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Message from the Editor-in-Chief

Dear Readers,

TOJET looks for academic articles on the issues of educational technology and may address assessment, attitudes, beliefs, curriculum, equity, research, translating research into practice, learning theory, alternative conceptions, socio-cultural issues, special populations, and integration of subjects. The articles should discuss the perspectives of students, teachers, school administrators and communities. TOJET contributes to the development of both theory and practice in the field of educational technology. TOJET accepts academically robust papers, topical articles and case studies that contribute to the area of research in educational technology.

The aim of TOJET is to help students, teachers, school administrators and communities better understand how to use technology for learning and teaching activities. The submitted articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJET. TOJET provides perspectives on topics relevant to the study, implementation and management of learning with technology.

I am always honored to be the editor in chief of TOJET. Many persons gave their valuable contributions for this issue.

TOJET, Hacettepe University, Sakarya University, Anadolu University, Near East University, Eastern Mediterranean University, Governor State University, Ohio University, and Louisiana State University will organize the 9th International Educational Technology Conference (IETC 2009) in May 2009 in Ankara - Turkey.

Prof. Dr. Aytekin İŞMAN
Sakarya University

6TH, 7TH AND 8TH GRADERS' ATTITUDES TOWARDS ONLINE HOMEWORK ASSIGNMENT SITES

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ABSTRACT
This study has pedagogical implications in view of rapidly growing technological development and widespread use of the Internet in instruction. The spread of online homework sites with highly commercial aims has opened a new research area regarding the structure, aim and the significant role of homework in education. Particularly, the changes in students' preparing homework behaviours have caused new educational, ethical and financial problems for educational policy makers, teachers and parents. The main purpose of this study was to discern the 6th, 7th and 8th grade students' attitudes towards Online Homework Sites (OHS). A scale was administered to 737 students in Aegean region of Turkey.

The results of the study indicated that 86.7% of the students used the OHS and these students had positive attitudes towards OHS. Gender, school, grade, age, computer use proficiency and frequency, Internet use frequency, and education levels of parents appeared to have a statistically significant effect on the attitudes towards OHS.
Key Words:Online homework sites, Homework, Assignments, Primary students, Primary education, Internet

INTRODUCTION

Homework assignments which have been defined in different aspects have a crucial role in education since they reinforce learning. Homework is defined as written/oral individual or group tasks assigned to students by the teacher to be done out of school time with the purpose of getting prepared for a new learning material or reinforcing, expanding, practicing or completing newly learned material (Cooper, 1989:7; Corno, 1996: 27). According to Yücel (2004: 148), assignments are mental or physical tasks related to a particular topic or unit for students to cover. Generally, assignments which provide instruction to continue outside of the classroom are one of the means to gain new abilities, experiences, skills and benefit from the previous learning activities. They assist students to understand what is learnt at school better and improve their retention levels and help them to improve their study skills, especially time management, during non-school hours. Assignments also promote students' self-discipline, independence and responsibility characteristics (McPherson, 2005). Hence, the aim of an assignment is to teach students studying independently, planning efficiently, getting organized in group assignments and thinking individually (Sgouros & Martin, 2005). Beside positive effects of homework described as immediate achievement and learning, long-term academic and nonacademic benefits, there are also some negative effects such as satiation (loss of interest in academic material, physical and emotional fatigue), denial of access to leisure time and community activities (parental interference, pressure to complete and perform well, confusion of instructional techniques), and cheating (copying from other students, help beyond tutoring) (Cooper, 1994).

Research evidence shows that regardless of students' ability or prior coursework academic achievement is positively related to homework completion (Keith & Cool, 1992; Cooper, Lindsey, Nye, & Greathouse, 1998). In addition, homework exerts its greatest influence in higher rather than lower grades (Cooper, Valentine, Nye, & Lindsey, 1999). Especially, in middle and high school (Grades 6-10), there is a positive correlation between the amount of homework completed by students and their grades. In the lower grades (Grades 2-4), however, this relationship is negative. This finding, coupled with research showing that students' emotions are depressed when they are engaged in homework (Leone & Richards, 1989), has led some to argue that homework can indeed be detrimental in elementary school.

Researchers have also found that, because of their limited cognitive capacity, younger children tend to have less effective study habits and are less able to focus and avoid distraction than older children (Hoover-Dempsey et al., 2001). Furthermore, elementary school teachers believe more strongly in homework's value for the purpose of training students on how to study and use their time well. This implies that for elementary level teachers, the content of homework may be less important than the opportunity it provides to foster long-term time management skills, the effects of which would not be evident in younger children's school grades (Muhlenbruck, Cooper, Nye, & Lindsey, 2000).

There are mainly four assignment types, namely; creative, extensive, preparation and practice. In addition to these types, there are integrated assignments such as book reports, creative essays and scientific projects which require students to use several skills in a particular task. Besides, the changes in the roles of teachers and students because of the use of information technologies in education and instruction should not be ignored. Teachers' roles have changed from "assignment giver and organizer" to "facilitator and supporter". Teachers provide students to utilize their skills and practice what they learn by using technology instead of giving all students the same assignment (Zisow, 2002).

The claims that utilizing Internet technologies in education improves learning and increases motivation have caused several arguments. Some think that since technology has details causing loss of attention, it prevents students from getting important information and from constructing knowledge, and it also affects students' perceptions. As anyone may present anything on open global information nets, students have to check the accuracy of information and this task appears to be difficult for them (Braten & Stromso, 2006: 1027-1042). However, it has been known that the Internet is a powerful mean to access sources since only a mouse click is needed to access sources which used to be very hard to find in the past. Nevertheless, students have to distinguish between reliable and unreliable information sources (Sgouros & Martin, 2005).

The increase of internet-based information sources has led to development of various online assignment sites serving several purposes. These sites contain different studies such as online courses and assignments written by other students. There are different sites serving according to their price, scope and different ages. Packhard and Holmes (2001) state that there are seven types of assignment sites. *a) Portal sites:* These introductory sites provide links to other information sources. *b) Information sites:* These sites are rare compared to introductory sites, and they present their own articles or information.. *c) Article sites:* Almost one third of assignment sites provide buying, selling or sharing articles and term assignments. Some sites let students download fulltext ready-made homework assignments. Students hand in these assignments as if they themselves had done them. Some of these sites are free to access while some of them require fees. In addition, there are essay sites requiring subscription to access libraries and information services. Subscription may require fees as well as it may require an assignment to be sent to the site. However, there are studies showing that students' grades decrease because of the poor quality of such ready-made assignments downloaded from the Internet. *d) Ask someone who knows sites:* These sites provide on-line courses. In this service teachers or other volunteers answer students' questions online via chatting, e-mail or spontaneous messages. Although most of these sites are free, some online courses require fees or subscription. *e) Sites containing various book or site summaries:* Users may download some studies for free or after paying a fee. These sites present summaries of books or other studies. *f) Online encyclopedias or libraries:* Britannica or World Book sites provide fulltext encyclopedias on-line to their subscribers. In addition, there are a few free articles and free short-time subscriptions to introduce the site to its users. *g) Course service sites:* Most presentations are on-line and some of these sites provide interactive courses.

It has been argued whether students benefiting from OHS are negatively affected. Researchers claim that such sites (usually) give no indications as to why a problem might be wrong; multiple submissions could lead students to adapt a trial-and-error strategy instead of carefully thinking through the problem; and simply grading a number tends to put even more emphasis on getting the final answer right by any means without actually understanding the process (Bonham & Beichner, 2001). Depending on country, there are different sites serving according to their price, scope and age groups. In developing countries like Turkey, ironically OHS are usually managed by non-educationalist people who have commercial aims. It should also be noted that the OHS managed by non-educationalist people are not organized systematically as described by Packhard and Holmes (2001) in previous paragraphs. Some sites let students download assignments based on subscription and varying amounts of monthly or annual charges. Students hand in these assignments to their teachers as if they themselves had done/prepared them. It is thought that use of OHS which have become widespread with the development of technology may affect students negatively since they find information so easily and this may lead them to copy or buy information and avoid doing the homework on their own. However, it may also be claimed that developing technologies cause changes in education and instruction, and increase student interest in school, lessons and assignments because the reflection of Internet technology on education and instruction enables easier access to information resources and help students to do the assignments in relatively shorter periods of time. OHS are also a dimension of distance learning. Thus, spread of assignment sites has caused a new area of research. Also in traditional instruction, stale assignments cause problems for students and their families. However, one of the benefits of information technologies that require parents to contribute to their children's assignments has been a problem for some families. In their study, Reach and Cooper (2004) stated that most families did not understand the assignments of their children and they needed support and assistance. Students' attitudes towards assignment may have a negative effect on their achievement since teachers give a lot of assignments which are mostly stale, causing waste of time and boring students.

It could be emphasized that homework assignments may increase students' interest in school and/or course topics and improve their academic development. Thus, they must exist in education. Therefore, it is very crucial to describe, investigate and offer solutions to the problems of one of the recent outcomes of the Internet technology; OHS. The importance of researching / studying possible impacts of such sites on educational system and students cannot be ignored as non-ethical aspect of using OHS causes problems for parents, educational policy-makers and teachers. The spread of commercial assignment sites and their unethical use by students was also in the news of some highly circulated Turkish newspapers (Milliyet, 18.10. 2003; Sabah, 14.09.2003, 23.10.2005; Radikal, 14.08.2006) There are a few studies in literature about the use and reasons of use of online assignment sites but no studies measuring attitudes of primary level students towards these sites. In this study, students' attitudes towards OHS are investigated and effect of OHS on education is examined in terms of effectiveness, ethics and practicability dimensions.

AIM OF THE STUDY

The purpose of this study was to examine primary school students' (6^{th}, 7^{th} and 8th graders) use of OHS available on the Internet and reveal the variables affecting their attitudes towards these sites. The reasons for using OHS and suggestions for accurate and efficient use of OHS were also examined. The study is considered to be significant since not only does it describe the use of OHS in the sample of primary schools but also offers some suggestions for pedagogical implications. Students' inclining towards OHS and learners' opinions about the use of these sites may redirect education and instruction. This study is needed in the field since primary school considered being the basic step for education and instruction, and students' opinions related to developing technologies gain importance.

Research Questions

The main question of the study was "What are the students' opinions and attitudes towards the use of OHS and what do they suggest for the accurate and efficient use of these sites?". Sub-questions were set as;

a) What is the present status of participants' use of OHS?
b) What are the participants' attitude levels towards OHS?
c) Is there a significant relation between participants' individual characteristics and their attitude levels towards OHS?
d) What are the opinions of participants related to the reasons for using OHS?
e) What are the suggestions of participants related to the accurate and efficient use of OHS?
f) Are there any interactions among independent variables (gender, school, grade, age, proficiency and computer use frequency, Internet use frequency, and education levels of parents) and attitudes of students?

METHODOLOGY

Method

A general survey design was used in this study. Data related to the individual characteristics of primary school students, reasons and suggestions for using OHS were collected in the second half of 2007.

Participants

A total of 737 students in a primary school in a city located in Aegean region of Turkey participated in this study. The distribution of participants according to their grades and gender is close to each other and the participants ranged in age from 11 to 15 (Table 1). In addition, 57.9% of the participants had personal computers; 25.9% of them rated their computer use proficiency as average, 46.9% of them as advanced. 67.4% of the participants use computer several times a week, 46.8% of them go to Internet cafes; 42.6% of them rated their Internet using skills as good and 26.9% of them as advanced. 64.6% of the participants reported that they use the Internet several times a week. 33.6% of the participants' mothers were graduates of primary school and 31.2% of them were high school graduates. 32.8 % of participants' fathers were high school graduates and 24,8% of them were university graduates. Family income of 36% ranged between 501-1000 Turkish Lira (approx. 400-800 US Dollars) per month.

Table 1. *Demographics*

Characteristics		f	%
Grade	6	231	31.3
	7	261	35.4
	8	245	33.2
Age	11	7	0.9
	12	214	29.0
	13	260	35.3
	14	226	30.7
	15	30	4.1
Gender	Female	356	48.3
	Male	381	51.7

Instruments

Attitudes Towards Online Homework Sites Scale developed by Arıkan and Altun (2007) was used in the study. The scale had four parts including personal information, reasons for using OHS, attitudes towards OHS, and suggestions for OHS. In personal information part, participants were asked "yes-no" questions for the reasons of using the OHS and suggestions for using them. A five-point likert scale was used for attitudes towards OHS. There were 24 statements to which participants indicated their opinions by marking "strongly agree", "agree", "no idea", "disagree", and "strongly disagree". The attitude scale had three subscales as "effectiveness", "ethics", and "practicability" subscales. These subscales defined 42.74% of the total variance. Table 2 summarizes factor and reliability analysis of the scale.

Table 2. *Reliability and factor analysis of attitudes towards OHS scale*

Subscale	**K**	$\bar{x}$	**Sd**	α	**rjx**	**Variance %**	**n**
Effectiveness	9	32.02	8.28	0.85	5.67	23.6	737
Ethics	8	30.75	6.77	0.79	2.77	1.53	737
Practicability	7	23.08	5.97	0.70	1.83	7.61	737
Total Scale	*24*	*85.64*	*15.29*	***0.84***			*737*

RESULTS

1. The state of participants' use of OHS

Table 3 shows that 35.4% of the participants used OHS 10 or less than 10 times a month, 51,3% used OHS over 10 times a month.

Tablo 3. *The frequency and percentage of students' use of OHS*

State		**f**	**%**
State of using OHS	User	639	86.7
	Non-user	98	13.3
Frequency of using OHS in a month	1- 5 times	134	18.2
	6- 10 times	127	17.2
	11- 15 times	103	14
	16- 20 times	70	9.5
	Over 20 times	205	27.8

Online homework sites which have Turkish content were used by 62.8% of the participants for Science and Technology. 62.4% for Social Sciences, 42.2% for Turkish, 42.1% for Math, 17.9% for Theology, 15.3% for English, 15% for Computer, 13.7% for Technology and Design, 11.3% for Introduction to Citizenship. 9.9% for Physical Education, and 9.9% for Art courses. The students used 14 different OHS of which 85% are payment/membership based, 15% with no charge to use.

2. Attitude levels of the participants towards OHS

The total attitude level of students towards OHS ranged between 24 to 120 points (Table 4).. As a result, 15.2% of the students had low, 68.2% had average and 16.6% had high level of attitude towards OHS. Students' scores for the effectiveness subscale ranged between 9 to 45 points. 14.2% of the participants had low, 69.9% had average and 15.9% had high level of attitudes towards OHS for the effectiveness subscale. Students' scores related to the ethics subscale ranged between 8 to 40 points. As a result, 13.6% of the participants had low, 72.4% had average, and 14% had high level of attitudes towards OHS for the ethics subscale. Students' scores

related to the practicability subscale ranged between 7 to 35 points. 16.3% of the participants had low, 70% had average, and 13.7% had high level of attitudes towards OHS for the practicability subscale.

Table 4. *Students' attitude levels towards OHS*

	K	$\bar{x}$	sd
Effectiveness	9	32.02	8.28
Ethics	8	30.75	6.77
Practicability	7	23.08	5.97
Total Scale	*24*	*85.64*	*15.29*

3. Participants' individual characteristics and their attitude levels towards OHS

According to the t-test results significant differences were found between the participants' gender, owning a personal computer, visiting Internet cafes and utilizing OHS in independent groups (Table 5, 6 and 7).

Table 5. *t-test results related to OHS according to gender and subscales*

		n	$\bar{x}$	S_x	df	t
Total Scale	Female	356	85.38	15.04	735	0.44
	Male	381	85.88	15.53		
Effectiveness	Female	356	31.40	7.75	735	2.06*
	Male	381	32.63	8.39		
Ethics	Female	356	31.74	6.26	735	4.44***
	Male	381	29.55	7.03		
Practicability	Female	356	22.24	5.63	735	3.47**
	Male	381	23.69	5.73		

***p<0.001. **p<0.01. *p<0.05.

As is evident in Table 5, there was no significant difference between females and males in terms of their general attitudes towards OHS. There were significant differences in favour of males ($p<0.05$) at "effectiveness" subscale, in favour of females ($p<0.01$) at "ethics" subscale, and in favour of males ($p=0.001$) at "practicability" subscale.

There was a significant difference ($p<0.05$) between participants' attitudes towards OHS in favor of ones owning a computer (Table 6). A significant difference ($p<0.001$) was also found between participants favoring the owners at subscale "ethics".

