECHNOLOGY-RELATED STUDIES BASED ON ROGERS' THEORY

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The process of adopting new innovations has been studied for over 30 years, and one of the most popular adoption models is described by Rogers in his book, *Diffusion of Innovations* (Sherry & Gibson, 2002). Much research from a broad variety of disciplines has used the model as a framework. Dooley (1999) and Stuart (2000) mentioned several of these disciplines as political science, public health, communications, history, economics, technology, and education, and defined Rogers' theory as a widely used theoretical framework in the area of technology diffusion and adoption.

Rogers' diffusion of innovations theory is the most appropriate for investigating the adoption of technology in higher education and educational environments (Medlin, 2001; Parisot, 1995). In fact, much diffusion research involves technological innovations so Rogers (2003) usually used the word "technology" and "innovation" as synonyms. For Rogers, "a *technology* is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome" (p. 13). It is composed of two parts: hardware and software. While hardware is "the tool that embodies the technology in the form of a material or physical object," software is "the information base for the tool" (Rogers, 2003, p. 259). Since software (as a technological innovation) has a low level of observability, its rate of adoption is quite slow.

For Rogers (2003), adoption is a decision of "full use of an innovation as the best course of action available" and rejection is a decision "not to adopt an innovation" (p. 177). Rogers defines diffusion as "the process in which an innovation is communicated thorough certain channels over time among the members of a social system" (p. 5). As expressed in this definition, innovation, communication channels, time, and social system are the four key components of the diffusion of innovations.

Four Main Elements in the Diffusion of Innovations

Innovation

Rogers offered the following description of an innovation: "An *innovation* is an idea, practice, or project that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, p. 12). An innovation may have been invented a long time ago, but if individuals perceive it as new, then it may still be an innovation for them. The newness characteristic of an adoption is more related to the three steps (knowledge, persuasion, and decision) of the innovation-decision process that will be discussed later. In addition, Rogers claimed there is a lack of diffusion research on technology clusters. For Rogers (2003), "a technology cluster consists of one or more distinguishable elements of technology that are perceived as being closely interrelated" (p. 14).

Uncertainty is an important obstacle to the adoption of innovations. An innovation's consequences may create uncertainty: "*Consequences* are the changes that occur in an individual or a social system as a result of the adoption or rejection of an innovation" (Rogers, 2003, p. 436). To reduce the uncertainty of adopting the innovation, individuals should be informed about its advantages and disadvantages to make them aware of all its consequences. Moreover, Rogers claimed that consequences can be classified as desirable versus undesirable (functional or dysfunctional), direct versus indirect (immediate result or result of the immediate result), and anticipated versus unanticipated (recognized and intended or not).

Communication Channels

The second element of the diffusion of innovations process is communication channels. For Rogers (2003), communication is "a process in which participants create and share information with one another in order to reach a mutual understanding" (p. 5). This communication occurs through channels between sources. Rogers states that "a *source* is an individual or an institution that originates a message. A channel is the means by which a message gets from the source to the receiver" (p. 204). Rogers states that diffusion is a specific kind of communication and includes these communication elements: an innovation, two individuals or other units of adoption, and a communication channel. *Mass media* and *interpersonal communication* are two communication channels. While mass media channels include a mass medium such as TV, radio, or newspaper, interpersonal channels consist of a two-way communication between two or more individuals. On the other hand, "diffusion is a very social process that involves interpersonal communication relationships" (Rogers, 2003, p. 19). Thus, interpersonal channels are more powerful to create or change strong attitudes held by an individual. In interpersonal channels, the communication may have a characteristic of *homophily*, that is, "the degree to which

two or more individuals who interact are similar in certain attributes, such as beliefs, education, socioeconomic status, and the like," but the diffusion of innovations requires at least some degree of heterophily, which is "the degree to which two or more individuals who interact are different in certain attributes." In fact, "one of the most distinctive problems in the diffusion of innovations is that the participants are usually quite heterophilous" (Rogers, 2003, p. 19).

Communication channels also can be categorized as *localite channels* and *cosmopolite channels* that communicate between an individual of the social system and outside sources. While interpersonal channels can be local or cosmopolite, almost all mass media channels are cosmopolite. Because of these communication channels' characteristics, mass media channels and cosmopolite channels are more significant at the knowledge stage and localite channels and interpersonal channels are more important at the persuasion stage of the innovation-decision process (Rogers, 2003).

Time

According to Rogers (2003), the time aspect is ignored in most behavioral research. He argues that including the time dimension in diffusion research illustrates one of its strengths. The innovation-diffusion process, adopter categorization, and rate of adoptions all include a time dimension. These aspects of Rogers' theory will be discussed later in more detail.

Social System

The social system is the last element in the diffusion process. Rogers (2003) defined the social system as "a set of interrelated units engaged in joint problem solving to accomplish a common goal" (p. 23). Since diffusion of innovations takes place in the social system, it is influenced by the social structure of the social system. For Rogers (2003), structure is "the patterned arrangements of the units in a system" (p. 24). He further claimed that the nature of the social system affects individuals' innovativeness, which is the main criterion for categorizing adopters.

The Innovation-Decision Process

Rogers (2003) described the innovation-decision process as "an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation" (p. 172). For Rogers (2003), the innovation-decision process involves five steps: (1) knowledge, (2) persuasion, (3) decision, (4) implementation, and (5) confirmation. These stages typically follow each other in a time-ordered manner. This process is shown in Figure 2.1.

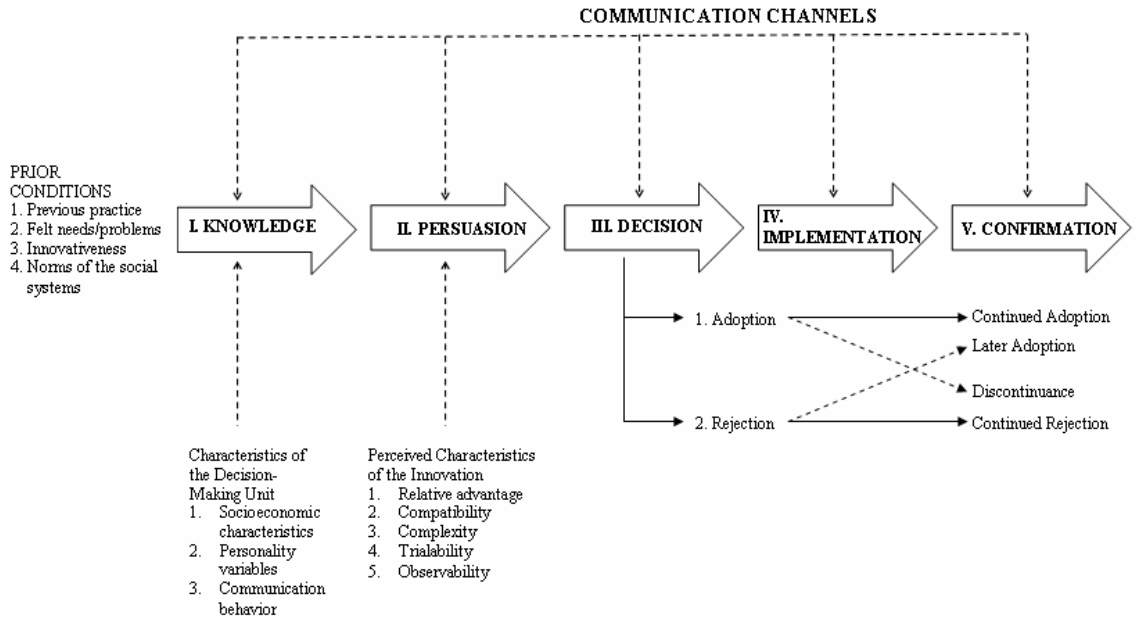

Figure 2.1. A Model of Five Stages in the Innovation-Decision Process (Source: *Diffusion of Innovations, Fifth Edition* by Everett M. Rogers. Copyright (c) 2003 by The Free Press. Reprinted with permission of the Free Press: A Division of Simon & Schuster.)

The Knowledge Stage

The innovation-decision process starts with the knowledge stage. In this step, an individual learns about the existence of innovation and seeks information about the innovation. "What?," "how?," and "why?" are the critical questions in the knowledge phase. During this phase, the individual attempts to determine "what the innovation is and how and why it works" (Rogers, 2003, p. 21). According to Rogers, the questions form three types of knowledge: (1) awareness-knowledge, (2) how-to-knowledge, and (3) principles-knowledge.

- Awareness-knowledge: Awareness-knowledge represents the knowledge of the innovation's existence. This type of knowledge can motivate the individual to learn more about the innovation and, eventually, to adopt it. Also, it may encourage an individual to learn about other two types of knowledge.
- How-to-knowledge: The other type of knowledge, how-to-knowledge, contains information about how to use an innovation correctly. As Wetzel (1993) stated, even the faculty who have technical backgrounds may not use technology in teaching, if they do not have knowledge of how to use it correctly. Thus, technology is not used at an expected level, since they need help in how to use the technology effectively in teaching (Spotts, 1999). Rogers saw this knowledge as an essential variable in the innovation-decision process. To increase the adoption chance of an innovation, an individual should have a sufficient level of how-to-knowledge prior to the trial of this innovation. Thus, this knowledge becomes more critical for relatively complex innovations.
- Principles-knowledge: The last knowledge type is principles-knowledge. This knowledge includes the functioning principles describing how and why an innovation works. An innovation can be adopted without this knowledge, but the misuse of the innovation may cause its discontinuance. For Sprague et al. (1999), the biggest barrier to faculty use of technology in teaching was that faculty lack a vision of why or how to integrate technology in the classroom.

To create new knowledge, technology education and practice should provide not only a how-to experience but also a know-why experience (Seemann, 2003). In fact, an individual may have all the necessary knowledge, but this does not mean that the individual will adopt the innovation because the individual's attitudes also shape the adoption or rejection of the innovation.

The Persuasion Stage

The persuasion step occurs when the individual has a negative or positive attitude toward the innovation, but "the formation of a favorable or unfavorable attitude toward an innovation does not always lead directly or indirectly to an adoption or rejection" (Rogers, 2003, p. 176). The individual shapes his or her attitude after he or she knows about the innovation, so the persuasion stage follows the knowledge stage in the innovation-decision process. Furthermore, Rogers states that while the knowledge stage is more cognitive- (or knowing-) centered, the persuasion stage is more affective- (or feeling-) centered. Thus, the individual is involved more sensitively with the innovation at the persuasion stage. The degree of uncertainty about the innovation's functioning and the social reinforcement from others (colleagues, peers, etc.) affect the individual's opinions and beliefs about the innovation. Close peers' subjective evaluations of the innovation that reduce uncertainty about the innovation outcomes are usually more credible to the individual: "While information about a new innovation is usually available from outside experts and scientific evaluations, teachers usually seek it from trusted friends and colleagues whose subjective opinions of a new innovation are most convincing" (Sherry, 1997, p. 70). Individuals continue to search for innovation evaluation information and messages through the decision stage.

The Decision Stage

At the decision stage in the innovation-decision process, the individual chooses to adopt or reject the innovation. While adoption refers to "full use of an innovation as the best course of action available," rejection means "not to adopt an innovation" (Rogers, 2003, p. 177). If an innovation has a partial trial basis, it is usually adopted more quickly, since most individuals first want to try the innovation in their own situation and then come to an adoption decision. The vicarious trial can speed up the innovation-decision process. However, rejection is possible in every stage of the innovation-decision process. Rogers expressed two types of rejection: *active rejection* and *passive rejection*. In an active rejection situation, an individual tries an innovation and thinks about adopting it, but later he or she decides not to adopt it. A *discontinuance* decision, which is to reject an innovation after adopting it earlier, may be considered as an active type of rejection. In a passive rejection (or non-adoption) position, the individual does not think about adopting the innovation at all. Rogers stated that these two types of rejection have not been distinguished and studied enough in past diffusion research. In some cases, the order of the knowledge-persuasion-decision stages can be knowledge-decision-persuasion. Especially in collectivistic cultures such as those in Eastern countries, this order takes place and group influence on adoption of an innovation can transform the personal innovation decision into a collective innovation decision (Rogers, 2003). In any case, however, the implementation stage follows the decision stage.

The Implementation Stage

At the implementation stage, an innovation is put into practice. However, an innovation brings the newness in which "some degree of uncertainty is involved in diffusion" (p. 6). Uncertainty about the outcomes of the innovation still can be a problem at this stage. Thus, the implementer may need technical assistance from change agents and others to reduce the degree of uncertainty about the consequences. Moreover, the innovation-decision process will end, since "the innovation loses its distinctive quality as the separate identity of the new idea disappears" (Rogers, 2003, p. 180).

Reinvention usually happens at the implementation stage, so it is an important part of this stage. Reinvention is "the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation" (Rogers, 2003, p. 180). Also, Rogers (2003) explained the difference between invention and innovation. While "invention is the process by which a new idea is discovered or created," the adoption of an innovation is the process of using an existing idea" (Rogers, 2003, p. 181). Rogers further discussed that the more reinvention takes place, the more rapidly an innovation is adopted and becomes institutionalized. As innovations, computers are the tools that consist of many possible opportunities and applications, so computer technologies are more open to reinvention.

The Confirmation Stage

The innovation-decision already has been made, but at the confirmation stage the individual looks for support for his or her decision. According to Rogers (2003), this decision can be reversed if the individual is "exposed to conflicting messages about the innovation" (p. 189). However, the individual tends to stay away from these messages and seeks supportive messages that confirm his or her decision. Thus, attitudes become more crucial at the confirmation stage. Depending on the support for adoption of the innovation and the attitude of the individual, later adoption or discontinuance happens during this stage.

Discontinuance may occur during this stage in two ways. First, the individual rejects the innovation to adopt a better innovation replacing it. This type of discontinuance decision is called *replacement discontinuance*. The other type of discontinuance decision is *disenchantment discontinuance.* In the latter, the individual rejects the innovation because he or she is not satisfied with its performance. Another reason for this type of discontinuance decision may be that the innovation does not meet the needs of the individual. So, it does not provide a perceived relative advantage, which is the first attribute of innovations and affects the rate of adoption.

Attributes of Innovations and Rate of Adoption

Rogers (2003) described the innovation-diffusion process as "an uncertainty reduction process" (p. 232), and he proposes attributes of innovations that help to decrease uncertainty about the innovation. Attributes of innovations includes five characteristics of innovations: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. Rogers (2003) stated that "individuals' perceptions of these characteristics predict the rate of adoption of innovations" (p. 219). Also, Rogers noted that although there is a lot of diffusion research on the characteristics of the adopter categories, there is a lack of research on the effects of the perceived characteristics of innovations on the rate of adoption.

Rogers (2003) defined the *rate of adoption* as "the relative speed with which an innovation is adopted by members of a social system" (p. 221). For instance, the number of individuals who adopted the innovation for a period of time can be measured as the rate of adoption of the innovation. The perceived attributes of an innovation are significant predictors of the rate of adoption. Rogers reported that 49-87% of the variance in the rate of adoption of innovations is explained by these five attributes. In addition to these attributes, the innovation-decision type (optional, collective, or authority), communication channels (mass media or interpersonal channels), social system (norms or network interconnectedness), and change agents may increase the predictability of the rate of adoption of innovations. For instance, personal and optional innovations usually are adopted faster than the innovations involving an organizational or collective innovation-decision. However, for Rogers, relative advantage is the strongest predictor of the rate of adoption of an innovation.

Relative Advantage

Rogers (2003) defined relative advantage as "the degree to which an innovation is perceived as being better than the idea it supersedes" (p. 229). The cost and social status motivation aspects of innovations are elements of relative advantage. For instance, while innovators, early adopters, and early majority are more status-motivated for adopting innovations, the late majority and laggards perceive status as less significant. Moreover, Rogers categorized innovations into two types: preventive and incremental (non-preventive) innovations. "A preventive innovation is a new idea that an individual adopts now in order to lower the probability of some unwanted future

event" (Rogers, 2003, p. 233). Preventive innovations usually have a slow rate of adoption so their relative advantage is highly uncertain. However, incremental innovations provide beneficial outcomes in a short period.

When faculty members face the new demands placed on them, they will adopt technology (Casmar, 2001). If teachers see that technology has value in their instruction, then they will use it (Finley, 2003; McKenzie, 2001; Parisot, 1995; Spotts, 1999). To integrate technology successfully into teacher education courses, teacher education faculty should see the need providing helpful experiences for themselves and their students (Schmidt, 1995).

To increase the rate of adopting innovations and to make relative advantage more effective, direct or indirect financial payment incentives may be used to support the individuals of a social system in adopting an innovation. Incentives are part of support and motivation factors. Another motivation factor in the diffusion process is the compatibility attribute.

Compatibility

In some diffusion research, relative advantage and compatibility were viewed as similar, although they are conceptually different. Rogers (2003) stated that "compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 15). A lack of compatibility in IT with individual needs may negatively affect the individual's IT use (McKenzie, 2001; Sherry, 1997). In her literature review, Hoerup (2001) describes that each innovation influences teachers' opinions, beliefs, values, and views about teaching. If an innovation is compatible with an individual's needs, then uncertainty will decrease and the rate of adoption of the innovation will increase. Thus, even naming the innovation is an important part of compatibility. What the innovation is called should be meaningful to the potential adopter. What the innovation means also should be clear. This is part of the complexity attribute.

Complexity

Rogers (2003) defined complexity as "the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 15). As Rogers stated, opposite to the other attributes, complexity is negatively correlated with the rate of adoption. Thus, excessive complexity of an innovation is an important obstacle in its adoption. A technological innovation might confront faculty members with the challenge of changing their teaching methodology to integrate the technological innovation into their instruction (Parisot, 1995), so it might have different levels of complexity. If hardware and software are user-friendly, then they might be adopted successfully for the delivery of course materials (Martin, 2003).

Trialability

According to Rogers (2003), "*trialability* is the degree to which an innovation may be experimented with on a limited basis" (p. 16). Also, trialability is positively correlated with the rate of adoption. The more an innovation is tried, the faster its adoption is. As discussed in the implementation stage of the innovation-decision process, reinvention may occur during the trial of the innovation. Then, the innovation may be changed or modified by the potential adopter. Increased reinvention may create faster adoption of the innovation. For the adoption of an innovation, another important factor is the vicarious trial, which is especially helpful for later adopters. However, Rogers stated that earlier adopters see the trialability attribute of innovations as more important than later adopters.

Observability

The last characteristic of innovations is observability. Rogers (2003) defined *observability as* "the degree to which the results of an innovation are visible to others" (p. 16). Role modeling (or peer observation) is the key motivational factor in the adoption and diffusion of technology (Parisot, 1997). Similar to relative advantage, compatibility, and trialability, observability also is positively correlated with the rate of adoption of an innovation.

In summary, Rogers (2003) argued that innovations offering more relative advantage, compatibility, simplicity, trialability, and observability will be adopted faster than other innovations. Rogers does caution, "getting a new idea adopted, even when is has obvious advantages, is difficult" (p. 1), so the availability of all of these variables of innovations speed up the innovation-diffusion process. Research showed that all these factors influenced faculty members' likelihood of adopting a new technology into their teaching (Anderson et al., 1998; Bennett, & Bennett, 2003; Parisot, 1997; Slyke, 1998; Surendra, 2001).

Adopter Categories

Rogers (2003) defined the adopter categories as "the classifications of members of a social system on the basis of innovativeness" (p. 22). This classification includes innovators, early adopters, early majority, late majority, and laggards. In each adopter category, individuals are similar in terms of their innovativeness: "Innovativeness is the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system" (Rogers, 2003, p. 22). Braak (2001) described innovativeness as "a relatively-stable, socially-constructed, innovation-dependent characteristic that indicates an individual's willingness to change his or her familiar practices" (p. 144). For Rogers, innovativeness helped in understanding the desired and main behavior in the innovation-decision process. Thus, he categorizes the adopters based on innovativeness. As Figure 2.2 shows, the distribution of adopters is a normal distribution.

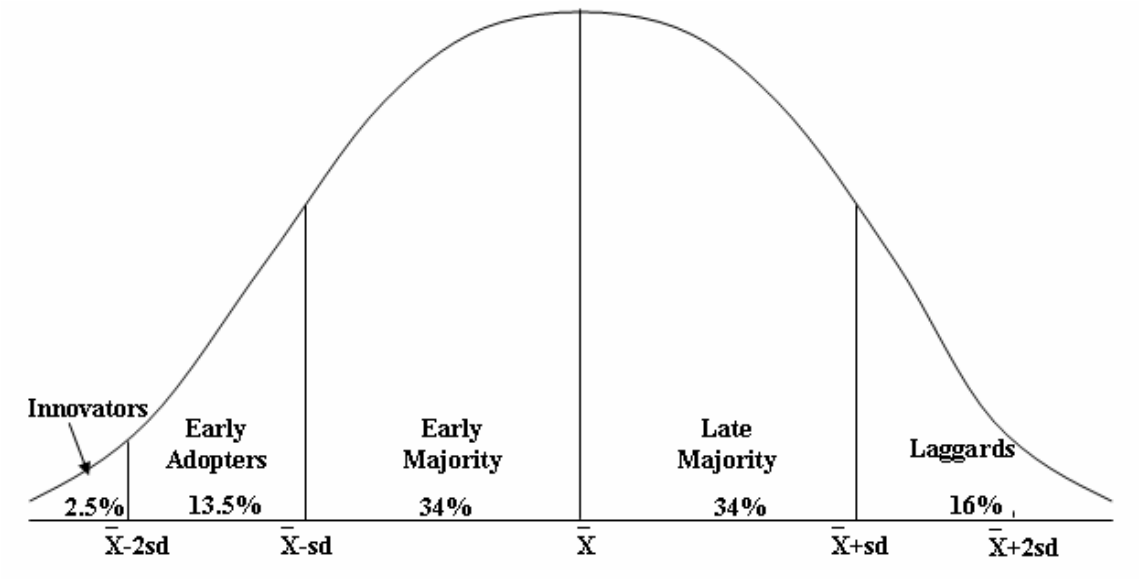

Figure 2.2. Adopter Categorization on the Basis of Innovativeness (Source: *Diffusion of Innovations, fifth edition* by Everett M. Rogers. Copyright (c) 2003 by The Free Press. Reprinted with permission of the Free Press: A Division of Simon & Schuster.)

Also, Rogers (2003) noted that incomplete adoption and non-adoption do not form this adopter classification. Only adopters of successful innovations generate this curve over time. In this normal distribution, each category is defined using a standardized percentage of respondents. For instance, the area lying under the left side of the curve and two standard deviations below the mean includes innovators who adopt an innovation as the first 2.5% of the individuals in a system.

Innovators

For Rogers (2003), innovators were willing to experience new ideas. Thus, they should be prepared to cope with unprofitable and unsuccessful innovations, and a certain level of uncertainty about the innovation. Also, Rogers added that innovators are the gatekeepers bringing the innovation in from outside of the system. They may not be respected by other members of the social system because of their venturesomeness and close relationships outside the social system. Their venturesomeness requires innovators to have complex technical knowledge.

Early Adopters

Compared to innovators, early adopters are more limited with the boundaries of the social system. Rogers (2003) argued that since early adopters are more likely to hold leadership roles in the social system, other members come to them to get advice or information about the innovation. In fact, "leaders play a central role at virtually every stage of the innovation process, from initiation to implementation, particularly in deploying the resources that carry innovation forward" (Light, 1998, p. 19). Thus, as role models, early adopters' attitudes toward innovations are more important. Their subjective evaluations about the innovation reach other members of the social system through the interpersonal networks. Early adopters' leadership in adopting the innovation decreases uncertainty about the innovation in the diffusion process. Finally, "early adopters put their stamp of approval on a new idea by adopting it" (Rogers, 2003, p. 283).

Early Majority
Rogers (2003) claimed that although the early majority have a good interaction with other members of the social system, they do not have the leadership role that early adopters have. However, their interpersonal networks are still important in the innovation-diffusion process. As Figure 2.2 shows, the early majority adopts the innovation just before the other half of their peers adopts it. As Rogers stated, they are deliberate in adopting an innovation and they are neither the first nor the last to adopt it. Thus, their innovation decision usually takes more time than it takes innovators and early adopters.

Late Majority
Similar to the early majority, the late majority includes one-third of all members of the social system who wait until most of their peers adopt the innovation. Although they are skeptical about the innovation and its outcomes, economic necessity and peer pressure may lead them to the adoption of the innovation. To reduce the uncertainty of the innovation, interpersonal networks of close peers should persuade the late majority to adopt it. Then, "the late majority feel that it is safe to adopt" (Rogers, 2003, p. 284).

Laggards
As Rogers (2003) stated, laggards have the traditional view and they are more skeptical about innovations and change agents than the late majority. As the most localized group of the social system, their interpersonal networks mainly consist of other members of the social system from the same category. Moreover, they do not have a leadership role. Because of the limited resources and the lack of awareness-knowledge of innovations, they first want to make sure that an innovation works before they adopt. Thus, laggards tend to decide after looking at whether the innovation is successfully adopted by other members of the social system in the past. Due to all these characteristics, laggards' innovation-decision period is relatively long.

In addition to these five categories of adopters, Rogers (2003) further described his five categories of adopters in two main groups: earlier adopters and later adopters. Earlier adopters consist of innovators, early adopters, and early majority, while late majority and laggards comprise later adopters. Rogers identifies the differences between these two groups in terms of socioeconomic status, personality variables, and communication behaviors, which usually are positively related to innovativeness. For instance, "the individuals or other units in a system who most need the benefits of a new idea (the less educated, less wealthy, and the like) are generally the last to adopt an innovation" (Rogers, 2003, p. 295). For Rogers, there was no significant difference between the ages of earlier adopters and later adopters, but this categorization and its characteristics are beyond this study.

Technology-Related Studies based on Rogers' Theory

Although many studies used Rogers' theory as their theoretical framework, few studies among them have considered computer use for instructional purposes (Isleem, 2003). The following studies are contextually related to instructional computer use.

Using quantitative research methods and Roger's diffusion theory, Isleem (2003) examined the level of computer use for instructional purposes by technology education teachers in Ohio public schools. Isleem studied the relationships between the level of computer use and selected factors: expertise, access, attitude, support, and teacher characteristics. Isleem discovered that technology education teachers use more mainstream computer applications than computer specialized applications. Moreover, Isleem found teachers' perceived expertise, perceived access to computers, and perceived attitude toward computers as the significant predictors of the level of computer use. In his study, Isleem emphasized that providing training is a main strategy to increase computer use.

Medlin (2001) used Rogers' (1995) diffusion of innovations theory to examine the selected factors that might influence a faculty member's motivation and decision to adopt new electronic technologies in classroom instruction. Medlin organized the findings into three groups: social, organizational, and personal motivational factors. As social factors, friends, mentors, peer support, and students were found to be the significant predictors that may influence a faculty member's decision to adopt electronic technologies in the classroom. The organizational variables, including physical resource support and mandates from the university, also were statistically significant in predicting the faculty members' use of electronic technologies in the classroom. "Personal interest in instructional technology," "personal interest in improvement in my teaching," and "personal interest in enhancing student learning" were cited as three personal motivational variables that might affect faculty members' decision to adopt instructional technologies. However, Medlin did not find a significant difference among the self-identified adopter behavior categories based on Rogers' theory in terms of social, organizational, and personal motivational factors.

Jacobsen (1998) used Rogers' (1995) diffusion theory to determine the adoption patterns and characteristics of faculty who integrate computer technology for teaching and learning in higher education. She used both qualitative and quantitative methods to analyze the characteristics of early adopters and the difference between early adopters and mainstream faculty. The selected factors investigated were patterns of computer use, computer expertise, generalized self-efficacy, participant information, teaching and learning changes, motivators to integrate technology for teaching and learning, impediments to integrating technology for teaching and learning, learning about technology, methods for using and integrating technology in teaching and learning, and evaluating the outcomes of using technology for teaching and learning.

Less' (2003) quantitative research study used Rogers' (1995) diffusion of innovations theory to investigate faculty adoption of computer technology for instruction in the North Carolina Community College System. She classified the faculty members based on Rogers' five categories of innovation adoption and compared them on the demographic variables of age, gender, race/ethnicity, teaching experience, and highest degree attained. While a significant relationship emerged between Rogers' adopter categories and their years of teaching experience and highest degree attained, the results did not show an important difference between faculty adopter categories and age, gender, and race/ethnicity. Less further classified the faculty as users in any of Rogers' five categories and non-users of computer technology in instruction. No significant difference existed between users and non-users in demographic characteristics of age, gender, race/ethnicity, teaching experience and highest degree attained.