Table 6. *Analysis related to students' owning a computer*

		n	$\bar{x}$	S_x	df	t
Total Scale	have	427	86.73	15.81	7235	2.52*
	have not	298	83.81	14.53		
Effectiveness	have	427	32.36	8.61	723	1.52
	have not	298	31.43	7.37		
Ethics	have	427	31.32	6.65	723	3.61**
	have not	298	29.49	6.85		
Practicability	have	427	23.05	6.09	723	0.35
	have not	298	22.89	5.21		

***p<0.001 **p<0.01 *p<0.05.

A significant difference ($p<0.05$) was found between participants favoring the participants who do not visit Internet cafes at subscale "ethics" (Table 7).

Table 7. Analysis related to students' visiting Internet cafes

		n	$\bar{x}$	S_x	df	t
Total Scale	Visit	345	85.50	15.52	726	0.21
	Do not visit	383	85.73	15.05		

Effectiveness	Visit	345	32.37	8.34	726	1.10
	Do not visit	383	31.71	7.88		
Ethics	Visit	345	30.06	6.88	726	2.15*
	Do not visit	383	31.13	6.59		
Practicability	Visit	345	23.07	5.76	726	0.41
	Do not visit	383	22.89	5.73		

*p<0.05

As shown in Table 8, the attitude levels of the users of assignment sites were higher compared to the non-users in terms of all subscales (p<0.001). Findings in Tables 6 and 7 show that computer ownership and having opportunity to visiting internet cafes lead students to more positive attitudes towards OHS than have nots. This may result from income level of parents as some researchers believe that students from higher-income families have more resources (such as computers and internet) and receive more assistance with homework, while low-income family students may have fewer resources and less assistance and are therefore less likely to complete the homework and reap any related benefits (McDermott, et al., 1984; Scott-Jones, 1984 cited in Edvantia for the Center for Public Education, 2008).

Table 8. *T-test results related to the state of utilizing OHS*

		n	$\bar{x}$	S_x	**df**	**t**
Total Scale	User	639	87.18	14.45	735	6.63**
	Non-user	98	76.46	17.45		
Effectiveness	User	639	32.59	7.95	735	4.67**
	Non-user	98	28.52	8.52		
Ethics	User	639	31.20	6.38	735	5.57**
	Non-user	98	27.20	7.93		
Practicability	User	639	23.39	5.50	735	4.32**
	Non-user	98	20.734	6.54		

**p<0.001

According to One-Way ANOVA test results (Table 9), significant differences were found between participants in terms of their computer use proficiency. Tukey's test of additivity revealed that (Table 10) there were significant differences (p<0.05) between the participants having weak computer proficiency and participants having average computer proficiency favoring average ones; between participants having good proficiency and participants having weak proficiency favoring good ones; between participants having advanced proficiency and participants having weak proficiency favoring advanced ones; and between participants having advanced proficiency and participants having average proficiency favoring advanced ones.

Table 9. *One-Way ANOVA results related to computer proficiency*

Subscale		**Sum of squares**	**Df**	**Mean squares**	**F**
Effectiveness	Between groups	1126.22	4	281.56	4.38**
	Within groups	46770.23	727	64.33	
	Total	47896.45	731		
Ethics	Between groups	769.61	4	192.40	4.27**
	Within groups	32724.40	727	45.01	
	Total	33494.01	731		
Practicability	Between groups	497.31	4	124.33	3.85**
	Within groups	23509.69	727	32.34	
	Total	24006.10	731		
Total Scale	Between groups	4993.13	4	1248.28	5.44*
	Within groups	166693.00	727	229.29	
	Total	171686.14	731		

*p<0.001, **p<0.01

As seen in Table 10, higher perceived computer proficiency of participants lead them to show more positive attitudes towards OHS. Having confidence and feeling comfortable in using computers, copying, editing, saving, summarizing and printing a work in a word processor may be the reasons of such positive attitudes.

Table 10. *Post Hoc results related to computer use proficiency*

		Low	Average	Good	Advanced	Significance
Effectiveness	Weak	-0.18	0.16	-1.40	-3.41	
	Low		0.34	-1.22	-3.23	
	Average			-1.56	-3.57*	Adv>Avg
	Good				-2.01	
Ethics	Weak	-6.24*	-6.16*	-6.62*	-6.64*	Adv>Weak Good>Weak Avg>Weak Low>Weak
	Low		0.01	-0.37	-0.40	
	Average			-0.46	-0.49	
	Good				-0.00	
Practicability	Weak	-4.41	-4.45*	-5.01*	-5.32*	Adv>Weak Good>Weak Avg>Weak
	Low		-0.00	-0.60	-0.91	
	Average			-0.56	-0.87	
	Good				-0.31	
Total Scale	Weak	-10.84	-10.45*	-13.03*	-15.37*	Adv>Weak Good>Weak Avg>Weak
	Low		0.40	-2.19	-4.53	
	Average			-2.58	-4.93*	Adv>Avg
	Good				-2.35	

*p<0.05

As can be seen in Table 11 and 12, significant differences (p<0.001) were found between the participants having 'weak' and 'advanced' Internet use proficiency favoring advanced ones; between participants having 'low' proficiency and 'advanced' proficiency favoring advanced ones; between participants having advanced proficiency and good proficiency favoring good ones; and between participants having low proficiency and good proficiency favoring good ones.

Table 11. *One-Way ANOVA results related to Internet use proficiency*

Subscale		**Sum of squares**	**df**	**Mean squares**	**F**
Effectiveness	Between groups	1819.44	4	454.86	
	Within groups	46039.86	721	63.86	7.12**
	Total	47859.30	725		
Ethics	Between groups	973.46	4	243.37	
	Within groups	32136.99	721	44.57	5.46**
	Total	33110.45	725		
Practicability	Between groups	680.63	4	170.16	
	Within groups	23026.97	721	31.94	5.33**
	Total	23707.60	725		
Total Scale	Between groups	8396.25	4	2099.06	
	Within groups	160736.54	721	222.94	9.42**
	Total	169132.79	725		

**p<0.001

Table 12. *Post Hoc results related to Internet use proficiency*

		Low	Average	Good	Advanced	Significance
Effectiveness	Weak	2.60	1.76	-0.37	-2.35	
	Low		-0.84	-2.98	-4.95*	Adv>Low
	Average			-2.13	-4.11*	Adv>Avg
	Good				-1.98	
Ethics	Weak	-2.03	-4.27*	-4.75*	-5.64*	Adv>Weak Avg>Weak Good>Weak
	Low		-2.24	-2.72	-3.60*	Adv>Low
	Average			-0.48	-1.37	
	Good				-0.89	
Practicability	Weak	-2.03	-3.00	-3.31	-4.68*	Adv>Weak
	Low		-0.96	-1.29	-2.65*	Adv>Low
	Average			-0.32	-1.69*	Adv>Avg
	Good				-1.36	
Total Scale	Weak	-1.46	-5.50	-8.43	-12.67*	Adv>Weak
	Low		-4.05	-6.98*	-11.21*	Adv>Low
	Average			-2.93	-7.16*	Adv>Avg
	Good				-4.23*	Adv>Good

*p<0.05

As seen in Table 12, at all subscales significant differences were obtained mostly in favor of advanced Internet users' attitudes towards OHS. The higher Internet usage skills participants have, the more they are able to benefit from OHS. It is considered that easy access to intended homework assignment, previous experiences of using such web sites, feeling comfortable to download work belongs to someone else can be possible reasons.

Table 13 demonstrates significant differences at p<0.001, and p<0.05 levels between the participants' attitudes towards OHS at all subscales in terms of their Internet use frequency.

Table 13. *One-Way ANOVA results related to Internet use frequency of students*

Subscale		**Sum of squares**	**df**	**Mean squares**	**F**
Effectiveness	Between groups	1567.54	2	783.77	
	Within groups	46274.92	724	63.92	12.26**
	Total	47842.46	726		
Ethics	Between groups	339.96	2	169.98	
	Within groups	32728.29	724	45.21	3.76*
	Total	33068.24	726		
Practicability	Between groups	511.23	2	255.61	
	Within groups	23538.73	724	32.51	7.86**
	Total	24049.95	726		
Total Scale	Between groups	5790.69	2	2895.35	12.70**
	Within groups	165087.27	724	228.02	
	Total	170877.97	726		

*p<0.05, **p<0.01

Further analysis showed significant differences between the participants' Internet usage frequency mainly in favour of a few times a week and every day users (Table 14). It is clear that the more frequently participants use Internet, the more positive attitudes towards OHS they have.

Table 14. *Post Hoc results related to Internet use frequency*

	Frequency of Internet use	A few times a week	Every day
Effectiveness	A few times a month	-4.08*	-3.52*
	A few times a week		0.56
Ethics	A few times a month	-1.83*	-1.94

Practicability	A few times a week		-0.11
	A few times a month	-1.92*	-0.32
Total Scale	A few times a week		1.60*
	A few times a month	-7.83*	-5.79*
	A few times a week		2.05

*p<0.05

Regarding education levels of students' mothers, there was a significant difference at the subscale "practicability" (Table 15). Further analysis revealed that the participants whose mothers were university graduates significantly have less positive attitudes (p<0.05) from those whose mothers were graduates of secondary or high school (Table 16)..

Table 15. *One-Way ANOVA results related to education levels of students' mothers*

Subscale		Sum of squares	df	Mean squares	F
Effectiveness	Between groups	644.65	5	128.93	
	Within groups	47705.39	730	65.35	1.97
	Total	48350.04	735		
Ethics	Between groups	484.26	5	96.85	
	Within groups	33094.33	730	45.34	2.14
	Total	33578.59	735		
Practicability	Between groups	406.53	5	81.31	
	Within groups	23646.24	730	32.39	2.51*
	Total	24052.77	735		
Total Scale	Between groups	2511.02	5	502.20	
	Within groups	169448.96	730	232.12	2.16
	Total	171959.98	735		

*p<0.05

Table 16. *Post Hoc test results related to education levels of students' mothers*

		Primary	Secondary	High School	Under graduate	Graduate
Practicability	Illiterate	0.176	-0.619	-0.40	1.61	0.69
	Primary		-0.795	-0.59	1.44	0.52
	Secondary			0.21	2.23*	1.31
	High School				2.02*	1.10
	Undergrad.					-0.92

*p<0.05

Regarding education levels of fathers, there was a significant difference (p<0.001) at the subscale "ethics" (Table 17). According to the Post Hoc tests results (Table 18), the participants whose fathers were university graduates showed significantly different attitudes from those whose fathers were graduates of primary and secondary schools. There was also a significant difference between the participants whose fathers were secondary school graduates and the participants whose fathers were graduates of high school in favor of the latter one.

Table 17. *One-Way ANOVA test results related to education levels of students' fathers*

Subscale		Sum of squares	df	Mean squares	F
Effectiveness	Between groups	209.84	4	52.46	0.80
	Within groups	47907.94	727	65.90	
	Total	48117.78	731		
Ethics	Between groups	942.79	4	235.70	5.28**
	Within groups	32464.54	727	44.66	
	Total	33407.33	731		
Practicability	Between groups	62.49	4	15.62	.48
	Within groups	23812.02	727	32.75	

	Total	23874.51	731		
Total Scale	Between groups	1221.89	4	305.47	1.31
	Within groups	169882.93	727	233.68	
	Total	171104.82	731		

** p<0.001

Table 18. *Post Hoc test results related to education levels of students' fathers*

		Secondary	High School	Undergraduate	Graduate
Practicability	Primary	0.46	-1.63	-2.59*	-1.16
	Secondary		-2.08*	-3.04*	-1.61
	High School			-0.96	0.47
	Undergraduate				1.43

*p<0.05

As above findings revealed, the higher parents' education level it gets, the less students have positive attitudes towards OHS. Perkins and Milgram (1996) reported that when parents have an understanding of their child's learning style, students have significantly more positive attitudes towards homework. Students' attitudes towards doing homework are related to the role of parental facilitation with homework tasks (Cooper, 2001). Highly educated parents are able to guide and convince their children do homework by themselves and make them aware of the importance of homework tasks. Therefore, making use of OHS could be considered to be unethical by highly educated parents, and they may try to prevent their children from such web sites.

One-Way ANOVA test results showed (Table 19) that there were significant differences (p<0.001) between the participants' attitudes towards OHS in terms of frequency of utilizing OHS at all subscales.

Table 19. *ANOVA test results related to frequency of utilizing the OHS*

Subscale		**Sum of squares**	**df**	**Mean squares**	**F**
Effectiveness	Between groups	2204.42	4	551.10	
	Within groups	37967.03	634	59.89	9.20**
	Total	40171.45	638		
Ethics	Between groups	1048.98	4	262.25	6.40**
	Within groups	25986.18	634	40.99	
	Total	27035.17	638		
Practicability	Between groups	887.27	4	221.82	7.53**
	Within groups	18680.34	634	29.46	
	Total	19567.61	638		
Total Scale	Between groups	11215.20	4	2803.80	14.36**
	Within groups	123793.88	634	195.26	
	Total	135009.08	638		

**p<0.01

As demonstrated in Table 20, students who used OHS more frequently (21 and over in a month) tend to show more positive attitudes at all subscales than the other users (up to 15 times in a month). This may be due to completing their homework in a relatively short time therefore saving time for other activities as stated by students in Table 21,

Table 20. *Post Hoc test results related to frequency of utilizing the OHS*

		6-10	**11-15**	**16-20**	**21 and over**
Effectiveness	1-5	-0.79	-3.48*	-1.51	-4.53*
	6-10		-2.68	-0.72	-3.74*
	11-15			1.97	-1.06
	16-20				-3.03*
Ethics	1-5	-0.96	-1.93	-2.39	-3.36*
	6-10		-0.97	-1.43	-2.40*
	11-15			-0.46	-1.43
	16-20				-0.96
	1-5	-0.47	-0.63	-1.18	-2.90*

Practicability	6-10		-0.17	-0.71	-2.434*
	11-15			-0.54	-2.27*
	16-20				-1.73
Total Scale	1-5	-2.22	-6.04*	-5.07	-10.80*
	6-10		-3.82	-2.85	-8.58*
	11-15			0.97	-4.76*
	16-20				-5.72*

*p<0.05

Multiple comparisons were also utilized in order to find out existence of any interaction between all variables (the states of utilizing OHS, gender, grades, age, computer use proficiency, Internet use proficiency, education levels of parents..), but no interactions were obtained. This may be due to the participants characteristics, culture, and/or research environment.

4. Participants' reasons for using the OHS

In the second part of the OHS scale, 737 participants were asked to state their opinions as 'yes' or 'no' for 13 statements asking their reasons for using the OHS. As seen in the Table 21, major reason for using OHS for doing homework is saving time. More than half of the students reported that bringing enjoyment to the process, spread of the OHS, teachers' suggestions, assignments loading, lack of sufficient information resources, navigations from other sites, parents' suggestions were among the reasons that related to their use of OHS. Cooper (1994) reported that elementary students' performance did not improve when they spent more time on homework. However, it seems that elementary school teachers in this sample in Turkey, may be unaware of this fact or do not really think about it. In addition, students stated that they used OHS because finding books in libraries was difficult. Possible reasons for enjoyment in using OHS could be easy access to ready and original assignments on OHS, using computer and surfing on the Net, completing assignments in a relatively short time easily and using assignments as an excuse to get permission from parents to go to internet cafes.

Table 21. *Participants' reasons for using OHS*

	Reasons	f	%
1	Saving time in doing assignments	655	88.9
2	Brings enjoyment to the process	520	70.6
3	Spread of the OHS	500	67.8
4	Teachers' suggestions	494	67.0
5	Assignments loading	383	52.0
6	Parents' suggestions	372	50.5
7	Lack of sufficient information resources	369	50.1
8	Friend's suggestions	355	48.2
9	Not doing the assignment until the deadline.	287	38.9
10	Navigations from other sites	246	33.4
11	Facilities in Internet cafes (access, consultations, friends etc.)	212	28.8
12	Teachers' giving same type of assignments	201	27.3
13	Dislike of doing assignments	175	23.7

5. Participants' suggestions related to OHS

In the fourth part of the OHS Scale; the participants were asked to state their opinions as "yes" or "no" for 11 statements asking their suggestions related to using the OHS.

Table 22. *Participants' suggestions related to OHS*

	Suggestions	f	%
1	The content of OHS should be examined by experts	629	85.3
2	The spread of OHS should be supported	587	79.6
3	OHS should direct students instead of presenting assignments	529	71.8
4	The use of OHS should be supervised by teachers	533	72.3
5	Teachers should give creative assignments to prevent use of OHS	471	63.9
6	Resource centers such as libraries should be supported to prevent the use of OHS	475	64.5
7	A different assessment should be used for students using	297	40.3

	OHS		
8	To prevent the use of OHS teachers should not give assignments	213	28.9
9	Access to OHS in Internet cafes should be banned	174	23.6
10	OHS should be banned by the authorities	84	12.8
11	Students who use the OHS should be punished	55	7.5

As is evident in Table 22, the students suggested that (1) the content of OHS should be examined by the experts, (2) the spread of OHS should be supported, (3) the use of OHS should be supervised by teachers, (4) OHS in Turkey should direct students instead of presenting assignments, (5) resource centers such as libraries should be supported to prevent the use of OHS, (6) teachers should give creative assignments to prevent use of OHS. In addition, participants also stated that OHS should include references in assignments. They also stated that teachers should give practical assignments instead of theoretical ones. They expected the sites to be more organized, free, have updated information, and links to other sites. Finally, they indicated that teachers should give fewer assignments requiring creative solutions for problems.

Above suggestions reveal that making use of OHS effectively requires them to be reviewed and policies for using such sites should be developed. Therefore, educators should be responsible for moderation of OHS including membership system, uploading or downloading assignments and other regulations.

CONCLUSIONS

Findings show that 70% of students had positive attitudes towards OHS. Males tend to use OHS more effectively and practically than females, however, in terms of ethical issues female students are more careful. Computer ownership and increasing proficiency in computer and internet use affects students' attitudes towards OHS positively. Mothers' and fathers' educational background appears to have an effect on students' attitudes in terms of practicability and ethics. Furthermore, the differences between the states of utilizing OHS, grades, and age, had an effect on the attitudes towards OHS. Finally, the use of internet and OHS frequency seem to have positive impact on students' attitudes.

It could be argued that giving low level assignments would not prevent students from using OHS. Teachers should rather give original assignments requiring creative solutions to problems, develop critical thinking skills, support use of OHS, and they should not punish students for using them. OHS should be supervised by teachers, researchers and experts and these sites should direct students to investigate, to explore, to search instead of providing them ready assignments. Hence, while giving technology based assignments teachers should pay attention to some points such as students' access to Internet facilities, computer use skills, competence in using on-line systems. While doing assignments before or after school, students should be assigned tasks which do not require using extra programs. Homework should be brief, should involve materials commonly found in the home, and should not be too demanding (Cooper, 1994; Zisow, 2002). Since, student achievement is found to be unrelated to the frequency of setting homework or time spent on homework (De Jong et al., 2000). Moreover, parents', students' and teachers' ideas regarding homework and homework practices alter significantly between early childhood and high school (Epstein et al., 1997). Giving meaningful assignments which meet students' needs and helping them to improve their technology use skills and presenting assignments in an enjoyable way are among the most important factors for using technology while doing assignments at home.

Electronic assignment method which meets the needs of teachers requires a wide organization. The most important point is that students and their parents should be informed about teachers' assignment systems and also the delivery and grading of assignments. In addition, alternative ways to do assignments should be found for those who do not have e-mail or Internet access. Since assignments are under the control of teachers, the ones who did or did not do their assignments should be known via filtering e-mails (Zisow, 2002:6-9).

It seems that assignments increase student motivation and academic achievement and should continue to take a part in educational process. Students using Internet technologies at home should do their assignments under control of their parents. Since information is limitless and there is freedom of choice on the Internet, students may be led to unrelated sites and may show inclination towards unethical behaviors in order to gain more time for leisure activities. Assignment sites developing parallel with technology should take into consideration all these possible problems. There have been changes in giving, doing, and assessing assignments as a result of technological developments. Technology promotes facilities for education and instruction and increases learner motivation. However, technology should be used appropriately and assignment process should be observed. As a result, assignments should be chosen according to the needs, conditions, homework preferences and interests of students. Developing countries should set clear legislation and policies and/or guidelines in order to provide

guidance to schools on homework. In these policies; types of homework activities, the amount of time to be set per week and for each educational level, purpose and principles of homework, expectations and roles of students, teachers, and parents, marking of homework and provision of feedback, time allocations for different subjects, strategies to follow up on homework should be clarified. Some strategies such as parental communication and involvement, short and relevant tasks, homework planners/diaries across a period of time and teaching students self-monitoring techniques may help to reduce the problems related homework (The State of Queensland, 2004). Students' facilities to access resources should be taken into consideration while giving technology based assignments. The quality of sources in assignment sites and their operation should be supervised by experts and teachers.

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A COMPARATIVE STUDY TO EVALUATE THE EFFECTIVENESS OF COMPUTER ASSISTED INSTRUCTION (CAI) VERSUS CLASS ROOM LECTURE (CRL) FOR COMPUTER SCIENCE AT ICS LEVEL

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ABSTRACT
This study was aimed to evaluate the effectiveness of CAI vs. classroom lecture for computer science at ICS level. The objectives were to compare the learning effects of two groups with class room lecture and computer assisted instruction studying the same curriculum and the effects of CAI and CRL in terms of cognitive development. Hypothesis of this research were based on six levels of blooms taxonomy as there was one major hypothesis: There is no significant difference exist for CAI student in gaining a high cognitive achievement than students of same level having Traditional CRL. The study was delimited to three colleges of Faisalabad city. The research was true- experimental in nature. The research design followed by researcher is The Pre-test - Post test Equivalent groups Deign. The software used for CAI group was basically the combination of Discovery environment and simulation soft wares, however, the time for drilling and practice was given to student. It a designed to cover the all levels of cognitive domain described by B. S. Blooms (1956). A question paper containing 30 items multiple choice test was compiled from the curriculum, with a representative number of questions from each of the cognitive levels. Findings of this research indicate that total gain in cognitive domain by CAI was significantly superior to the total gain in cognitive domain by CRL teaching method. This study concluded that the skills of knowledge, analysis and synthesis assured significant increase. The CAI proved to be very much effective in increasing the evaluation and application skills of students to experimental group. Comprehension skill, however, not much affected by the CAI. According to the results of this study it was suggested that CAI as an effective teaching method should be applied to improve teaching quality and by using CAI it will be possible to eliminate lingual, regional and ethical biases between teacher and student.
Key words: computer assisted instructions, classroom lectures, cognitive domain,

INTRODUCTION

Computer Aided/Assisted Instruction (CAI) has existed for over four decades, but it was not widely used until the advent of the personal computer. CAI started making inroads in the workplace when network personal computers started becoming widespread in the late1980s.In early 90s CAI as an alternative to the traditional classroom training has been implemented by large businesses with robust instructional budgets, yet there remains a need for small to medium size employer to find an efficient method for delivering effective, reasonably priced instruction to their students.

CAI could benefit the human resources by opening up a greater number of training topics required for job advancement and provide new skills in using technology in the learning processes.

Initially, the use of computer-assisted instructional material (CAI) to enhance traditional teaching was a novel concept. However, increasing pressures at all levels of education perpetuated a need for time-efficient, effective teaching modalities that maintained the quality of teaching. CAI was considered to be a viable solution to these problems.

The studies do not provide conclusive evidence to support or reject the effectiveness of computer assisted instruction but were selected because of the similarities to this study. The objectives of the study were to examine the effect of computer-assisted instruction upon cognitive achievement and to measure the effectiveness in contrast of classroom lecture (CRL) method.

Computer Assisted Instruction (CAI).

CAI grew into greater favor in the mid-1990s, when the US Department of Labor-sponsored National Alliance of Business reported small and mid-sized companies should embrace new technologies such as CAI, so they may use technology to cause needed change; rather than reacting as technology changes affect them. Their report showed CAI can assist in increasing worker knowledge, as it can be designed to provide consistent training in new standards, such as the quality standard ISO 9000. They also reported benefits from the individualized pace

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of training, and a better ability to accommodate an increasingly diverse workforce (Bergman & Kaufmann, 1995).

Studies by Beth Wilson (1998), shows that thoughtfully designed computer software can present multiple, dynamically linked representation in ways that are impossible with static, inert media such as books and chalkboards. Some of the most fruitful applications of computer technology derive its capacity to present educationally powerful, dynamic visual images particularly in science and math.

CAI has the potential to serve a dual purpose by enhancing the learning experience for resident students, while opening the educational experience up to distance students (Brahler, 2005).

Bloom's Taxonomy

In an effort to explicate the specific intentions of our educational system, Benjamin S. Bloom (1956) and his colleagues published a Taxonomy of Educational Objectives" in the cognitive domain. According to him, the taxonomy is designed to be a classification of the student behaviors which represent the intended outcomes of the educational process (p. 12). His taxonomy consists of six major classes and their associated subclasses (see Figure: 1). These classes are arranged in hierarchical order from simple to complex. The most basic level, *knowledge*, is exemplified by the simple recall of information (e.g. specific facts, universals, methods, etc.). This process involves little more than bringing to mind the appropriate material (p. 201). At this level, the taxonomy refers only to the knowledge itself, not the utilization or application of this knowledge. The other levels in the taxonomy are distinguished from the first level as "intellectual abilities and skills." In other words, levels 2.00 to 6.20 require "organized modes of operation and generalized techniques for dealing with materials and problems".

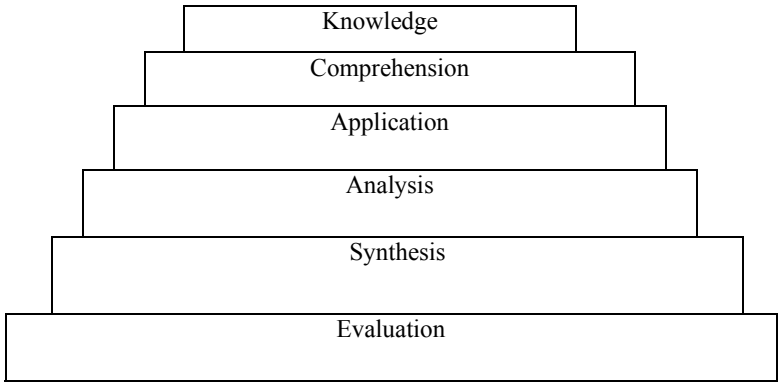

Figure 1 Six major classes /levels of Bloom's Taxonomy

Knowledge is the lowest level of intellectual ability and requires only that the student knows what is being communicated. With this fundamental understanding, the student is able to translate or rearrange the information without distorting its original meaning. In order to attain the next level; the student must be able to *apply* the appropriate abstraction (i.e. theory, principle, idea, or method) without being prompted.

Analysis implies the ability of a student to breakdown information into its constituent elements and to explicate the relationships between the various ideas expressed. This process is divided into three parts: analysis of elements, analysis of relationships, and analysis of organizational principles. In contrast to analysis, *synthesis* involves the process of putting together parts in order to form a whole, i.e. creating a novel pattern or structure. At this level, the student moves into the role of a "producer" (Jones, 1990).

The highest level within the cognitive domain, *evaluation*, requires that the student make both quantitative and qualitative judgments concerning the extent to which criteria are satisfied by certain materials or methods. Such evaluations are made on the basis of internal evidence (i.e. logical accuracy and consistency) or in terms of external criteria (i.e. a comparative process).

Computer-assisted Instruction and cognitive development

How can students be tested on the ability to function at the highest levels of Bloom's classificatory system using the MPC? In answering this question, delineation of several of the most common types of computer-assisted instruction (CAI) and their relation to the taxonomy will prove useful. (Scott D. Lipscomb, 2004).

Wright and Forcier (1985, p. 96) defined CAI as a learning environment characterized by instructional interaction between computer and student.... [The teacher] sets up the learning environment, ensures that each student has the necessary skills to engage in a particular cognitive activity, and adjusts the learning activities according to the students' needs.The instructional goal of the learning material may affect development time as well. Development time increases as the learning goals for the materials ascend bloom's learning taxonomy from knowledge to skill to attitude and as the technical complexity of the computer work increases from basic to intermediate, to high (Golas, 1993). Obviously many more hours would be required to develop an entire course.

Educational psychology provides many theoretical principles to be applied in the development and evaluation of computer assisted instructional technology. Milheim and Martin (1991) in studying learner control motivation, attribution and informational processing theory, identify learner control as an important variable in developing the pedagogy of soft wares.It is beneficial to generally maximize learner control as it increases the relevance of learning, expectations for success and general satisfaction contributing to heightened motivation (Keller & Knopp, 1997).

CAI software for cognitive domain

Many classifications of CAI available in market, six specific types by Spiro and Jehng (1990, pp. 163-205) seem to be most often utilized for educational purposes.

Drill and Practice instructional programs simply assist the student in remembering and utilizing information that the teacher has already presented, reinforcing previous learning through repetition. It is most important to improving knowledge level.

Tutorials are designed to introduce unfamiliar subject matter. The format of a computer tutorial often emulates a dialogue between the computer and the student, i.e. information is presented, questions are asked of the student and on the basis of the response given, a decision is made to move on to new material or review what has already been presented. These first two CAI types are most successful at improving the *knowledge* and *comprehension* levels of Bloom's taxonomy.

Instructional Games present course content in a competitive and entertaining manner, in an effort to maintain a high level of student interest. Though most frequently used to reinforce factual knowledge at the lower levels of the taxonomy, it is quite possible to create instructional games that demand application skills from all levels.

Simulations require the student to apply acquired knowledge to a novel situation. As a result, the student must analyze a presented scenario, make decisions based on the information given and determine a course of action. The simulated environment must change based on the course of action taken, presenting a significant challenge to the programmer. Successful performance relies on skills up to Bloom's level of analysis.

Problem-solving software requires the student to use high level cognitive abilities in the process of considering the problem at hand, analyzing the problem situation and its various solutions, predicting respective outcomes, determining which specific plan to attempt, and enacting the appropriate action(s) (Shute, 1993, p125). Well-designed software that fits this classification may require abilities from all levels of the taxonomy. However, perhaps the best way to have a student use abilities of synthesis is to have him/her create a novel hypertext system (Jones, 1990, p. 270). In this case, the student would be forced to identify relationships and evaluate all aspects of the chosen set of course materials. Evaluative ability can be tested (and improved) throughout programs representing any of these five types of CAI by prompting the student at significant times during the session and providing appropriate feedback or explanation.

Discovery-environment; in addition to the delineated types of CAI, it is also possible to provide a *discovery-environment* (Kendall, 1987, p. 192) within which the student is given a high level of freedom in determining the specific information presented during each session, as well as the order of presentation"(Spiro & Jehng, 1990).

Effects of CAI on Cognitive Achievement

Low technology methods of teaching use printed handouts and overhead transparencies. Overhead transparencies are primarily a labor saving device for classroom instruction. The teacher need not write the same information each time it is used. They allow easy presentation of color and graphics. The common attributes of print and overhead transparencies are affordability, reliability, flexibility, standardization of equipment, and ease of creation and use. However, they become unwieldy with large quantities of curriculum. They are static, and their distribution requires time and effort (Kearsley, 1990).

Television, videotape, and film have the advantage of ease of duplication and distribution to diverse audiences, but share a lack of interaction between the learner and the instructor. (Whetzel, 1996). Disadvantages to these formats also include high production cost, lack of involvement of local instructors, and learner boredom due to the lack of interaction (Kearsley, 1990).

Satellite training is a method of broadcasting curriculum to people in different locations simultaneously. Some systems have no feedback, some have audio feedback through a telephone line; which works well for question and answer periods. The feedback aspect solves some of the problems of one-way television broadcast. This system is suited for delivering consistent curriculum to widely scattered personnel, and is used by the postal service, the military and large financial corporations (Collis, Vingerhoets, & Moonen, 1997).

Teleconferencing consists of two-way communication. Audio-conferencing is a low cost, easily implemented system, and may be set up using existing telephone equipment. Videoconferencing is more technically challenging and requires more specialized equipment (Whetzel, D., Felker, D., & Williams, K. 1996). Computer conferencing uses existing computer equipment with the addition of microphones, but has been severely limited by bandwidth considerations (Kearsley, 1990).

CAI as an effective teaching method

Ebenezer S. O. Collier (2004) described that instruction supplemented by properly designed CAI is more effective than instruction without CAI. Computers can be used for text and test reading, games, tutorial, drill and practice, and simulation of laboratory experiments. Computer-assisted instruction can play an important role in classrooms and laboratory work not as substitute for other activities but as an additional tool.Cuoco and Goldenberg (1996) found in a mathematics curriculum that CAI offered the learner the ability to tinker with concepts in order to visualize results. Learners who could manipulate formulae, variables, and models independently using a CAI-based tool gained a better working knowledge of these concepts compared to learners listening to the same concepts presented by lecture. Bergman and Cheney (1996) found CAI increases learner knowledge when it involves the synergy of multiple senses. Learners were found to retain new knowledge better when the curriculum was presented with a combination of formats of text, sound, graphics and video.