Using Rogers' diffusion theory, Blankenship (1998) employed both qualitative and quantitative research methods in studying the factors that were related to computer use by instructors in teaching. In his study, the variables were attitude toward computers, access to computers, training in computer use, support for computer use, age, grade level taught, curriculum area, gender, and teaching expertise. All these factors were used to predict computer use by teachers in classroom instruction. One of the major findings of the study was that grade level and curriculum area must be considered for successful training. Also, attitude, support, access, and age were statistically significant predictors of computer use in classroom instruction. Finally, Blankenship suggested the following strategies to increase computer use in classroom instruction: grade and curriculum targeted computer training, technical support, and computer labs in every building.

Using quantitative research methods, Surendra (2001) examined the diffusion factors proposed by Rogers (1995) and other sources to predict the acceptance of Web technology by professors and administrators of a college. He reviewed the training factor among the types of access. Access in general and training in particular were found to be the best predictors in the diffusion process of Web technology-based educational innovation. Moreover, he found that the diffusion factors, Rogers' attributes of innovations, are useful predictors of the adoption of innovation. Also, a relationship was found between computer knowledge and the adoption of innovation.

Carter (1998) conducted a computer survey and in-depth interviews to determine computer-based technologies that were being used by the faculty members and the factors that affect their use of these technologies. Faculty attitudes toward using computer-based technology, support, resources, and training were the selected factors needed to use these technologies effectively. Also, Carter found that word processing software, e-mail, and Internet resources were the most frequently used computer-based technologies.

Another study was conducted by Zakaria (2001) on factors related to IT implementation in the curriculum. The selected factors in the study were the Malaysian Ministry of Education Polytechnic faculty members' attitudes toward IT, their IT use in teaching, and the availability of IT. Despite a lack of IT use in general, faculty members usually had a very positive attitude toward IT use in their teaching. Most faculty members reported barriers to IT use in their teaching. Furthermore, Zakaria argued there was a gender difference in terms of IT use. No significant difference existed between the faculty members' department membership and IT use in general. Also, he found that the highest level of education was negatively correlated with IT use and other demographic variables, and the level of education was correlated with email and World Wide Web use. While age was positively correlated with teaching experience, teaching load was significantly correlated with online discussion use. Finally, the highest level of education and adoption willingness were found to be the most significant predictors of IT use in teaching.

Analyzing the data quantitatively and qualitatively, Anderson et al. (1998) studied the attitudes, skills, and behaviors of the faculty members related to their IT use at a large Canadian research university. Based on Roger's (1995) two major adopter categories, they defined the faculty members as "earlier adopters" and "mainstream faculty" and provided strategies for reducing the gap between these two groups. Although mainstream faculty used information technologies for research and professional communication applications, their adoption of these applications in teaching was very low. To increase their adoption of computer

technologies for instructional purposes, the incentives, training programs, and barriers should be taken into account in comprehensive adoption strategies.

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ESTIMATING AVAILABILITY OF MIDDLE LEVEL SKILLED MANPOWER

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ABSTRACT
The economic reform policies are being introduced in India in phases since 1990. It demands for competent middle level skilled manpower in country. By keeping this in mind, National Council for Education, Research and Training (NCERT), New Delhi, India introduces a revised policy in 1992 and promotes vocational education. Today, several institutions are offering vocational education in almost all parts of India. In this paper we have used multiple regression technique to estimate availability of middle level skilled manpower in certain part of India. This estimation is useful to Government agencies and Industries.

Key Words: Vocational Education; Regression Technique; Statistical Technique.

INTRODUCTION

Vocationalisation of education implies an organized way of developing job related skills. It aims at laying foundations for the world of work. UNESCO associates Vocational Education (VE) with the upper secondary stage of education and defines as education designed to prepare skilled personnel at lower level of qualifications for one or group of occupations, traders or jobs [1]. The National Policy on Education of India [2] made revolutionary changes in education system.

1. The education structure is reorganized into 10+2+3 pattern.
2. Promotion of vocational education at +2 stage.

In pursuance to this, NCERT gave a scheme for introduction of vocational education. It was first introduced at higher secondary level in 1976-77. A Centrally Sponsored Scheme (CSS 1988) was introduced in 1988. This policy was further revised by NCERT in 1992, keeping in mind growing need of skilled manpower. Today, the economy of India is growing at the rate of 8% and because of 'Globalisation' several industries are opening up, even in rural part of India.

Regression analysis is a statistical technique primarily used for prediction of a value of variable. It can be used to analyze the relationship between single dependent variable and several independent variables. It can be used in Educational Science as well [3]. The availability of middle level skilled manpower can be estimated by using this technique. For this purpose, we have considered a case study of five districts of Marathwada region, Maharashtra State, India.

DATABASE

The estimated middle level skilled manpower are those students who are appearing for their final course of vocational education. A data of five districts of Marathwada, viz. Aurangabad (1), Beed (2), Parbhani (3), Jalna (4), and Hingoli (5) is collected. The data contains number of students studying vocational course, total number of students studying at +2 stage, and number of institutions offering education at +2 stage.

Dependent variable: Number of students studying vocational course (X_1).
Independent variables: Total number of students studying at +2 stage (X_2) and number of institutions offering +2 education (X_3).

The data collected shows the status of March 2005 [4]. Table 1 shows the database.

District Code	X_1	X_2	X_3
1	1824	30743	126
2	1573	27721	133
3	342	9494	65
4	209	12311	52
5	277	4408	28

Table 1: Database

SETTING A BASELINE: PREDICTION WITHOUT AN INDEPENDENT VARIABLE

Baseline prediction can be done by computing mean of the dependent variable. The regression equation can written as:

Predicted middle level skilled manpower = Average of X_1.

Table 2 shows the baseline prediction.

District Code	X_1	Baseline Prediction	Prediction Error	Prediction Error Squared
1	1824	845	979	958441
2	1573	845	728	529984
3	342	845	-503	253009
4	209	845	-636	404496
5	277	845	-568	322624
Total	4225		0	2468554

Table 2: Baseline Prediction

From the table 2 we observe that sum of squared errors is 2468554. This error can be minimised by simple and multiple regression.

SIMPLE REGRESSION

The prediction can be further improved by considering any independent variable. For this, we have to select 'best' independent variable among the two independent variables. Table 3 shows the correlation matrix between X_1, X_2 and X_3.

Variable	X_1	X_2	X_3
X_1	1.00		
X_2	0.962663	1.00	
X_3	0.948690	0.971592	1.00

Table 3: Correlation Matrix

From Table 3, we observe that, variable X_2 has highest correlation to dependent variable X_1. Therefore, simple regression equation can be set as:

$$X_1 = b_0 + b_1X_2$$

In this regression equation b_0 is intercept and b_1 is slope. They can be find out by using mathematical procedure known as least squares [5]. By using 'MS Excel' program they are computed as:

$b_0 = -256.598000$ $b_1 = 0.065047$

$$X_1 = -256.598+0.065047X_2$$

Table 4 shows the simple regression results.

District code	X_1	X_2	Simple Regression Prediction	Prediction Error	Prediction Error Squared
1	1824	30743	1743.14400	80.85639	6537.7570
2	1573	27721	1546.57100	26.42857	698.4693
3	342	9494	360.95890	-18.95890	359.4401
4	209	12311	544.19640	-335.19600	112356.7000
5	277	4408	30.12962	246.87040	60944.9800
Total				2.27E-13	180897.3

Table 4 : Simple Regression Results

Observe that compared to baseline prediction, sum of squared error decreases to 180897.3. The strength of relationship can be given by R^2. The value of R^2 is:

$$R^2 = 0.926719$$

This indicates that 92% of variation in dependent variable is explained by independent variable X_2. Figure 1 shows simple regression along with trend line.

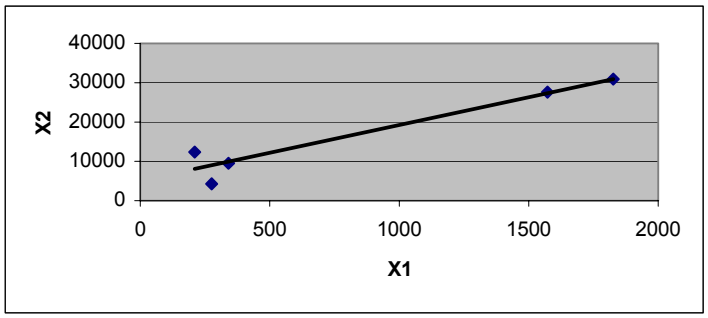

Figure 1: Simple regression

MULTIPLE REGRESSION

Prediction can be further improved by using another variable X_3. The equation for multiple regression can be written as:

$$X_1 = b_0 + b_1 X_2 + b_2 X_3$$

The values of b_0, b_1 and b_2 can be found out by using least squares method [5]. In 'MS Excel', they are compured as:

$b_0 = -317.378$ $b_1 = 0.04937$ $b_2 = 4.037619$

$$X_1 = -317.378 + 0.04937 X_2 + 4.037619 X_3$$

Table 5 shows results of multiple regression.

District code	X_1	X_2	X_3	Multiple Regression Prediction	Prediction Error	Prediction Error Squared
1	1824	30743	126	1709.18	114.8199	13183.62
2	1573	27721	133	1588.248	-15.2476	232.4888
3	342	9494	65	413.8245	-71.8245	5158.763
4	209	12311	52	500.4105	-291.41	84920.06
5	277	4408	28	13.33737	263.6626	69517.98
Total					-192.725	173012.9

Table 5: Results of Multiple Regression

Observe that sum of squared error is reduced to 173012.9. The variable X_3 is much similar to that of X_2, hence prediction is little improved.

CONCLUSIONS

By using multiple regression technique it is possible to predict the availability of middle level skilled man power. Such type of work is useful for Government for planning of vocational education. When an industry goes to open a plant in certain region of the country, it can estimate for availability of skilled manpower.

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NEW INFORMATION AND COMMUNICATION TECHNOLOGIES IN THE DEMOCRATIC REPUBLIC OF CONGO: STRATEGIES AND MEASURES

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ABSTRACT
This article will primarily allow a definition of the strategic development of ICT in the Democratic Republic of Congo, to be put forward. For the most part it involves the precision of many types of measures and strategies (such as institutional, regulatory, infrastructural measures), human resources, the development of content and partnerships, all of which do not yet exist in the Democratic Republic of Congo.

While encouraging an active and sincere partnership between public and private sectors, with all the difficulties this implies, this article will also allow for the recognition of the role that ICT can play in the development of Democratic Republic of Congo, if correctly integrated and adequately used, as well as conform to the Democratic Republic Congo's norms and realities.

Taking into account the near absence of laws and regulations about the use of ICT in the Democratic Republic of Congo, we have put forward several pertinent strategies and measures and have suggested appropriate ways of executing them.

Key words: ICT, strategies and measures, ICT development

INTRODUCTION

Since 1998, many countries have been celebrating the advent of the internet. The Democratic Republic of Congo, however has as of yet, remained in the population promotional phase, the politicisation of issues concerning the insertion of new technologies into society, the conscious-raising level of critical and pertinent uses of the internet, and consideration for the often forgotten, such as the rural communities.

Despite the obvious efforts in the past several years to democratize society, as well as efforts to reconstruct and modernise the economy as approved by the Democratic Republic of Congo, there are still particularly low indicators of human development. The serious problems of poverty are continuously exacerbated, and these undermine the Democratic Republic of Congo. The average lifespan, universal access to education and an acceptable standard of living are all below international norms. Along with the aforementioned problems, the inefficiency of institutions, the low quality of governance and political instability constitute the major difficulties that interfere with the actual development of new technologies.

At the same time, the development of new technologies that support this movement is a phenomenon that is irreversible. The consequence is that, the Democratic Republic of Congo must play a major but non-exclusive role in the sector of new technologies. In addition, new horizons must be opened, notably the partnership with the private sector in which strong leadership must be developed. Finally, we must adapt the use of ICT to the actual needs of the Congolese community in order to hope for visible and rapid results. The necessity for a stable, predictable and transparent regulatory environment in the Democratic Republic of Congo would favour a stronger foundation for the commencement of this public/private partnership.

Taking into account the near absence of laws and regulations concerning ICT in the Democratic Republic of Congo, we have put forward several pertinent strategies and measures and have suggested appropriate ways of executing them.

In terms of institutional measures, it is vital to have a clear vision. This must allow for the promotion of an institutional environment favourable to the reinforcement of human capabilities and general support for this sector's activities.

With regard to regulatory measures, a legal and representative framework favouring the definition and management of norms in this sector must be created. With regard to the measures of infrastructure, basic

telecommunication infrastructures must be promoted and reinforced. Measures of investment promoting a suitable environment for investment and competition in the ICT sector must lead the way for developing content and partnership.

CURRENT SITUATION OF STRATEGIES AND MEASURES OF ICT IN CONGO

Due to wars and political conflicts, the Democratic Republic of Congo is classified among the poorest countries in the world and certain indicators consider it, among the poorest of the African continent south of the Sahara, with nearly 80% of its population surviving on the limit of human dignity, with under US$ 0.20 per person, per day (Democratic Republic of Congo, 2005).

The Democratic Republic of Congo does not actually possess in its official documents clearly defined national strategies about the use of new technologies. What we can access, however, is the two-fold issue of the Democratic Republic of Congo's situation. This can be defined in terms of constraints and opportunities. On the one hand, the infrastructure concerning ICT throughout the country varies from almost in existence, in progress or completely obsolete and therefore nonexistent. On the other hand, the situation of the private sector in the Democratic Republic of Congo is more or less encouraging ICT and therefore should be further encouraged.

This general situation, in which we can observe a quasi-total absence of judicial coverage, demands the necessity of a clear definition of the roles of the different partners.

If the Democratic Republic of Congo wishes to use ICT to commence the process of development, the fundamental issue at hand is how to find the best partnership between the public and private sectors.

This partnership in the Democratic Republic of Congo also faces certain constraints in the public and private sector. The Congolese public sector is characterised by low wages, pressing demands in multiple domains for the reduction of poverty, a great need in ICT coverage, and short term interest. The private sector is characterised by limited investment opportunities, difficulties in the maintenance and development of ICT activities, and difficulties in paying taxes.

Additionally, the reinforcement of the capacity of human resources in the ICT sector poses a crucial problem to financing training abroad; finances that the Congolese partners in this field do not have at present. The demand for personnel knowledgeable in technological domains increases daily.

This situation does not attract potential investors. Consequently, the government must affirm its willingness to render the country more attractive to investors by improving productivity in all sectors and reducing transaction costs.

The present situation in the domain of infrastructures and connection of ICT in the Democratic Republic of Congo is much worse than originally believed. Infrastructures are obsolete or nonexistent, with a low rate of connection. In general, aside from coverage and infrastructures at the level of high media that necessitate reinforcement, the majority of telecommunication infrastructures is held and managed by public enterprises in the Democratic Republic of Congo.

CHALLENGES TO OVERCOME

There is lack of favourable conditions for the development of ICT in order to encourage the commitment of the private sector. There is lack of strategies for the use of ICT and lack of training program of a new labour force. There is also ignorance that the ICT domain is also a creator of new jobs and new professions.

Expanding the measures and strategies of development in an efficient partnership with the private sector and civil society; and reinforcing the quality of the legal and regulatory environment in order to turn it into an advantage rather than a constraint.

Presently, the situation remains disgraceful and it is the leaders of Democratic Republic of Congo and people's duty to adopt all necessary measures in order to overcome these challenges. This can be accomplished by defining strategies to mobilise partnerships and resources to support the national measures in ICT, putting into place an institutional framework that will favour ICT development.

Overcoming such challenges must in practice also allow for the following goals to be reached: the international Web with several international transit centres; reinforce the connection in the Democratic Republic of Congo to the internet, which would allow the various partners to have instant access to large global Webs; and find a way of decreasing the cost of connection and access to the internet. This will in turn create a favourable environment

for the development of ICT through the reduction of this sector's fiscal pressure on the Democratic Republic of Congo.

STRATEGIES

In the case of the Democratic Republic of Congo, we do believe that we must facilitate partnerships and reinforce capacities in order to elaborate and provide successful ICT measures and strategies in a suitable environment, create high-level dialogue about the contribution of ICT in the long-term that would involve partnership between the public and private sectors, and develop ICT services supporting private investment. All of this is only possible with the reinforced cooperation between the Democratic Republic of Congo and other nations.

Continuing along the line of developing infrastructures to improve connection, we shall define the following perspectives: campaign on ICT, introduction of ICT in the educational sector; promotion and reinforcement of the use of ICT for better productivity in administration; consider the improvement of connection in the Democratic Republic of Congo by the launch of satellite; and favour the entrepreneurial spirit in the ICT domain due to the elaboration of laws managing new services.

To encourage and promote the public-private partnership, principles based on the orientation of the private sector's resources towards public interest must be applied.

Given the constraints attached to the public sector-private sector partnership in the domain of ICT, we propose that there be: the necessity of promoting a regulatory, stable, predictable, transparent and suitable environment; the development of supporting funds for ICT development; and the development of specific concepts concerning the partners in the national political framework of economic development. At this stage, the idea of liberalisation of national enterprises is indispensable.

- Liberalisation

Liberalisation, which has as a principle the opening of the market place, offers many opportunities to this sector. It notably refers to the following: offering more opportunities to the growth of the private sector; accelerating economic growth; encouraging new investments; improving competition and efficiency; and of increasing productivity.

Meanwhile, initiatives such as the liberalisation of the local market place and the opening of the market to foreign players are to be encouraged through the creation of a regulatory framework for the market based on transparency, flexibility, general comprehensive statement and the law of the industry, as well as new market structures and a new regime of authorisation.

- National Enterprise

This concept developed and used by Malaysia for the promotion of its economic development has the following principles: the public and private sectors become partners and key players by working in the midst of the same enterprise that is the nation. There are therefore two complementary entities: one is in charge of the commercial and economic activities (the private sector) and the other is in charge of services (public sector).

The prosperity of the nation is only possible if the commercial and economic sectors attempt to promote production, marketing and sales, all the while optimising the profitably of investments, and if the services section of the cooperation, supplies in its own right, all the necessary support.

The partners for the development of ICT are multiple in the Democratic Republic of Congo, but we shall only focus on some of them. The partners we shall include are the government, the private sector, NGOs and the Church, etc.

The government of the Democratic Republic of Congo has the duty to guarantee social cohesion, to define strategies and policies in cooperation with the players from the private sector, to serve as the originator and facilitator of initiatives and to become the regulator rather than simply the controller.

The private sector also has its own obligations, such as responsibility, entrepreneurial spirit, innovation, competition, fair-play and participation in development projects.

In this movement to develop ICT, NGOs and Church have the task of promoting the above ideas to the population: being present in the field, educating local communities, constituting a lobby of playing an interfacing role by holding responsible dialogues with the key players.

In their capacity they also have a role to play in this move to develop ICT. They must work towards having a multiplying effect, serve as catalysts, facilitate regional and international integration, and possess and provide funds.

CONCLUSION

We suggest that for better results in the development of ICT, the Democratic Republic of Congo has to: Share resources and experiences with other countries in matters concerning ICT by developing education and human resources; associate the private sector to the matter of ICT measures and strategies; improve the connection on a sub-regional, national and international level by giving the necessary motivation for investment and innovation; and take advantage of experience of other countries. This does not mean that it needs to copy other experiences, but rather be inspired to define its own policies; by capitalising on the experiences of Congolese entrepreneurs evolving in the international ICT sector; by understanding other nations' experiences in order to sustain the Democratic Republic of Congo's initiatives, favour the transfer of technology and expertise.

Taking into account the near absence of laws and regulations concerning ICT in the Democratic Republic of Congo, we have put forward several pertinent strategies and measures and have suggested appropriate ways of executing them.

In terms of institutional measures, it is vital to have a clear vision. This must allow for the promotion of an institutional environment favourable to the reinforcement of human capabilities and general support for this sector's activities.

With regard to regulatory measures, a legal and representative framework favouring the definition and management of norms in this sector must be created. With regard to the measures of infrastructure, basic telecommunication infrastructures must be promoted and reinforced. Measures of investment promoting a suitable environment for investment and competition in the ICT sector must lead the way for developing content and partnership.

ICT therefore constitutes an accelerator to social and economic development if it is correctly integrated and used in an adequate manner, conforming to the specific norms of the Democratic Republic of Congo.

This being said, we hope that clear strategies and measures will first be defined by the Democratic Republic of Congo in order to facilitate a sincere partnership between all of the nation's forces.

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SCHOOL MANAGEMENT INFORMATION SYSTEMS IN PRIMARY SCHOOLS

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ABSTRACT
Developments in information technologies have been impacting upon educational organizations. Principals have been using management information systems to improve the efficiency of administrative services. The aim of this research is to explore principals' perceptions about management information systems and how school management information systems are used in primary schools. The respondents of this study were 98 elementary school principals in Edirne. Data were gathered using a five-part questionnaire. The first part collected demographic information about respondents. The others had statements about school management information systems. The data were analyzed using frequency, percentage, mean and standard deviation. Results indicated that although technologic infrastructures of elementary schools are insufficient, school management information systems have an important contribution to school management.

KEYWORDS: school management information system, elementary school, principal

İLKÖĞRETİM OKULLARINDA OKUL YÖNETİMİ BİLGİ SİSTEMLERİ

ÖZET
Bilgi teknolojilerindeki gelişmeler eğitim örgütlerini etkilemektedir. Okul yöneticileri yönetim bilgi sistemlerini yönetsel hizmetlerin etkililiğini artırmak amacıyla kullanmaktadır. Bu çalışmanın amacı ilköğretim okullarında okul yönetimi bilgi sistemlerinin kullanımı ve okul yöneticilerinin yönetim bilgi sistemlerine ilişkin görüşlerini saptamaktır. Araştırmanın katılımcıları 98 Edirne ili ilköğretim okulunun yöneticisinden oluşmaktadır. Veri toplama aracı olarak beş bölümden oluşan bir anket geliştirilmiştir. Birinci bölüm ile katılımcılara ilişkin kişisel bilgiler elde edilmiştir. Diğer bölümler okul yönetimi bilgi sistemleri ile ilgili sorulardan oluşmaktadır. Elde edilen veriler frekans, yüzde, aritmetik ortalama ve standart sapmaları hesaplanarak çözümlenmiştir. Araştırmanın sonucunda ilköğretim okullarında teknolojik altyapının henüz yetersiz olmasına karşın, okul yönetimi bilgi sistemlerinin yöneticilere okul yönetimi konusunda önemli katkılar sağladığı saptanmıştır.

ANAHTAR KELİMELER: Okul Yönetimi Bilgi Sistemleri, İlköğretim Okulu, Okul Yöneticisi

INTRODUCTION

Today, which we call information age as many technologic developments have been experienced; the biggest risk that an organization could take is to stay insensitive to change. Many significant factors such as continuous developments in information technologies, information exchange, increasing expectations of the society, modern managing perceptions and applications cause organizations all over the world to develop new applications in order to survive (Demir, 2003). Because of their priority in modern societies, Information Technologies have reached a state of high priority in education, too. Recently, contributions of information technologies to education have been among the mostly emphasized subjects (Webber, 2003; Flanagan&Jacopsen, 2003; Selwood, 2000, Pelgrum, 2001; Yuen, Law&Wong, 2003). Every country aims to provide their citizens with the most contemporary education in line with their financial efficiency. For this reason, big investment plans about the use of information systems have been put into action all over the world (Yuen, Law&Wong, 2003; Pelgrum, 2001). In our country, too, in order to support Primary Education Program, 600 million $ of loan in total was taken out in World Bank on June 25, 1998 and July 26, 2004. In the first section of the program, at least two primary schools in each of the 921 countries of Turkey were equipped in terms of information technologies and then activated. In-service training courses about the use of computer in primary education which was given to 2.250 coordinators of information technology sections and 35.000 teachers were financed. In the second section of the project ending on February 28, 2006, it is expected that information technology software are distributed to the 3.000 primary education schools around Turkey and education portal is established. By training 600 computer teachers, in-service training is planned for all the primary school inspectors working on the field, and for at least 106.381 educators formed of managers and teachers of primary schools which have or will have information technology classes, on use of information technologies in education and use of educational software, which will be prepared in line with recent instruction programs (World Bank, 2002; MEB, 2002).

School Management Information Systems

Being at the beginning stage of the School Management Information Systems, computerization of the school management is the basic subject of today's school management. Principals have started to make use of information systems in the gradually-increasing daily management staffs (May, 2003). Generally speaking, the

reasons to use information systems can be stated as increasing effectiveness at work by processing information, increasing managerial effectiveness by meeting the need for information and gaining superiority in competitions by directing strategies (Yuen, Law&Wong, 2003). School management information systems aim to provide support for the managing and educational activities of the school managers by processing information. Telem (1999) defines school management information systems as "a management information system designed to match the structure, management task, instructional processes and special needs of the school". As for a broad definition, contributions of the information systems to schools can be defined as making programs more effective, making the teaching process and the changes in learning environment professional, enabling teachers to exchange their experiences in a more systematic way, working in teams, determining the needs of the students (Gurr, 2000; Pegler, 1992), supporting the school managers and other staff in doing their duties, developing their performances, effectiveness and efficiencies (Telem&Buvitski, 1995). In other words, school management information systems increase effectiveness and efficiency by saving time and facilitating development of alternative solutions for sophisticated problems (Vissher&Wild, 1997; Pegler, 1992).

Information systems support not only information process but also innovations (Haag, Cummings&Dawkings, 1998; Bellum, 2003). As being adaptable to changes, these systems are helpful to cope with the demands for change. Therefore, school management information systems improve the adaptation of the school to the environment. They enable the school to comprehend and define inner and outer information transfer. Thereby, school management both meets the demands and expectations of its inner (teacher, student) and outer members; and ensures that school activities are arranged accurately and on time (Pegler, 1992).

Introduction of school management information systems to schools have caused significant changes in roles and working styles of managers (Telem, 1999). School management information systems have changed school management in the areas of leadership, decision making, workload, human resource management, communication, responsibility and planning (Gurr, 2000). Strategically school management information systems help the manager in determining the aims of the school, making long term plans, distributing resources, and forming educational methods of future, determining performances of teachers and success of the school (Telem&Buvitski, 1995; Telem, 1991). In this way, school management information systems can also be used as a tool to initiate and use educational leadership of the manager (Telem, 1999).

School managers can make more efficient decisions when they get correct and up-to-date information by school management information systems (Christopher, 2003). Decision making is the heart of educational management. Daily, problematic conditions that require decision making are based on the complicated and unexpected nature of school environment. For this reason, as a problem solver, the educational manager has to gather and analyze information continuously (Perez&Uline, 2003). In addition, managers have been required to make more decisions in short times because of the increasing expectations from the educational system (Christopher, 2003). Moreover, decision making has been faster, more frequent and more complicated in schools of today. In order to make decisions under these conditions, gathering data that is continuous, up-to-date and that can be accessed on-time and analyzing and using this data is an obligation (Telem, 1991; Gentry, 2005). Success of school development studies are mostly based on data based decision making. However school managers are not able to use the data efficiently in this aspect (Gentry, 2005).

School management information systems provide information and various reports from the database in order to make decisions in line with the aims of the school and facilitate controlling of the activities to achieve the aims (Telem&Buvitski, 1995; Telem, 1991; Christopher, 2003). Information technology helps the manager to access, manage and report the information quickly and easily. While telecommunication nets provide the manager with wide resources of information that can be used in problem solving, written communication has been grown richer by means of word processors and e-mails (Perez&Uline, 2003).

As we can see information systems have changed the roles of school managers (Pegler, 1992) and have changed their methods of working (Christopher, 2003). One of these is to develop a database that includes information on student registration and family, discontinuity, grades, staff and classes, and course information. These are just a step of school information systems. Other parts of information systems are management of school library, finance, fixtures, school schedule planning, standard reports sent to higher levels of school administration, etc. These are simple data processing activities that increase efficiency of school management (Pegler, 1992). Moreover, use and analysis of information at schools will not only make managers realize what should be done in order to develop student performances, but also will ensure success in accomplishing these changes. When managers use data, they will start to realize innovation efforts on this issue (Christopher, 2003). As a result, it can be stated that by means of information systems school managers will be able to determine required

information, access the information, interpret the data, use the data in decision making and evaluating and developing efficient use of the system.