A comparative study conducted in 1996 on frog dissection in a traditional lab and by a CAI simulation found users reported higher satisfaction levels using the simulation. While some of the satisfaction was due to the ability to perform a dissection without requiring an actual animal, users also reported satisfaction with the branching ability of the instruction, the ability to make their own choice on navigating the dissection, and the ability to back up and correct mistakes (Kinzie, Larsen, Burch, & Boker, 1996).When utilizing the CAI as a tutor, involving the student in the learning process interactively is of utmost importance. Computers are not constrained to the linearity evidenced in textbooks or earlier instructional software. The use of hypertext and hyper linking allows the student to determine his/her own presentation sequence, within limits established by the instructor and/or programmer (Scott D. Lipscomb, 2004).

The importance of maintaining the 'human interaction' component in an on-line teaching learning environment and CAI cannot be over-emphasized. Interactions between instructors and students, as well as peer interactions between students, are requisite to facilitating critical thinking and promoting enriched learning (McCormack & Jones, 1998).A major advantage of CAI is that, by necessity, it requires the student to be an active participant in the learning process. It is not only possible, but *necessary* for the student to interact with the computer or else nothing will happen (Chabay & Sherwood, 1992, p. 154). In order to progress from one screen of information to the next, in most cases, the student must respond using the computer's peripheral hardware (e.g. keyboard, mouse, joystick, or specially-designed devices). As a result, it is impossible for the student to assume the role of a mere observer (Lockard, Abrams, & Many., 1987, p. 144).

If an instructor, who uses structured CAI within a course, continues to hold traditional meeting sessions with students, the class rooms time can mature into an enriched experience which benefits students more by allowing more interaction between faculty and peers than in the traditional classrooms (Brooks, 1997).

In traditional classrooms settings, students and faculty often do not interact, rather they sit (as if separated by miles), and write downwards describing a linear presentation of materials. In the computer-assisted teaching model, students could access CAI materials during their course preparatory time, and class time could be reserved for conceptual discussions, peer interactions and mentoring. Rather than spending time making linear presentations of lecture material, instructors could implement creative teaching strategies in the classrooms (Porter, 1997).Time liberated by replacing the most didactic lectures with computer-delivered lectures may benefit faculty, students and universities in several ways for example; it may allow faculty time to facilitate more

learner-centered activities by promoting interaction between peers and between students and faculty (Kommers, 1996, p.18).It is generally accepted that CAI has a higher development cost than CRL, but it can be recovered by use with a large number of users over time (Bergman & Cheney, 1996).

CAI represents a reduction of support in other areas, such as science research laboratories or resident teaching laboratories, for a couple of examples. Therefore, maximizing the effective use of resources and minimizing the cost of developing CAI, while still achieving instructional objectives, is crucial (Bui, 1999, p.14).

Mahmood (2004) conducted a study on CAI and traditional method of instruction. This study examined the effect of computer-assisted instruction on student achievement in general science as compared to traditional method of instruction. The result revealed that the experimental group out performed the control group in all achievement areas i.e. overall, by levels of cognitive domain and by type of content. Students like the CAI program and benefited from it. They found it better mode of instruction than the traditional method.

Barakter (2000) conducted a study, as quoted by Mahmood (2004), employing meta- analysis research approach. Purpose of this study was to determine whether CAI had an over all positive effects on students achievements in secondary and college level science education, when compared with traditional forms of instruction and to determine whether specific study or program characteristics were related to CAI effectiveness. Forty two studies comparing CAI and traditional instruction in science were included in this meta- analysis.The overall effect size was found to be 0.273 standard deviation, suggesting that CAI has a small positive effect on students' achievements in science education at college and secondary level. An average students exposed to CAI exceeded the performance of 62% of the students who were taught by using traditional instructional method.
Mintz (2000) and Campbell (2000), as quoted by Mahmood (2004), compared computerized and traditional instruction in the area of elementary Mathematics and elementary reading. It was found that there was significant difference in critical thinking skills between students who received CAI and students that did not.

A qualitative study aimed to ascertain the worth of CAI program for intermediate Algebra course was conducted by Miller (1999), as quoted by Mahmood (2004), The main point concerning CAI that emerges from this study was the benefits to students of immediate feed back from the computer. And the value of interaction as a means of learning Mathematics and the advantage of individualized instruction.

OBJECTIVES OF THE STUDY

The objectives were to compare the learning effects of two groups of learners studying the same curriculum. One group used traditional CRL; the other used CAI format instruction. The outcome was the ability to determine the relative feasibility of the two methods by comparing.

i. To compare the effects of CAI and CRL in terms of cognitive development.
ii. To illustrate the results of learner knowledge gained through CAI and CRL.
iii. To measure the development of comprehension skill by CAI and CRL.
iv. To analyze the effect of CAI and CRL on the application skills of students.
v. To take apart the effects of CAI and CRL with respect to analysis and synthesis skills of students.
vi. To assess the effectiveness of CAI to enhance learner's ability of evaluation in comparison of CRL.

HYPOTHESIS

H_0 There is no significant difference exist for CAI student in gaining a high cognitive achievement than students of same level having Traditional CRL
H_1 significant difference occur for learners using CAI acquire knowledge as effectively as learners in receipt of the same curriculum in a traditional CRL format
H_2 CAI students have a significant comprehension skill then traditional CRL students.
H_3 Significant difference existed in CAI's developmental ability of increasing application skills in students effectively then CRL.
H_4 CAI is significantly stronger by analysis and synthesis skill of students then CRL.
H_5 Evaluation skill is significantly better developed in students by CAI in comparison of CRL.

METHODOLOGY

Research Design

The research was *true- experimental* in nature because the equivalence of the control and experimental groups were provided by random assignment of subjects to experimental and control treatments. Both groups have average score 12 points something in pre-test. This showed the equivalence of the control and experimental groups. The research design followed by researcher is *the Pre-test - Post test Equivalent groups Deign.*

Limitations and delimitations

i. *No any test was conducted to select samples.*
ii. *Samples were selected by stratified sampling procedure.*
iii. This study did not examine alternatives of CAI such as internet or distance learning.
iv. Computer use was limited to the presentation of curriculum only.
v. While computer-aided testing (CAT) is commercially available, it was not used in this study. Identical paper multiple-choice tests were used for both groups.
vi. The curriculum topic was limited to Microsoft Word and common hardware devices.
vii. The subjects of the study were limited to ICS (computer sciences).
viii. The sample included girls and boys as study subjects; average age of 18 years, of different ethnic backgrounds from two different colleges.
ix. Learners use Urdu as an instructional medium.
x. The curriculum was provided in Urdu. However, common terms and notion were used in English to maintain their correct impression.

Population

All students of computer science at ICS level from all colleges of Faisalabad are the population of this study. However, the researcher took the student from Govt. College of Science Faisalabad and Govt. College for Boys Samanabad, Faisalabad as the sample of the study.

Sample

This study surrounded the city of Faisalabad as the population of the study. The subject students of ICS level were selected at stratified basis. In order to get wide random samples, 20 students from each of the following neighbor colleges were selected for the said study:

- Govt. College for Boys, Samanabad, Faisalabad
- Govt. College of Science, Samanabad, Faisalabad

In order to avoid the institutional interference and pressures from experimental study, teacher, subject students and study results, the study was conducted in a third college having all well equipped CAI and CRL labs as follows:

- Oxford Textile and Computer College, Samanabad, Faisalabad ,

Pilot Test

A multiple choice question (MCQ) test containing 45 items was constructed and pilot tested, item analysis was done by measuring the (difficulty lever and item discrimination index) difficulty level from 0.5 to 0.7 considered the appropriate and discrimination index form 0.35 to 0.50 was considered .The items having the difficulty level and discrimination index below and above the mentioned range were discarded and 30 items were selected for final version of the test and reliability of the test was 0.827(Cronbach's Alpha).

Procedure of the Study

In order to avoid the inter personal and intra personal variation of two different teachers for CAI and CRL groups, it was decided to conduct the both classes by a single teacher having a competence to conduct both CAI and CRL instructions side by side on the same dates. Two designs of experimental curriculum were formed, one for CAI and other for CRL. The CAI format lessons were installed on the hard disks of the personal computers. Other applications on the personal computers, such as internet access and games, were removed or disabled. Before start of experiment, each subject student was introduced to the CAI format and they were familiar with hypertext, the navigation buttons, and the mouse and were able to navigate the lessons independently. A selected room with desks, chairs, paper, clock, and a white board was used for the CRL sessions.

The teachers delivered the material using the binder of CAI printouts as a script to equivalent the both formats. The white board was used as necessary to clarify difficult points. Subjects were encouraged to take notes and advised the notes could be used as reference material during the test. Subjects could ask questions as necessary, and review current and prior content as desired. A test containing 30 items multiple choice test was compiled from the curriculum, with a representative number of questions from each of the cognitive levels as given in (Table 1). The same test was given as a pretest to all subjects prior to beginning instruction.

Table 1. Cognitive parameters weight age of the test

Sr. No.	Parameter	Number of questions	% Weight age
1	Knowledge	9	30 %
2	Comprehension	5	16.6 %
3	Application	4	13.4 %
4	Analysis and synthesis	4	13.4 %
5	Evaluation	8	26.6 %

(All questions carried out equal marks)

The same test was used for evaluation at post-test stage. It was given to all subjects following completion of experimental study. Upon completion, the subjects were informed of their score and the incorrect answers were reviewed if requested. At this time, the pretest was also offered for review if requested.

Data Collection

Data was collected from both the groups by giving them a test consisted of 30 items, which was further subdivided into the parameters of cognitive domain.

Data Analysis

Collected data was tabulated and analyzed in terms of mean scores and two way analysis of variance followed by Dunkun Multiple Range Test (DMRT) was used as data analysis tool.

Findings

The findings drawn after the analysis are as under:

Table 2. Showing ANOVA on total cognitive achievement

Source of variation	DF	SS	MSS	F-Value	P-Value
Student	19	653.74	34.407	1.46 NS	0.1360
Teaching M	3	1743.44	581.146	24.79 **	0.0000
Error	57	1341.81	23.541		
Non-additivity	1	223.96	223.958	11.22	
Residual	56	1117.85	19.962		
Total	79	3738.99			

The results are given in table 2 the intra student variations were non-significant with very small F value. Both of the student groups obtained 12.5 to 20.1 marks in pre- experiment test but the variations were not significant. After the treatment, there was 60 % to 77 % increase in total cognitive achievement of students for CRL and CAI over control. In post experiment evaluation, however, there were no significant variations in 'acquiring of knowledge' by both CRL and CAI groups with respect to pre-test evaluation. The variations between two methods were highly significant with respect to other pre-fixed objectives.

Table 3. Showing ANOVA on total gain in knowledge

Source of variation	DF	SS	MSS	F. Value	Prob
Student	19	78.24	4.118	0.77 NS	0.7335
Teaching M	3	91.34	30.446	5.67**	0.0018
Error	57	305.91	5.367		
Non-additivity	1	29.88	29.880	6.06	
Residual	56	276.03	4.929		
Total	79	475.49			

The above table 3 shows that the intra student variations were non-significant with very small F value. Both of the student groups obtained 3.95 to 4.2 marks in pre- experiment test but the variations were not significant. After the treatment, there was 59 % to 45 % increase in *knowledge* of students for CRL and CAI over control. In post experiment evaluation, there were no significant variations in acquiring of knowledge by both CRL and CAI groups. The variations between two methods were highly significant with 5.67 F value.

Table 4. Showing ANOVA on total gain in comprehension

Source of variation	DF	SS	MSS	F- Value	P-value
Student	19	26.95	1.418	1.06 NS	0.4162
Teaching M	3	76.55	25.517	19.02**	0.0000
Error	57	76.45	1.341		
Non-additively	1	1.87	1.867	1.40	
Residual	56	74.58	1.332		
Total	79	179.95			

The above table 4 shows that the intra student variations were non-significant with very small F value. Both of the student groups obtained 1.9 to 4 marks in pre- experiment test but the variations were not significant. After the treatment, there was 110 % to 85 % increase in *comprehension* of students for CRL and CAI over control. In post experiment evaluation, there were no significant variations in acquiring of knowledge by both CRL and CAI groups. The variations between two methods were highly significant.

Table 5. Showing ANOVA on total gain in application

Source of variation	DF	SS	MSS	F. Value	P-value
Student	19	20.80	1.095	0.78 NS	0.7153
Teaching M	3	24.40	8.133	5.82**	0.0015
Error	57	79.60	1.396		
Non-additivity	1	10.55	10.547	8.55	
Residual	56	69.05	1.233		
Total	79	124.80			

The table 5 reveals that the intra student variations were non-significant with very low F value. Both of the student groups obtained 1.9 to 2.3 marks in pre- experiment test but the variations were not significant. After the treatment, there was 21% to 77 % increase in *application skill* of students for CRL and CAI over control. In post experiment evaluation, there were no significant variations in acquiring of knowledge by both CRL and CAI groups. The variations between two methods were highly significant.

Table 6. Showing ANOVA on total gain in analysis and synthesis

Source of variation	DF	SS	MSS	F. Value	P-value
Student	19	25.70	1.353	1.28 NS	0.2323
Teaching M	3	46.30	15.433	14.61 **	0.0000
Error	57	60.20	1.056		
Non-additivity	1	4.49	4.488	4.51	
Residual	56	55.71	0.995		
Total	79	132.20			

The table 6 shows that the intra student variations were non-significant with very small F value. Both of the student groups obtained 1.3 to 3.1 marks in pre- experiment test but the variations were not significant. After the treatment, there was 138% to 56 % increase in analysis and synthesis skill of students for CRL and CAI over control. In post experiment evaluation, there were no significant variations in acquiring of knowledge by both CRL and CAI groups. The variations between two methods were highly significant.

Table 7. Showing ANOVA on total gain in evaluation

Source of variation	DF	SS	MSS	F. Value	P-value
Student	19	47.44	2.497	1.02 NS	0.4503
Teaching M	3	132.74	44.246	18.14 **	0.0000
Error	57	139.01	2.439		
Non-additivity	1	13.67	13.672	6.11	
Residual	56	125.34	2.238		
Total	79	319.19			

The table 7 reveals that the intra student variations were non-significant with very small F value. Both of the student groups obtained 3.35 to 4.75 marks in pre- experiment test but the variations were not significant. After the treatment, there was 37% to 117 % increase in *evaluation skill* of students for CRL and CAI over control. In post experiment evaluation, there were no significant variations in acquiring of knowledge by both CRL and CAI groups. The variations between two methods were highly significant.

More Findings

The results showed that intra student groups' variation were non-significant in all cases. The student definitely gained in cognitive domain by both of the teaching method as shown by comparison of pre-test and post-test.

1. Total gain in cognitive domain by CAI was significantly superior to the total gain in cognitive domain by CRL teaching method.
2. The application of CAI teaching method to experimental group led to a highly significant increase in knowledge skill of students then students having CRL treatment.
3. Inter teaching method variations were non significant with respect to *comprehension*. Students significantly gained comprehension skill as observed in post- test compared to pre-test with the two methods respectively.
4. Post-experiment test of both groups showed significant lead of CAI (+77) compared to CRL (+21).
5. The gain of analysis and synthesis skill in post-test evaluation by CAI is 146% higher than CRL.
6. 80 % increase in evaluation skill of students of experimental group proved the extraordinary significance of CAI teaching method over CRL.

CONCLUSIONS

This study concluded that CAI proved to be significantly superior to the CRL. The skills of knowledge, analysis and synthesis assured significant increase. The CAI proved to be very much effective in increasing the evaluation and application skills of students to experimental group. Comprehension skill, however, not much affected by the CAI. There for students of experimental group was looking well motivated and ready to learn each day of experimental duration of CAI treatments than students of CRL treatments.

RECOMMENDATIONS

1. CAI as an effective teaching method may be applied to improve teaching quality.
2. CAI may use as a supplementary learning tool to teaching low I Q level students.
3. CAI may also be used effectively in teaching subjects in which simulation models can help improving cognitive abilities.
4. By using CAI it will be possible to eliminate lingual, regional and ethical biases between teacher and student.

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A MODEL OF COOPERATIVE EDUCATION -"GROUP LEADER TRAINING PROGRAM" FOR INDUSTRY EMPLOYEES

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ABSTRACT
Studies on continuous education and alteration are highly significant in order to improve the technical and social abilities of the industry employees. Generally, these kinds of educational facilities are carried on in the range of in-house training. Besides in-house training, it is also possible to improve the abilities of the employees with the projects with the help of the cooperation of the schools and industry.

In this research, the initiation, planning, implementation, development and the evaluation of the "Group Leader Training Program" that has been implemented and developed for the training of group leader candidates of Bosch Bursa Plants, which is one of the leading intuitions of automotive industry, is examined. In this model, which comprises the education of the employees in Uludag University, 325 staff in nine groups has been certificated after completing the program of 280 hours and ten modules and other personal development courses between 2001 and 2008. A remarkable progress has been revealed by the former (old)-new (trained) comparative competence evaluations that have been implemented on the educated group leaders within the project. Continuous education and alteration is crucial for the people who work at the engineering technology area in order to improve their social and technical abilities.

Keywords: Cooperative Education, Continuous Education, In-House Training, Life-long Learning.

INTRODUCTION

Taking into consideration that educational institutions are the sources of meeting the manpower of the industry, different strategies and road maps have been designated to educate the qualified manpower the sector needs. (Tekin et al, 2006). The rapidly changing knowledge and skill requirements in the engineering profession require that engineers educated mainly in the scientific principles of a broad engineering discipline need to develop new skills and acquire more specific knowledge to better equip them for each of the succession of engineering roles that comprise their careers. Satisfying their needs requires the efficient flexible delivery of up-to-date, industry relevant programmes (Ferguson, 2007). Continuous education and alteration is crucial for the people who work in the engineering technology area in order to improve their social and technical abilities in terms of career planning and strengthening the degrees of management. These kinds of training facilities in the world are usually being carried out within the scope of in-house training. Moreover, the cooperation between the university and industry is a highly common practice to transfer the industry's acquisitions to the students.

From its beginnings, cooperative education has evolved into a program offered at the secondary and postsecondary levels in two predominant models. In one model, students alternate a semester of academic coursework with an equal amount of time in paid employment, repeating this cycle several times until graduation. The parallel method splits the day between school and work. Thus, the co-op model includes school-based and work-based learning and, in the best programs, "connecting activities" such as seminars and teacher-coordinator worksite visits. These activities help students explicitly connect work and learning (Kerka, 1999). Positive results may also be gathered when the practice of cooperative education is reversely evaluated rather than its current commonplace implementation, that is, the training of industry employees in the educational institutions. In this type of cooperation, depending on the requirements of the Industry both short-term programs for specific topics and more comprehensive long-term programs may be organized.

Quite interestingly, Taylor has maintained as follows on this issue: "Cooperative education as a strategy for combining classroom learning with workplace training is becoming well known internationally. So too are the concepts of life-long learning and continuous education and in the minds of many authors learning is not confined to what happens in a classroom, neither is it a 'one-off' experience. Cooperative education typically occurs when a learner is placed into the actual working environment. The question arises, what about a working adult entering the academic arena? If this process is formalized could there be a new slant to cooperative education - one of life-long learning and reversal of cooperative education where the world of work sends its

adult learner into the education sector? There is some recent research that suggests that there is now a growing trend worldwide - a trend of *reverse cooperative education*" (Taylor, 2002).

STARTING POINT

The first activities regarding the training of Bosch Bursa Diesel Systems employees and group leader (GL) candidates started in 1998. In these activities, especially the principal of the development of a module-based and competence-based program has been adopted. The philosophy of the starting point in the program has been the GL candidates' taking their education that is based on technical knowledge, skills and conducts from the universities and private institution as an addition to their in house training. In the designation of the training modules, the principle of not only the company needs but also the conception of academic understanding of the educationalists has been adopted (Arslan et al, 2003).

In the preparation process, the company coordinators carried out some department meetings and comparative need analyses with the employees, the group leaders and Germany Feuerbach Bosch. As a result of these analyses, the group leaders are supposed to have the characteristics that are shown in Figure 1. The steps that have been prepared to make them acquire these characteristics are determined as follows:

- Need analysis
- Determination of evaluation parameters
- Designation of the implementation plan
- Source planning
- The scheme of responsibility
- Determination of evaluation methods
- The reflection of the results

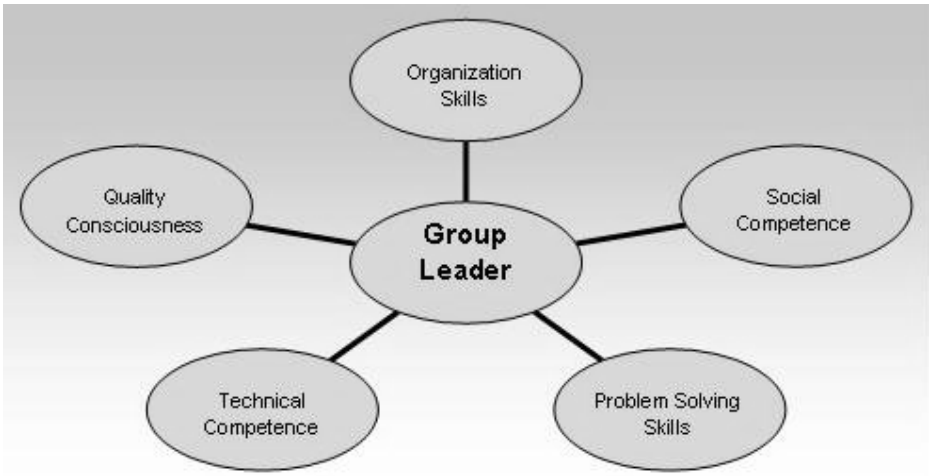


Figure 1. Supposed Characteristics of GL

The project systematic of GL training program (GLTP) that has been formed in order to make the GLs acquire these characteristics is determined as shown in table 2.

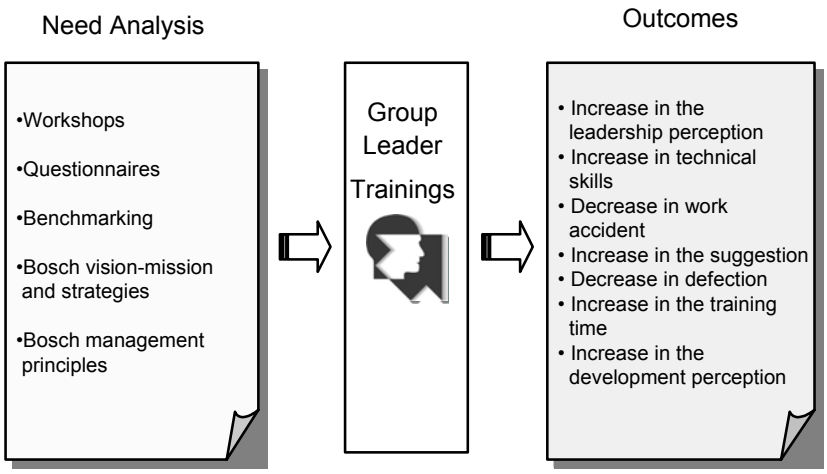


Figure 2. Goals of the GLTP

PLANNING AND IMPLIMENTATION

Determination of Internal Requirements of the GLTP

After the formation of the framework of GL training program, a program development team of 12 people has been formed from The Uludag University Vocational School of Technical Sciences (UUVSTS) and company educational department. Two people from this team have been put in charge of coordination. The program development team has firstly carried out a research in order to determine what the company employees expect from the GL position in terms of technical and social respects. The expectations of both the employees and the coordinators for each department have been recorded in this research. After the research for six months, the characteristics each department expects from the candidates have been stated. This data has been employed in the formation of the modular training program, taking into account of academic criteria by the program development team.

Program development criteria,
Thanks to the data collected from the company, the program development team has determined the necessary criteria for each module, considering the criteria below. These criteria are:

- A structure to meet the basic demands of the company
- Compatibility to continuous development
- Flexible timing and educational structure
- A modular approach

The demands taken from the company units included the dismembered issues and unit related issues that would be given in a short time rather than separate individual modules. Handling over 50 issues, the program development team has initially classified them according to their fields and after the fields have been determined, the process of integration of the issues has started. In the terminal stage, modular structure and course contents have been formed, taking into consideration of the contents of similar courses or the contents of the training in the vocational educational institutions. After the determination of vocational training in this way, management development, training regarding the organization and their contents has been determined. In this stage, the experts both within and outside the company have supported the team.

Modules that are going to be taught in terms are shown in Table 1 and 2. The reason of having two different programs is that people who have an occupational retraining are going to complete two courses but the ones who are working in occupational retraining are only going to complete the second program. In that way, graduates' repeating the same training is obstructed. In Table 3, all the specified trainings, which are needed for managerial and social qualities, are given that all candidates must have who want to be leader in the groups. These trainings are taken from an institution outside the university.

Table 1. Qualification Program (First Certificate Program) 14 Weeks

COURSES	Hours (T+P) / Week	Total
Manufacturing Technology I	2+1	42
Technical Drawings and Standards	1+1	28
Electricity and Electronic Science	1+1	28
Hydraulic- Pneumatic	1+1	28
Computer Numerical Control	1+1	28
Windows, Excel, Word	1+1	28
Material Science	1+1	28
Technical Mathematics	2	28
Measurement Technology	1	14
Industrial Organization and Planning	2	28
TOTAL	20	280

Table 2. Specialist Program (Second Certificate Program) 14 Weeks

COURSES	Hours (T+P) / Week	Total
Manufacturing Technology II	2+1	42
Digital Electronics	1+1	28
Electro Hydraulic and Pneumatic	1+1	28
CNC / Fanuc	1+1	28
Machine Components	1+1	28
Thermal Treatment and Material Inspection	1+1	28
Quality Assurance and Standards	1	14
Programmable Logic Control	1+1	28
General and Technical Communications	2	28
Product Information	1+1	28
TOTAL	20	280
T: Theoretical P: Practical		

Table 3. Consultancy Firm (The improvement of social and method based skills)

COURSES		Total
Mutation Dynamics		16
Communication		16
Co-work and Administration		16
Solving Problems and Presentation Techniques		24
TOTAL		72

Practice

In this modal that comprises the training of the workers in UUVSTS, who have completed their training and taken a certificate, there is the module that constitutes of 10 modules 325 staff and 280 hours among 9 groups between the years 2001 and 2007. These people are still continuing their work as GL. Trainings generally started a 16 o'clock and were continued as 20 hours per week. Training programs were planned as full day or several days a week in accordance to the need and the availability of the management. While some of the implementations of the lessons were done in real business environments in factories, most of them were done in classes and laboratories.

Measurement of Success

The measurements of success of the GL candidates in courses were done as one midterm and one final exam for all lessons. Exams were done as oral, practical or written according to the quality of the lesson. If one participant fails a module he is given the right to another exam in the appointed date. If he fails because of discontinuity he has to attend the next training.

Evaluation

Four different methods are used to increase the efficiency and the contribution of the workers which are:

- Questionnaires that are done at the end of the training both by the school and the factory

- Training evaluation, betterment, suggestion development meetings
- Comparing beginning and end knowledge level
- Evaluations that are done by a perfection measuring system

At the end of the 5 year training many betterment suggestions are taken and applied to the program. The most striking one among them is the revision that is done on the hour and content of the modules. Contents are gone through and betterments are done. At the end of this, the process of the course has been reduced to 240 hours and the theory/ practice ratios have been changed. The improvement of technology and the change within the factory affected this process.

The placement tests that are applied to candidates at the beginning of each training and the grade points average at the end of the training give serious clues about the candidate's success ratio. Educators also see their own deficiencies with this program and they continue their education by eliminating these deficiencies. Such an example is shown in Figure 3.

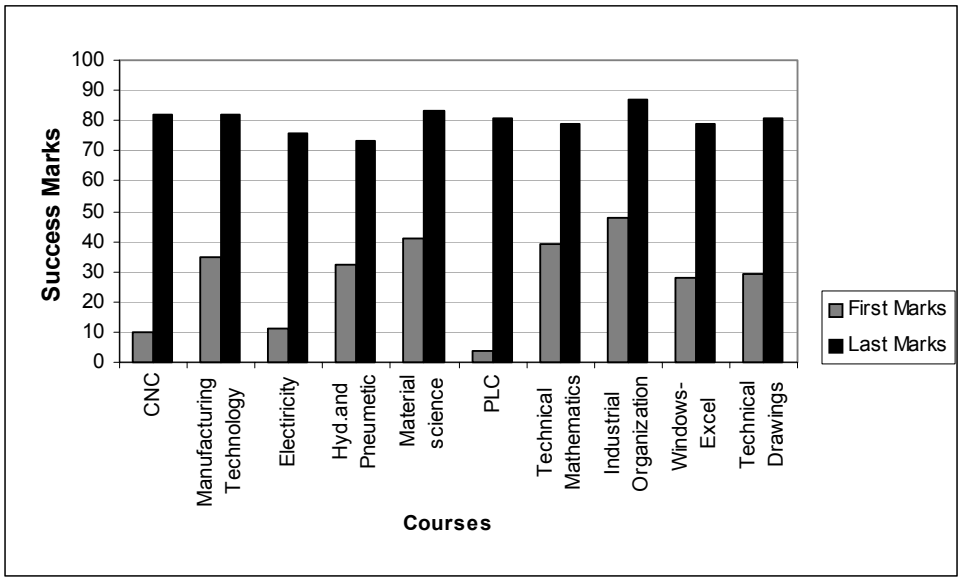
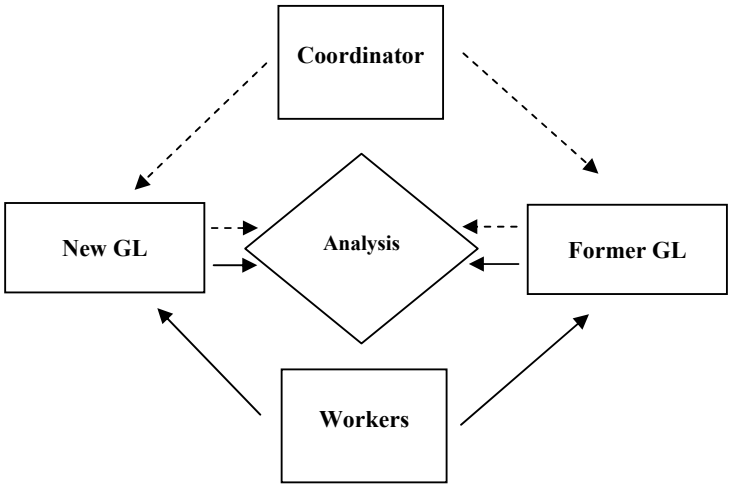


Figure 3. The Marks Before and After Training

Perfection Measurement

The perfection measurement is done as is shown in Figure 4. With the system that has 32 questions which include information, motivation, improvement, personal attitude, teamwork, organisation, management, attitude based on operation and technical knowledge and skill, every GL is being evaluated by employees, coordinators and former GLs. This study was done in 2004 and it was evaluated by 109 former GL, 82 new GL, 171 employees and 20 coordinators.



Analysis method: Questionnaire

Specification of Questionnaire
- All participants were given detailed information about questionnaire
- Anonymous

Important data's:
20 Production coordinators
171 workers
Σ 191 participants
109 former GL,
82 New (Trained) GL

Figure 4. Perfection Measuring Management

At the end of this study, a 0, 14% betterment is seen as it is shown in Figure 5. Though this value may seem to be a minor change it is taken as a serious improvement when GLs working in the factory for about 20 years are being compared to those who are not much experienced but have completed their training successfully. Meanwhile, the perfection analysis including the general analysis which contains the technical perfection is designated to have increased. Together with the betterments that are done, the second measurement results are expected to increase in 2008.