Researches in various countries confirm that school management information systems increase organizational and managerial effectiveness. After studies done with American school managers, Hedberg, Harper, Bloch and College (1992) stated that efficiency has increased in decision making at schools where school management information systems are used. In his study where Gurr (2000) examined effects of school management information systems on working of primary school managers in Australia, managers stated that use of school management information systems has introduced them information technologies and the facilities, lessened their workload and made management process more efficient, helped them use time more efficiently, made teachers feel themselves more important, made them and the teachers wish to improve themselves more, made important changes in education and teaching, and increased the quality of in-school communication. In their study with school managers, Telem and Buvitski (1995) found that school managers believed that school management information systems lead to important changes at school. According to school managers, this application has increased school standards, helped decisions on the level of control and strategy, increased the quality of teaching programs, facilitated student-teacher interaction, increased the coordination between teachers, facilitated systematic and continuous information transfer to parents, and increased communication with other institutions and the central organization. In his study where Gurr (2000) examined effects of information systems on school managers of local schools, he determined that information systems have largely changed roles of school managers. Managers stated that a manager who does not use the information systems is not able to achieve his duties sufficiently anymore. Lastly, Anderson and Dexter (2005) in their studies determined that technology leadership of school managers is more important than background in the efficient use of technology at schools.

However in literature there are researches that show that school managers had problems in using school management information systems. For example Visscher and Bloemen (1999) in their study with 195 managers and teachers working in 63 high schools in Holland found out that school management information systems were mostly used in routine works and managers and teachers did not have sufficient education on the system. Managers and teachers indicated that while school management information systems had positive effects on evaluation of efficiency of the school, development of using sources, quality of educational programming and in-school communication, it increased their workload and caused stress. The research indicated that this stress is reduced in schools where education is sufficiently given on the system and where innovation is clearly stated as a vision. In addition it was found that the staff that used the system had higher motivation, was keen to take more education, and adopted the vision of the school more. In the research where Warren (1998) examined the effects of information systems on educational decision making, he found out that school managers have not taken sufficient education on efficient use of the information technologies. Crouse (1994) found that education increased the possibility to use the information systems. Also Jacops (1992) claimed that there was a correlation between the amount of education the managers took, and the use of information technologies. As a result, it can be stated that school managers had to take over the responsibility of leadership in an unfamiliar area without sufficient education.

As we can see communication and information technologies have increasingly had a role on the activities of schools. During this period, many things have been said and written about the importance of computers (Selwood, 2000; Christopher, 2003). Although there are many researches on the role and necessity of information technologies in education, many of these are about the educational functions of information systems and just a few of them are about school management. In other words, although there are many researches on the role of information systems on class and teaching, few studies have been done on the use of them in educational management and their effects on the managers. The aim of this study is to examine the use of information systems in school management and to find out ideas of managers about managerial information systems. In this aspect, these questions were searched:

1. How are the information technology facilities in primary schools in Edirne?
2. What are the studies done by using managerial information systems in primary schools in Edirne?
3. What are the contributions of managerial information systems and the problems in primary schools in Edirne?

METHOD

Research Model

The model of this research, which aims to examine the use of information systems in school management and to find out ideas of managers about managerial information systems, is survey model.

Population

Population of this research is formed of school managers working in 170 primary schools in Edirne. However managers from 98 schools responded to questionnaires. Among the school managers included in the research, 26 of them have worked for 1-5 years (26.5%), 25 of them for 6-10 (25.5%), 18 of them for 11-15 (18.4%), 9 of them for 16-20 (9.2%), and 14 of them have worked for 21 and more years (14.3%). 25 of the participants (25.5%) are undergraduate, 69 (25.5%) of them are graduate and just one of them (25.5%) is a post-graduate. Among the school managers included in the research, six of them didn't respond to question about occupational experience and three of them didn't respond to question about education level.

Data Collection and Analysis

A questionnaire was developed as an instrument of data collection. In the first part of the questionnaire, there were some items about the personal information of the school managers such as vocational experience and education level. In the second part, the items were about information technology facilities related to the information systems of the school and opinions of the school managers about technological facilities. The items about the number of the computers in the school and number of the computers connected to the Internet were open-ended and later, they were classified after examining their distributions. Participants were expected to choose among the options presented for the items about the places of the computers and the ones connected to the Internet and also the softwares used. Lastly, there were open-ended items related to the places to consult in case of a problem about the program and the ones related to reliability. In the third part of the survey, there were items related to the studies done with the school managing information systems and items about by whom these studies were done. These items were divided into two parts as the preparation of various documents, lists and statistics, and data entry. The fourth part consisted of the contributions of managing information systems to school management and problems encountered. These items were in the form of five point likert scale. Options were ordered as; "Strongly disagree", "Disagree", "Undecided", "Agree" and "Strongly Agree". The answers were ordered from "Strongly Disagree" to "Strongly Agree" by grading them from 1 to 5. The fifth part included experiences of school managers in information systems and effects of managing information systems to the manager. In this part, school managers were asked questions about their experiences in information systems and the effects of managing information systems to their managerial efficiencies and occupational developments. Options were ordered as; "Strongly disagree", "Disagree", "Undecided", "Agree" and "Strongly Agree". The answers were ordered from "Strongly Disagree" to "Strongly Agree" by grading them from 1 to 5. In this part, To determine the validity of questionnaire was used the technique of content-related validity according to the opinions of the experts,

At the end of the study, the data were analyzed by evaluating their arithmetic average, standard deviation and frequencies and percentages.

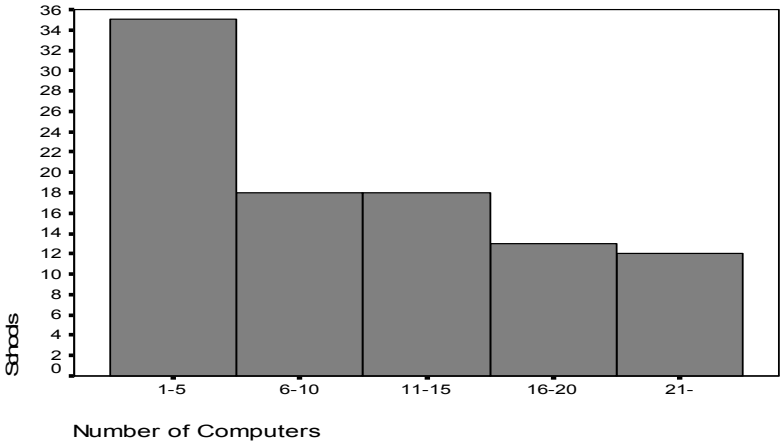
FINDINGS

The findings of the study were presented under the titles of information technology facilities of schools, studies done with the managing information systems in schools, contributions of managing information systems to school management, and the problems suffered, information system experiences of school managers and effects of information systems to them.

Facilities of Information Technology in Schools

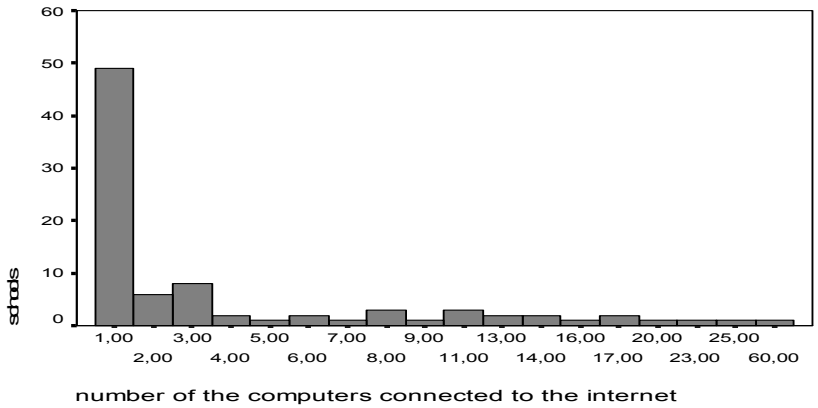
Under this title, facilities of information technology in schools and opinions of school managers about technological facilities were presented. The number of the computers, and computers connected to the internet, their location and software used in schools and opinions of school managers about the software were presented below in graphics and tables.

Graphic 1. Number of Computers in Schools



When the number of the computers in schools within the scope of the study was examined, it was found that 35 (%35.7) out of 96 schools had 1-5 computers, 18 (%18.4) schools had 6-10, 13 schools (%13.3) had 16-20 and 12 schools (%12.2) had 21 and more computers. As it is seen in Graphic 1, %54 of the schools within the scope of the study had less than 10 computers.

Graphic 2. Number of Computers Connected to the Internet in Schools



As it is seen in graphic 2, the number of the computers connected to the internet was considerably poor. In addition, only %27.6 of these schools had a web page.

Table 1. Locations of Computers and the Computers Connected to the Internet in Schools

	Computer		Internet	
Location	f	%	f	%
Room of the Manager	85	86.7	70	71.4
Deputy Manager Rooms	74	75.5	51	52
Teacher's Room	56	57.1	34	34.7
Computer Laboratory for the Students	62	63.3	33	33.7
Guidance service	15	15.3	12	12.2
Library	15	15.3	6	6.1

85 (%86.7) managers out of 98 that were included in the study had a computer in their rooms and 70 (%71.4) of them had internet connections. Deputy Managers rooms with 74 (%75.5) came after that. Only 51 (%52) of computers had internet connection in deputy manager rooms. 56 teachers room (%57.1) had computers and 34 of them were connected to internet (%34.7) in 98 schools. On the other hand, only 15 (%15.3) of the libraries and guidance services had computers. (Table 1)

Table 2. Software Used in Schools.

SOFTWARE		N	Y
School Management Software Package	f	45	50
	%	45.9	51.0
Budget Programs	f	47	48
	%	48.0	49.0
Word Processor (Microsoft Office-Word vb.)	f	15	81
	%	15.3	82.7
Spreadsheet (Microsoft Office-Excel)	f	17	79
	%	17.3	80.6
Presentation (Microsoft Office-Power Point vb.)	f	30	66
	%	30.6	67.3
İlsis Software	f	41	55
	%	41.8	56.1
Library Program	f	90	5
	%	91.8	5.1

As it is observed in Table 2, the most used softwares by the school managers in the schools were word processing (%82.7) and spreadsheet (%80.6) softwares. In %51 of all the schools, school management softwares were prepared by private companies. The least used software was the library program (%5.1).

Table 3. Ideas of School Managers about the Programs Used

IDEAS ABOUT THE PROGRAM		N	Y
Do you find the programs useful?	f	6	90
	%	6.1	91.8
Do you think you use these programs with all their functions?	f	58	38
	%	59.2	38.8
Do you pay attention to computers being ready to use all the time?	f	6	92
	%	6.1	93.9
Can you get help easily when you come across a problem with the programs?	f	41	54
	%	41.8	55.1

%91.8 of all the school managers who took part in the research found the programs they used user-friendly in school management. However, % 38 of them thought that they used these programs with all the functions. Besides, %93.3 of the school managers stated that they paid attention to the computers' being ready to use all the time and only %55.1 of them said that they could get help easily when they came across a problem. (Table 3)

Table 4. Agencies where Schools Get Help in Case of a Problem

GETTING HELP	f	%
We don't get help	11	11.2
Server	46	46.9
Surrounding	22	22.4
Teacher of Computer	14	14.3
On-line Help	5	5.1

As it is seen in Table 4, % 46.9 of school managers got help from the server when they had a problem related to the programs at school.

While %76.5 of the school managers said "Yes" to the question "Do you take precautions for the safety of the information in the computer?" %21.4 of them said "No". The precautions taken for the safety of the information in the computers by the school managers were given in Table 5.

Table 5. Precautions Taken for the Safety of the Information

PRECAUTIONS		N	Y
Anti-virus programs	f	70	28
	%	71.4	28.6
Password	f	71	27
	%	72.4	27.6
Back up	f	63	35
	%	64.3	35.7

While % 75.5 of the schools which took part in the research took precautions, %25.5 of them did not take any precautions. For the safety of the programs, in %28.6 of the schools anti-virus programs, in % 27.6 of the schools cipher and in %35.7 backing up were used (Table 5).

DATA		Data Entry Not-Available	School Principal	Assist. School Principal	Official	Teacher
Information about	f	7	52	55	1	8
Students	%	7.1	53.1	56.1	1	8.2
Student Grades	f	15	29	54	1	26
	%	15.3	29.6	55.1	1	26.5
Attendances	f	16	26	58	2	2
	%	16.3	26.5	59.2	2	2
Institutional	f	6	69	38	4	4
Information	%	6.1	70.4	38.8	4.1	4.1
Information about the	f	10	51	40	9	4
teachers	%	10.2	52	40.8	9.2	4.1
Curriculum and	f	19	34	47	3	13
Courses	%	19.4	34.7	48	3.1	13.3
Budget	f	37	29	14	13	4
	%	37.8	29.6	21	14	4.1
Salary-Payroll	f	32	26	25	21	3
	%	32.7	26.5	25.5	21.4	3.1
Accrument Data	f	38	26	22	17	2
	%	38.8	26.5	22.4	17.3	2
Fixtures	f	25	39	35	12	3
	%	25.5	39.8	35.7	12.2	3.1
Library	f	41	17	23	12	21
	%	41.8	17.3	23.5	12.2	21.4

As it is shown in Table 6, the most intensive data entries into the information systems at schools were respectively as follows: institutional information, information about students, student grades and attendances. The least data access was seen in libraries of schools. When it was examined who entered the data at schools, it was clear that the most important part of this work was done by the school principals and their assistants. The school principal usually entered the data about institutional information (%70.4), information about the teachers (%52), fixtures (%39, budget (%29.6), payroll (%26.5) and accrument (%26.5); and assistant principals entered the data about attendances (%59.2), information about the students (%56.1), grades(%55.1), curriculum and courses (%48) and library (% 12.2) at schools within the scope of this research. As it is obvious, the role of the teachers in entering data was very scarce. Only in 26 of 98 schools, teachers were assigned to enter the student grades into the system, of 13 schools (%13.3) they were assigned to enter the curriculum and the courses and of 22 schools (%21.4) the library data.

Table 7. Preparation of Lists and Documents through Information Systems at Schools

Preparation of Lists & Documents		No Data Entry	School Director	Assistant School Principal	Official	Teacher
Students	f	4	43	54	5	11
	%	4.1	43.9	55.1	5.1	11.2
Teachers	f	6	57	46	10	6
	%	6.1	58.2	46.9	10.2	6.1
Fixtures	f	18	41	34	12	7

	%	18.4	41.8	34.7	12.2	7.1
School	f	30	40	28	14	2
Expenditures	%	30.6	40.8	28.6	14.3	2
Payroll	f	27	30	30	19	5
Arrangement	%	27.6	30.6	30.6	19.4	5.1
Student Statistics	f	7	40	52	3	12
	%	7.1	40.8	53.1	3.1	12.2
Library Statistics	f	42	17	18	12	19
	%	42.9	17.3	18.4	12.2	19.4

As it is observed in Table 7, the lists and documents prepared by information systems at schools within the scope of this study were the lists and documents related to the students and the teachers and statistics related to the students respectively. Information systems were used relatively lesser in the preparation of library statistics at schools. When the people who were responsible for the preparation of the lists and the documents were analyzed, it was observed that this responsibility was carried out mostly by school principals and assistant school principals. Through the information systems at schools in the scope of this study, mostly school principals prepared the lists and documents related to the teachers (%58.2), fixtures (%41.8), school expenditures (%40.8) and payroll (%30.6); and assistant school principals prepared the lists and documents and (%55.1) statistics (%53.1) related to the students. As it is clear, teachers got the least part in preparation of the lists and documents. Only in 11 schools (%11.2) of 98 schools, teachers were assigned to enter data and documents about the students and in 12 schools (%12.2) student statistics and in 19 schools (%19.4) library statistics.

The contribution of Management Information Systems to School Management and the Problems Encountered

The contribution of Management Information Systems to School Management was given in Table 8 and the problems encountered were given in Table 9 below.

Table 8. The contributions of Information Systems to School Management

CONTRIBUTIONS	N	$\overline{X}$	SS
Preparation of documents became easier	97	4.43	.72
Keeping the records became easier	97	4.40	.73
Correspondence became easier	97	4.39	.72
Many more operations can be done compared to the past times	97	4.38	.77
It is easier to correct the mistakes	96	4.34	.58
The information asked by the upper institutions can be transmitted in a short time.	98	4.33	.88
The frequency of mistakes is nearly zero.	98	4.32	.86
It is easy to detect the mistakes	96	4.32	.88
Information related to the students can be transmitted to the parents easily.	96	4.04	.92

It can be observed that the level of the contribution of information systems to school management was at a high level. It was stated that the most important contribution of information systems to school management was that preparation of document got easier ($\overline{X}$ =4.43). This was followed by the ease of keeping the records($\overline{X}$ =4.40), the ease of correspondence($\overline{X}$ =4.39), more operations' being done compared to the past ($\overline{X}$ =4.38), the ease of correction of the mistakes($\overline{X}$ =4.34), the ease of the information asked by the upper institutions' being transmitted in a short time ($\overline{X}$ =4.33), the frequency of mistakes' being least ($\overline{X}$ =4.32), the ease of detecting the mistakes ($\overline{X}$ =4.32), the ease of the information related to the students being transmitted to the parents easily ($\overline{X}$ =4.04) (Table 8)

Table 9. Problems Encountered Related to Management Information Systems

PROBLEMS	N	$\overline{X}$	SS
We have to give a break in case of an electricity cut.	93	3.66	1.23
The risk of data's being lost increased (electricity cut, system collapse)	97	2.93	1.24
We have some problems related to the softwares.	95	2.87	1.13
It is a serious time consumer to check e-mails all the time.	97	2.24	1.01
We cannot do the necessary work when the responsible people are out of the school.	92	2.15	.81

We had enough time to prepare the studies required by the upper institutions(to enter the personal information to the system, etc)	96	1.97	.88
We cannot update the data that we entered to the computer or to the Internet regularly.	96	1.89	.77

As it is seen in Table 9, school managers stated that the fact that they had to pause the work in the case of electricity cut off ($\overline{X}$ =3.66) was the most frequent problem about the information systems and while the fact that they could not update the data regularly ($\overline{X}$ =1.89) was the least frequent one.

Information System Experiences Of School Managers and Their Effect to the Managers

Under this title information system experiences of the school managers and effects of management information systems to the managers were presented. Here are the findings about school managers' experiences and frequencies of computer and the Internet use and the education they received about these subjects, which were the indicators of school managers' information system experiences: the level of computer use of the %32.7 of the school managers was basic level, %54.1 of them was average and %12.4 of them was advanced. Managers stated that their frequencies of computer use ($\overline{X}$ =3.58) and internet use ($\overline{X}$ =3.22) were at a medium level. %81.6 of the school managers received education about working with computers. On the other hand, %77.6 of them answered the question "Would you like to receive education about computers?" as "yes". Findings about the effects of management information systems to the managerial effectiveness of the school managers were presented in Table 10 and findings about their effects to the managers' vocational development were presented in Table 11.

Table 10. The effects of Information Systems to the Managerial Effectiveness of the School Managers

Effects To The Managerial Effectiveness Of The School Managers	N	$\overline{X}$	SS
It makes it easy for me to reach the information I need to solve the problems	98	4.40	.60
The data that are input in the computer are effective in making managerial decisions	96	4.14	.80
I can make use of time more effectively	97	3.54	.89
My workload has reduced.	98	3.53	1.32
My responsibilities have reduced	98	2.17	1.11

As it is seen in Table 10, school managers relatively stated that the most important effect of the information systems to their managerial effectiveness was that they made it easy for them to reach the information they needed, to solve the problems ($\overline{X}$ =4.40) and that the data that were input in the computer were effective in making their managerial decisions ($\overline{X}$ =4.14). The least important relative effect of the information systems to school managers' managerial effectiveness was that they reduced the workload ($\overline{X}$ =3.53) and the responsibilities ($\overline{X}$ =2.17) of the managers.

Table 11 The Contribution of Information Systems to the Professional Development of the School Manager

Contributions to the Professional Development of the School Manager	N	$\overline{X}$	SS
This improved my desire to develop myself.	97	4.45	.72
This changed my perspective of the technology.	97	4.34	.83
These studies improved the quality of my work.	96	4.23	.76
Working with a computer encourages me about finding alternatives in solving the problems.	98	4.23	.70
Working with a computer improved my skill of solving the problems.	97	4.13	.84

As it can be seen in Table 11, school managers considered the contributions of information systems to their professional developments very important in all items. The most important contribution of Information Systems to professional developments was stated as the desire of developing himself ($\overline{X}$ =4.45). This was followed as the change of perspective of the technology ($\overline{X}$ =4.34), improvement of the quality of the works ($\overline{X}$ =4.23), encouragement of finding alternatives in solving the problems ($\overline{X}$ =4.23), improvement of problem solving skill ($\overline{X}$ =4.13)

DISCUSSION

According to the results of this study which was about the usage of School Management Information Systems in primary schools and which intend to determine the viewpoints of the school managers related to management information systems, it was observed that the number of computers was not enough and there was only one computer connected to Internet in most of the schools. Besides, in few of these schools, there was a web page of the school.

In the study conducted by Pelgrum (2001) in 26 countries and by Mentz and Mentz(2003) in the schools of South Africa, it was seen that one of the most important obstacles of the applications of management information systems was the inadequacy of the numbers of the computers. For that reason, it can be said that there was an important infrastructure problem of the realization of school management's information systems in today's schools. As Gregorash stated (2004) the consistency with technological improvements increased with the usage of technology. For that reason, it is compulsory to supply educators especially school managers with enough technological opportunities to make them accept and harmonize the improvements. The problems encountered show the necessity that the applications of information system should be done in the scope of an effective program.

Furthermore, there is an important difference among the schools in terms of having these technologies. This imbalance makes us think that there are some inequalities related to the usage of these technologies' opportunities not only for the manager and teachers but also for the students. This situation shows that there is a possibility of coming face to face with the problem which is discussed widely and called "digital division" not only country-wide but also in the schools in the same province.

Moreover, it was observed that there are still some school managers and assistant school managers who don't have a computer in their rooms at the schools in the scope of this study. Among the school managers and assistant school managers who have a computer in their rooms, some of them use a computer without an Internet access. Besides there are some schools whose teachers do not have the opportunity of making use of the information technologies. It is seen that The Ministry of Education's objective (MEB, 2002) which is supplying each staffroom with at least two computers; supplying guidance service, library, school managers with Internet access in order to communicate with the central and provincial offices and also for the usage of management has not been achieved yet.

As it was stated before, instrument insufficiency in technology is a serious handicap for managers and teachers in using information technologies in their studies and for expectations such as being a literate of information and leader of technology to become real.

While school managers defined their frequencies of internet and computer use as medium level, they described their level of computer use as inefficient. In the study of Peterson (2000) and Jetton (1997), managers found their efficiency in using computer low. When examined in terms of the programs used, it is seen that software which managers used most are Word Processor and Spreadsheet**.** In their studies about school managers, Gurr (2000), Peterson (2000), Blake (2000), Borruso (2000) and May (2003) stated that managers used word processor software more often than graphic and database software. In addition, apart from these softwares, managers participating in this study have been using school managing software prepared by private companies.
As it is seen, the Ministry of National Education could not achieve its aim of buying the softwares such as those which keep records of the students for the school management, management information system and decision making system software, database software for the school guidance services, library automation software for the libraries, accounting software for the school accountings; and putting them into use of the schools (MEB, 2002). Therefore schools try to obtain these softwares by their own efforts.

Majority of the managers involved in the study found the software they used in the school management practical. However, very few of them thought that they used all functions of these softwares. This may result from the fact that managers have insufficient education about the managerial software. The Ministry of National Education attaches more importance to teacher training in technology training during the studies of in-service training. Training of the managers is a serious problem even in the other countries which practice the applications of managerial information systems in their schools. For example, in his study involving schools of 26 countries, Pelgrum (2001) showed that having insufficient education is among the most important hurdles of managerial information system applications according to the school managers. Likewise, Jetton (1997) in his study involving school managers from Texas, Allen (2003) in his study involving managers from Ohio, Dowson (2001) in his study involving managers from Louisiana, Goeltz (1998) in his study involving managers from

Idaho, Borruso (2000) in his study involving managers from New York showed that, according to the managers, inefficiency in the use of technology resulted from the insufficient education they received.

As it was also highlighted by Anderson and Dexter (2005), being a leader in technology, school manager should learn how to use technology while fulfilling his duties because a school manager is a key to increase the use of technology in schools. Therefore, managers' education in the use of technology is as indispensable as those of teachers. It is arduous to back up further innovations in an area about which you have a little knowledge. When it comes to an innovation involving technology, leadership is a crucial factor. No matter how much teachers are educated in technology, it would be impossible to put them into practice without the leadership of the education manager. (Dawson&Rakes, 2003).

Education, here, refers to more comprehensive studies that can make managers literate of computers; not to the short-term in-service training courses about the use of information technologies since majority of the managers in the mentioned schools have received education in working with computers. On the other hand, almost all of these managers gave "Yes" answer to the question "Would you like to receive education about computers?" Therefore, the quality, time and methods of the education given could be revised. Particularly, online education services could be emphasized so that continuum and duties of managers are not hindered.

Majority of the managers stated that they took pains to have all computers always ready to use. Only half of the managers involved in the study stated that they could get help easily when they encountered a problem about software. When a problem was encountered, school managers, firstly, asked for help from the place they bought the software. Also, in his study including schools of 26 countries, Pelgrum (2001) stated that among the most important hurdles which managers encounter in applications of the managerial information systems is that they cannot get enough help when they encounter a problem. It is seen that this is the case in the schools in Edirne. It is clear that specialists to help managers to solve the problems encountered not only in information technologies but also in software are needed at schools. These specialists could be one of the teachers of computer technologies or among the other teachers in the school who received a comprehensive training in this subject. Until it is ensured that each school has an information systems specialist, Centers of School Technical Support within the body of Offices of Education Service Centers should be activated.

Managers involved in the study mostly stated that they took precautions for the safety of the data in the computer. These precautions were antivirus programs, password and back up.

In the schools within the scope of the study, the most frequent data input were institution's data, students' data, instructors' data, students' grades and attendances respectively. Lists and documents prepared by means of information systems were those about students and instructors and statistics about students respectively. In the decision making of the manager about educational and managerial activities and in organizing school activities both on time and without any handicap, these data were relatively more important than other data and lists and documents prepared by means of those data. Therefore, data input in these subjects and studies based on these data are expected to be intensive. However, as it is seen, it is a matter of fact that information systems are still used in simple data processing techniques and routines in these schools. In fact, results of the studies in most of the countries (May, 2003; Christopher, 2003) show that school managers use information systems at the said level.

On the other hand, it's seen that an important part of the study related to the improvement and use of database was done by the headmaster and assistant headmasters. However, teachers took very little part in both data entry and preparation of list, statistics and document. In schools which had a transition period in information systems, due to this research results, the workload of these applications were mostly undertaken by the headmaster and the assistants. There are some teachers responsible for data entry at schools during the practices which are done in different countries. For example in Nederland these officials are called as "SIS Officers, (Visscher and Bloemen, 1999), in Israel "School Computer Manager". These teachers are responsible for the preparations of the reports, statistics and various lists to the administration and also responsible for the database update (Telem, 2001). In our country, since an officer like them doesn't work in our schools and the managers mostly undertake these businesses, it might restrict the time for their other administrative duties. For today, this might not be so much restrictive. The school administers indicated that they did not have important problems about entering information which are wanted from upper institutions to the system, updating the data regularly, etc. However, in the future if the mentioned works become more complex, problems about this might increase. On the other hand, in their research Hedberg and his friends (1992) determined that School Management Information Systems are used more effectively in the schools where teachers participate in data entering and reporting studies. In this point of view, if the participation of the teachers to these studies and the encouragements of the unwilling

teachers can be achieved, it might provide more affective usage of School Management Information Systems in primary schools.

The examination of the information systems shows relatively that the most important contribution is the simplification of the document preparation. Getting easier of data saving and correspondence, making more operations, correcting errors more easily than before, transmitting the information which is wanted from upper institutions, decreasing errors, noticing the errors easily and transferring the information related to the students easily follow in turn. In Schiller's research which was done with Australian School Managers (2003), the managers stated that they did their studies quickly and more qualified with School Management Information Systems. In research of Zain, Atan, and Idrus (2004) which was done in Malezia, it was determined that the most important effects of School Management Information Systems are not only deciding the information but also reaching information easily. In researches of May (2003), Borruso (2000), Peterson (2000), Inkster (1998) and Arnold (1998) it was established that technology affects the work performance of the school managers positively. As a result School Management Information Systems provide important contributions about the school management to the school managers.

While school managers stated that the most frequent problem they suffer from information systems is that they have to stop working in cases such as electricity cut, the least frequent problem was given as the lack of systematic up-dating of data. Also in the study of Pelgrum (2001) in 26 countries, in the study of Mentz and Mentz (2003) in South Africa, and in the study of Zain, Atan and Idrus (2004) in Malaysia, school managers stated that lack of infrastructure such as electricity cut, lack of technical support, and the problems with providing data security hindered effective use of the system. Similarly, the most important obstacle in effective use of the managerial information systems here is the lack of infrastructure, therefore lack of planning.

School managers stated that the most important relative effect of information systems to their managerial effectiveness is that it allows to reach easily the information needed to alter the problems and that the data input in the computer are effective in making managerial decisions. In the studies done in this subject produced similar results in many countries. In their study about Israeli school managers, Telem and Buvitski (1995); in his study about Australian school managers, Gurr (2000); in his study about South African managers, Van Heerden(1991); in his study about school managers in Virginia, Christopher(2003); and in his study about school managers in Texas, Gregorash (2004) found that school management information systems help school managers make managerial decisions. As Telem (1991) emphasized, more frequent, more complex and faster decisions have been made in schools of today. This decision making requires more data and complex relations among these data which should be taken into consideration. Moreover it is a must to base these decisions on current/recent data. The results of this study reveal that school management information systems allow managers to be able to make effective decisions based on recent/current data.

The less important relative effect of information systems to their managerial effectiveness is that they lessen managers' responsibilities and workload. In the study of Telem and Buvitski (1995), and in the study Visscher and Bloemen about managers in Holland, it was seen that school management information systems changed the duties of school managers but did not lessen their workload. These results show similarity with the findings of this study. This may result from the fact that school management information systems do not change the duties of the managers but the way they implement their duties. As we see, information systems do not lessen the workload of the managers but make radical changes by entrusting new duties and developing the old ones. (Pegler, 1992; Christopher, 2003; Gurr, 2000; Flanagan&Jacopsen, 2003). For example, student lists or statistics that were prepared manually before have now been prepared with school management information systems from now on. Here, it is apparent that the most important achievement of the school managers in school management information systems is the economy of time. In this study, also, managers showed that they made use of their times more effectively owing to the school management information systems. In the study of Telem (1997), school managers stated that they made use of their times more effectively through school management information systems, which agrees with the results of this study. In conclusion, it can be said that school managers can make more effective decisions by having more data as well as they have enough time to implement them.

For all of the items, school managers stated that the contribution of information systems to their vocational development was at a serious level. They stated that the most important contribution of information systems relative to their vocational development is that their enthusiasm to improve themselves has increased. Following that, changing opinions about technology, increased quality of the studies, courage to look for different alternatives to solve problems and increased ability to solve problems come respectively. In the studies of both Gurr (2000) and Schiller (2003), it was determined that school management information systems had positive

effects on the vocational developments of the managers. As it was stated by the studies (Kicklighter, 2004; Seay, 2004; Patterson, 2004; Mannino, 2004; Duncan, 2004; Gene, 2003; Owens, 2003), school managers are one of the keys to the success in the educational innovations.

Managers, being the leader of the school, should also undertake the responsibility of easing the innovation process. Managers' view of technology and their attitudes towards the use of technology have effects on teachers, too. This fact attaches importance to managers' adaptation and their positive attitude towards technological innovations.

In conclusion, a study with long-term plans initiated by completing insufficiencies in infrastructure is needed for the effective use of school management information systems in schools. Managers should be encouraged to use information systems and they should believe that data are valuable sources for decision making and that the information systems back up the implementation of educational reforms. It should be ensured that school managers took part in making decisions about these applications in order to make them embrace innovations.

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THE EFFECTS OF DIGITAL PORTFOLIO ASSESSMENT PROCESS ON STUDENTS' WRITING AND DRAWING PERFORMANCES

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ABSTRACT
In this paper, it was investigated the effect of digital portfolio assessment process on the drawing and story writing performances of the 14-15 ages students. For this reason, a digital portfolio assessment rubric was prepared in order to evaluate students' drawing and story writing works. For the validity and reliability analyze was applied to 52 high school students. According to analyzes, the digital portfolio assessment rubric, which is valid and reliable, can be used in order to evaluate students' drawing and writing performance. For the application of program, an experimental and a control group were used in the study. The study was conducted during 4 months. The data was gathered 52 students, 17 in the experimental groups and 35 in the control groups. Digital portfolio assessment process was used in the experimental group and traditional assessment plan was used in the control group. In both groups students were wanted to engage drawing and writing. Results indicate that no significant differences ($p>.05$) were found on drawing and writing performances pre-test scores of the groups but a significant difference ($p<.05$) were found in favor of experimental group in post-test scores of both groups.
KEY WORDS: Performance assessment, digital portfolio, assessment rubric.

INTRODUCTION

Performance assessment techniques are often recommended as alternatives to traditional fixed-response rating scales and to standardized tests of achievement. Performance assessment has been defined to consist of such measures of understanding and skill of higher-order, complex tasks as "direct writing assessments, open-ended written questions, hands-on experiments, performances or exhibits, and portfolios" (Aschbacher, 1991).

Portfolio assessment is used in many fields such as fine arts, marketing, architecture and education. Portfolio is defined as "a purposeful collection of student works that display the efforts, development and successes of the learner" (Paulson, Paulson & Meyer, 1991: 60; Jacobson, Sleicher & Maureen, 1999; Mullin, 1998). The most distinctive property of portfolio is that it makes a person both assessor and assessed, apart from making him/her assessed. In this case, apart from being the object of assessment, the student is both the partner of the assessed object and the assessment (Wolf, 1991: 130). Here, the learner actively participates in the selection of the content and determining the selection criteria. Portfolios serve both for the teacher and for the student. It provides students the opportunity to project their successes and teachers the opportunity to evaluate the development and success of the students. Students test their own works and project them on their targets for the future. Traditional tests do not reveal the development and all skills of the individual (Barton & Collins, 1993).

One of the many benefits of portfolio is that brings clarity to the fairness problems in assessing the student performances. Assessment will no longer be a secret method, the quality of their works will be judged by themselves and they will develop standards. In determining the assessment criteria negotiation between the learners and between learner-teachers has an important role. In order to shape the assessment criteria, class discussions of students are allowed. This method provides an educational environment both for the students and for the teachers (Mullin, 1998). This environment will enable the student to be responsible for his/her own development and learning and be aware of his/her own improvement. So, an opportunity will be provided for the learners to assess their own learning. For this reason, it is important to develop an assessment rubric that is reliable and applicable as independently as possible.

Students and teacher reach a common decision by acting together to determine the structure, contents and criteria of the portfolio and the necessary documents. While defining the liabilities of teaching, Beevevino, Dengel & Adams (1999: 276) state them as "choosing activities, making the students participate in the activities, arranging problematic situations, acting as a catalyst and providing the divergent solutions of the students". Instead of arranging the learning of students autocratically, the teacher should support the students for their personal

tendencies. This new task of the teacher focuses on encouraging instead of judging students and showing alternatives instead of imposing ideas. This situation provides flexibility for the learning environment.

Digital portfolio is the transformation of all the products reflecting the development of an individual into soft copies that can be read in digital format (Chang, 2001). The conveniences that technology has brought in every field have given way to the idea that the portfolios could be prepared in digital environment. Digital portfolio is similar to the traditional portfolio; however digital portfolios require especially technology knowledge and skills. In addition, digital portfolios require the use of a composition of electronic media resources such as hypermedia programs, database, word processor software and web design programs. Digital portfolios are collected in a hard disc, a CD-Room or Home Page, corrections can be made on them when necessary and it is easy to carry them.

Woodward & Nanlohy (2004) made a research that aims to report on the process of the development of digital portfolios as an alternative method of reporting and presenting student learning, as opposed to the current paper-based portfolios used in pre-service teacher education. A study of the processes employed by nine students who elected to develop their portfolios digitally was carried out over a three-semester period. This resulted in a procedure that assisted students in using Information Communication Technology to showcase their learning. The advantages and limitations of the use of such technology and the results of this process during its initial implementation were discussed.

Druin, Revelle, Bederson, Hourcade, Farber, Lee & Campbell (2003) made a research on 98 second and third grade children (ages 7–9 year-old). The results of the study show distinct differences between conditions in how children discussed their shared goals, collaborative tasks, and what outcomes they had in successfully finding multimedia information in the digital library.

Tezci & Dikici (2004) investigated whether there is an effect of portfolio assessment approach on the verbal and figural creativity of the high school students. In the study, Torrance's Creativity Thinking Test Verbal and Figural Form were used to measure verbal and figural creativity of the students. In the results, a significant difference was found in favor of experimental group both verbal and figural creativity in post-test scores of both groups.

Education should support the development of creative thinking and teaching-learning activities, methods and techniques, teaching materials and assessment situations both in teacher-student relationship and in education environment. Teacher-student relationship, assessment approaches affect the development of creative thinking processes considerably (Torrance, 1995; Olson, 1999). Education should focus on teaching students high-level objectives in the cognitive and psychomotor fields. Creative thinking will grow in situations where there is psychological reliability for the individual. Objective tests measure the behaviors of students, especially in knowledge and comprehension of Bloom's Taxonomy levels; it can be applied in the application level scarcely. The questions asked in objective measurement and assessment approaches are closed-ended and measure the development of convergent thinking, therefore may hinder the development of creative thinking.

The education process that will enable to develop creative thinking should be less restrictive, emphasizing the learning of the student, including high level thinking processes in measurement and assessment, based on real life situations instead of being artificial, non-threatening and it requires enabling psychologically independence and reliability. As a matter of fact, the studies that have been carried out to develop creative thinking include divergent thinking processes. These can be listed as follows: writing stories, drawing a picture, writing poems, creative education programs, rhythmic works, scientific activities (Everatt, Steffert, & Smythe, 1999; Wolfradt, & Pretz, 2000; Niu & Sternberg, 2003). Because of the list, it is necessary to research drawing and writing performance of students.

The main aim this research was to investigate the effects of digital portfolio assessment process on the drawing and story writing performances of the students. In other words, it is to determine whether there is a difference between the drawing and writing performances of the experimental group students to whom portfolio assessment was applied and the control group students to whom traditional assessment approach was applied.

METHOD

Participation

In this study, pre-test and post-test model of Champbell & Julion (1966) were formed to an experimental group and a control group by using. The population of the research is composed of adolescents varying between ages of fourteen and fifteen. As the research has a digital property and work will also be done with the students in

the Internet environment, seventeen students as experiment group and thirty-five students as the control group students were selected by random sampling.

Data Gathering Method
An assessment rubric has been developed for the assessment of the digital portfolio materials that the students prepared as a data-collecting tool. The basic components of the student performances required for drawing performance are: "character, action, creativity and esthetics". The basic components of writing performance are: "Subject, character, stage setting and conflict". Point assignment was made that enables measurable assessment for each component of assessment rubric. Points were assigned as increasing one by one from "zero" to "four and five". This kind of point assignment provides flexibility for the scorers in scoring (Herman, Gearhart & Baker, 1994; Custer, 1996; Moscal, 2000).

Eight evaluators including the researchers evaluated the drawings and writings of the students painted and written. The researcher and two art teachers participated in the assessment. The assessors made assessments individually and without an outside effect. The scorers weren't informed which group is the control group and which one is the experimental group during application of the program. Shaka & Bitner (1996) and Moscal (2000) state that there should be a harmony between the scorers for the reliability of the evaluation rubrics. The concept of scorer reliability was used for this. Wragg (2001: 23-24) mentions that there is a way to ensure the reliability of the harmony in the points that the scorers give without being aware of each other. The scorer reliability is the possibility that different scorers assign similar points. Koretz, Stecher, Klein, McCafery & Deibert (1993: 49) mention that increasing the harmony between the scorers is enabled by increasing the material to be scored and the scorers. In the event that there is a disharmony between the scorers, teaching the scorers is important.

In the initial application, the drawings of 52 students were studied. The results of the reliability analysis made for the points given by the scorers in the initial application are as follows:

Correlation among the Scorers for Sub-Components of Drawing Performance Rubric
While the lowest correlation among the four scorers is .79 between the C and D scorer, the highest correlation is .85 between A and C scorers in scoring the character. Cronbach Alpha value has been found .94.

While the lowest correlation among the four scorers is .63 between A and B scorers, the highest correlation has been .86 between A and C scorer in scoring action. Cronbach Alpha value is .93.

While the lowest correlation among the three scorers is .48 between B and C in scoring creativity, the highest correlation has been found .65 between B and D scorer. Cronbach Alpha value is .83.

While the lowest correlation among the three scorers is .74 between C and D scorers in scoring the basic components about esthetics, the highest correlation has been found .91 between A and D scorers. Cronbach Alpha value is .94.

However, Wragg (2001) states that the scorers may incline to "central clustering". Therefore, after the scoring of the assessors, the works of 10 students of which the highest (three works), medium (four works) and the lowest (three works) scored works of the experiment and control groups were subjected to scoring by a researcher and assessor again, and the similar point assignments were analyzed. The works of those who did not perform the task were not included in the scoring. The interscorer reliability should be 65% in situations where no error is required, that is 0% decomposition, and 85% in situations where there is a ±1 difference between points (Greene, 2001; Wragg, 2001; Koretz et. al., 1993). The scoring reliability of the two scorers as a result of the reliability analysis of the scoring rubric developed in this context is as follows: Character: 70%, action: 70%, creativity: 70%, esthetics: 70%, creativity: 70%.

Correlation among the Scorers for Sub-Components of Writing Performance Rubric
While the lowest correlation among the four scorers is .59 between the A and B scorer, the highest correlation is .86 between B and C scorers in scoring the subject. Cronbach Alpha value has been found .91.

While the lowest correlation among the four scorers is .46 between the A and D scorer, the highest correlation is .81 between B and C scorers in scoring the character. Cronbach Alpha value has been found .90.

While the lowest correlation among the four scorers is .59 between the A and B scorer, the highest correlation is .79 between C and D scorers in scoring the stage setting. Cronbach Alpha value has been found .90.

While the lowest correlation among the four scorers is .58 between the A and D scorer, the highest correlation is .78 between B and C scorers in scoring the intrigue. Cronbach Alpha value has been found .89.

After the scoring of the assessors, the works of 10 students of which the highest (three works), medium (four works) and the lowest (three works) scored works of the experiment and control groups were subjected to scoring by a researcher and assessor again, and the similar point assignments were analyzed. The scoring reliability of the two scorers as a result of the reliability analysis of the scoring rubric developed in this context is as follows: Subject: 80%, Character: 70%, Stage setting: 70%, Conflict: 80%.

Correlation between Students' School Marks and Rubrics Points
Koretz et. al. (1993) states that determining whether the rubric can be generalized or not in the validity studies of the rubric is important. For this, the successes of the students should be consistent in alternative measurements. Another analysis made within this framework searches the correlation between the art lesson success mean and the mean that is acquired with the drawing performance rubric. At the end of the analysis, Pearson correlation coefficient has been found meaningful at .70 and .01 level. Correlation between the Turkish-literature lesson success and writing performance has been found meaningful at .84 and .01 level.

Correlation among Sub-Components of Drawing and Writing Performance
Koretz et. al. (1993) states that the students will basically display the same performance of the certain performance tasks with the sub-components of the performance. In other words, a student should have similar levels of performance in the sub-components of drawing and writing performance. While the lowest correlation is .50 between character and creativity in the scoring of drawing performance, the highest correlation is .77 between creativity and esthetics. While the lowest correlation is .88 between subject and character in the scoring of writing performance, the highest correlation is .95 between stage setting and conflict.

Application of Program
In the process of the research teaching was carried out in a traditional manner by researchers in the control group. As for he experimental group, teaching was carried out depending on the digital portfolio evaluation. The process was completed as following:

Identification of the Aims: First of all students were required to identify aims for their portfolios they would prepare. The study of the identification of the aims was carried out at the first week. The significance of the aims, the frame, that would be provided for the portfolios the students would improve, its significance and necessity were explained to the students.

Identification of the features necessary for a qualified study and the presentation of assessment rubric in this frame: What would be the features necessary for a qualified study (drawing, writing stories) were determined by discussing in face-to-face meeting with students. The instruction of the evaluation that had been improved beforehand was presented in this frame. What features were sought for the studies that would carried out by students and the duties that would presented, the instruction of the evaluation indicating the criteria for evaluation and scoring system were explained to each student.

Duties (Responsibilities): Each student was required to draw at least a picture based on a story and make up a story based on a picture for his/her portfolio that s/he would hand in at the end of the practice. It was stated that the students could add the studies determined by themselves apart from these duties. The time for drawing a picture based on given story and making up a story based on given picture was determined as 10 weeks. Furthermore, the time for making up a story depending on a picture determined by students themselves and drawing a picture depending on the story written by students themselves was determined as 6 weeks.

Prerequisite-tests aimed studies were taken from experimental and control groups before starting the program. The program lasted for 4 months. With 2 hours in class and 4 hours computer based, a total number of 6 hour-practiced in a week were done. During the application of the program, it was made use of the packet programs such as Word Processor, Paint Brush and Illustrator. The works of the students in computer environment were stored on electronic mail addresses and CD-Rooms in the process of the application of the program. Students asked questions via electronic mail out of the classroom, presented their works, shared ideas, asked the opinions of their friends about their works and explain their own idea and opinions. At the end of the program, students handed in the completed portfolios. Those portfolios were evaluated as final-test. In each stage of the written stories and drawn pictures (at the end of each course) the quality of the students' works were evaluated. Besides, necessary correction and feedback were provided so that there was scope for students to realize incorrect and inefficient parts of their works and to revise them.

Sample works and rubric: Sample works and the instruction of the evaluation were sent to the electronic mail addresses of the students. Thus, the students had opportunity to know not only which samples of the work were good, average and unsuitable but also for what reasons those works were evaluated in that way. They got chance to improve their works in that frame.

The storage of the works and the style of the presentation: The explanation for the storage of the students' works and how they would present prepared portfolios were given in the first session. There were some alternatives for students to store their works on computers, cd-rooms or disks. The opportunity of making use of scanner was given to students in order to transfer the works done by pen and paper to digital environment. Students presented the drafts of each of work their own in a chronological order.

Analysis of Data

Data acquired at the end of the research were processed in SPSS for Windows package program. Arithmetical mean, standard deviation and *t*-test were used as analysis techniques. In the comparison of groups, independent samples *t*-test was used and the homogeneity of the variations was tested with Levene's Test. In the pre-test and post-test comparisons, paired samples *t*-test was used and the homogeneity of the variations was tested with Kolmogorov-Smirnov Z test. In the situations where the variances are homogeneous, (p>.05) parametrical tests (*t*-test) were used. Reliability level is .05

FINDINGS and COMMENTS

In this section, the findings acquired as a result of the research have been analyzed according to the related hypotheses.

Hypothesis 1: There is not a meaningful difference between pre-test and post-test the drawing based on story points of the experimental group to whom digital portfolio assessment was applied.

Table 1. Table of Analysis Related To the Pre-Test and Post-Test Scores of the Experimental Group in Which Digital Portfolio Assessment Was Used

Sub-Components	Exp. Group	n	$\overline{X}$	Std. Dev.	Kolmogorov z	Kolmogorov Sig.	r	df	t	p
Character	Pre-test	17	2.31	1.25	.686	.734	-.14	16	-5.34*	.000
	Post-test	17	5.07	1.54	1.040	.230				
Action	Pre-test	17	1.94	1.20	.560	.913	-.08	16	-5.31*	.000
	Post-test	17	4.70	1.67	.892	.404				
Creativity	Pre-test	17	2.07	1.06	.604	.858	-.01	16	-5.30*	.000
	Post-test	17	4.72	1.74	.549	.924				
Esthetics	Pre-test	17	2.09	.98	.929	.353	-.08	16	-4.83*	.000
	Post-test	17	4.54	1.76	.621	.836				

*p<.05 Significance

According to the *t*-test result made between pre-test and post-test points of the experimental group to whom digital portfolio assessment method was applied, it was seen that a meaningful difference existed $[t(16) = -5.34\, p < .05]$ in the character aspect, $[t(16) = -5.31 p < .05]$ in action aspect, $[t(16) = -5.30\, p < .05]$ in creativity aspect, $[t(16) = -4.83 p < .05]$ in esthetics aspect and hypothesis 1 was rejected. This situation can be interpreted that the applied digital portfolio assessment method improves the drawing performances of the students (See Table 1).

Hypothesis 2: There is not a meaningful difference between the pre-test and post-test drawing based on story points of the control group to whom traditional method was applied.

Table 2. Table of Analysis Related To the Pre-Test and Post-Test Scores of the Control Group in Which Traditional Method Was Used

Sub-Components	Control Group	n	$\overline{X}$	Std. Dev.	Kolmogorov z	Kolmogorov Sig.	r	df	t	p
Character	Pre-test	35	2.36	1.02	1.231	.097	.28	34	-1.83	.075
	Post-test	35	2.76	1.15	1.062	.209				
Action	Pre-test	35	2.15	1.07	1.093	.183	.11	34	-1.83	.076
	Post-test	35	2.57	1.00	.738	.648				
Creativity	Pre-test	35	2.26	1.08	1.142	.148	.25	34	-2.44*	.020

	Post-test	35	2.73	.68	.990	.281				
Esthetics	Pre-test	35	2.11	.99	1.246	.090	.64	34	-2.09*	.044
	Post-test	35	2.38	.77	.690	.728				

*p<.05 Significance

According to the result of the *t*-test made between the pre-test and post-test points of the control group to whom traditional teaching method was applied, there was a meaningful difference of $[t(34) = -1.83 p > .05]$ in character aspect, $[t(34) = -1.83 p > .05]$ in action aspect, $[t(34) = -2.44 p < .05]$ in creativity aspect, $[t(34) = -2.09 p < .05]$ in esthetics aspect and hypothesis 2 was rejected. It can be said that the drawing performances of the control group students has improved (See Table 2). In this case, it will be better to make a comparison between the experimental group and the control group.

Hypothesis 3: There is not a meaningful difference between the drawing based on story pre-test points of the experimental group to whom digital portfolio assessment method was applied and the control group to whom traditional method was applied.

Table 3. Results of the Analysis Related To the Pre-Test Scores Between The Experimental Group and Control Group

Sub-Components	**Groups**	**n**	$\overline{x}$	**Std. Dev.**	**Leven's Test F**	**Sig.**	**df**	**t**	**p**
Character	Exp.	17	2.31	1.25	.538	.467	50	-.14	.885
	Control	35	2.36	1.02					
Action	Exp.	17	1.94	1.20	.305	.583	50	-.64	.525
	Control	35	2.15	1.07					
Creativity	Exp.	17	2.07	1.06	1.180	.282	50	-.59	.557
	Control	35	2.26	1.08					
Esthetics	Exp.	17	2.09	.98	.175	.678	50	-.50	.956
	Control	35	2.11	.99					

According to the result of the t test made between the experimental and control group before the application of digital portfolio assessment method, there is not a meaningful difference $[t(50) = -.14 p > .05]$ in character aspect, $[t(50) = -.64 p > .05]$ in action aspect, $[t(50) = -.59 p > .05]$ in creativity aspect, $[t(50) = -.50 p > .05]$ in esthetics aspect (See Table 3). In this case, hypothesis 3 was accepted for the character, action and creativity and esthetics aspects. The pre-test results show that similarity the students' drawing performance. It will be beneficial to examine the analysis between the experimental group and the control group after the application of digital portfolio assessment method.

Hypothesis 4: There is not a meaningful difference between the drawing based on story post-test points of the experimental group to whom digital portfolio assessment method was applied and the control group to whom traditional method was applied.

Table 4. Result of the Analysis Related To the Post-Test Scores Between The Experimental Group and Control Group

Sub-Components	**Groups**	**n**	$\overline{x}$	**Std. Dev.**	**Leven's Test F**	**Sig.**	**df**	**t**	**p**
Character	Exp.	17	5.07	1.54	1.611	.210	50	6.02*	.000
	Control	35	2.76	1.15					
Action	Exp.	17	4.70	1.84	.680	.112	50	5.71*	.000
	Control	35	2.57	1.67					
Creativity	Exp.	17	4.72	1.00	.710	.211	50	5.92*	.000
	Control	35	2.73	1.74					
Esthetics	Exp.	17	4.54	1.76	.743	.264	50	6.15*	.000
	Control	35	2.38	.77					

*p<.05 Significance

According to the result of the *t*-test made between the post-test points of the experimental group and the control group, it is seen that there is a meaningful difference $[t(50) = 6.02 p < .05]$ in character aspect, $[t(50) = -5.71 p < .05]$ in action aspect, $[t(50) = 5.92 p < .05]$ in creativity aspect, $[t(50) = 6.15 p < .05]$ in esthetics aspect (See Table 4). In this case, hypothesis 4 has been rejected. There has been more increase in the arithmetical mean of the experimental group than that of the control group. The acquired data reveal that digital portfolio assessment method improves the drawing based on story performances of the students more than the traditional assessment method.

Hypothesis 5: There is not a meaningful difference between pre-test and post-test the writing based on picture points of the experimental group to whom digital portfolio assessment was applied.

Table 5. Table of Analysis Related To the Pre-Test and Post-Test Scores of the Experimental Group in Which Digital Portfolio Assessment Was Used

Sub-Components	Exp. Groups	n	$\overline{X}$	Std. Dev.	Kolmogorov z	Kolmogorov Sig.	r	df	t	p
Subject	Pre-test	17	1.95	.85	1.006	.263	.51	16	-6.05*	.000
	Post-test	17	3.16	.80	.692	.724				
Character	Pre-test	17	2.23	1.07	1.205	.109	.50	16	4.17*	.001
	Post-test	17	3.22	.82	.556	.916				
Stage setting	Pre-test	17	2.04	1.06	.776	.584	.51	16	-4.48*	.000
	Post-test	17	3.16	1.18	.702	.707				
Conflict	Pre-test	17	2.10	1.04	1.011	.258	.40	16	-4.31*	.001
	Post-test	17	3.22	.90	.550	.923				

*p<.05 Significance

According to the *t*-test result made between pre-test and post-test points of the experimental group to whom digital portfolio assessment method was applied, it was seen that a meaningful difference existed $[t(16) = -6.05 p < .05]$ in the subject aspect, $[t(16) = 4.17 p < .05]$ in character aspect, $[t(16) = -4.48 p < .05]$ in stage setting aspect, $[t(16) = -4.31 p < .05]$ in conflict aspect and hypothesis 5 was rejected. This situation can be interpreted that the applied digital portfolio assessment method improves the writing performances of the students (See Table 5).

Hypothesis 6: There is not a meaningful difference between the pre-test and post-test writing based on picture points of the control group to whom traditional method was applied.

Table 6. Table of Analysis Related To the Pre-Test and Post-Test Scores of the Control Group in Which Traditional Method Was Used

Sub-Components	Control Group	n	$\overline{X}$	Std. Dev.	Kolmogorov z	Kolmogorov Sig.	r	df	t	p
Subject	Pre-test	35	1.89	.82	1.299	.069	.20	34	-3.85*	.000
	Post-test	35	2.62	.94	1.063	.209				
Character	Pre-test	35	2.17	1.00	1.291	.071	.16	34	2.39*	.022
	Post-test	35	2.66	.87	.863	.445				
Stage setting	Pre-test	35	1.99	1.09	1.083	.191	.11	34	-2.83*	.008
	Post-test	35	2.60	.80	.849	.467				
Conflict	Pre-test	35	2.08	.93	1.154	.901	.12	34	-2.61*	.013
	Post-test	35	2.62	.92	.098	.392				

*p<.05 Significance

According to the result of the *t*-test made between the pre-test and post-test points of the control group to whom traditional teaching method was applied, there was a meaningful difference of $[t(34) = -3.85 p < .05]$ in subject aspect, $[t(34) = 2.39 p < .05]$ in character aspect, $[t(34) = -2.83 p < .05]$ in stage setting aspect, $[t(34) = -2.61 p < .05]$ in conflict aspect and hypothesis 6 was rejected. It can be said that the writing based on picture performances of the control group students has improved (See Table 6). In this case, it will be better to make a comparison between the experimental group and the control group.