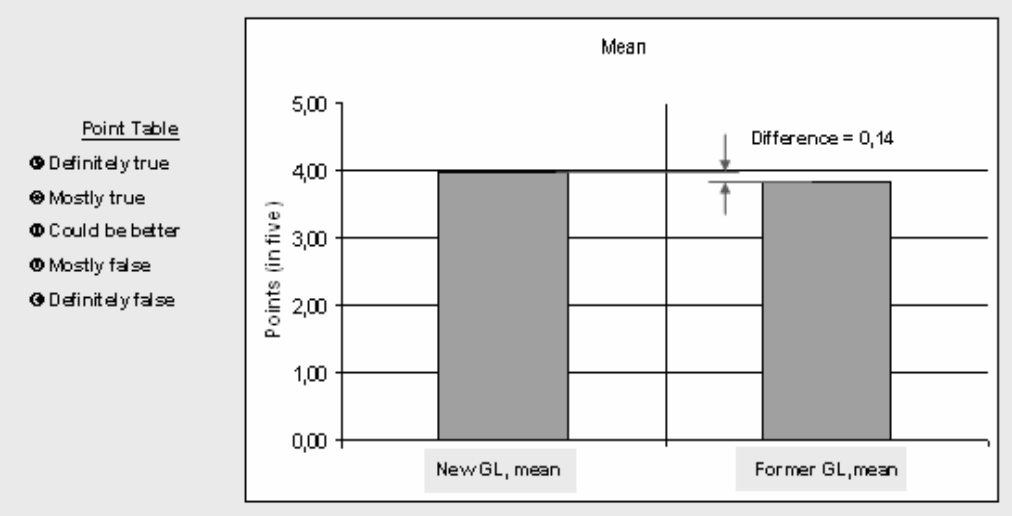


Figure 5. Perfection Measurement Results

CONCLUSION

At the end of the GLTP perfection evaluation the contribution of efficiency, the personal and occupational rises have been stated as a major improvement. One of the most important yields of this training is the contribution of the candidates to questioning, creating solutions and suggestions, and having a dynamic approach to constant improvement.

The success of the GLTP program is taken by the other educations that were needed within the factory. In the year 2008 a new program, which includes Bosch-Rexroth, is put into practice. It especially attracts attention because it aims at occupational perfection and because it gives knowledge and skills that may be useful in the future.

The purpose of such certificate programs is to increase the level of knowledge of workers. Besides, by instructing the participants in accordance with the development of technology, it is aimed to increase the motivation and working performance of workers and to help them improve their productivity. It is obvious that rather than cooperative education, which has from school to industry practice, reverse cooperative education, which has from industry to school practice, and has more effective contributions to the improvement of the sides.

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ACADEMIC STAFF PERCEPTIONS OF ICT AND ELEARNING A THAI HE CASE STUDY

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ABSTRACT
This paper examines the issues affecting the implementation of eLearning at a university in Bangkok. eLearning and the use of ICT is playing key role in shaping teaching and learning in Thailand. Its implementation is providing innovative and creative opportunities for knowledge development and ICT technology transfer. This paper shows that there will be a need to engage in higher levels of eLearning systems development in order to create an overall integrated ICT vision and eLearning strategy for the university.

The present study draws data from an anonymous questionnaire administered in the International programmes of study at graduate level in a university in Bangkok. There were a total of 22 returns.

The data suggests that eLearning is not widely used at the university as it is perceived as less effective; whereas traditional pedagogic practices as well as being widely used is also perceived as being the most effective method. The theoretical and practical implications of the results are discussed.

Data is drawn from a small number of academic staff and thus further university-wide research is necessary.
This paper critically evaluates the practicalities associated with eLearning in a university experiencing significant changes and assesses its potential in addressing useful eLearning developments.

The paper gives a clear insight into the issues surrounding eLearning and addresses some of the implications for longer-term ICT and eLearning developments.

Keywords—eLearning, ICT, Lecturer, Strategy.

INTRODUCTION

This is a study of the issues relating to ICT and its use in influencing the development of eLearning practices in the university sector, Thailand. Much research has been carried on in the area of eLearning which continues to be one of the hottest research topics in higher education today (Chan, Chow, and Jia (2003); as a long-term solution to the issue of *lifelong learning* (Zhang et al., 2004); and is a growing trend internationally (Bates, 2005). Consequently, the perceived rapid growth of the Internet and other developing ICT technologies – product/software and structural - brings a new era of eLearning possibilities to higher education as eLearning developments continue to radically change education (McPherson, 2003a). Internationally, many researchers perceive that eLearning is a technology driven by itself for its own purpose (James, 2008), rather than being viewed as a pedagogical driver (Carnaby, 2005). Further, the "e" in eLearning doesn't necessarily make learning easier, simpler, more effective or more cost effective than traditional pedagogical methods (Hildebrandt and Teschler, 2006). Thus technology and those managers of universities who control its development and use would appear to be demanding cheaper alternatives to traditional university provision and it is this that firmly rests higher educational strategy at the door of eLearning developments. There are many and varied reasons for this. They include:

1 Globalization pressures, with increasing needs for appropriate digital knowledge and pedagogic provision made available across country boundaries
2 Online learning distributed both domestically and internationally is seen as critical to the ongoing success of universities (Sax, 2003)
3 Increased pressures for ICT access in LDCs (Middlehurst, 2000)
4 Increasing demands for life-long learning – especially in MDCs – that create opportunities for universities in LDCs through mostly young mobile students
5 Increased opportunities for private universities resulting from government funding reductions and retrenchment of government leadership in higher education systems world-wide

Given the above, universities in Thailand are forced to recognise that there are some serious issues that need to be addressed in the short-term and important challenges that need to be managed in the longer-term. As an

example, the pressures on Thai universities to provide evidence of achieving set course standards and student performances to government and of ensuring that stakeholder money is spent as efficiently and effectively as possible all together exact an influence on educational institutions and possibly explain why many are turning towards managing 'quality' in eLearning environments (Gray and Wilcox, 1995).

Short-term concerns facing universities include the options of focusing on eLearning designs and discovering how these can be integrated into the more traditional educational offering in the form of blended learning structures and practices - a combination of traditional classroom and online study (Hanna, 1998; Heinze & Procter, 2004; and Lorenzetti, 2004). However, of increasing concern in the longer-term would be the human elements such as lecturer and administration developments and changes as a consequence of strategic eLearning orientations in Thai universities. Consequently, technology itself could provide a more flexible and much more adaptable approach to eLearning involvement in useful pedagogic developments. Thus, Thai universities have new opportunities, which are directly linked to ICT and any consequent eLearning outcomes. The growth in *virtual* university activities (first established in the mid 1980s), allows traditional universities to expand their reach and increase the flexibility of the educational offering. Through this, blended learning (Hanna, 1998) offers new learning methods and pedagogy, while open source software and courseware facilitate sharing of resources and reduce costly duplication of effort through which information technology has been viewed as a solution to universities' cost and quality management problems (Selim, 2005). These changes promote the more important learner-centred pedagogy that appear to be deemed appropriate today by many researchers (Harvey & Knight, 1996) and indicate that web-based platforms operate more effectively (Lockyer, Patterson & Harper, 2001). Of increasing interest are Western management and administration developments and changes, which are considered to offer some help for eLearning strategic orientations in Thai universities (Taguma, 2006).

These changes together promote the more engaged learner-centred pedagogy that is deemed appropriate today. However, while the use of ICT across educational institutions has been established, integration into the teaching and learning process has been slow (Harrison *et al*; 2002).

QUALITY IN LEARNING

Since the mid-1980's public concern about quality in higher education has been increasing (Green, 1994). Pounder (1999) and James (2005) argue that quality is an ambiguous term to define. However, quality is often defined as *fitness for purpose* (Deming, 1986) and relates to the needs of the user/customer; *Fitness for use* (Juran, 1988), which indicates that quality depends upon a subject's view of what is the purpose of that phenomenon; and a useful view is Crosby's *conformance to requirements* (Crosby, 1979). However, in higher education the customer is not always easily identified and is easily masked behind a myriad of influences such as parents, students, administrators, teachers, government and employers - to name a few. Quality, thus, is a pervasive value judgement interpreted by different stakeholders whose influence depends on relative power functions. For example, using Juran's notion of quality would mean that for Thai universities the educational product must fit the purpose of these stakeholders but would be specifically targeted to students and employer requirements. Further, university learning outcomes must be regarded as cost-efficient relative to other types of educational provision and also that it gives a sufficient return on investment, i.e. that the company and the employee is better off not only after the learning change – but also taking into consideration the financial costs and time invested.

Quality management offers a means by which educational organisations can help to positively develop mechanisms surrounding employee participation, lecturer/student satisfaction and, possibly just as importantly, educational competitiveness. It is from this basis that pressures to introduce flexible learning practices appear to have become more prevalent - not specifically to target an enriched learning environment, but to provide a more efficient use of resources. Consequently, interest in these learning practice developments seem to have grown out of this quality management orientation. In this way, quality management may be seen as associated with the drive towards the trend of developing the use of more flexible approaches to the provision of education, and the application of quality management is transforming the ways and methods in which individuals can satisfy their educational needs. This results in more scope for the student, but appears paradoxically, to put more pressure on the educational system to deliver. Quality management practices may be seen as becoming more important in the application of managerial features of operational eLearning requirements of educational institutions and providing more effective eLearning practices and outcomes for both staff and students.

QUALITY IN ELEARNING

According to the European Commission (2001), eLearning is defined as t*he use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration*. There would appear to be a number of eLearning quality models

developed in the last 10 years. For example, Fry (2000) suggested that eLearning was the *delivery of training and education via networked interactivity and a range of other knowledge collection and distribution technologies*. Ehlers (2004) argues that as learners learn for themselves, then ICT and eLearning is a supportive necessity. Quality in eLearning cannot wholly or uniquely be defined as there are too many parameters affecting the perceptions of its meaning (James, 2005). Consequently, quality practices in Thai universities need to be revised and updated as eLearning developments progress.

Emerging issues in eLearning implementation

eLearning is another way of teaching and learning as it comprises instructions delivered through all electronic media including the internet, intranets, extranets, satellite broadcasts, audio/video tapes, interactive TV and CD-ROMs (Govindasamy, 2002). It facilitates access to knowledge that is relevant and useful. eLearning involves the delivery of education and training to *anyone, anytime and anywhere*. It is a technology that takes the classroom to geographically distinct and separate environments.

The development and delivery of eLearning is underpinned by a desire to solve appropriate learning, teaching, technology and delivery performance problems. The successful outcome of eLearning depends on how learning is designed to take place online, that is, the underlying pedagogy and the real value of eLearning lies in the ability of educational managers to deploy its useful characteristics to educate the right people to gain the right knowledge and skills at the right time. In this respect, not everyone is suited for good eLearning experiences and any positive outcomes.

The successful implementation of eLearning depends on the adherence to underlying pedagogical principles that are embedded in the eLearning experiences. But as the technology changes, so does the pedagogy. Though these principles apply to both the eLearning and the traditional classroom delivery methods, they are yet to be included effectively within the former (Bixler and Spotts, 2000). These pedagogical principles should form the basis for inclusion of features in eLearning management systems.

The availability of strong institutional support is crucial for eLearning deployment and success (Zhang, 2007). The changing roles of staff must be recognised and acknowledged. Support strategies must be developed for management of the transformation processes. Standards must be set and applied consistently. Although the teaching and learning process encourages a flexible and independent approach to knowledge acquisition, the notion of student support is markedly different from the traditional method. Students learn as a result of interaction with programmed instructional systems that have been long thought out and automated in some instances. Assessment reinforces the learning approach a student adopts and is an indispensable part of teaching and learning. Evaluation and assessment of learning should be based on higher order thinking skills, so that students may adopt a deeper holistic approach to eLearning (Twomey, 1996), rather than a fragmented oscillating perception related to traditional knowledge delivery and development.

Consequently, given the above, the main purpose of this study is to investigate the quality perceptions of lecturing staff affecting eLearning strategy development in a Thai university.

METHODOLOGY

An on-line synchronous web-based survey using a self-administered questionnaire was used to collect data in this study (Kehoe & Pitkow, 1996). Web-based surveys are becoming increasingly common (Lazar & Preece, 1999) and thus it is anticipated that this method would be accepted by respondents. This follows the work of Sheehan & Hoy (1999) and Weible & Wallace (1998) as ICT provided an inexpensive procedure for conducting online surveys instead of through the postal mail and had the ability to be fast and efficient. The on-line survey was made available over 30 days with pop-up boxes (based on Comley, 2000) for the survey rationale, strategy and process when each staff member logged into their respective university on-line accounts. The target segment was all postgraduate lecturers conducting teaching assignments on all international masters' programmes available in the first semester 2007. The survey was supplemented with data resulting from an assessment of appropriate freely available documents located on the university web-site (in English).

The number of lecturers exposed to the pop-up boxes accounted for 90% of the target segment for the survey – 28/31 in total. Three did not use their university account and were discounted from the survey target. The survey responses (22 – 78.6%) were automatically verified and stored using database technology. Privacy issues were reduced to a minimum as the data collected was not made available except to the researcher and further no individual data stream could be directly interrogated or related back to any individual responding because of secure connection technology and encrypted page responses.

Framework of the Web-survey

The outline of the framework for this study is shown in Figure 1 below.

Figure 1 - Research Framework

The framework consists of six major components, namely University Strategy; University ICT Provision; Programme Delivery and Performance; Funding, University ICT Support; and Collaboration. The issues raised from the literature forming the basis for this framework is set out in Table 1, below.

Component and Example Question	Literature
University Strategy How effective is the present university strategy for utilising eLearning?	Daugherty and Funke (1998) Visscher (1996) Chen and Hsiang (2007) Latchem and Hanna (2001) Kohli and Devaraj (2004)
University ICT Provision How widespread is the available ICT provision at this university?	Davis (1989) Legris et al. (2003) Laurillard (1993)
Programme Delivery and Performance In what ways do the university ICT provision affect your ability to engage in eLearning practices at this university?	Fabry and Higgs (1997) Rovai and Barnum (2003) Little (2001); Hong (2002) Joint (2003) Chen and Hsiang (2007) Law et al., (2000) Goldstein (1997) Preston et al. (2000) Volery and Lord (2000) Agarwal & Karahanna, (2000)
Funding/Costs What funding arrangements are you aware of that affect ICT developments at this university?	Inglis (1999) Mayadas, 2001
University ICT Support How effective is the ICT support mechanisms at this university?	Visscher and Wild (1997) Mitev and March (1998) Lo et al. (1999) Pelgrum & Anderson (1999)
Collaboration What collaboration efforts are undertaken at this university to enhance your eLearning experiences?	Adam (2001) Middlehurst (2002)

Table 1 - Research Literature

Profile of the 22 respondents Full-time - 34%; Aged between 24 – 50 - 78%; Older than 51 – 22%; Female: 57%. Highest level of Education – PhDs – 56%; Masters - 40%; Undergraduate – 4%.

Lecturer Perceptions of the Quality of ICT and Elearning Developments

University Strategy

The university does not appear to have an integrated singular strategy for eLearning or a published strategic institutional policy for eLearning. However, the university develops a concentrated and specific eLearning process that seeks to exploit eLearning and it's supporting ICT to enhance a skills-based provision. The university appeared to attempt to encourage the use of eLearning to deliver and promote engagement on selected courses only – those courses specifically directed at skills development or the work-place. This was based on the evidence of eLearning courses solely targeted to software or language skills orientations. The main outcomes of this research strongly supports the thesis that the broader strategic eLearning environment (e.g. organisational) determines whether or not ICT developments will be successful and ultimately provide effectively for learner needs (Papp, 2000). In this respect, this influence does not take the university beyond level six in terms of Hanna's (1998) seven strategic models (7 being the lowest developmental setup). Further, this study also confirms Fullan's (2005) more recent exposition on the importance of connecting ICT policy development with capability and capacity building as a strategy to sustain changing international pedagogic needs. Here, the university fails in its exercise of strategic intent through the lack of public policy development.

University ICT Provision

The level of use of eLearning technologies in programme delivery and consequent student interaction appears to be poor. The research outcome indicates that across the normal graduate curriculum only 8% of the programmes have some form of ICT involvement – and 95% of eLearning provision has no involvement beyond e-mail or digital lecture presentations. The university currently offers online services for only 11.9% of the 42 courses made available on the university web-site. Only 14.3% of the specific programmes made available portrays an approach to eLearning practices and these do not have any strategic management involvement as they are offered by a small department of the computer centre. However, the university claimed that they seek to develop the provision of both blended programmes and to develop fully online eLearning environments in the near future. This suggests that the university could adopt a partial-blended approach to eLearning for some programmes offered (Hanna, 1998) - which involves the integration of eLearning with traditional media and methods in line with course content, level and students. But this development was not widespread, nor was it in-depth. Neither was this seen by many lecturers as a useful development (59.1%) because of the lack of expertise available for giving advice and for linking the system to staff, students and the classroom. However, some staff (45.4%) presume themselves to be *native* ICT capable (Prensky, 2001), are younger than 30 years of age and take ICT 'for granted' suggesting that given the opportunity their engagement in eLearning practices is assured. However, a perceived weakness is in the linking to university-wide management information and administrative systems (77.2%), which is vital for universities to manage ICT and its consequent change (Bates, 2000). Thus, the university-wide system is not effectively integrated into the learning sphere and this has created increasing pressures on the university quality system to deliver.