Hypothesis 7: There is not a meaningful difference between the writing based on picture pre-test points of the experimental group to whom digital portfolio assessment method was applied and the control group to whom traditional method was applied.

Table 7. Results of the Analysis Related To the Pre-Test Scores Between The Experimental Group and Control Group

Sub-Components	Groups	n	$\overline{x}$	Std. Dev.	Leven's Test F	Leven's Test Sig.	df	t	p
Subject	Exp.	17	1.95	.85	.001	.997	50	.256	.799
	Control	35	1.89	.82					
Character	Exp.	17	2.23	1.07	.162	.689	50	.210	.835
	Control	35	2.17	1.00					
Stage setting	Exp.	17	2.04	1.18	.303	.584	50	.154	.878
	Control	35	1.99	1.09					
Conflict	Exp.	17	2.10	1.04	.262	.611	50	.060	.952
	Control	35	2.08	.93					

According to the result of the t test made between the experimental and control group before the application of digital portfolio assessment method, there is not a meaningful difference $[t(50) = .256 p > .05]$ in subject aspect, $[t(50) = .210 p > .05]$ in character aspect, $[t(50) = .154 p > .05]$ in stage setting aspect, $[t(50) = .060 p > .05]$ in conflict aspect (See Table 7). In this case, hypothesis 7 was accepted for the subject, character, stage setting and intrigue aspects. The pre-test results show that similarity the students' drawing performance. It will be beneficial to examine the analysis between the experimental group and the control group after the application of digital portfolio assessment method.

Hypothesis 8: There is not a meaningful difference between the writing based on picture post-test points of the experimental group to whom digital portfolio assessment method was applied and the control group to whom traditional method was applied.

Table 8. Result of the Analysis Related To the Post-Test Scores Between The Experimental Group and Control Group

Sub-Components	Groups	n	$\overline{x}$	Std. Dev.	Leven's Test F	Leven's Test Sig.	df	t	p
Subject	Exp.	17	3.16	.80	.876	.354	50	3.02*	.048
	Control	35	2.62	.94					
Character	Exp.	17	3.22	.82	.078	.781	50	2.19*	.033
	Control	35	2.66	.87					
Stage setting	Exp.	17	3.16	.78	.080	.778	50	2.36*	.022
	Control	35	2.60	.80					
Conflict	Exp.	17	3.22	.90	.008	.931	50	2.18*	.033
	Control	35	2.62	.92					

*p<.05 Significance

According to the result of the *t*-test made between the post-test points of the experimental group and the control group, it is seen that there is a meaningful difference $[t(50) = 3.02 p < .05]$ in subject aspect, $[t(50) = 2.19 p < .05]$ in character aspect, $[t(50) = 2.36 p < .05]$ in stage setting aspect, $[t(50) = 2.18 p < .05]$ in conflict aspect (See Table 8). In this case, hypothesis 8 has been rejected. There has been more increase in the arithmetical mean of the experimental group than that of the control group. The acquired data reveal that digital portfolio assessment method improves the writing based on picture performances of the students more than the traditional assessment method.

Result and Discussion

The data of this research show that digital portfolio assessment improves the drawing and writing performances of the students more. It is also observed that the live discussion environments made with the students to determine digital portfolio assessment criteria have improved the cooperative working attitudes of the students. In addition, the studies made by the students to determine the criteria for the assessment rubric that the students have prepared with their friends increased the level of knowledge about drawing and writing. It is also observed

that this research carried out in an independent and non-threatening environment has developed the friendship attitudes and socialization of the students positively. Increase in the knowledge about drawing and writing and providing an independent environment for the students has also improved the creativity levels of the students.

The results of the research have indicated that digital portfolio assessment approach is effective in scoring the abilities of students to make up stories and draw pictures. However, it is vital that the rubrics of assessment that have been prepared should be reliable. In addition, the research has shown that compared to traditional approaches, teaching based on this approach is more efficient in the improvement of aforementioned skills. The process lasting from teachers' preparation of instructions with students to the presentation and evaluation of the works can be considered as a teaching.

The difficulties experienced by the students in developing digital portfolios emerged from two sources. One related to the software and the other to the digital portfolio itself. The main limitation reported by students in learning diaries associated with these subjects and in tutorial interactions was that associated with the use of information and communication technologies. They experienced difficulties learning how to use new software programs and were fearful of hardware failures that might ruin many hours of intensive work. The students' program of choice for the digital portfolios was Paint Brush, Microsoft PowerPoint and Word. These programs were seen as somewhat familiar and generally available on their home computers. Another difficulty arose as the size of the portfolios grew exponentially. They became very large, very quickly causing storage problems. Students had some difficulty creating multi floppy Zip files of their projects or in arranging for someone in their network of friends and family to burn their project to CD-Room. Availability of a common version of the program also presented numerous challenges. Such a finding has a parallel relationship with the findings of Woodward & Nanlohy (2004).

An increase in the performances of both the students of digital portfolio assessment process and the students of traditional plan in the way of the character, action, creativity and their aesthetics level identified for drawing. It is also found out that an increase in the performances of both the students of digital portfolio assessment process and the students of traditional plan in the way of the subject, character, stage setting and their aesthetics level identified for story writing. Such a finding has a parallel relationship with the findings of Tezci & Dikici (2004). It has been found out that the students applied portfolio assessment approach more creative. It can be stated that these findings have a parallel relationship with that of Druin et.al. (2003). Students of the each group have managed to produce creative products. It can be interpreted that the teaching and learning situation, which is non-threatening, has a positive effect on student creativity. Besides, this result obtained for creativity has given support to the ideas of Torrance (1995) and Olson (1999) claiming that assessment approaches and the interaction between student and teacher influence creative thinking capability of students. It can be considered that there is a decrease in exam anxiety.

CONCLUSION

The portfolio assessment, differing from tests, is based on the cooperation of the teacher and students in finding solutions to the problems. Searching for a solution to a problem in cooperation means to produce more suggestions for solutions. The individual learns how to analyze, synthesize and criticize the others' ideas while trying to make the others accept his/her ideas, which provides significant contributions to the critical thinking a lot. The portfolio assessment also contributes to the critical thinking of the students during their artistic studies.

Digital portfolio assessment is an assessment method that can be applied successfully both in teaching the subject and assessing the learned material. Apart from its positive effects on academic success, it also contributes to high self-confidence. Digital portfolio assessment method affects the development of children in various aspects positively apart from their learning skills.

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THE INFLUENCE OF TEACHING NOTE-TAKING AND INFORMATION MAPPING ON LEARNING AND RECALLING IN SCIENCE

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ABSTRACT
This work describes an experimental research on note taking and concept mapping in a science class of 5 graders in Kayseri (Central Anatolia, Turkey) in the academic year 2002 - 2003. Gained results are in favor of convictions that view note taking as an effective learning strategy. At least it was more effective than concept mapping in the experiments of the present study. A possible reason for this is that students benefited from their notes by recapitulating lesson contents whereas concept maps were not used in such a way. This assumption is supported by other experimental evidence that ascribe the advantages of note taking to its function as external memory store that helps students to better process lesson contents.

Key words: Note taking, concept mapping, experimental, science, and primary education

1. INTRODUCTION

Note taking is a general learning strategy that has been well studied in a variety of different learning environments (Akinsanya and Williams, 2004). Patterson et al. (1992) classify note taking as an organizing and focusing strategy. Notes help to remember the important points of a lesson and can be used for revision and reference purposes. There are three benefits of note taking. First, it increases attention to the lesson. While recording a set of notes it is impossible for a student to get bored or inattentive. Second, it aids memory for the lesson. It is easier to remember noted lesson points than non-noted points. Third, it produces a set of notes available for review. Since memory is fallible, it is necessary to review the subject.

The results obtained from studies on note taking strategies are controversial. According to many studies, students who take notes perform better than those who do not (Kiewra, 1985). Some researchers found that note taking is effective on recalling (Fisher and Harris, 1973; Kiewra et al., 1989; Rish and Kiewra 1990) and assists students' learning (Annis and Davis, 1975; DiVesta and Gray, 1972; Barnett et al., 1981; Kardash and Kroeker, 1989). Note taking assists student's learning during both encoding and storage stages. The encoding effect is the result of the process of attending to and recording important details of a lesson. It is argued that the storage effect is the result of the reviewing of notes. The combined effect of encoding and storage processing is said to be more beneficial than encoding on its own (Hartley, 1983; Kiewra et al., 1991, 1995; Peper and Mayer, 1978, 1986).

On the other hand, a number of other studies have found no advantage of taking notes. These studies indicate that note taking has no significant effect on the general performance of students (Lipsky, 1984). Peper and Mayer (1978) show that while note taking has no effect on general performance, it does have an effect for low capacity students. Thus, the effect of note taking may depend on the level of students. Kiewra (1985) suggested that these different results are due to the type of note taking practice. Sometimes students record exactly everything what a teacher says with very little engagement. At other times, students employ "conceptual note taking" (Rickards and McCormick, 1988), summarizing (King, 1992) or self-questioning (Spires, 1993). All these latter types of note taking involve significant levels of engagement and are thus more effective (Trafton and Tricket, 2001).

Concept maps are schematic diagrams that use a graphical/verbal system to illustrate the relation of one concept to another (Nowak and Gwin, 1984). Concept maps should not simply list information from text randomly, or even in a linear fashion. Rather, they should depict the structure of knowledge in propositional statements that illustrate the relationships among the concepts in a map. A concept map consists of three basic elements:

1. Concept names written inside ovals, rectangles, or other shapes represent concepts.
2. Linking lines (as in flow charts) or arrows (as in arrow diagrams) show the connections between two concepts.
3. Linking phrases, which label linking lines, describe the relations between concepts.

Concept mapping is a learning strategy that can be expert, teacher and learner generated. Experts apply it to textbook, instructional or multimedia design, for example (Johnsen et al., 2000). Teachers can take advantage of concept maps to prepare e.g. lesson plans, teaching materials and learning aids. Learners can use it to represent

and organize information to be able to better understand and remember the subject under consideration (Chularut and DeBacker, 2004). For them, concept maps are aids to summarize subjects as well as support discussion and reflection. The more a learner binds concepts and examples together in a concept map, the deeper they can understand a subject (Baroody and Bartels, 2001).

The goal of the present study is to assess how much the two learning strategies concept mapping and note taking are suitable and efficient in the given primary school context as described below.

2. METHOD

2.1 Participants

The research was carried out with 135 students in three classes at grade 5 of Arif Eminoglu Primary School located in the District of Kayseri in Central Anatolia, Turkey. It was applied during the first half of the academic year 2002-2003 over a study period of 4 weeks. One control group with 41 students and two study groups with 48 and 46 students were randomly selected.

2.2 Materials

Chapter. The chapter "Getting to Know Our Body" in the course book "Science Curriculum for Elementary Students" (MEB, 1992) was studied.

Chapter Period. 24 lesson hours were given over a study period of 4 weeks (6 hours per week) corresponding to 4 units. For each unit, aims and objectives were established so that the data gathering for the assessment could be prepared.

Prior Knowledge. The Cognitive Entrance Behavior Test (CEBT) consisting of 28 multiple-choice questions and the Level Determination Test (LDT) with 52 multiple-choice questions were prepared. The CEBT was applied after selecting the control and study groups at the beginning of the 5 weeks training period (Figure 1), which proved that all groups had really been at the same learning level. The LDT was implemented as a pre-test at the beginning of the experiment (Figure 1). Of this test, 19 questions pre-tested knowledge, 18 questions comprehension, and 15 questions application. The samples of each type are shown in Table 4. Both tests have been deemed adequate with regard to scope and validity by a group of experts on the program itself in science and science education. The reliability coefficients of the instruments have been found as satisfying by using KR-20 formulae; 0.83 and 0.89 respectively.

Achievement Test. The same LDT was applied twice again as a post-test at the end of the study period of 4 weeks, and as a delayed post-test to measure recognition levels after 6 weeks (Figure 1). Both tests were checked and approved by a group of experts in science education.

Experimental Design. In this research the Control Group Pretest-Final Test type experimental design was applied.

Data Analysis. For this, a variance analysis was used. As the three groups were seen to be equal regarding their pre-learning status, the differences between their averaged post-test scores were examined to measure their recognition level. The same differences of the delayed post-test were analyzed to measure their recognition level again. Besides, the Scheffe Test (Pfaffenberger and Patterson, 1981) was applied to estimate group differences. .

2.3 Procedure

The following procedure was applied in this research. The 41 students of the control group continued their science course without any training on the learning strategies considered here. The 1st study group was educated in concept mapping (CM group), the 2nd study group in note taking (NT group) over a training period of 5 weeks as shown in Figure 1.

The 48 students of the CM started to work on concept maps prepared by the author in the beginning of the training period. Then they expanded the given concept maps to refine their contents. Afterwards, students were asked to create their own concepts maps both in a lesson and as homework, and then discuss the results with their classmates in class. Then they compared their own maps with the one prepared by the author. In time, students of the CM group became more skilled in making their own concept maps.

The 46 students of the TM group learnt to create note taking matrices, one of the note taking strategies. They were trained in a similar way as the students of the CM group. In the beginning they worked on note taking

matrices made by the author. After spending some time on their refinement, students began to prepare their own matrices both in a lesson and as homework that were then discussed in class. Then they evaluated their own matrices using the one created by the author. In this way, students of the TM group learnt how to produce matrices for note taking.

Both study groups were tested at the end of the training period after completing small projects on concept mapping and note taking, respectively.

3. RESULTS

As shown in Figures 2 illustrating the data of Table 1, no significant differences exist for the pre-test scores between control and study groups gained through the LDT, which was applied at the beginning of the study period (Figure 1). Thus, the CEBT results were confirmed that all groups were equally selected with regard to their pre-study level.

Figure 2a. Pre-test scores of control and study groups
Figure 2b. Post-test scores of control and study groups
Figure 2c. Delayed post-test scores of control and study groups

Table 1. Test scores of control and study groups
(M = Mean value, S = Standard deviation, N = Number of students)

Comparing the control and CM pre- and post-test scores (Figure 2a and 2b), one observes that there is hardly any difference between their scores. The same is true for the post- and delayed post-test scores (Figure 2b and 2c), meaning that concept mapping had no visible effect on the CM group in this experiment.

Doing the same for the NT group, a significant difference is recognizable for the post-test knowledge score (Figure 2b), and the delayed post-test knowledge and application score (Figure 2c). These results are confirmed by the F-values of the variance analysis (Table 2) and the difference values of the Scheffe tests (Table 3). Thus, one can conclude that note taking matrices had a positive impact on the NT group in this experiment.

Table 2. F-values of variance analysis for different LDT categories
(Largest F-values in bold without considering the Total)

Table 3. Scheffe tests for control and study groups
(D = Difference, S = Standard deviation, p = probability factor)
(Largest D-values in bold without considering the Total)

4. DISCUSSION

Considering the gained results the main question is why the CM study group did not do significantly better than the control group in their post- and delayed post-tests. The following reasons or a combination of them may provide an answer:

1. Teaching of concept mapping was not sufficient in terms of quality and quantity.
2. Students of the CM group didn't learn concept mapping in depth because it's much harder to understand and apply than note taking, especially for 5 graders (comp. Johnsen et al., 2000).
3. The acquired CM knowledge was not giving any advantage for the post-tests because they only consisted multiple-choice questions students couldn’t apply their CM knowledge to.

In the opinion of the author the first two reasons played more important roles, and discussions with students of the CM group after the experiment confirmed this. Of course, other factors are also involved, for example, the fact that the time period set aside for carrying out the experiment with training and study periods may be insufficient to produce the expected effects.

5. CONCLUSIONS

The goal of this work was to assess how much the two learning strategies concept mapping and note taking are suitable and efficient in the context of a Turkish primary school. Obtained results from the experiment indicate that note taking can help students to improve their levels of knowledge and maybe application. But this is not the case for concept mapping, where no significant differences between control and study groups were observed. This is quite unsatisfactory and needs further reseach with various grade and subject levels over a longer study period in order to gain more insight and identify the real reasons.

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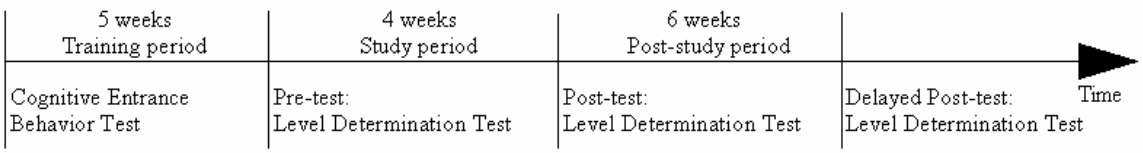

Figure 1. Time plan with periods/tests located above/below the time axis

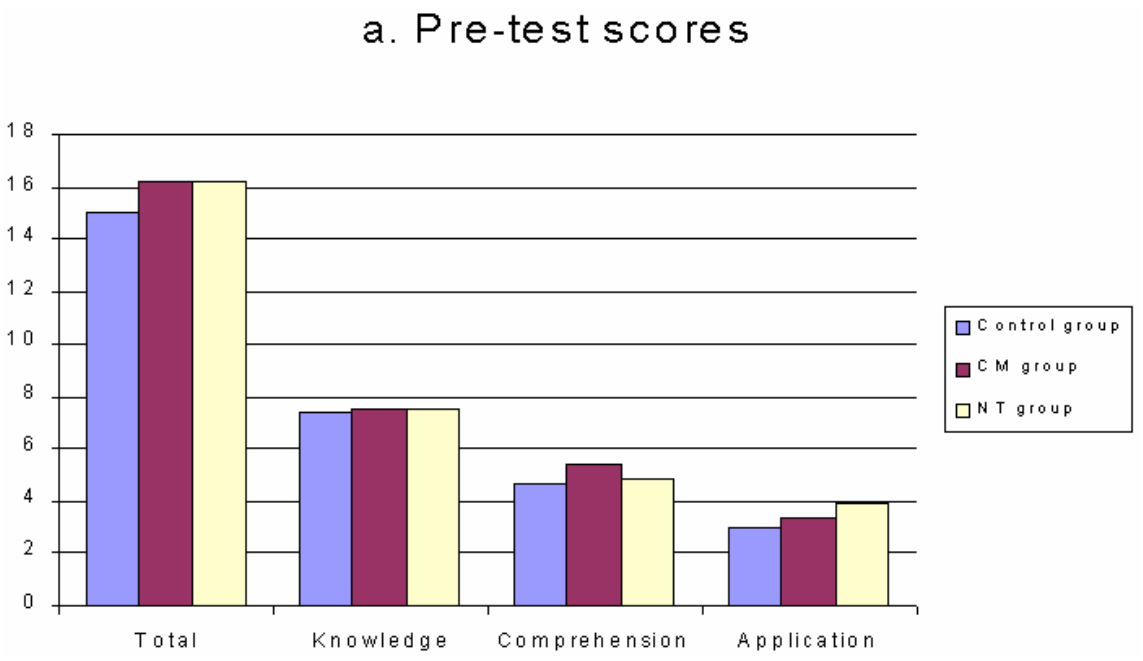

Figure 2a. Pre-test scores of control and study groups

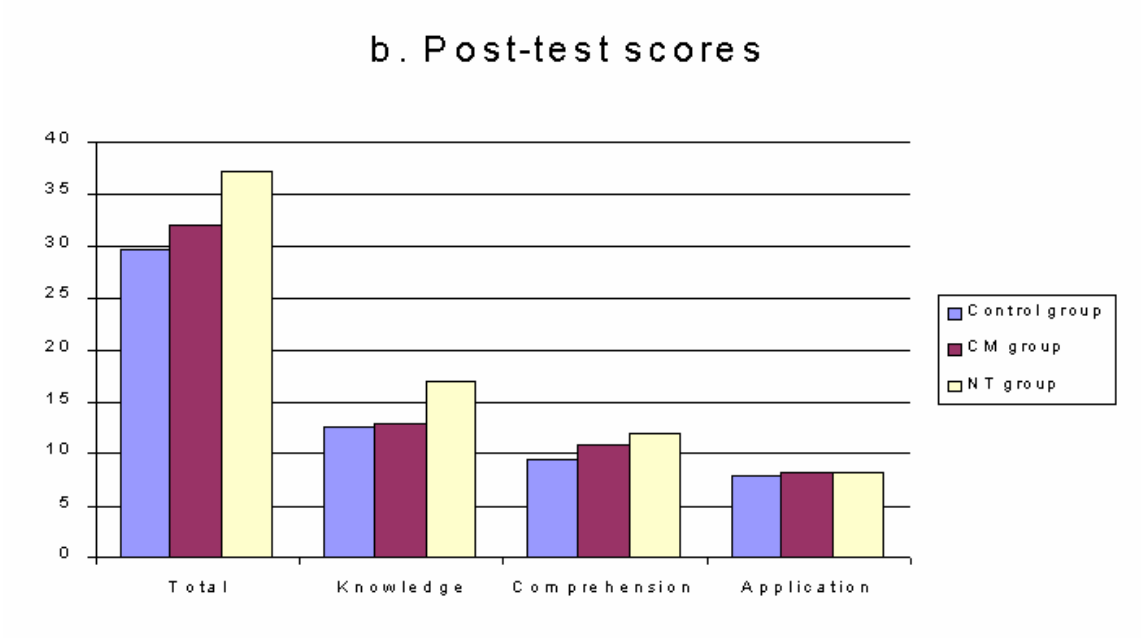

Figure 2b. Post-test scores of control and study groups

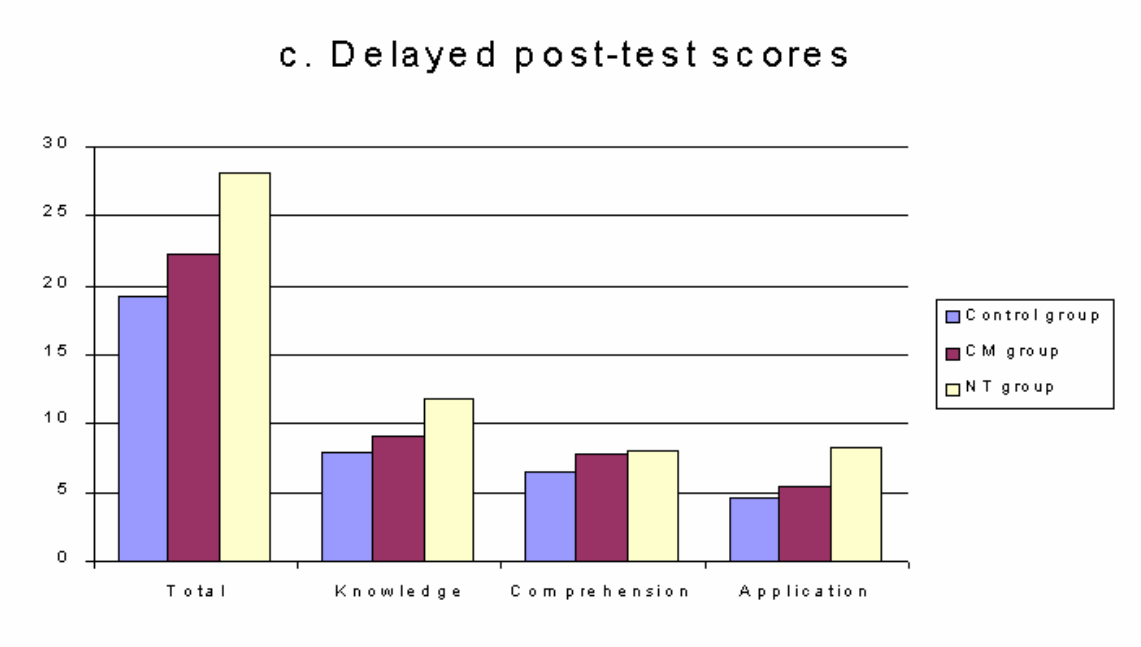

Figure 2c. Delayed post-test scores of control and study groups

Table 1. Test scores of control and study groups
(M = Mean value, S = Standard deviation, N = Number of students)

Group		N	Pre-test		Post-test		Delayed post-test	
			M	S	M	S	M	S
Control	Total	41	15.019	3.791	29.780	5.332	19.171	5.572
	Knowledge		7.415	1.975	12.537	2.501	7.927	2.553
	Comprehension		4.634	2.022	9.415	3.082	6.537	2.829
	Application		3.000	1.844	7.829	1.787	4.707	1.965
CM	Total	48	16.208	5.061	31.98	7.50	22.333	6.155
	Knowledge		7.542	1.967	12.896	3.520	9.125	2.900
	Comprehension		5.375	1.996	10.938	2.740	7.792	2.767
	Application		3.333	2.309	8.146	2.484	5.417	2.172
NT	Total	46	16.261	5.331	37.171	3.349	28.109	5.030
	Knowledge		7.478	2.383	17.022	1.374	11.826	2.831
	Comprehension		4.870	2.083	12.000	1.606	8.087	2.336
	Application		3.913	4.896	8.152	1.897	8.196	1.655

Table 2. F-values of variance analysis for different LDT categories
(Largest F-values in bold without considering the Total)

	Total	Knowledge	Comprehension	Application
Pre-test	0.867	0.040	1.566	2.300
Post-test	19.66***	**40.37*** **	11.326**	0.332
Delayed post-test	28.67***	**22.90*** **	4.133*	**40.13*** **

*p < .05 **p < .01 ***p < .001

Table 3. Scheffe tests for control and study groups
(D = Difference, S = Standard deviation, p = probability factor)
(Largest D-values in bold without considering the Total)

Differences of post-test results				
Total	Comparison	D	S	p
	Control / CM	2.199	1.2113	>.05
	Control / NT	7.394***	1.2234	< .001**
	CM / NT	5.195***	1.1753	< .001**
Knowledge	Comparison	D	S	p
	Control / CM	.3592	.5607	>.05
	Control / NT	**4.486*** **	.5663	< .001**
	CM / NT	**4.126*** **	.5440	< .001**
Comprehension	Comparison	D	S	p
	Control / CM	1.523	.5392	>.01
	Control / NT	2.586***	.5446	< .001**
	CM / NT	1.063	.5232	>.05
Application	Comparison	D	S	p
	Control / CM	---	---	---
	Control / NT	---	---	---
	CM / NT	---	---	---
Differences of delayed post-test results				
Total	Comparison	D	S	p
	Control / CM	3.163	1.194	>.01
	Control / NT	8.938***	1.206	< .001**
	CM / NT	5.776***	1.158	< .001**
Knowledge	Comparison	D	S	p
	Control / CM	1.198	.5902	>.05
	Control / NT	**3.899*** **	.5961	< .001**
	CM / NT	**2.701*** **	.5762	< .001**
Comprehension	Comparison	D	S	p
	Control / CM	1.255	.5632	>.05
	Control / NT	1.550*	.5688	< .05*
	CM / NT	.295	.5464	>.05
Application	Comparison	D	S	p
	Control / CM	.709	.4136	>0.05
	Control / NT	**3.488** **	.4178	>0.01**
	CM / NT	**2.779***	.4013	<0.01**

*p < .05 **p <.01 ***p <.001

Table 4. Level Determination Test Samples for each type.

LEVELS	NO	QUESTION
KNOWLEDGE	3	Which of the following is not the task of a skeleton? a.) Protects the inner organs b.) Shapes the body c.) Helps the inner organs to work d.) Helps the body movements
COMPREHENSION	28	Ali says 'I can have the blood transfer from all people but I have no Rh in my blood'. What is the blood type of Ali? a. 0 Rh (+) b. AB Rh (+) c. 0 Rh (-)

<table>
<tr><td></td><td></td><td>d. AB Rh (-)</td></tr>
<tr><td>APPLICATION</td><td>47</td><td>
<table>
<tr><th></th><th>BLOOD TYPE</th><th>Rh</th></tr>
<tr><td>Ali</td><td>0</td><td>+</td></tr>
<tr><td>Veli</td><td>AB</td><td>-</td></tr>
<tr><td>Ömer</td><td>A</td><td>+</td></tr>
<tr><td>Kaya</td><td>B</td><td>-</td></tr>
</table>
According to the table above, which following is incorrect?

a. Ömer can have the blood tranfer from Ali
b. Veli can have the blood transfer from Kaya
c. Kaya can have the blood transfer from Veli
d. Ali can never have blood transfer from the others
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THE TEACHER EDUCATION VILLAGE: GROWING PARTNERSHIPS TO INTEGRATE EDUCATIONAL TECHNOLOGY INTO CURRICULA AND CLASSROOMS

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In her book *It Takes a Village* Hillary Rodham Clinton wrote, "Children are not rugged individualists. They depend on the adults they know and on thousands more who make decisions every day that affect their well-being" (Clinton, 1996, p.7). Although Clinton is writing of raising children and the importance of family and community in this process, similar statements could be made about teacher preparation. "It takes a village" to produce educators qualified to meet the complexities of 21st century classrooms and many give explicit attention to collaboration among members of the "village" (Holmes Group, 1986; Goodlad, 1994; Sirotnik, 1999; Sirotnik & Goodlad, 1998). In fact, the U.S. Department of Education's "Preparing tomorrow's teachers to use technology" (PT3) program emphasized the use of partnerships to effectively promote technology integration in the daily practices of future teachers.

This article explains and analyzes a four-year, ongoing effort to facilitate effective uses of educational technologies in a large teacher preparation program via partnerships between the university and public schools and between colleges at the university. The research question – *How can diverse partnerships related to technology integration facilitate effective uses of educational technologies within a "village" responsible for preparing prospective teachers?* – is situated within our Teaching and Technology Initiative.

TEACHING AND TECHNOLOGY INITIATIVE

The Teaching and Technology Initiative (UFTTI) was designed as part of the US Department of Education's PT3 program to facilitate and accelerate systemic change related to technology integration in our teacher education program. Two of the major goals of this initiative were to provide innovative opportunities for faculty development related to technology use and to develop stronger curriculum-based, technology-enhanced field experiences for our prospective teachers. While each of these goals required different partnership strategies, Stephens and Boldt (2004) state that, in general, partnerships are problematic in nature because of the difference in the rhetoric and reality of partnerships. They note that school and university personnel are frequently not prepared for the intimacy required in building partnerships with trust, mutual respect, and a common vision.

Recognizing the complexities associated with partnerships, we relied on a variety of literature to inform our work. We explicitly focused on factors related to change within the teacher education program at large, change by individual educators (public schools and at the university) within partnerships, and change in the teaching and learning environment. We selected three educational change models to guide us. The CREATER model (Havelock & Zlotolow, 1995) helped us consider change at a systemic level, the Concerns-based Adoption Model (Hall, 1973) provided guidance related to change at an individual level, and the Conditions of Change (Ely, 1976) focused on environmental factors related to change. The partnership described below result from consideration of these various educational change models.

PARTNERSHIPS IN THE UFTTI

The partnerships highlighted in this article are between the university and public schools (i.e. Curriculum-based, technology enhanced field experiences) and between colleges at the university (i.e. Teaching and Technology Teams). Partnership participants included public school teachers and administrators, College of Education (COE) faculty, College of Liberal Arts and Sciences (CLAS) faculty, prospective teachers and graduate (master and doctoral) students. Members from each of these groups comprise key players in our "village" responsible for preparing prospective teachers.

Teaching and Technology Teams

One of the goals of the Teaching and Technology Initiative was to provide innovative professional development opportunities for faculty. Because teacher education students participate in courses throughout the university community, it was important to form partnerships with departments in various colleges so students could see modeling of technology in teaching in all of their courses—not just in traditional technology courses. Partnership opportunities that assisted faculty in becoming fluent in the use of educational technologies

appropriate for their specific content and context were needed. This meant moving from general training on software and equipment toward content-specific, technology-based instructional strategies for the curriculum. Hence, negotiations began with the Deans of the Colleges of Education and Liberal Arts and Sciences, department chairs within these colleges, faculty, and doctoral students to insure this vision was supported and sufficient time and resources were allocated to the potential partnerships. It was also critical to ensure the partnerships were beneficial for each college, department, faculty members, and doctoral students.

These efforts resulted in the formation of eight Teaching and Technology Teams. Technology Fellows, education doctoral students, were paired with a faculty member in the College of Education or College of Liberal Arts and Sciences. These pairs worked together consistently for two to three academic years up to 15 hours a week. The Fellows shared their knowledge of integrating technology while the faculty members helped the doctoral students understand the role of a professor at a research I university. Faculty members received a 10% workload credit each semester for participating in the partnership as well as $1,000 an academic year to purchase supplies, equipment, and/or software that would assist them in the integration of educational technologies into their courses. Partnerships were formed in the areas of science education, English education, children's literature, and early childhood education from the College of Education, and German, physics, chemistry, and calculus from the College of Liberal Arts and Sciences. Over the past four years, the partnerships influenced over 5,300 students, many of whom were preservice teachers.

Because of the extended time, resources, and support provided to the Technology and Teaching Teams, faculty continue to use technology in their teaching and to create or use new instructional strategies that facilitate better student understanding of the content in their courses. This is occurring even after Fellows move on to different stages of their professional careers.

Curriculum-based, Technology-enhanced Field Experiences

Another major goal of the Teaching and Technology Initiative was to strengthen the technology-based field experiences for preservice teachers. This required providing preservice teachers firsthand experience integrating technology in K-12 classrooms. Again, negotiations took place to ensure that participants in the partnership had appropriate and adequate time, resources, support, and a common vision for this goal. Beginning with district personnel and branching to principals, negotiations began on the possibility of forming these partnerships. After initial agreements were reached, discussions with inservice and preservice teachers took place. Preservice teachers were then paired with inservice teachers in local schools to collaboratively develop and integrate curriculum-based, technology-enhanced activities. These partnerships were based on the notion of collaboration rather than on an expert/novice relationship. The teachers' experiences and knowledge (particularly, their knowledge of how classrooms work) were combined with the preservice teachers' experiences and knowledge (particularly, their knowledge of how technology may be used in instruction) to develop instructional environments useful to the inservice teacher and improve both partners' ability to integrate technology into the curriculum. The goals of the partnership included:

- Providing inservice teachers with an opportunity to explore instructional applications of educational technologies in their own classrooms
- Providing preservice teachers in-depth experience with the use of educational technologies in a classroom setting, and
- Developing positive relationships between local public schools and the university

Over the last four years, 39 preservice teachers have collaborated with 42 inservice teachers to implement nearly 50 curriculum-based, technology-enhanced field experiences that have influenced over 1,000 K-5 students in eight different elementary schools.

PURPOSE OF THE STUDY

Each partnership has been researched separately in terms of effectiveness, impact and participant perceptions (author a, in press; author b, 2004, authors a & b, 2003). The purpose of this study is to look at these partnerships in tandem to answer the question - *How can diverse partnerships related to technology integration facilitate effective uses of educational technologies within a "village" responsible for preparing prospective teachers?* Lessons learned and implications for teacher educators are drawn from the analysis to provide guidance to others interested in similar partnership work.

METHODOLOGY

A variety of data collection methods were used throughout the four years of these partnerships and contributed to the analysis conducted for this study. Methods included interviews and/or focus group sessions with all

participants, document analysis of artifacts created during the partnerships, observations, reflective journals from doctoral students and prospective teachers, and surveys. As the co-principal investigators for the Teaching and Technology Initiative, we also used reflective notes taken throughout the four years of the partnerships.

To analyze this wealth of data we used qualitative analytic procedures (Rossman & Rallis, 1998). First, we read through the data (with which we were already familiar with from writing other articles and completing grant reports) paying explicit attention to the research question - How can diverse partnerships related to technology integration facilitate effective uses of educational technologies within a "village" responsible for preparing prospective teachers? Then, we began recording themes that emerged from the data related to this question. We triangulated our initial impressions through scholarly discussions and established four themes. Finally, with an eye toward making the categories "concrete," we read through all the data again and extracted salient "snippets and segments of data" (Rossman & Rallis, 1998, p. 180).

FINDINGS

The following themes emerged from our data analysis and will be presented in detail in the following sections. While all partnerships are contextually based, we believe other teacher educators will benefit from considering our themes as they work within their unique settings.

1. These partnerships impacted our teacher education "village" in ways that would not have been possible otherwise.
2. The importance of relationship building and its effects on culture and context were evident through the partnerships.
3. Reciprocal mentoring was an outcome of these partnerships that strengthened our teacher education "village."
4. Increased professional activity was an important outcome of the partnerships and helped disseminate ideas to others.
5. These partnerships impacted our teacher education "village" in ways that would not have been possible otherwise.

Teachers tend to teach as they were taught (Lortie, 1975) and these partnerships enabled preservice teachers to see technology modeled in both COE and CLAS courses (via Teaching and Technology Teams). The partnerships also enabled preservice teachers to have authentic experiences incorporating technology in K-12 environments (via curriculum-based, technology-enhanced field experiences) and such authentic experiences are essential for preservice teachers to become technology-using inservice teachers (Strudler and Wetzel, 1999).

New curricular units incorporated into COE and CLAS courses included the instructional use of online databases, video case studies, concept mapping software, personal response systems, discussion boards, digital microscopes, scientific probes and general software applications such as those found in the Office suite. In addition, three new courses in which technology is modeled as an instructional tool were created.

Within the field experiences, preservice teachers implemented nearly 50 curriculum-based, technology-enhanced projects. Many of these projects involved K-12 students using a variety of technologies such as concept mapping software, digital microscopes, general applications such as those found in the Office suite, digital video, and Smart Boards to synthesize content in a multimodal fashion.

We can confidently claim that the tangible results described above would not have been possible without partnership strategies and that the accompanying shift in mindset related to technology integration by partnership participants would not have occurred. One elementary principal noted the partnerships helped his teachers get into the "the mindset of integrating technology in their day-to-day instruction." Likewise, a teacher educator stated her students began to see the use of educational technologies in her courses as "a shift in ideology and value" rather than as an unnecessary addition to the course. There were different objectives for and outcomes from the partnerships, however, each contributed to integrating educational technologies into learning environments for preservice teachers in ways that would have not otherwise been possible.

The importance of relationship building and its effects on culture and context were evident through the partnerships.

Partnerships are built on relationships that take time and effort to cultivate. In fact, nearly all participants mentioned the importance of relationship building as evidenced in this quote from a Fellow:

> Dr. X and I have mostly worked to develop trust between us. I think we have that now and are freely sharing ideas with each other and trust the dependability of each other and are working on new simulations for the Chemistry labs.

Participants also recognized the effect these relationships had on their culture and context. That is, they recognized the relationships they built influenced those around them. For example, one inservice teacher stated,

> The real influence [of the partnership] is the fact that as a teacher I am using the technology and other teachers are seeing this example. Technology use motivates teachers in my view. It is more of a responsibility to use technology than a competition. Technology inspires questions and curiosity in teachers. Teachers catch the spirit when they see other teachers using the technology.

Likewise, a university faculty member envisions that as a result of the work started in these partnerships "all of our classes would look different… as students move from one course to the next; they would see technology integrated in different subjects in meaningful ways." In many ways, our four-year initiative has been about building capacity for technology integration within our teacher education village one relationship at a time.

Reciprocal mentoring was an outcome of these partnerships that strengthened our teacher education "village."

These partnerships were designed to promote reciprocal mentoring or a model in which partners learn from and provide knowledge or assistance to each other. The concept of reciprocal mentoring related to technology integration is not new, however, successful implementation is never guaranteed (Maeers, Browne, & Cooper, 2000). Our data suggests that reciprocal mentoring did occur throughout these partnerships. An inservice teacher stated that

> The preservice teacher learned things from the inservice teachers because they are in your classroom watching how to teach and manage the classroom… so it is like no other relationship… they are the real teacher… the interns bring good ideas… it more like you are colleagues… It's just a different relationship [than student teaching].

A preservice teacher also effectively described the reciprocal mentoring that occurred in her partnership:

My teacher and I were partners in this whole thing. Her knowledge of her classroom and her experiences with teaching paired with my knowledge of technology and how to use it in the classroom was a good combination. Two strong knowledge bases were integrated as we worked together towards a common goal … we shared ideas and kind of fed off each other. So the partnership worked really well. We both learned from each other.

In many cases, particularly in the faculty-graduate student relationships, reciprocal mentoring went beyond technology integration as one Fellow explains:

> I would definitely say we are colleagues. I mean, I go to him about questions about just other aspects of academia. I'm in the job search process, so I'll go to him and ask him questions about, "What should I do here?" So it's not just a work relationship as far as PT3 goes. There's other stuff. So it's definitely been a very good relationship.

The reciprocal mentoring that occurred during these partnerships is particularly important given the partnerships were built on traditionally hierarchical relationships (i.e. faculty member-graduate student and inservice teacher-preservice teacher) in which one partner is assumed the mentor and the other the mentee. We suspect the attention given to relationship building (see previous theme) contributed to successful reciprocal mentoring which in turn contributed to the effects on culture and context also discussed in the previous theme.

Increased professional activity was an important outcome of the partnerships and helped disseminate ideas to others.

All participants noted they experienced professional growth related to technology integration as a result of the partnerships. This fact alone is not necessarily noteworthy given the purpose of the partnerships, but the fact that many participants translated this growth into articles and presentations is deserving of attention. Nearly 10 publications and 20 presentations (with more planned in the coming academic year) resulted from the partnership work.

University faculty and graduate students are expected to participate in professional dissemination and all participants disseminated information about their technology integration efforts during the course of the partnerships. More importantly, they disseminated these efforts in journals and at conferences related to their discipline. This spread conversations about technology integration beyond educational technology journals and conferences. These professional experiences also contributed to the reciprocal mentoring discussed in the previous theme as faculty members helped doctoral students learn the ins and outs of scholarly writing and presenting.

Unlike university-based personnel, inservice and preservice teachers are often neither expected to nor supported to participate in professional dissemination. As a result of these partnerships inservice teachers presented at a statewide conference, preservice teachers presented at a regional conference, and a team of inservice and preservice teachers published an article about their technology integration work. Professional involvement is a key factor in empowering teachers to make changes in their classrooms (Dana & Silva, 2003) and our data suggests partnerships may be one avenue to encouraging such behavior.

Summary of Findings

Diverse partnerships related to technology integration facilitate effective uses of educational technologies within a "village" responsible for preparing prospective teachers by (1) enabling technology integration opportunities that would not be possible without the partnerships, (2) heightening awareness of and interest in technology integration within the culture and context of each partnership, (3) supporting a model of reciprocal mentoring in which partners learn from and provide knowledge or assistance to each other, and (4) increasing or initiating professional involvement and dissemination related to technology integration.

IMPLICATIONS FOR TEACHER EDUCATORS

These research findings led to two major implications for teacher educators regardless of context. The first implication is approaching the preparation of prospective teachers with diverse partnerships benefits not only the prospective teachers but also the members of diverse groups within the educational village. The second major implication for all teacher educators is providing resources, support, and time to allow all members of the partnership to develop trust, a common vision, and to grow professionally is critical in producing powerful partnerships. The following paragraphs will briefly elaborate on these implications.

Establishing Diverse Partnerships

Diversity in partnerships broadens and extends the vision of what education can be for preservice teachers. In our experience, preservice teachers now see technology modeled in daily teaching across the university community as well as having the opportunity to have strong technology-based field experiences in their preinternship and internship. Preservice teachers that participated in the technology-based field experiences also had the opportunity to practice using technology in the classroom with the support of inservice teachers. This practical application permitted students to combine the rhetoric of using technology in the classroom with the realities of teaching. In addition, preservice teachers can observe technology modeled in different content areas and within vastly different contexts. The diversity of these partnerships allowed preservice teachers to experience different ideas about integrating technology into a variety of academic areas and observe how these educators handled other classroom management issues associated with using technology in the classroom.

Resources, Support, and Time Contribute to Powerful Partnerships

By carefully attending to change models, we were able to create environments and willing participants ready to create powerful partnerships producing significant results. For example, the inservice teachers that participated in these partnerships grew in their use of integrating technology into the curriculum. Yet, these teachers also grew professionally in other ways. Many of the inservice teachers participated in a presentation at the state educational computing conference. For some of these teachers, this was their first opportunity to present at a conference. These teachers spoke of the confidence gained in their ability to use technology and how they were empowered as teacher educators.

Faculty and doctoral students at this university also grew professionally from these partnerships. Doctoral students noted how much they benefited from gaining new perspectives of what it means to be a faculty member at a research I institution. Many of the faculty and doctoral students presented at conferences and wrote journal articles about the partnerships. In addition, faculty learned new instructional strategies appropriate for their content and the context in which they teach. This professional growth benefited faculty and doctoral students.

By taking the time to negotiate common visions for the partnerships, allocating resources and time, and ensuring these partnerships take place over an extended period of time, the rhetoric of partnerships mesh with reality. In

addition, by establishing mutual trust and respect, the intimacy of partnerships can take place. Most importantly for our context, there is a new perspective of the responsibility of preparing high-quality teachers to use educational technologies in their teaching by the village surrounding this teacher education program.

Additional Lessons Learned

Because of these successful partnerships, valuable lessons that do not directly relate to the research findings were learned and it would be irresponsible not to share these general lessons learned. Context is always a critical issue when establishing partnerships. Yet, there are five general lessons learned in the Teaching and Technology Initiative that can inform practice in other teacher education programs. These lessons are the importance of: developing mutual respect and trust in the partnership, balancing quality verses quantity, sustaining action and progress, providing win-win situations, and celebrating victories.

Developing mutual respect and trust in partnerships is essential before long-term, sustained progress can be made. Respect and trust also address power issues that can occur in partnership. Mechanisms must be in place to allow respect and trust to occur. It is not realistic to expect this to happen quickly; therefore, powerful partnerships take time to develop. This relates to the next lesson learned.

Sustaining action and progress in partnerships takes time. Each of the partnerships that took place in the UFTTI lasted a minimum of three years. This long-term commitment allowed stakeholders in the partnerships to negotiate roles, develop common visions, and then to implement action plans. Time indicates to all involved the true commitment of each stakeholder to the partnership.

A third lesson is to strive for quality over quantity. In the beginning of this initiative, we spread ourselves thin by having too many partnerships starting at once. This prohibited us from providing as much support, resources, and most importantly time in getting the partnerships established. We wanted to impact many schools with the UFTTI. However, we discovered it was more effective to work on systemic change at one or two schools. Although working in individual classrooms within various schools benefited the teacher and students in those classrooms, working with an entire school on the integration of technology helped change the culture of the school to one that expects technology to be a normal part of the teaching and learning process. Starting with a small number of partnerships and then gradually increasing those numbers was a much more effective strategy than beginning all partnerships at the same time.

Fourth, having partnerships that allow all stakeholders to be in a win-win situation is critical. By carefully relying on the frameworks provided by Ely (1976) in his *Conditions of Change*, we were able to help create environments that were open and ready for successful partnerships. Each participant in the partnerships could see how his or her efforts were respected, how he or she gained from the partnership, and how he or she were making a difference in the education of children in Florida.

Finally, the importance of celebrating victories in partnerships is important. Although each partnership celebrated milestones together, we found bringing all partnerships together on a yearly basis to celebrate the success of each partnership was positive for all participants and informative to the local educational community. The various partnerships learned from each other as presentations were made, shared solutions and concerns in small discussions, and then just celebrated with a huge celebration feast. This not only allowed participants in the partnerships to benefit but allowed others in the educational community to learn of these great accomplishments. Accomplishments from each partnership were also shared on the Teaching and Technology Initiative website (http://www.coe.ufl.edu/school/pt3).

CONCLUSION

The findings from the diverse partnerships in the University of Florida Teaching and Technology Initiative did facilitate effective uses of educational technology for preservice teachers. Our teacher education program was impacted in ways not possible without partnerships while respecting the context, culture, beliefs, and visions of the partnerships. These partnerships also strengthened connections between units that are sometimes at odds. Now, there is an atmosphere of trust and openness between the diverse partners. Finally, these diverse partnerships promoted professional growth among all partnership participants.

Partnerships to assist preservice and inservice teachers in using technology in teaching require great time, effort, and resources; yet, the results of effective partnerships produce preservice and inservice teachers who can use technology in curricula and classrooms and have a broad perspective of how this can occur and benefits their students. The responsibility of preparing preservice teachers does not lie solely with teacher education programs; this "village" responsibility requires effective partnerships with other units in universities and

colleges, public schools, business, and the community. We all have responsibility in preparing future educators and by learning from each other to ensure the rhetoric of partnerships becomes reality.

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WHAT TECHNOLOGY PLAYS SUPPORTING ROLE IN LEARNING CYCLE APPROACH FOR SCIENCE EDUCATION

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ABSTRACT
There has been a movement nationally over past several decades to integrate technology into extent curriculum. This is true both at the K-12 level and in higher education. The purpose of this study is to show what role science education has played in this effort (i.e., what documents, research or associations provide positions on technology usage) and what role technology should or could play in a learning cycle approach in the light of current research. In this study, first of all, the concepts of technology and educational technology including a rationale for the use of technology in education were examined in historical perspective and then what relationship between "Learning Cycle approach" and educational technology in science education was showed. As a result, how we can create technology-based curriculum in our learning cycle approach and how we, as teachers, can use technology in learning cycle approach will shown.
Keywords: Technology Integration, Science education, Learning cycle approach

INTRODUCTION

Technology has an impact on every aspect of modern life. However, technology has by passed the classroom. It is time to more fully integrate technology into the educational settings since skillful use of technology supports the development of process skills such as higher order skills, adaptability, critical thinking, problem solving, and collaboration that are essential to succeed in our rapidly changing information age. If we ask what technological tools in school are, most of people would say first computers and computers represent the only educational technology available. This, of course, is not true since there are many different kinds of technology in the classroom. While computers and their related devices (probeware, electronic databases, CD-ROMS, the internet, and multimedia presentations) are part of technology, and also overheads, televisions, VCR, digital cameras, videodiscs, and traditional science equipment are too.

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.

TECHNOLOGY IN HISTORICAL PERSPECTIVE

There are many good examples of using of technological resources to enhance learning in science classrooms. There is no doubt that a rapid increase in technological resources has a revolutionary effect on teaching of science (Windelspecht, 2001). However, using technology in science classrooms is not common in schools yet. A little research on education history will show the reason behind this fact.

Before 1800, instruction at both elementary and secondary levels was predominantly individual. The standard practice was for the village schoolmaster to call one or several pupils to his desk, and teach individually. The Lancasterian monitorial system, developed by Englishman Joseph Lancaster, provided the basis for the eventual support of free public schools at the end of the 18th century, and spread in the beginning of 19th century. The method relied heavily on using the advanced students to teach the younger ones. By the Lancasterian system, large-group instruction started and classrooms were constructed that would make the most effective use of instructional media and student grouping. Under this system, one master taught a select group of older pupils, the monitors, and these in turn taught the rest. Lancasterian system is "a system which is, in education, what he neat finished machines for abridging labor and expense are in the mechanical arts" (Spring, 1990).

In the early 1900s, the educational community in modern countries found a new ideology, called the meritocracy movement. The Meritocracy movement claimed that education and educational phenomena could best be studied through the use of current scientific paradigms. Moreover, this new ideology suggested that human intelligence itself could be effectively measured through the use of scientific techniques. At that time, there were limited technological tools, blackboards, desks, pencils, notebooks, basic mathematical tools, used in American schools.

By the early 1900s, many important technological inventions, such as telephones, electrical lighting, automobiles, had occurred. Electricity especially opened a huge door in the education. Teachers were able to give their lectures at night, even though students had been working at night already. By the 1950s, photography,

photojournalism, sound motion pictures, and broad radio firmly established American educational traditions. These inventions were very useful for education, because, in the 1920s and 1930s, industries were successful in convincing the educational community that film and radio were especially capable of shaping public morality, improving educational teaching perspectives, and firmly entrenching American educational goals. However, these new technologies did not turn educators away from print-based cultures (Engle, 2001). Print-based culture started with the invention of the Gutenberg press in 1492. Steinberg (1961) asserted, "The history of printing is an integral part of the general history of civilization" (p. 89). By many educational historians, the importance of the printing process is clearly confirmed in the many stages of education. World education was negatively influenced by World War II. Business interests, the scientific community, and military leaders criticized the education system in their countries in the 1940s and 1950s. In 1958, American Congress passed the National Defense of Education Act, in hopes of constructing the indifference of American schools towards the declining scientific and technological progress in education, caused by financially driven factory-style schools. By through 1960's, network television was adopted in the modern countries life. Two-thirds of Americans reports and most of their information about the world were being watched via television, but many researchers and educators realized that the rise of the television society left education in a poor position. By 1970's, science teachers began to use the overhead projector, which show diagrams, charts, or figures that clearly indicate analysis of the topic, pictures. This device has now become a traditional use of technology in the classroom. Slides, slide shows, and documentary videos are also very useful technological tools for students, especially for editing, observing, interviewing, and investigating.

Clearly, the most important invention is the computer and now the most popular tool. Konrad Zuse invented the first computer in 1936 but it was not used until World War II in public. In addition, computer did enter the classroom after the 1980's. In the last decade, we have seen an explosion in using the computer in education. A Nation at Risk in the US (1983) cited computer competence as a fourth basic skill that was both an important and empowering experience in the world in which we live. Accordingly, computer skills are needed for both subsequent formal educations as well as for one's individual life experiences (Gilder, 1993). Currently, three major national projects are underway in the United States that are designed to restructure science education and develop scientific literacy. The Project 2061 (American Association for the Advancement of Science, 1993), the National Science Education Standards (National Research Council, 1996), and National Educational Technology Standard (International Society for Technology in Education [ISTE], 2002) emphasized how important of educational technology and increased the awareness and interest of science for educators, students and average citizen. According to The Office of Technology Assessment, in 1988, 95% of all American schools have one or more computers (Mistler-Jackson and Songer, 2000). There is no doubt an increasing trend of using technology in the U.S. education system, especially since computers that collect, display evidence, and summarize, as a part of these standards, started to be seen the most important tool to improve student learning (Pedersen & Totten, 2001).

If technology is to become an integral part of K-12 and higher education, then it must also become an essential part of instructional tools and teacher preparation programs. Although educators know how important and useful technological tools are in the classroom, they still lack technology efficiency in science classes. Davis and Falba (2002) stated that traditionally, technology has not been central to teacher preparation experience in most colleges of education. Similarly, Pedersen and Yerrick (2000) reached the same conclusion in that; inadequate preparation of technology continues to be problem. Many teachers need training and support in the use of new methods and new media, in their research. According to Czerniak and Lumpe (1995), only 16% of teachers reported using technology almost everyday and 28% reported using it several times a week. Most frequently, teachers are using technology for communication such as email and telephone system (Frank & Zhao, 2003). Odom, Settlage and Pedersen (2002) had found almost same results that small differences were found for telecommunication and word processing. However they found large differences in teaching students at a distance, database applications, support research efforts, and desktop publishing areas of using technology as an instructional tool in their research. These results mean that our teachers know enough information about using technology in telecommunication and word processing but they need to be taught in other areas of using technology.

In spite of this, the trend of using technology in schools is rapidly increasing. Brownell, Haney, and Sternberg (1997) stated that 77 percent of the teachers and building administrators have a positive attitude toward classroom technology. Odom, Settlage and Pedersen (2002) concluded "the varieties of technology that could potentially be incorporated into science instruction and teacher preparation seem to be increasing at rapid rate" in (p.397).

In traditional education, every science teacher have been using textbooks and generally a single textbook guides the curriculum (Pedersen & Totten, 2001), after entering computer in science classroom, most textbooks come with a supplemental CD-ROM. At this point, Simon's research (2001) explains clearly why technology integration is important in students learning. He created the web page with students' contributions. The course web site included many useful learning tools such as, sample problems, lecture notes, glossaries, assignments, test results, and graphics. His students stated course web site had better than using textbook. According to the studies conducted by Iding, Crosby, and Speitel (2002), and Rizza (2000), pre-service teachers who using computers for their own personal use were at least moderately proficient with computers, and had access to computers at schools and in individual classrooms. Also Beyerbach, Walsh, & Vannatta (2001) reported similar results for teachers who were interested in learning more about using computers and technology for instructional and educational purposes.