Programme Delivery and Performance

Presently, no lecturer has the task or responsibility to provide full on-line access for postgraduate programmes, but can access specialised self-study teaching modules. Most lecturers (72.7%) appeared to believe that these were supplemental to the courses provided; and were also considered as lacking in critically focused learning (77.2%) as these programmes were not part of the normal on-going assessment process – especially during pre-MBA entry. This diametrically conflicts with the findings of Strother (2002) where eLearning was found to be the preferred mode of learning of [modern] teachers.

When considering staff skills and access to ICT, the university's ability to provide access and produce electronic resources, and the extent to which eLearning is deployed have not been well utilised (63.63%). Blended-learning activity appeared to have become more widespread but localised (27.3%), seemingly at the expense of the use of ICT in traditional courses (54.5%) and often seen as a support mechanism (45.4%) outside scheduled programmes and lessons. This may be due to a redefinition or retrenchment of some pedagogic activities (27.3%), as blended-learning can be more readily backwards-converted into more traditional learning events. Specialised software companies have contributed to helping the university deliver remote learning programmes (68.2%).

The research has identified that there is no common eLearning model in use throughout the graduate school. The university is using ICT and eLearning practices in very different ways across all teaching areas and to varying extents. However, when using eLearning, the dominant model the university expects to use is a low-level 'blended' approach, combining ICT and traditional methods to deliver classroom learning after Hanna (1998). In this respect, lecturers reported that delivery practices beyond simple e-mail and downloading may be perceived

as difficult (45.4%). Further, the most commonly advised were traditional models of student development based on close *delivery* of technical skills to students (72.3%), which current research suggests is not the most effective approach for the development of important eLearning outcomes (Hiebert, Gallimore, & Stigler, 2002). However, these also raise some concerns as Reeves et al. (2004) suggests that cursory developments in eLearning do little to help change the university delivery pattern from the standard lecture format – meaning short-term eLearning developments rarely create the catalyst for wider eLearning approaches that persist.

There were considerable differences between lecturers in relation to their approach and knowledge of ICT and consequent any pedagogic implications for eLearning developments. For example, some lecturers have either not considered eLearning yet (68.2%) or have considered it but not taken it forward (13.6%) and thus engage rather passively in eLearning developments. Various reasons were advanced such as the lack of ICT skills available (18.2%), but the most prevalent reason was the perceived complexity of eLearning development (77.3%) and that students may not be trained effectively to handle the new eLearning requirements (50%). However, these findings also corroborate the outcomes of Maki and Maki (2002) suggesting that the computer-based instruction was not as useful as the traditional format and in this respect blending processes may not be considered by many as necessary in the short-term at this university.

Where eLearning was used in the university, the most commonly used eLearning activities were the online delivery of specialist software driven course materials (81.8%); online management of course related literature (77.3%); bulletin/discussion boards (13.6%); online formative-assessment (4.5%); online submission of student assignments (68.2%); and student collaboration or group activities using chat methods (0.5%). This suggests that any support activities targeted at departments need to take into account the differing department eLearning contexts.

Lecturer perceived reasons for using eLearning were stated as cost-reduction (68.2%); and managing increased student numbers (18.2%); improved teaching focus and capability (45.4%); and encouragement of student-centred learning (31.8%).

Funding/Costs

No lecturer had received any funding for any developments in eLearning practices utilised and the issue of the efficacy of arrangements for effectively managing eLearning developments appears to be centralised with top managers. Bates (1999) suggests that eLearning can provide a cost-effective measure for preparing students more adequately – but the demonstrated lack of lecturer engagement with eLearning may have revealed a serious strategic cost-control issue. However, lecturers themselves control any eLearning engagement (72.7%) and therefore could have a major influence on the direction of ICT and eLearning development that pertains to their lecturing needs and subsequently to their student needs.

University ICT Support

New ICT programmes for staff along with pedagogical and technical support are continuously being developed and provided but do not engage as required by Brusilovsky (2000). Further, new staff are not publically encouraged to introduce (36.4%) or utilise (50%) eLearning practices in the classroom and as such do not seem to be pressured into changing or modifying their teaching delivery methods. The gap between lecturers' skills in their personal use of ICT and their skills in using ICT with learners has not been bridged which may reflect a lack of lecturer confidence (Trinidad, 2005) in their use of ICT in public (63.6%) or the lack of support services (72.7%). This latter aspect was a particularly important issue raised by Collis and Moonen (2001).

Collaboration

The university has established partnerships for online participation with universities - domestically and overseas. However, this appears to be in the initial development stages as few lecturers directly engage in these opportunities (81.8%) and only one lecturer reported an engagement using web-conferencing - consequently there is perhaps suitable potential to establish a 'collaborative teaching and learning community' (Bates, 2005). It would appear that the university is testing possible *low-level* future technological and pedagogic options following Bates (2001) which appear to be long-term oriented. Lecturers indicate (68.2%) that this is a slow change process resulting from inadequate strategic intent (63.6%) or unsuccessful monitoring processes (36.4%). Table 2, below, indicates the outcomes from the research.

Component	Confirms	Not Confirmed
University Strategy	Hanna (1998); Fullan (2005)	
University ICT Provision	Latchem and Hanna (2001); Pergrum & Anderson (1999)	
Programme Delivery and Performance	Hiebert, Gallimore, & Stigler (2002); Papp (2000); Hanna (1998); Maki and Maki (2002)	Strother (2002)
Funding/Costs	Whitty et al. (1998)	Mayadas (2001); Guri-Rosenblit (2001b)
University ICT Support	Bates (2001)	Collis and Moonen (2001)
Collaboration	Kaufman (1991); Enders and Fulton (2002)	

Table 2 - Research Outcomes

CONCLUSION

eLearning and the use of ICT has a key role to play in Thailand higher education in helping to shape university leadership, teaching and learning, the curriculum, assessment, and collaborative working practices involving lecturers/students and other universities. Some online learning courses have begun testing the feasibility of online teaching and assessment and exploring the potential of eLearning to extend and utilise educational programmes for students. These issues raise questions on how the university could meet the growing need to balance learning and quality practices through an extended university-wide pedagogic provision using ICT resulting in more effective eLearning provision. The findings of this small-scale study corroborate the outcomes of Collis and van der Wende (2002) in that *change in relation to the use of ICT has been gradual and unsystematic* which in practice reflects a combination of specific environmental parameters such as strategic intent and financial feasibility.

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ACTION RESEARCH: AN APPROACH FOR THE TEACHERS IN HIGHER EDUCATION

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ABSTRACT
Introduction: Action Research is a formative study of progress commonly practiced by teachers in schools. Basically an action research is a spiral process that includes problem investigation, taking action & fact-finding about the result of action. It enables a teacher to adopt/craft most appropriate strategy within its own teaching environment.
Objective: The objective of present work is to study the effectiveness & advantage of Action Research at higher education level. Bio-Statistics taken as difficult, dry & non-interesting subjects by most of the biological sciences students was selected for the study.
Methodology: Practical Action Research (one of its mode) was chosen as a scheme of study to address the major problems of these students. Beginning the cycle of Action research, students views were collected & main problem areas was identified. Within our educational environment, solutions (Actions) were implicated & results were evaluated periodically. Each time modifications were made by symmetrical communication to students without any attempt to direct the outcome of deliberate process.
Results: The students' response in form of behavior & class room assessments showed a positive change in their interest & understanding of the subject.
Conclusion: The study concluded that at all educational levels, Action Research can be adopted to improve the teaching/learning outcomes & should also be practiced by university teachers as important educational strategy.
Key Words: Formative Study, Action Research, Practical Action Research

INTRODUCTION

Historical Background: The origins of Action Research (AR) are unclear in the literature but generally Kurt Lewin is considered the 'father' of AR (Kemmis & McTaggert, 1990; Zuber-Skerrit, 1992 & Holter & Schwartz-Barcott, 1993), who first coined the term, in his paper about Minority Problems (Kurt, 1946). Its function in educational system began with the Science in Education Movement of late nineteenth century in which scientific method was applied to education (Masters, 1995) followed by the UK originated Teacher-Researcher Movement advocating that all teaching should be based upon research (McKernan, 1991).

By the mid 1970s, it was discussed as a separate field of research and four major types were reported including: 1) Traditional: that was applied WITHIN organizations in the areas of Organization Development, Quality of Working Life (QWL), Socio-technical systems (e.g., Information Systems), and Organizational Democracy. This traditional approach tends toward the conservative, generally maintaining the status quo with regards to organizational power structures. 2) Contextual: that encompasses relations BETWEEN organizations. It stresses that participants act as project designers and co-researchers. The concept of organizational ecology and the use of search conferences come out of contextual action research. 3) Radical: it has a strong focus on emancipation and the overcoming of power imbalances. 4) Educational Traditional Action Research: A fourth stream, that of Educational Action Research, has its foundations in the writings of John Dewey, the great American educational philosopher of the 1920s and 30s, who believed that professional educators should become involved in community problem-solving. Its practitioners, not surprisingly, operate mainly out of educational institutions, and focus on development of curriculum, professional development, and applying learning in a social context. It is often the case that university-based action researchers work with primary and secondary school teachers and students on community projects (O'Brien, 2001). Initially AR was limited to school settings and practiced by teachers to observe the effect of any teaching strategy modification on focused students or to incorporate progressive changes in the syllabus taking all stakeholders but owing to its flexibility and more practical approach, now it has been experimented at all levels of professional & formal education.

Basic Concept: "Action research...aims to contribute both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously. Thus, there is a dual commitment in action research to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction. Accomplishing this twin goal requires the active collaboration of researcher and client, and thus it stresses the importance of co-learning as a primary aspect of the research process" (Thomas *et. al*., 1986) AR is a formative study of progress that is simply "Learning by Doing". Scientifically, it can be described as a systematic inquiry that is collective, collaborative, self-reflective and

undertaken by participants (students, teacher, colleagues or any other stakeholder) in an educational situation in order to improve the rationality of their own educational practices, as well as their understanding of these practices and the situations in which theses practices are carried out, with an aim to contribute to the practical concerns of immediate problematic state, being limited in available resources in accordance with typical classroom circumstances (modified from McCutcheon & Jurg, 1990; Kemmis & McTaggert, 1990 & Rapoport, 1970).

Core Components: There are many ways in which AR can be practiced in a particular setting. It is a cyclical process that never ends but always provides a conclusion with more ideas to bring upon progress and improvement. Whatever the settings and participants are, usually it has been carried out into four consecutive phases.

Fig.1 shows a simple model of the cyclical nature of the typical AR process, each cycle has four steps: Plan, Act, Observe, Reflect (Dan, 1995).

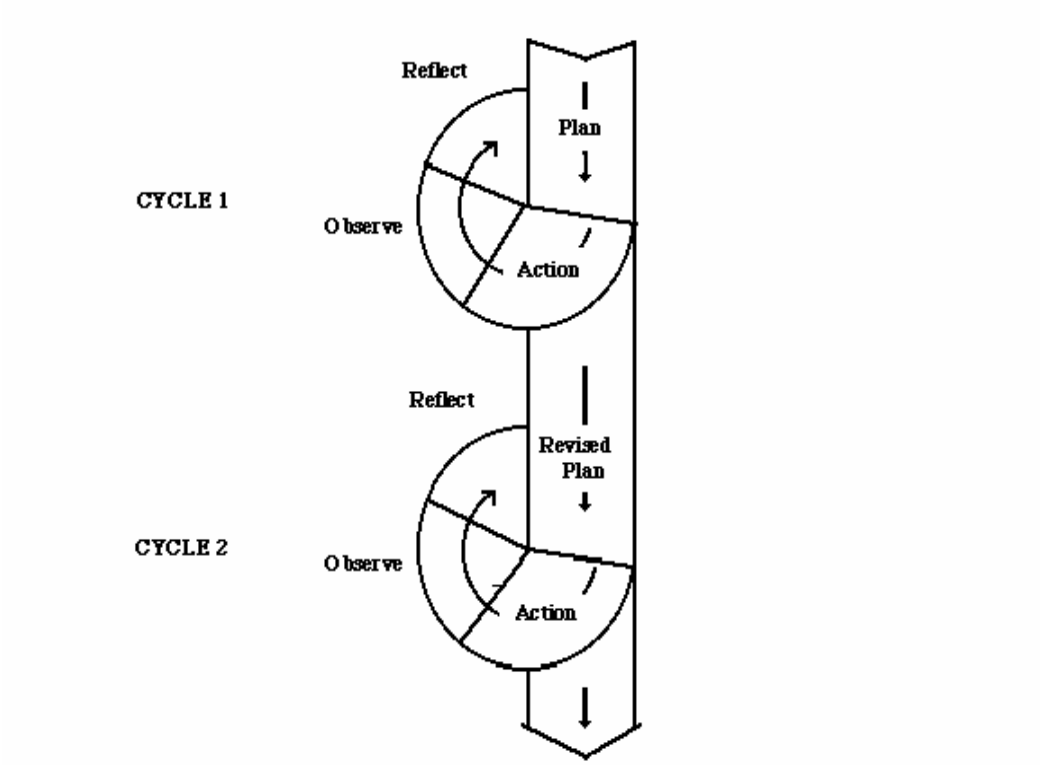

Figure 1: Simple Action Research Model (from Dan MacIsaac, 1995)

Gerald Susman (1983) gives a somewhat more elaborate listing. He distinguishes five phases to be conducted within each research cycle (Fig. 2).

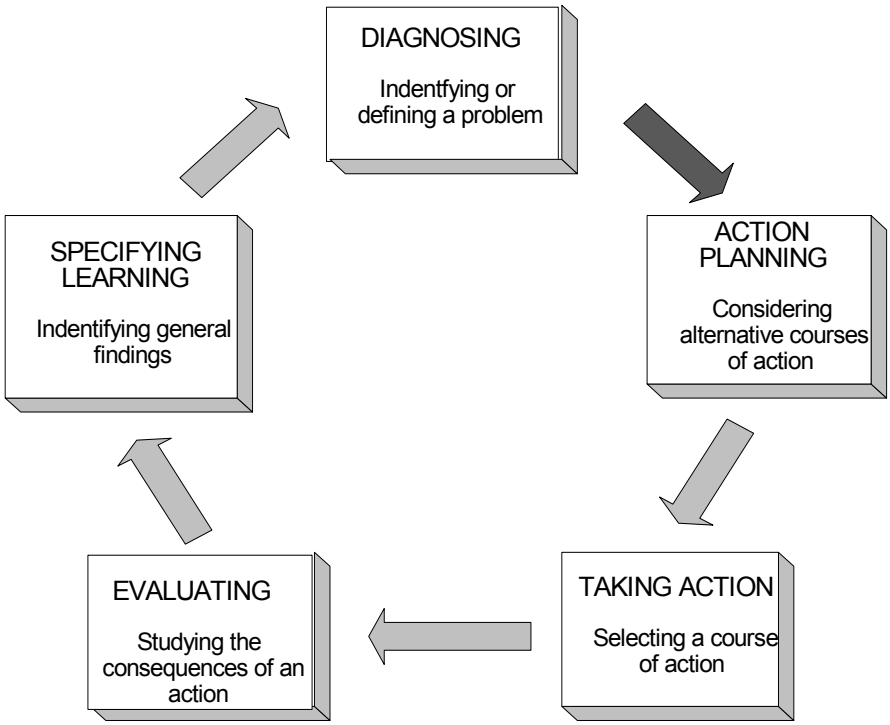

Figure 2: Detailed Action Research Model (Adapted From Gerald Susman, 1983).

Initially, a problem is identified. This is followed by a collective postulation of several possible solutions, from which a single plan of action emerges and is implemented. Data on the results of the intervention are collected and analyzed, and the findings are interpreted in light of how successful the action has been. At this point, the problem is re-assessed and the process begins another cycle. This process continues until the problem is resolved. (Gerald, 1983 & McKay, 1992).

Principles: What gives action research its unique position is the set of principles that guide the research. Richard (1989) provides a comprehensive general overview of six key principles. These can be considered in any of the educational settings.