There are also negative perspectives about using technology in the schools. Extensive amount of research conducted to investigate teachers' experiences about the use of technology in their instruction suggest that the majority of teachers do not feel well prepared to integrate technology into their teaching because of time that to learn, plan, and implement educational technology is too long, especially for computers. Zammit (1992) found that a major obstacle to successful technology integration was the lack of teacher confidence and skill when using technology. Main problem, according to many teachers and educators, is a severe lack of resources, which are software, laptop and desktop computers, connections from computer to TV, digital cameras, and funding (Simon, 2001). Driscoll (2001) reviewed previous surveys and studies about technology integration by teachers and concluded that there was little consistency or consensus among groups in defining how technology was utilized in some schools. In some cases, participants stated that technology could be used to enhance learning, but the majority of the subjects tended to refer to technical aspects of technology. Hannafin and Savenye (1993) listed some research-based possible explanations why teachers are hesitant to use computers. These reasons consisted of poorly designed software, doubt that computers improve learning outcomes, resentment of the computer as a competitor for student's attention, unsupportive administrators, increased time and effort required of the teacher, fear of losing control of center stage, and fear of looking stupid in front of the class. They stated that the interactive nature of the computer and its capacity to enable student-centered exploration require a fundamental shift in the role of the teacher. The teacher can no longer be an active giver of information to relatively passive learners. They pointed out that terms like manager of information, coach, guide, organizer, initiator, and diagnostician appear in the literature to define the technology-oriented teacher's new role.

LEARNING CYCLE APPROACH AND TECHNOLOGY

A basic understanding of scientific concepts and process is essential in order to be successful and to make informed decisions about variety of complex questionjs. Learning cycle approach is an inquiry-based learning. Teachers need to know how to create a physical environment that engages all students. Learning cycle approach's goal is to enhance learning and provide students with more authentic science experience that imitate those real scientists and are in accordance with the nature of science. In addition, science education reforms have placed important on the need for integrating technology into science teaching, learning and assessment. There is no doubt about high connection of between learning cycle approach and infusing technology.

One of the biggest contributors to learning cycle approach is Dewey. According to Dewey, the basis for learning would be the natural impulses to inquire or to find out things (inquiry); to use language and thereby to enter into the social world (communication); to build or make things (construction); and to express one's feelings and ideas (expression) (Bruce & Levin, 1997). Based on Dewey's theory, our inquiry unit will focus on human experience that is continuous and interactive. Piaget, Vygotsky, and Brunner support learning environment and activities that are developed to allow for the viewing of students as thinkers who are emerging at different rates (Brooks & Brooks, 1993). In the light of these perspectives, learning cycle approach has three important phases, (1) exploration; means gathering and recording data, experience through a discussion session in which the child will begin to discover the science concept through his or her questions, (2) term introduction; teacher takes an active role in leading the students to develop the concept and students explain the concept with guidance from the teacher, students make their own meaning out of the observations, (3) concept application; students continue to expand the concept by conducting more activities and using additional resources for investigation, teacher should make an assessment of the students' abilities and thinking habits in investigating science ideas. In the curriculum of learning cycle, teachers should use a multidisciplinary approach that integrates technology with effective learning and teaching practices. Witfelt (2000) observed that it was really important to combine several learning theories such as constructivism, cooperative method, postmodernism, multiple intelligence, and even behaviorism in our science classrooms with technology. In every phases of learning cycle, every kinds of technological tool can be used by teacher. This approach provides students and teachers an opportunity to address current real-world issues.

How can we create technology-based curriculum in our learning cycle approach? First of all, we have to "create the learning objectives and exploring lesson plan". This plan should fit national and state standards, which fits a current or past learning expectation we have covered. Then we can go through to "design our technology-based lesson". We have to explore the possibilities of technology-based activities our students can accomplish to meet the curriculum standard we have chosen, and then strive to choose the best technology activity for the lesson plan tasks, such as Microsoft office software. Generally our students need to be taught how to use computer and/or some software. That is we must determine any prerequisite skills students need and at what levels allowing for some review if needed. Third rule is "implementing the lesson". Implementation is the process of putting our lesson design into practice. With regard to technology, it should always be used as a tool in your design to augment the lesson's objectives. The main point is that technology itself does not make learning happen. The teacher is still the most important factor in the classroom and technology should be used in implementation to support the teacher. David and Falba (2002) said "learning cycle curriculum enables teachers and students to make sense of science in their daily lives, use technology that they see used around them, and engages in authentic science practice" (p. 323). The role of teacher in learning cycle approach is a facilitator and students are like scientists (Witfelt, 2000) and teachers are using technology as a tool in exploration phase. In the technology-based curriculum, assessments should be hands-on, real-world exercises in data collection (exploration phase). Also the purpose of exploration phase should be to help students learn generalized, systematic ways of thinking that can be transferred to other disciplines. MacKinnon (2002) gave same examples of how teachers integrate technology into their curricula such as "I use the computer in my class as a reinforcement of topics we have covered. Students use the internet to find information for their reports. My students must turn in their homework in word-processed form. I use PowerPoint to make all presentations to my class (p. 57)."

Computers and other new information technologies can be used to support the full range of learning. Dewey's suggestions are obviously match with learning cycle approach. Teacher should make available to students appropriate technological resources with which they can gather, evaluate, and record (in exploration phase), and analyze data and develop (in term introduction phase) and broaden their science understanding (in concept application phase) (Davis & Falba, 2002, p. 303).

The relationship between learning cycle approach and technology is very close, in this connection; technology can be seen as an integral part of the cognitive tool. Mokros and Tinker (1987) concluded that use of the technology may be a "bridge between concrete and formal operations" (p. 381). Moreover technology provides a multi-modal approach to learning, thus, addressing learning style differences in students. Many studies showed that students who used technology in conjunction with hands-on instruction had increases in knowledge and attitudes about science (Gardner, Simmons, & Simpson, 1992). So technology is an ally to leaning cycle teachers, and should be effectively integrated into all three phases of learning cycle. Today, learning cycle teachers have seen technology is the eyes and ears of science, and, whether it is computer or a calculator, is vital to data collection (exploration) ,teaching the concepts (term introduction), and expanding knowledge (concept application).

How we, as teachers, can use technology in learning cycle approach. Jonassen & Reeves (1996), and Beyerbach, Walsh, & Vannatta, (2001) made a distinction in educational uses of technology between learning from computers and learning with computers. Much of the early research and development with technologies considered enhanced learning that could be achieved when computers played an important role in delivering content and creating learning opportunities to help students make meaning and develop an understanding. The integration of technology into instruction does not mean to teach students how to use technology. The purpose of technology integration does also not mean to teach student by drilling and testing. Instead, effective technology integration is a plan to use technological resources as tools to assist students to construct meaningful knowledge. In this type of technology use, planning, decision-making, and self-regulation of learning are the responsibilities of the learner, not the technology.

Means and Olson stated (1997) that

> When students are using technology as a tool or a support for communicating with others, they are in an active role rather than the passive role of recipient of information transmitted by a teacher, textbook, or broadcast. The student is actively making choices about how to generate, obtain, manipulate, or display information (p. 125).

The crucial thing is that some activities are better done without the use of technology while others are greatly enhanced by its use. Teachers should not forget that technologies never guarantee that technology will lead

directly or indirectly improvement in students learning and to modification in our science classroom practices and even inappropriate uses of technology can make learning much more difficult (Kumar & Altschuld, 1999). Teachers need to see the difference so they can make informed decision whether when they should use technology. The integration of technology in our science curriculum support students and teachers, as they collect, record, organize and analyze what they found. Thus a complementary relationship between technology and learning within learning cycle approach seems sound and advantages to teachers and students.

CONCLUSION

An understanding of relationship among teaching, learning, and technology are important aspects that educators need to keep in mind when integrating technology in their classrooms. Today's studies proved that we want preservice teachers to experience technology, to teach students with using technological tools, and to use inquiry-based learning environments in schools and colleges. Thus, technology infusion is situated within the larger context of inquiry-based learning. If computers and other technologies were used to their full capabilities, then learning goals in a classroom would not only be clearer, but also the resources and student outcomes would be positive. With computer software and the Internet, students are able to get information from around the world in a few minutes. There are so many resources right in front of us when we are in front of a computer. Word processing tools, which allow you to write a paper and fix mistakes later rather than rewriting the whole thing, Power Point programs that let you make presentations easily.

On the other hands, I don not believe that technology is the perfect solution for educator's woes. Throughout history there have been many innovations, which were popular in their time, and these innovations were thought the solution for all educational problems. Remember the beginning of the television and VCR for classroom use? These devices were supposed to be revolutionary devices that would improve all classroom teaching, making teachers more efficient (King, 1999). Teachers have to scratch technology can only help teachers to teach and students to learn in their brains.

The real concern is how teachers should implement this technology in their classroom. Teachers' attitudes toward technology appear to be in constant state of change, but the data indicates that in recent years more teachers are using technology to support learning contexts as a result of appropriate training. Therefore, pre-service teachers need training to learn new skills for facilitating learning in a technology-rich constructivist learning environments (Schifter, 1996).

Learning cycle approach asserts that learning is the active process of constructing rather then passively acquiring knowledge from directly teacher and using technology can increase instructional effectiveness, can reduce time and costs needed for learning. As the National Science Education Standards (NRC, 1996) stated that the major of science education is to produce students that are scientifically literate and technologically informed. Briefly, science and technology should be seen as tools that enable citizens to investigate and understand the problem of everyday life and to serve all communities (Davis & Falba, 2002).

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HEMŞİRE ÖĞRETİM ELEMANLARININ TEKNOLOJİYE İLİŞKİN TUTUMLARI

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ÖZET
Gelişen teknoloji, eğitim ve sağlık alanında etkili ve verimli hizmet sunma olanağını arttırmakta; tüm mesleklerde, hemşirelikte gerek eğitimde gerek uygulama alanlarında ülkemiz açısından da giderek önem kazanmaktadır. Bu bağlamda, gelişen teknolojinin doğru ve etkin kullanılabilmesi için bilimsel, ekonomik, sosyal ve etik boyutlarını sürekli değerlendirerek, gerekli düzenlemeleri yapabilecek bilgi, beceri, tutum ve davranışa sahip meslek üyelerinin, hemşirelerin yetiştirilmesi zorunlu hale gelmektedir. Bu konuda hemşire öğretim elemanlarına önemli rol ve sorumluluk düşmektedir. Ulusal ve uluslararası eğitim ve hemşirelik kuruluşlarının da vurguladığı gibi öğretim elemanının bu sorumluluğu yerine getirebilmesi için, teknoloji konusunda gerekli bilgi, beceri, tutum ve davranışa sahip olması gerekmektedir. Ancak, teknolojinin eğitime entegre edilmesinde öğretim elemanının bilişsel ve psikomotor niteliklerinin yanısıra, değer, inanç ve tutum gibi duyuşsal niteliklerinin de önemli olduğunu vurgulayan literatüre karşın hemşire öğretim elemanının teknolojiye ilişkin tutumunu ele alan çalışmalara rastlanmamıştır.

Bu bilgiler ışığında araştırma, hemşire öğretim elemanlarının teknolojiye ilişkin tutumlarını belirlemek amacıyla planlanmıştır. Elde edilen sonuçlar, öğretim elemanlarının teknolojiye ilişkin olumlu tutum içinde olduklarını göstermektedir.

Anahtar Kelimeler: Teknoloji, Tutum, Teknolojiye ilişkin tutum, Hemşire öğretim elemanı

ABSTRACT
Changing technology increases possibility of effective and productive service in education and health area; and also it acquires importance in all jobs by reason of in nursing in our country. Therefore, members of profession/nurses must be trained connected with knowledge, skill and attitude to use technology effectively. So nurse facultys have significant role and responsibility. As national and international education and health foundations emphasizes that facultys must have necessary knowledge, skill and attitude to achieve their responsibility. Although the literature which is emphasized that affective qualities (values, beliefs, attitude) are as much as important as cognitive and psychomotor qualities for integration of technology with education, there isn't met the research which is about nurse facultys' attitudes toward technology.

In the light of this explanation the research is planned to determine nurse facultys' attitudes toward technology. The results indicates that facultys' have positive attitude toward technology.

Key words: Technology, Attitude, Attitude toward technology, Nurse faculty

GİRİŞ

Bilim ve teknolojideki hızlı ve aynı zamanda şaşırtıcı gelişmeler ülkeleri büyük ve gizli bir rekabetin içine sokmuş ve bu rekabet, ülkelerin varolan teknolojik olanaklarını geliştirmelerini zorunlu hale getirmiştir. Ayrıca, insanların daha nitelikli bir ortamda yaşama beklentisi de teknolojideki gelişmeyi hızlandırmış ve teknoloji kullanımı bir ayrıcalık olmaktan çok zorunluluk olmuştur. Bu gelişim sürecinde eğitim, lokomotif görevini üstlenmiş ve yaşamın daha nitelikli hale getirilmesinde önemli rolü olan eğitim teknolojisi kavramını öne çıkarmıştır (Alkan, 1998, Meral ve Çolak, 2002, Meral ve ark, 1999). Bu yaklaşımla ele alındığında teknoloji; belli amaçlara ulaşmada, belli sorunları çözmede gözleme dayalı ve kanıtlanmış bilgilerin uygulanması, eğitim teknolojisi ise; davranış bilimlerinin öğrenme ve iletişim alanlarındaki araştırma ve kuramlara dayalı sistemli bir planlamaya uyarak, erişilebilen insangücü ve dışı kaynakları belli yöntem ve tekniklerle akıllıca ve ustaca kullanma ve varılan sonuçları değerlendirme yoluyla eğitimin özel hedeflerine ulaşma süreci olarak tanımlanabilir (Çilenti, 1984, Demirel, 2001).

Bilgi çağının en etkin unsurlarından biri olan teknolojinin kullanılması birey, toplum ve meslek üyesini olaylar ve olgular karşısında daha güçlü hale getirmek ve yaşamı kolaylaştırmakla birlikte bireye, topluma ve meslek üyesine yeni sorumluluklar yüklemektedir. Bu sorumlulukların bilincinde olan, teknolojiyi üretip kullanabilen, teknolojiyle bütünleşen birey, toplum ve meslek üyesinin her zaman daha önde ve daha güçlü olacağı yadsınamaz bir gerçektir (Bayık, 2001, Dinç, 1995, Kaya, 2003, Taşocak, 2002). İlgili literatür incelendiğinde, hemşireliği ve hemşirelik eğitimini öncelikli olarak etkileyen güçler arasında teknolojinin önemli bir yere sahip olduğu görülmektedir. Günlük ve mesleki yaşama giren teknoloji, doğru ve etkin kullanımıyla tüm sağlık bakımı

ve eğitim ortamlarında etkili ve verimli hizmet sunma olanağı sağlamakta, hemşirelikte de gerek eğitimde gerek uygulama alanlarında ülkemiz açısından da giderek önem kazanmaktadır (Aştı, 2003, Jeffries, 2005, Kaya, 2003, Mcneil et al, 2003). Bu doğrultuda hemşirelik kuruluşları teknolojiyi, hemşirelik uygulamalarının temel yapı taşı olarak kabul etmekte ve teknolojiyi etkili olarak kullanabilme konusunda bilgi, beceri ve tutuma sahip olmayı hemşirelikte aranan bir nitelik olarak vurgulamaktadır (Bernard, 1999, Mcneil et al, 2003). Bu durum, hemşirelik eğitim programlarının moral değerler, iletişim ve sosyal süreçler dikkate alınarak; ileri teknolojiyi doğru ve etkin kullanabilecek, teknolojinin, hemşireliğin özüne ve eğitimine etkilerini bilimsel, ekonomik, sosyal ve etik boyutlarıyla sürekli değerlendirip gerekli düzenlemeleri yapabilecek bilgi, beceri, tutum ve davranışa sahip meslek üyeleri mezun edecek biçimde yapılandırılmasını zorunlu kılmaktadır (Kaya, 2003).

Eğitimde teknolojinin bu kadar önemli olduğunu vurgulayan literatüre ve sağlık bakımı alanındaki yaygın kullanımına karşın, teknolojinin hemşirelik eğitimine entegre edilmesine yeterince önem verilmediği, teknolojik gelişmeleri diğer alanlara göre geriden izlediği söylenebilir (Aştı, 2003, Bernard, 1999, Dinç, 1995, Mcneil et al, 2003). Teknolojinin eğitime entegre edilmesinde öğretim elemanına dolayısıyla hemşire öğretim elemanına önemli sorumluluk düşmektedir. Uluslararası Teknoloji Eğitimi Derneği'nin de vurguladığı gibi (ISTE, 2000), öğretim elemanının başarılı bir şekilde teknolojiyi eğitime entegre edebilmesi için teknoloji okuryazarı olma, eğitimde teknolojiyi kullanabilme, öğrencileri teknoloji kullanmaya yöneltebilme, bilgiye ulaşma ve bilgiyi kullanma becerilerinin kazanılmasında öğrenciye destek olma, öğrenme ortamını öğrencilerin teknolojiyi kullanabilecekleri şekilde düzenleyebilme, mesleki gelişimleri ve deneyim paylaşımı için meslektaşları ile internet üzerinden işbirliği yapabilme gibi teknolojik becerilere sahip olması gerekmektedir (ISTE, 2000). Ancak, öğretim elemanının teknolojiye yönelik bilişsel ve psikomotor niteliklerinin tek başına yeterli olmadığı, duyuşsal niteliklerinin de çok önemli olduğu unutulmamalıdır. İlgili araştırmalarda da vurgulandığı gibi, teknolojiye karşı olumlu tutum geliştiren öğretim elemanları, teknolojiyi eğitime entegre etmede olumsuz tutum geliştiren öğretim elemanlarından daha başarılı olmaktadır (Akbaba, 2002, Mcneil et al, 2003, Meral ve Çolak, 2002, Meral ve ark, 1999).

AMAÇ

Bu araştırmanın amacı, İstanbul ilinde devlet ve vakıf üniversiteleri içinde yer alan hemşirelik ve sağlık yüksekokulları'nda görevli hemşire öğretim elemanlarının teknolojiye ilişkin tutumlarını belirlemektir. Ayrıca yaş, akademik unvan, akademisyen olarak çalışma yılı, kurumda yönetsel sorumluluğa sahip olma ve teknoloji ile ilgili eğitim programına katılma değişkenlerine göre hemşire öğretim elemanlarının teknolojiye ilişkin tutumları arasında anlamlı bir fark olup olmadığını ortaya koymaktır.

Araştırmanın Sınırlılıkları

Araştırma, İstanbul ilinde devlet ve vakıf üniversiteleri içinde yer alan hemşirelik ve sağlık yüksekokulları'nda görev yapan hemşire öğretim elemanları ve "Teknolojiye Karşı Tutum" ölçeğindeki maddelerle sınırlıdır.

YÖNTEM

Araştırma, hemşire öğretim elemanlarının teknolojiye ilişkin tutumlarını belirlemeye yönelik tanımlayıcı bir çalışmadır.

Evren ve Örneklem

Araştırmanın evrenini İstanbul ilinde devlet ve vakıf üniversiteleri içinde yer alan hemşirelik ve sağlık yüksekokullarında görevli 179 hemşire öğretim elemanı oluşturmuştur. Araştırmada evrenin tamamına ulaşılması hedeflenmiş, 162 öğretim elemanına ulaşılmıştır.

Verilerin Toplanması

Araştırma 2003-2004 öğretim yılı bahar döneminde gerçekleştirilmiştir. Araştırmanın verileri, bilgi formu ve "Teknolojiye Karşı Tutum" ölçeği ile elde edilmiştir. Bilgi formu, araştırmacı tarafından literatür ışığında geliştirilmiş olup, öğretim elemanlarının sosyo-demografik özelliklerine (yaş, medeni durum, mezun olduğu okul, görev yaptığı kurum, akademik unvan, çalışma yılı, kurumdaki yönetsel sorumluluk vb.) yönelik 13 sorudan oluşmaktadır. Öğretim elemanlarının teknolojiye karşı tutumları, Akbaba tarafından geliştirilen "Teknolojiye Karşı Tutum" ölçeği ile belirlenmiştir. Bu ölçek beşli likert tipindedir ve 37 maddeden oluşmaktadır. Ölçeğin Akbaba tarafından yapılan güvenirlik çalışmasında, toplam ölçek için cronbach alpha katsayısı .91 olarak bulunmuştur (Akbaba, 2002). Çalışmada da güvenirlik katsayısına bakılmış, cronbach alpha katsayısı .89 olarak saptanmıştır. Verilerin toplanmasında kurumlardan yazılı izin alınarak, öğretim elemanlarının gönüllü katılımı esas alınmıştır.

Verilerin Analizi
Elde edilen veriler SPSS 11.0 paket programında, frekans-yüzdeleme, aritmetik ortalama, Fisher Kesin X^2 (ki-kare) testi, t-testi, tek yönlü varyans analizi (ANOVA) istatistiksel yöntemleri kullanılarak analiz edilmiş ve önem düzeyi .05 olarak alınmıştır. Ölçekte yer alan maddelerin yorumlanması yapılırken olumsuz ifadeler tersine puanlanmış, Kesinlikle katılıyorum seçeneğine 4.20-5.00 puan, Katılıyorum seçeneğine 3.40-4.19 puan, Kararsızım seçeneğine 2.60-3.39 puan, Katılmıyorum seçeneğine 1.80-2.59 puan, Kesinlikle katılmıyorum seçeneğine 1-1.79 puan verilmiştir. Ölçekten alınan puan arttıkça teknolojiye ilişkin tutum olumlu yönde artmaktadır.

BULGULAR VE TARTIŞMA

Bölüm I: Öğretim Elemanlarının Sosyo-Demografik Özelliklerine İlişkin Bulgular
Araştırma grubunu oluşturan öğretim elemanlarının %25,3'ünün (41 kişi) 29-33 yaş, %22,2'sinin (36 kişi) 34-38 yaş grubunda, %63,4'ünün (102 kişi) evli, %50,0'sinin (81 kişi) yüksek lisans mezunu olduğu, %91,4'ünün (148 kişi) devlet kurumunda çalıştığı, %43,2'sinin (70 kişi) araştırma görevlisi olduğu ve %34,0'ünün (55 kişi) akademisyen olarak çalışma yılının 12 yıl ve üzeri olduğu belirlenmiştir. Ayrıca, öğretim elemanlarının %84,6'sının çalıştığı kurumda herhangi bir yönetsel sorumluluğu olmadığı, %69,9'unun teknoloji ile ilgili eğitim programına katılmadığı, %96,3'ünün kişisel bilgisayara sahip olduğu, %74,1'inin çalıştığı kurumun teknolojik donanımını yetersiz bulduğu ve %74,1'inin kurumundaki teknolojik donanımdan yararlandığı belirlenmiştir.

Tablo 1: Öğretim Elemanlarının Eğitim Etkinliklerinde Kullandıkları Teknolojik Araç-Gereçlerin Dağılımı

TEKNOLOJİK ARAÇ-GEREÇLER *	EVET		HAYIR	
	n	%	n	%
Tepegöz	162	100,0	-	-
Yazı Tahtası	148	91,4	14	8,6
Bilgisayar/Projeksiyon	140	86,4	22	13,6
Slayt Makinesi	112	69,1	50	30,9
Kağıt Tahtası	103	63,6	59	36,4
Tv/Video/Film	74	45,7	88	54,3
Diğer	4	2,5	158	97,5

***** Birden fazla seçenek işaretlenmiştir.

Tablo 1'de görüldüğü gibi, öğretim elemanlarının eğitim etkinliklerinde %100,0'ünün (162 kişi) tepegöz, %91,4'ünün (148 kişi) yazı tahtası, %86,4'ünün (140 kişi) bilgisayar/projeksiyon, %69,1'inin (112 kişi) slayt makinesi, %63,6'sının (103 kişi) kağıt tahtası, %45,7'sinin (74 kişi) Tv/Video/Film, %2,5'inin (4 kişi) bülten tahtası, maket, model, kesitler gibi araç-gereçleri kullandıkları belirlenmiştir. Bu sonuçlar, öğretim elemanlarının eğitim etkinliklerinde ağırlıklı olarak tepegöz ve yazı tahtasını kullanma alışkanlıklarına sahip olduklarının bir göstergesi olarak kabul edilebilir. Bu durumun öğrencileri, öğretme-öğrenme sürecinde çağdaş teknolojilerden (bilgisayar, simülasyon, data projeksiyon, televizyon vb.) yararlanmaları konusunda olumsuz yönde etkilediği düşünülmektedir.

Bölüm II: Öğretim Elemanlarının Teknolojiye İlişkin Tutumlarını İçeren Bulgular

Tablo 2: Öğretim Elemanlarının Teknolojiye İlişkin Tutumlarıyla İlgili Maddelerin Aritmetik Ortalamaları ve Standart Sapmaları

MADDE	ARİTMETİK ORTALAMA VE STANDART SAPMA	
	$\bar{X}$	*SD*
1.Günlük işlerimde teknolojiden yararlanmaktan kaçınırım.	4,40	1,12
2.İnsanları teknolojiyi kullanmaları için özendiririm.	4,29	0,93
3.Öğrencileri erken yaşlarda teknoloji ile tanıştırmayı faydalı bulmam.	4,37	1,22
4.Bilgisayar kullanmaktan hoşlanırım.	4,36	1,04

5.Yeni teknolojileri öğrenmenin zaman kaybı olduğunu düşünürüm.	4,72	0,73
6.Meslektaşlarım ile teknoloji üzerine konuşmaktan keyif duyarım.	3,99	0,94
7.Teknolojideki gelişmelerin okuldaki rolümü azaltacağını düşünürüm.	4,51	0,90
8.Okulumda yeni teknolojilerin uygulanmasından hoşlanırım.	4,80	0,50
9.Teknoloji fuarlarına katılmaktan hoşlanırım.	3,98	0,90
10.Teknoloji ile ilgili hizmet içi eğitim programlarına katılmak beni rahatsız eder.	4,67	0,69
11.Teknoloji ile ilgili yayınları izlemekten zevk alırım.	4,04	0,92
12.Okul yönetiminde teknolojinin yarar getireceğine inanmam.	4,56	0,89
13.Teknoloji ile ilgili televizyon programlarını seyretmekten zevk alırım.	4,06	0,91
14.Teknolojinin insanları yabancılaştırdığını düşünürüm.	3,14	1,29
15.E-posta (e-mail) kullanmanın bir kolaylık olduğunu düşünürüm.	4,74	0,70
16. İnsanlara teknoloji fuarlarına katılmalarını öneririm.	4,05	0,88
17.Teknolojiye bağımlı olmaktan korkarım.	3,55	1,24
18.Çalıştığım personelden teknolojik gelişmelere ilişkin bilgi almaktan hoşlanırım.	4,30	0,87
19.Teknolojinin insanlar arası etkileşimi azaltacağını düşünürüm.	3,10	1,20
20.Teknoloji ile ilgili konuşma yapılan ortamlarda bulunmaktan hoşlanırım.	3,89	0,99
21.Teknolojik gelişmeleri öğrenmek benim için fazladan bir yük sayılır.	4,45	0,72
22.Öğretim teknolojisinin öğrenmeyi arttırdığını düşünürüm.	4,37	0,90
23.İnsanları yeni teknolojik gelişmeler konusunda bilgilendirmekten hoşlanırım.	4,11	0,95
24.Teknolojinin insanı yerini alacağını düşünürüm.	3,76	1,15
25.İnternette araştırma yapmaktan hoşlanırım.	4,47	0,75
26.Kendimi teknolojik gelişmeleri öğrenmek için yaşlı bulurum.	4,44	0,97
27.Teknoloji konusunda oluşturulan gruplara katılmanın faydalı olacağına inanmam.	4,21	1,16
28. Teknoloji kullanan okulları desteklemem.	4,70	0,73
29.Okulumda yeni öğretim teknolojilerinin kullanıldığını görmek beni mutlu eder.	4,76	0,69
30.Personelin gelişen teknolojilerden faydalanmalarını okulum için gerekli görmem.	4,81	0,64
31.Hizmet içi eğitim programlarında teknolojiye geniş ölçüde yer verilmesini isterim.	4,48	0,87
32.İnternette araştırma yapmayı bir kolaylık olarak görmem.	4,72	0,70
33.Teknolojinin bilgiye ulaşmada tek yol olduğunu düşünürüm.	2,89	1,19
34.Teknolojinin kontrolümüz altında olduğuna inanırım.	3,66	1,13
35.İnsanlarla yeni teknolojik gelişmeler üzerine konuşmalara girmekten çekinirim.	4,06	0,96
36.E-posta kullanmak benim için önemli değildir.	4,50	0,82
37.Teknoloji ile ilgili kitaplar almaktan hoşlanırım.	3,45	1,02
Genel Ortalama	**4,20**	**1,06**

Tablo 2'de görüldüğü gibi, öğretim elemanlarının teknolojiye ilişkin tutum ölçeğinden 4,20±1,06 puan aldığı ve ölçekte yer alan 37 maddeden 22'sine kesinlikle katıldıkları, 12'sine katıldıkları belirlenmiştir. Öğretim elemanları en yüksek puanı; personelin gelişen teknolojiden faydalanmalarını okulları için gerekli gördüklerini (4,81±0,64) ve okullarında yeni teknolojilerin uygulanmasından hoşlandıklarını (4,80±0,50) ifade ettikleri maddelerden almıştır. En düşük puanı; teknolojinin insanlar arası etkileşimi azaltacağı konusundaki düşüncelerinde kararsız kaldıklarını (3,10±1,20), ve teknolojinin bilgiye ulaşmada tek yol olduğu konusundaki düşüncelerinde kararsız kaldıklarını (2,89±1,19) ifade ettikleri maddelerden almıştır. Bu bulgular, öğretim elemanlarının teknolojiyi eğitime entegre etmede olumlu tutum içinde olduklarını ancak, kişiler arası etkileşimi azaltacağı konusunda endişe yaşadıklarını ve bilgiye ulaşmada teknolojinin tek yol olmadığını düşündüklerini göstermektedir. Öğretim elemanlarının kişiler arası etkileşimi azaltacağı konusunda endişe yaşamaları, hemşireliğin insanı merkeze alan bir meslek olmasına bağlanabilir. Bu sonuçların teknolojinin eğitime entegre edilmesi açısından olumlu olduğu düşünülmektedir.

Tablo 3: Öğretim Elemanlarının Yaş, Akademik Unvan, Akademisyen Olarak Çalışma Yılı, Çalıştıkları Kurumdaki Yönetsel Sorumluluklarına Göre Teknolojiye İlişkin Tutumlarının Varyans Analizi Sonuçları

		n	$\bar{X}$	SD	F	p
YAŞ	**24-28**	24	158,08	10,17	**5,781**	**0,000***
	29-33	41	157,17	14,02		
	34-38	36	160,19	16,54		
	39-43	26	159,26	16,07		
	44-48	15	140,00	18,09		
	49 ve üzeri	20	147,70	12,32		
AKADEMİK UNVAN*	**Profesör**	16	149,62	13,49	**1,432**	**0,226**
	Doçent	12	149,83	16,86		
	Yard. Doçent	25	158,88	13,85		
	Araş. Gör.	70	157,14	14,77		
	Öğr. Gör.	36	154,83	19,16		
AKADEMİSYEN OLARAK ÇALIŞMA YILI	**1 ay- 2 yıl**	16	159,25	8,61	**1,389**	**0,240**
	3-5 yıl	36	153,94	15,85		
	6-8 yıl	35	156,54	13,50		
	9-11 yıl	20	161,15	22,00		
	12 yıl ve üzeri	55	152,87	15,71		
YÖNETSEL SORUMLULUK	**Müdür**	3	153,00	9,53	**0,353**	**0,842**
	Müdür Yard.	6	159,33	10,96		
	Yönetim Kurulu Üyesi	5	150,20	13,95		
	ABD Başkanı	11	152,63	11,38		
	Yönetsel Sorumluluğu Olmayan	137	155,87	16,45		

***** 3 kişi yetersiz veri nedeniyle değerlendirme dışı bırakılmıştır.

Tablo 3'de görüldüğü gibi, öğretim elemanlarının yaşlarına göre teknolojiye ilişkin tutum ölçeğinden aldıkları puan ortalamaları arasında istatistiksel olarak çok ileri derecede anlamlı fark olduğu (F:5,781, p≤0,001) ve en yüksek ortalamanın (160,19±16,54) 34-38 yaş grubuna ait olduğu saptanmıştır. Bu sonuç, öğretim elemanlarının bu yaş dönemlerinde teknolojiye ilişkin deneyim eksikliğini gidermeye ve yeni alternatifleri denemeye eğilimli olduklarını düşündürmüştür.

Öğretim elemanlarının akademik ünvanlarına (F:1,432, p>0,05), akademisyen olarak çalışma yıllarına (F:1,389, p>0,05) ve çalıştıkları kurumdaki yönetsel sorumluluklarına (F:0,353, p>0,05) göre teknolojiye ilişkin tutum ölçeğinden aldıkları puan ortalamaları arasında istatistiksel olarak anlamlı bir fark olmadığı belirlenmiştir. Bu sonuçlar doğrultusunda, akademik unvan, akademisyen olarak çalışma yılı ve kurumdaki yönetsel sorumluluğun teknolojiye ilişkin tutum geliştirmede etkili olmadığı söylenebilir.

Tablo 4: Öğretim Elemanlarının Teknoloji İle İlgili Eğitim Programına Katılma Durumlarına Göre Teknolojiye İlişkin Tutumlarının t- testi Sonuçları

		n	$\bar{X}$	SD	t	p
TEKNOLOJİ İLE İLGİLİ EĞİTİM PROGRAMINA KATILMA DURUMU*	**Evet**	47	156,53	13,45	**0,476**	**0,634**
	Hayır	109	155,21	16,81		

***** Bu soruya 6 kişi cevap vermemiştir.

Tablo 4'de görüldüğü gibi, öğretim elemanlarının teknoloji ile ilgili eğitim programına katılma durumlarına göre teknolojiye ilişkin tutum ölçeğinden aldıkları puan ortalamaları arasında istatistiksel olarak anlamlı bir fark olmadığı belirlenmiştir (t: 0,476, p>0,05). Ancak, puan ortalamaları incelendiğinde, eğitim programına katılanların (156,53±13,4) katılmayanlara (155,21±16,81) göre daha yüksek puan ortalamasına sahip oldukları görülmüştür. Bu sonuç doğrultusunda, daha önce teknoloji ile ilgili eğitim programına katılma durumunun,

öğretim elemanlarının teknolojiye ilişkin tutumlarına olumlu bir etkisi olduğu söylenebilir. Dolayısıyla, daha önce teknoloji ile ilgili eğitim programına katılanların diğer gruba kıyasla, tamamen olmasa da, aritmetik ortalamaları dikkate alındığında daha olumlu tutum içerisinde oldukları söylenebilir.

Tablo 5: Görev Yapılan Kurum ile Kurumun Teknolojik Donanımına İlişkin Görüşler Arasındaki İlişki (N: 162)

	Kurumun Teknolojik Donanımı		
Kurum	**Yeterli**	**Yetersiz**	**Toplam**
Devlet	29 (38,3)	119 (109,6)	148
Vakıf	13 (3,6)	1 (10,3)	14
Toplam	42	120	162
	Fisher Kesin X^2 : 35,74 **p=** 0,000 **p ≤ 0,001**		

Tablo 5'de görüldüğü gibi, öğretim elemanlarının görev yaptıkları kurum ile kurumun teknolojik donanımına ilişkin görüşleri arasında istatistiksel olarak çok ileri derecede anlamlı fark olduğu (Fisher Kesin X^2: 35,74, p≤0,001) ve vakıf üniversitelerinde görev yapan öğretim elemanlarının devlet kurumunda çalışan öğretim elemanlarına göre kurumunun teknolojik donanımını daha yeterli bulduğu saptanmıştır. Bu durum, vakıf kurumlarının ekonomik gücünün devlet kurumlarına oranla daha iyi olması nedeniyle gerekli teknolojik donanımı sağlamada devlet kurumlarına oranla daha avantajlı durumda olmaları ile açıklanabilir.

SONUÇ ve ÖNERİLER

Öğretim elemanlarının teknolojiye ilişkin tutumlarını belirlemek amacıyla yapılan bu çalışmada, öğretim elemanlarının genelde teknolojiye ilişkin olumlu tutum içinde oldukları ve teknolojiye ilişkin tutumlarının;

- yaşa göre farklılaştığı
- akademik unvan, akademisyen olarak çalışma yılı, kurumda yönetsel sorumluluğa sahip olma ve teknoloji ile ilgili eğitim programına katılma durumuna göre farklılaşmadığı saptanmıştır. Ayrıca vakıf kurumunda çalışan öğretim elemanlarının devlet kurumunda çalışanlara göre kurumun teknolojik donanımını daha yeterli bulduğu belirlenmiştir.

Araştırma bulguları ışığında;

- Kurum içinde sürekli eğitim etkinlikleri kapsamında teknoloji ile ilgili eğitim programları düzenlenmesi ve öğretim elemanlarının bu programlara katılımları teşvik edilmesi,
- Devlet kurumlarının teknolojik donanımının arttırılması, özellikle bilgisayar laboratuarlarının yaygınlaştırılması ve öğretim elemanlarının bu donanımdan yararlanmasını engelleyen nedenlere ilişkin çözümler üretilmesi,
- Her kurumun kütüphanesinde teknoloji ile ilgili yayınlara yer verilmesi,
- Öğretim elemanlarının, eğitim etkinliklerinde çağdaş teknolojik araç-gereçlerin (bilgisayar,projeksiyon vb.) kullanımı konusunda motive edilmesi,
- Yüksekokul, fakülte ya da kampüste eğitim teknolojisi merkezlerinin kurulması ve öğretim elemanlarına teknisyen desteği ile gereksinim duyduğu teknolojik araç-gereçlerin sağlanması
- Benzer çalışmaların farklı örneklem grupları, farklı üniversite, yüksekokul ve bölümlerde yapılması ve sonuçların yaşama geçirilmesi önerilebilir.

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ÖZET

Günümüzde teknolojinin eğitimde kullanılmasıyla öğretmenler öğretim materyallerini öğrencilerin daha hızlı bir şekilde yer ve zaman kısıtlaması olmadan öğrenebilme imkanın sağlayacak şekilde hazırlayabilmektedirler. Gelişmekte olan eğitim yazılımları sayesinde öğretmenler derslerini daha eğlenceli ve kalıcı bir şekilde işleyebilmektedirler. Bu becerilere sahip olmaları başka ihtiyaçları doğurmaktadır. Bu materyalleri hazırlayan öğretmenler; öğrencilerin ne sıklıkla, hangi zamanda bu ders materyallerine eriştiklerini, erişen öğrencilerin bu materyallerden ne kadar yararlandıklarını ölçme ihtiyacı duymaktadırlar. Öğretmenler bu ölçme ihtiyacını giderdiğinde, kendi materyallerini değerlendirme fırsatı ve materyallerde kullandığı öğretim yöntemlerini de sorgulama fırsatı bulacaktır. Bu sorgulama sonrasında öğretmen materyalin başarısını tatminkar bulacak ya da üzerinde bazı değişiklikler yapabilecek, başka bir ihtimal de tamamen yeniden tasarlayabilecektir.

Bu çalışmada yukarıdaki ihtiyaçların giderilmesi için hem öğretmenlerin öğrencileri değerlendirme fırsatını hem de kendi hazırladıkları tasarımların yeterliliğini ölçme imkanı sağlayan Web Tabanlı bir yazılım geliştirilmiştir. Bu yazılım genel hatlarıyla öğrenci ve öğretmen modüllerinden oluşan ve öğretmen modülünde öğrencinin aldığı derslerin; hangi zamanda, ne kadar süre ile çalışıldığı, uygulanan sınavlardan aldığı sonuçları öğretmenin karşısına çıkararak öğrenci hakkında daha kolay bir değerlendirme yapmasını sağlamaktadır. Sistem; öğrenci listesi, bireysel ve toplu öğrenci başarısı, konu, öğrenci ders çalışma süreleri, sınıf ve okul ortalamalarını aynı ekranda görme fırsatı verebilmektedir. Bunun yanı sıra öğretmenin hazırladığı ders materyallerinin etkinliğini görme imkanı sağlayarak daha başarılı ders materyalleri tasarlamasına imkan sağlamaktadır. Bu sistem öğretmenin, öğrencinin gelişimine daha olumlu katkı sağlamasına yardımcı olmaktadır.

Anahtar Kelimeler: Uzaktan Eğitim, Web Destekli Eğitim, Web Tabanlı Eğitim, Öğrenci Kontrolü

1. GİRİŞ

Geçmişten günümüze kadar eğitim insanoğlunun hayatında vazgeçilmez bir unsur olagelmiştir. Günümüzde nüfusun son derece artmış olması, bilginin gerek miktar gerekse ayrıntı yönünden hızla artması, birey yaşamı, sosyal ve ekonomik gelişme arasında gittikçe artan bağıntı, bilimsel ve teknolojik evrim ve sosyal talepteki artış çağdaş eğitim ihtiyaçlarını ortaya çıkarmıştır (Alkan, 2005). Günümüzdeki çağdaş eğitim gereksinimi ise, geleneksel nesnelci yaklaşımlardan yapılandırmacı yaklaşıma geçişi sağlamıştır.

Geleneksel sınıf ortamında her öğrencinin bireysel farklılığını göz önünde bulundurmak onları aktif konuma getirmek, öğrenmelerini yaşamla ilişkilendirmek ve çağın gerektirdiği teknolojik donanıma sahip bireyler oluşturmak oldukça zordur. Geleneksel sınıf ortamında öğreticilerin öğrenme etkinliklerini tanımlamaları ve öğrenme ünitelerine yönelik değerlendirmeler alıp öğrenciye dönüt vermeleri özellikle de kalabalık sınıflar için oldukça zordur. Bu zorluğun bir kısmı teknolojinin kullanılmasıyla aşılabilmektedir. Alkan'a (2005) göre eğitim ve teknoloji insanoğlunun mükemmelleştirilmesi, kültürlenmesi ve geliştirilmesi, doğaya ve çevreye karşı etken ve nüfuslu olabilmesinde en önemli iki temel unsurdur.

Teknolojik alanda ve özellikle internetteki gelişmeler; bilginin sınırsız ve kolay erişebilir olmasının yanı sıra, ucuz, hızlı ve yaygınlaşan bir bilişim teknolojisi olarak dikkat çekmektedir (Gürbüz, 2001).

Günümüzde sınıf ortamında yapılan eğitimi pekiştirmek, konu tekrarını sağlamak ve öğrenmeleri değerlendirmek amacıyla öğretmen öğrencilerine okul dışında da çalışabilmeleri için alıştırmalar vermektedir. Bunun nedeni sınıf içi uygulamalarda konu anlatımının yanında bu alıştırmaların kullanılmasının çok büyük zaman alması ve öğretmenin öğrencileri birer birer kontrol etmede zorluk çekmesidir. Öğretmenlerin alıştırmaları vermeleri ve öğrencilerin bu alıştırmaları yapıp öğretmen tarafından dönütlerin sağlanması yine vakit alıcı ve sürecin değerlendirme süreci çok sağlıklı işlememektedir. Bunun nedeni ise öğrencilerin ödevlerini arkadaşlarından kopyalamaları ya da kontrol edilmemesi nedeniyle eksik yapmaları veya hiç yapmamalarıdır.

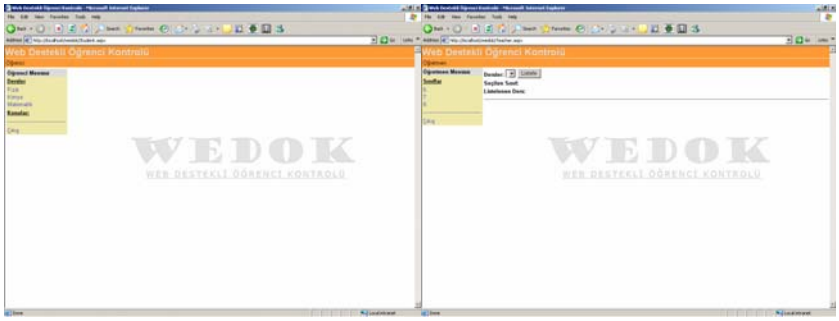
Bu noktada geliştirilen web tabanlı bir sistem sayesinde öğrencilerin yaptığı ödevler ve bu ödevlerin yapılış süreci işlevsel olarak kontrol edilebilmektedir. Günümüz eğitim sisteminde kalabalık sınıf ortamları bulunmaktadır. Bu kalabalık sınıf ortamında öğretmenlerin her öğrenci ile tek tek ilgilenmesi oldukça zor olabilmektedir. Burada amaç geliştirilen web tabanlı sistem yolu ile hem öğretmenin yükünü hafifletmek hem de öğrenciye bireysel çalışma alışkanlığı kazandırmaktır.

2. WEB TABANLI DERS ÇALIŞTIRICI YAZILIMI

Web Tabanlı Ders Çalıştırıcı öğrencilerin sınıf dışında, öğretmenin istediği gibi ders çalışma imkanı sağlayan ve bu çalışma saatlerini kaydeden bir sistemdir. Tasarlanan ders çalıştırıcı yazılımı ile öğretmenler öğrencilere verdikleri ödevlerin yapılıp yapılmadığını, testlerin çözülüp çözülmediğini, bunların hangi süreler ile ne zaman yapıldığını rahatlıkla takip edebilmektedirler.

Sistem öğretmen ve öğrenci olmak üzere iki modülden oluşmaktadır. Web Tabanlı Ders Çalıştırıcı Yazılımına, öğretmen öğrenci modülleri doğrultusunda hem öğretmene hem de öğrencinin kolayca ulaşabileceği ve şifre kontrollü bir başlangıç sayfası kullanarak girilmektedir. Öğretmen ve öğrenci kullanıcı tanımları ve verilecek haklar sistem yöneticisi tarafından önceden belirlenecek ölçütler doğrultusunda tanımlanmaktadır.

Kullanıcılar (öğretmen ve öğrenci) sistem yöneticisinin sağlamış olduğu kullanıcı adı ve şifresi ile sisteme erişmektedirler. Kullanıcı tanımlandığında öğretmen ve öğrenci yetki seviyeleri verilmekte sistem kullanıcıyı otomatik olarak öğretmen veya öğrenci modülüne yönlendirmektedir. Her iki modül de kendisine özgü bir ekran yapısına sahip olup, ihtiyaçlar doğrultusunda dizayn edilmiştir.



Şekil 1. Öğrenci ve Öğretmen Modülleri

2.1 Öğrenci Modülü

Öğrenci modülü öğretmenin tarafından HTML, Macromedia Flash ve Captivate kullanarak hazırlanmış ders materyallerini ve testlerini uygulanmasını temel almaktadır. Öğrenciler buradaki dersleri ve testleri uygulayarak öğretmenlerinin kendilerine vermiş olduğu sorumlulukları yerine getirmekte ve bu sistem sayesinde bu etkinlikler veritabanına yazılarak öğretmenin ihtiyaçlarına sunulmaktadır.

Öğrenci dersleri çalışma sürecinde her bir dakikalık çalışmasında bir dakikalık kaydı veri tabanına eklemektedir. Sürenin 1 dakikadan az olması durumunda kayıt yapmamaktadır. Ayrıca sisteme bağlı iken daha önceden belirlenecek kurallar doğrultusundaki süre boyunca herhangi bir hareket yok ise sistem bağlı konumdan çıkmaktadır. Bu durumda tekrar bağlanılmak istenildiğinde yeniden giriş yapılarak sisteme bağlanılması gerekmektedir. Bu kural öğrencinin yanıltıcı davranışlarını engellemek için konulmuştur.

Öğrencinin, konu anlatımına çalıştıktan sonra testi uygulaması gerekmektedir. Öğrencinin bir sonraki konuya geçmesi için konu anlatımını çalıştıktan sonra konuyu anlayıp anlamadığına dair bir test uygulaması yapılıp başarılı olması gerekmektedir. İstenildiğinde test için bir not barajı konulabilmektedir. Not barajı tüm sistem için

tek bir değer olabilmektedir. Konular bitmeden bir sonraki konuya ulaşamadığından birbirini takip eden konularda bir anlatım bütünlüğü sağlanabilmektedir.

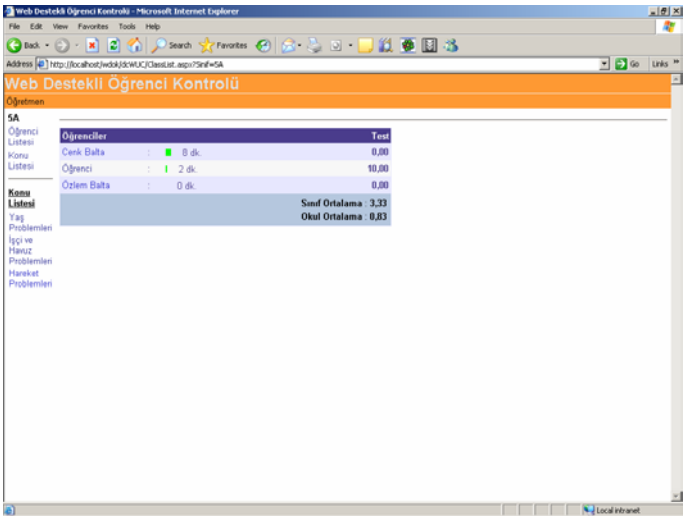
Test uygulaması öğretmen tarafından Macromadia Captivate programıyla çoktan seçmeli, doğru-yanlış, boşluk doldurma ve benzeri seçeneklerle hazırlanıp programın izin verdiği tüm değişiklikleri kullanarak istediği gibi hazırlanabilmektedir. Öğrenci test uygulamasını yaptıktan sonra "Send Mail" seçeneğini kullanarak sınavı bitirmektedir. "Send Mail" seçeneğini kullanıp sonuçları baraj kriterlerini de uygun olursa veri tabanına yazarak, hem bir sonraki konuya ulaşmasını sağlar, hem de notu öğretmenin görebilmesi için veri tabanının ilgili kısmına yazmaktadır.

2.2 Öğretmen Modülü

Sınıf ve ders yapılandırmaları doğrultusunda öğretmen, öğrenci ve ders menülerine ulaşarak bu kısımdaki öğrenci ve konu bazında zaman ve başarı puanı sonuçlarına ulaşır. Bu puanlar ve zamanlar öğretmen tarafından değerlendirilerek öğrencinin çalıştığı konular ve süreleri inceleyerek öğrencinin başarısı hakkında bilgi edinir ve değerlendirme yapar.

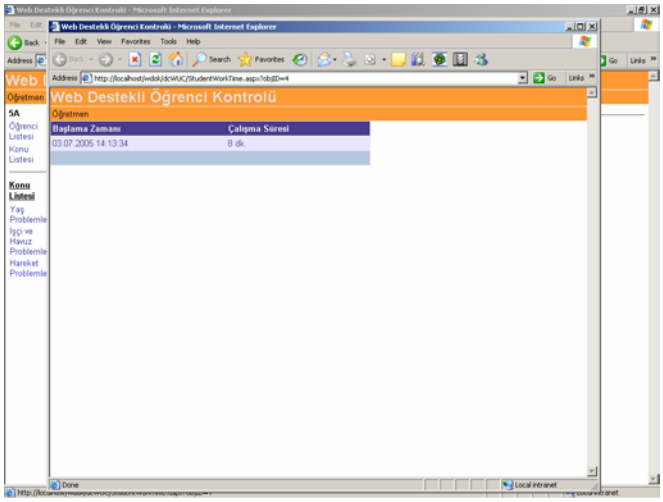
Öğretmenin sisteme girdiğinde vermiş olduğu dersler ve sınıflar menüsünden ilgili sınıfı ya da öğrenciyi seçebilir. Mevcut sınıflar ve tüm okul sınav ortalamaları ve alt menüler inildikçe özelleşen ve ayrıntılı bilgiler içeren menülere ulaşılabilmektedir.

Sınıf ve Ders seçildikten sonra konu ve öğrenci listesi menüsü gelmekte buradan öğrenci bazında ya da konular bazında değerlendirme listeleri çıkmaktadır (şekil 2) Her konunun öğrenci tarafından ne kadar süre ile (dakika olarak) çalışıldığı grafiksel ve sayısal olarak ekrana gelir.



Şekil 2 Konular öğrenci listesi

Bunun yanı sıra o sınıfa ait derslerin ortalaması ve tüm okul ortalamaları da aynı ekranda görünmektedir. Bu öğretmene öğrencilerin yaptıklarını gözleyebilme imkanı sağlar. Aynı zamanda bu ekranda konulara ait test sonuçları da bulunmaktadır. Öğrencinin üzerine tıklandığında o öğrencinin (Şekil 3), o konuya kaç defa, hangi zamanda, ne kadar süre ile bağlandığını gösteren bir pop-up penceresi açılır. Bu özellik öğretmene, öğrencinin dersi hangi zamanlarda çalıştığını tam olarak bilmesini sağlamaktadır. Bunun yanında öğrencinin hangi saatlerde ve düzenli olarak çalışıp çalışmadığı bilgisini de sunmaktadır.



Şekil 3 Çalışma süreleri ekranı

2.3 Sistem yöneticisi

Yapılan sistemin tüm okul tarafından sağlıklı bir şekilde yürütülmesi için bir sistem yöneticisine ihtiyaç vardır. Sistem yöneticisi okul bünyesindeki teknik bilgiye sahip müdür, müdür yardımcısı, sorumluluk verilmiş bir öğretmen olabileceği gibi bunun için görevlendirilmiş bir personelde olabilmektedir. Sistemin ihtiyacı olan gerekli kod düzeltimi, değiştirilmesi, işlerini yapan, Öğrenci ve öğretmen kullanıcı hesaplarını veren, değiştiren silen ders ve sınıf atamaları yaparak hangi öğrencinin hangi öğretmenin dersini aldığını tanımlamaktadır. Öğretmenin hazırladığı ders materyallerinin sisteme yerleştirilmesi ve gerektiğinde sisteme uyumlu hale getirilmesinden de sorumludur. Sistemin yönetilmesi ve ayakta kalmasını sağlayan kişidir ve tam sorumluluk sahibidir.

3. SONUÇ ve ÖNERİLER

Bu çalışmada geliştirilen yazılım sayesinde öğretmenler öğrencilerin sınıf ortamı dışında ne zaman ve ne kadar süre çalıştığını, neler yaptığını görebilmektedir. Bu durum öğrenciyi sınıf dışında da ders çalışmaya daha fazla yönlendirmektedir.

Geliştirilen yazılımda konular arasında geçişlerin sağlanabilmesi için öğrencinin konuyu açıp çalışması ve bağlı bulunan testi uygulaması gerekmektedir. Öğrenci, bu şartları sağlaması durumunda bir sonraki konuya geçebilmektedir. Bu özellik sayesinde öğrenci anlamadığı bir konuyu geçemeyeceğinden konular öğrenilerek geçilecek ve birbirine bağlı konularda hem öğretmene ders anlatmak konusunda hem de öğrencinin dersi anlaması konusunda yardımcı olacaktır.

Bu sistem ile öğretmenlerin ve öğrencilerin eğitim ve öğretimi algılama biçimlerine, değerlendirme yöntemlerine farklı bir açıdan yaklaşılmış bilişim teknolojilerini kullanmaktan çekinen öğretmenlerin, sınıfta öğrencinin yaptığı ödevi kontrol etmek için ayırdığı süreyi kısaltarak yalnızca verilere göz atması yeterli olmaktadır. Amaç öğretmene ek bir yük getirmek değil, harcayacağı süreyi azaltmaktır. Konu anlatım materyallerinin ilk başta hazırlanması zor olsa da sisteme bir defa aktarıldıktan sonra sürekli kullanılacağından dolayı zamandan tasarruf edildiği görülecektir.

Bu yazılım daha da geliştirilerek öğretmenin ders içeriğini sistem yöneticisine gerek kalmadan sisteme dahil etmesini sağlayan ara yüz yazılımı yapılabileceği gibi, sistemde örnek olarak hazırlanmış olan değerlendirme sorularının madde analizleri yapılarak soru bankası oluşturulabilir. Bunun yanında, elde edilen verilere yönelik süreç değerlendirmeyi temel alan not hesaplayıcı bir değerlendirme sistemi de geliştirilebilir.

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