1) *Reflexive critique:* An account of a situation, such as notes, transcripts or official documents, will make implicit claims to be authoritative, i.e., it implies that it is factual and true. The principle of reflective critique ensures people reflect on issues and processes and make explicit the interpretations, biases, assumptions and concerns upon which judgments are made. In this way, practical accounts can give rise to theoretical considerations.
2) *Dialectical critique:* Reality is consensually validated, which is to say it is shared through language. Phenomena are conceptualized in dialogue; therefore a dialectical critique is required to understand the set of relationships both between the phenomenon and its context, and between the elements constituting the phenomenon. The key elements to focus attention on are those constituent elements that are unstable, or in opposition to one another. These are the ones that are most likely to create changes.
3) *Collaborative Resource:* Participants in an action research project are co-researchers. The principle of collaborative resource presupposes that each person's ideas are equally significant as potential resources for creating interpretive categories of analysis, negotiated among the participants.
4) *Risk:* The change process potentially threatens all previously established ways of doing things, thus creating fears among the practitioners. One of the more prominent fears comes from the risk to ego stemming from open discussion of one's interpretations, ideas, and judgments. Initiators of action research will use this principle to allay others' fears and invite participation by pointing out that they, too, will be subject to the same process, and that whatever the outcome, learning will take place.
5) *Plural Structure:* The nature of the research embodies a multiplicity of views, commentaries and critiques, leading to multiple possible actions and interpretations. This means that there will be many accounts made explicit, with commentaries on their contradictions, and a range of options for action presented. A report, therefore, acts as a support for ongoing discussion among collaborators, rather than a final conclusion of fact.

6) *Theory, Practice, and Transformation:* For action researchers, theory informs practice, practice refines theory, in a continuous transformation. In any setting, people's actions are based on implicitly held assumptions, theories and hypotheses, and with every observed result, theoretical knowledge is enhanced. The ensuing practical applications that follow are subjected to further analysis, in a transformative cycle that continuously alternates emphasis between theory and practice.

Classification: In literature, many researchers have discussed different types of AR. Kemmis & McTaggert (1988) describe it as Technical, Practical (participatory) & Emancipatory. Holter & Schwartz-Barcott (1993) also explain three types: Technical collaborative, Mutual collaborative & enhancement approach. While McKernan (1991) also list three modes of AR: Scientific - technical, Practical – deliberative & Critical – emancipatory. Emily (1993) describes three other modes: Teacher researcher, Collaborative research & School-wide action research. But all modes are more or less interchangeable with similar basic objective of AR.

Practical Action Research: In the present study, Practical Action Research (PAR) mode has been carried out at the university level. It is described with many other names in literature including: participatory AR, Collaborative AR, Action learning etc (O'Brien, 2001). It focuses on improving learning by means of a self-reflecting process, exploring & solving problems (McNiff, 1988). It follows the typical spiral of AR (Mash & Meulenberg-Buskens, 2001) as shown in Figure-2. The researcher (teacher) becomes essentially facilitator or catalyst, and participants (students in this study) become co-learners in PAR; nobody is considered the expert (Walker, 1993). PAR is subjective and therefore not always neutral (Schensul, 1999). PAR requires mutual respect, adaptability, humility, trust & holistic approach to problem solving (Brydon-Miller, 1997).

BACKGROUND OF THE STUDY

The educational action research has been sub-classified into three broad categories which are teacher research, collaborative research and school-wide action research on the basis of major objective, settings, interested audience and impact (Emily, 1993)

The teacher research is focused to bring changes in a single classroom to support the individuals. The results are important for individual teacher and the impact of the study may or may not reach beyond the classroom.

The collaborative research is conducted to cause positive changes in one or more classrooms, levels, team or department to support university, educational service, agency etc. two or more educators are concerned with results and impact extends to grade level or department that reveals potential for partnerships.

On the other side the school-wide action research is focused at school improvement and student learning area of collective interest, supported by school leadership and external agencies or groups. The entire school community is the audience for result and it has the vast impact that gives potential to restructure and change the school.

Apparently the educational practical research has three discrete classes proposed for specific institutional level and need. But for the sake of practical approach, one would find them appropriate for all grades, levels and institutes without any markable distinction. A student in the university classroom may need special attention as a child in school or a dry, difficult, complex text may cause problems of understanding or need modification in the teaching strategy at any level.

The traditional educational research methodologies usually remain unsuccessful when mature students come up with hurdles in studies owing to their limitations as their conclusions are based upon a certain environment which may not be true for the focused group. Secondly the young adults are quite able to propose the solutions for their difficulties and if these are brought into practice they follow and respond it pleasantly. So dealing with the higher level students action research is a good choice which is flexible and modifiable as per situation, hurdles and resources, specially when the students are given importance and they are allowed to not only highlight the barrier but also asked them to coin a possible resolution. This type of AR where every one is supposed to be research participant and equally honored is referred as Participatory Action Research (PAR).

It has been a continuous finding for many years that students who enter the department of Physiology (a subject of Biological Sciences) feel uneasy in the class of Biostatistics. These students are having poor back ground knowledge and for most of them, it's the first exposure to the subject. More over being the students of biological sciences, they are usually weak in mathematical concepts & calculations. And if they are satisfactory with the simple calculations they find difficult to draw conclusions and inferences. Simply to have mathematics again after a break of about four years horrifies them. These factors collectively cause a fear about the subject and they take it a punishment inspite of understanding its usefulness. Even good students of the class do not perform

well. On the basis of previous sessions experiences, problems faced by most of the former pupils along with their remedies are discussed with the students in the introductory class but still the outcome objectives are not fully achieved. So we planned to practice PAR to identify the problems to get their immediately practicable solution compatible with the class construction and environment.

PAR has been used in school settings since long. Currently some universities have initiated research projects regarding teaching strategies based on Action Research. In this connection, the presented work was conducted to evaluate effectiveness of PAR as teaching approach at higher education level.

The objective of present study is to assess the efficacy, advantage and viability of Action Research at higher education level as a part of teaching plan to improve the students learning.

Owing to the salient features of PAR that include mutual respect, adaptability, humility, trust & holistic approach (Brydon-Miller, 1997) with a focal point of improving learning by means of a self-reflecting process, exploring & solving problems (McNiff, 1988), it is hypothesized that it may be proven a good approach to address the learning problems observed in a university classroom.

METHODOLOGY

A total of 45 students from B. Sc. (Honors) – III year took part in the study while studying the course of Bio-Statistics. It was discussed with them in detail the concept and objective of PAR. They are invited to become the part of study and to contribute through ideas sharing for a better outcome. Everyone was told to take himself as a co-investigator and motive for a positive change. Young students happily agreed to take part in the study in which they were the identical partner. Class performance was chosen as criteria to assess the gradual transformation and samples were collected in form of class observation, students' responses collected on a proforma, assignments and class tests.

In the initial classes, students' views about the subject were openly taken. Their misperception of considering it maths was corrected. The significance of subject in future studies especially with respect to the research point of view was explained them. To make it more charming, carriers associated with it were also described. Then the formal textual study began. They easily understood the basic concepts, terminologies & definitions. The advancement to descriptive statistics caused a clear change in class response. Here at this point, first PAR cycle was practiced following all its phases as shown in Table-1 (Adapted from Kemmis & McTaggert 1988).

MOMENT	WHAT'S HAPPENING
OBSERVATION	With the start of Descriptive Bio-Statistics, it was observed that students are losing their attention in the class. When ever a problem was given to solve, they took long time as just to pass the period. Although, home assignments were submitted regularly.
DIAGNOSIS	In the other class, teacher expressed her previous observations frankly with the students & asked them to commit about the situation. They pointed out many areas of problem but the common findings were; i. forgot the formula, ii. Knew the formula but unable to apply correctly & most important iii. The assignments were the efforts of a single group (studied the subject previously) offered to all class.
ACTION PLANNING	Students were asked to propose as many solutions as they can. Different approaches came up for instance rote formulas, write them daily, arrange a separate test, surprise description on board by students etc.
ACTION	All above solutions fulfilled only one requirement i.e. to know formula but how to use it? Finally it was decided & mutually accepted that everyone would write daily discussed formula at the end of note book with two clues "where & how to use". She would recall them each time before opening her note book so mistakes if any could be corrected. Plus everybody would look for more relevant examples & would share with others. Simultaneously, they promised not to cheat themselves again by mere cheating, but to remove their queries & confusions by group discussion or by teacher consultation.
EVALUATION	To evaluate the effectiveness of our solution, assignments were given. This time mistakes were less & not common. That showed, all students were keeping their promise and cooperating. With more varied exemplification, they understood the concept well.
LEARNING	The developing interest reflected that if students are involved in decision making about their ongoing teaching strategy, their learning improved more than anticipated.

Table 1: The PAR Moments by Method (From Kemmis & McTaggert 1988).

OBSERVATIONS

Till the end of chapter, they were doing well with respect to home assignments, class questioning & classroom practice question solving. They appreciated the ACTION and followed it. In the mid of semester, an announced class test was conducted to collect data about their performance. The results were not satisfactory (Fig. 3) and did not reflect their active class performance.

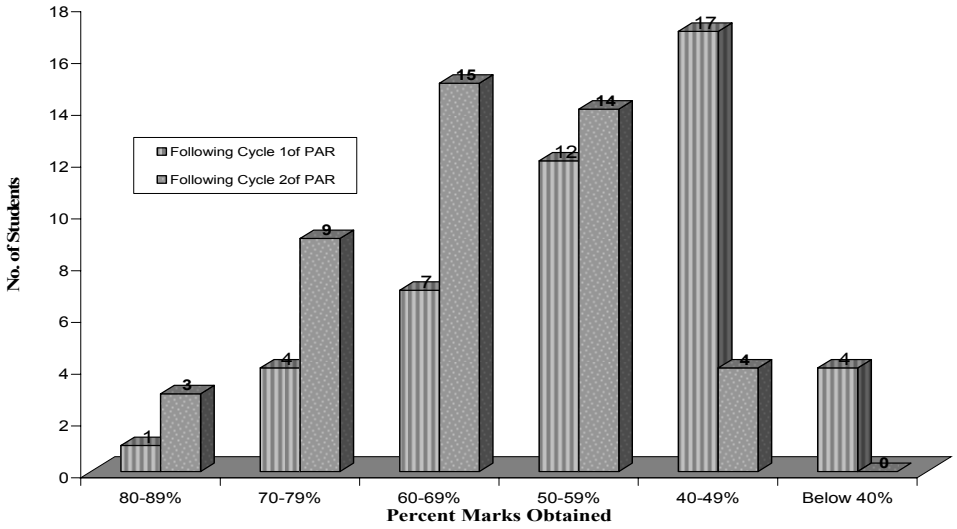

Figure 3: Comparison of Percent Test Marks Obtained by Students following Two Cycles of PAR

With this finding that still there is some problem in the process of learning, the second cycle of PAR was done. Again all phases of spiral were re-practiced. With identification of new problem area, modified or fresh solutions were crafted. Feed back was collected in shape of class test once again that depicted an improvement in the outcomes but still not excellence (Table 2).

Categories of Marks Percentage	Percent of Students Following Cycle 1of PAR (%)	Percent of Students Following Cycle 2 of PAR(%)	Improvement (%)
80-89	2	7	5
70-79	9	20	11
60-69	16	33	17
50-59	27	31	4
40-49	38	9	29
Below 40	9	0	9

Table 2: Effect of Action Research Cycles on Performance of Students as Measured in Form of Class Tests (N=45)

Again a new cycle would be ideal to do but limited time period of semester did not allow it.

FINDINGS AND RESULTS

The purpose of this article is to illustrate how PAR can be used in a university classroom at short level in restricted time period. The students feel pleasure when they are involved in modifications of the teaching & learning strategies. In fact, it works as a strong motive that stimulates students not only to work out the weaknesses and hurdles in the two way process of knowledge impartment but also to look for the appropriate solution. Fig. 3 elaborates its effect on their performance with progression of PAR. The student distribution in the Fig. 3 does not follow the normal distribution. It may be because of class construction or owing to small sample size. As normality increases with the sample size.

On the teacher's side, PAR practice is helpful in two ways. Firstly, it produces knowledge and action directly useful to the group of pupil in a classroom environment with its own features. Secondly, it gives an idea for the teaching planning of the coming class. The problems faced by current students and adopted solutions can be incorporated in next plan.

DISCUSSION

AR is an excellent approach to use in educational system. AR conducted in a classroom provides an accurate insight into pattern of student response and teaching strategies over the entire teaching session, not just a matter of days or two. It seeks to answer questions and solve problems that arise from the daily life of the classroom and to put findings into immediate practice (McKay, 1992 & Twine & Martinek, 1992). It is suitable because of its characteristics: systematic inquiry, reflexivity & focus on the practical as identified by McCutcheon & Jurg (1990). Usually it is driven by the practitioner's desire to improve its own practice with respect to a specific set of students, thus students reap immediate benefits (Williamson, 1992).

Several terms with a little variations on theme are encountered in education literature including: teacher research, teacher-as-scholar, interactive research, practical inquiry, classroom inquiry and practice-centered inquiry (Downhower et al, 1990 & Williamson, 1992). Similarly various modes with the variation in the situations have been discussed.

Among all of its modes, PAR is most appropriate for a university classroom as it involves the mutual collaboration to understand problem and its immediate solution (Holter et al, 1993). Its three primary features: collaboration, mutual education and acting on results developed from basic questions which are relevant to situation, as reported by (Macaulay et al, 1999) make it more reliable. It fosters the development of knowledge by emphasizing the part played by personal judgments in decisions to act for good. PAR is also based on mutually respectful partnership between researcher and students. Ideally, everyone is a co-researcher and should produce input at all levels of research (Mash, 2001).

A side from improvement in students performance (the main objective), they learnt other skills for instance to think about their main problem, to accept their weaknesses, to work out a good practical solution, to review their performance gradually, above of all to present their opinions in a discrete way with logic & to bear criticism. Through open discussion in the class, they learnt the manners to speak in a gathering.

PAR produced a good impact on the class environment and students' opinion about the subject. They enjoyed the strategy of PAR, known by their views collected at the end of semester through a questionnaire.

The PAR is a different approach from conventional research methodologies as it is more flexible. Here the supervisor is only facilitator not the governor. It involves every student in the process of progress. So, every modification in the plan of study is mutually accepted and acknowledged. The various assessment approaches like formative assessment, group discussions, mini projects, counseling and feed back proforma are the tools that help AR. All these approaches only guide to recognize the problematic area but do not offer any remedy for it. On the other side PAR is a sequential plan that not only highlights the bottom line error but also provide a chance to assess the effectiveness of the modification. It can be repeated as many time as possible.

Aside to the fore-mentioned benefits, the approach has its limitations. While involving the young students in such activities, the facilitator has to be very careful to drive the discussion in the right direction, to maintain the healthy class environment where everyone listens other, everyone tolerates others comments calmly and to generate feeling of respect for all. He has to make sure the participation by every student either verbally of in writing. From many of the solutions offered by students, he has to decide opt the appropriate one with some necessary modifications so it could be acceptable for all.

In addition to this, some of the following difficulties that interfere in the evaluation process cannot be ignored. The process requires extensive time in a closely scheduled semester. With consuming more times in discussions & class evaluation (through test, questioning, assignments), the coverage of syllabus became difficult. Teacher had to utilize extra time in students' assessment & data analysis. But these difficulties can be overcome by assigning separate time for such activities or by working out free hours after discussion with students.

The study has its own limitations. It was shared with a small group of students as a pilot project. Its impact can be enhanced by the involvement of other colleagues and expanding it towards the other subjects both theories and labs.

CONCLUSION

PAR is very applicable at higher levels of education. The principles of PAR such as mutual collaboration, reciprocal respect, co-learning and acting on results from the enquiry are all essential in the teacher-student relationship. Designing of PAR projects at departmental level, will help to enhance the learning outcomes progressively.

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AN INVESTIGATION OF PRIMARY SCHOOL SCIENCE TEACHERS' USE OF COMPUTER APPLICATIONS

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ABSTRACT
This study investigated the level and frequency of science teachers' use of computer applications as an instructional tool in the classroom. The manner and frequency of science teachers' use of computer, their perceptions about integration of computer applications, and other factors contributed to changes in their computer literacy are investigated in this study. 63 primary school science teachers from the Northwestern part of Turkey participated in this study. A survey was administered to teachers. Results demonstrated that improving the computer literacy of science teachers seems to increase science teachers' computer use and consequently increase their integration of computer applications as an instructional tool. Internet, email, and educational software CDs found to have high percentage in teachers' use of computer applications in the classrooms. Also, the results indicated gender difference exists between science teachers' integration of computer applications as an instructional tool.

Key Words: Computer Literacy, Integration of Technology, Science Education

INTRODUCTION

Research explicitly reports that science education and computer technology created a meaningful partnership over the century (Flick, & Bell, 2000). The introduction of computer technology took place in science education as a tool for learning science content and processes and as a topic of instruction in itself (National Research Council [NRC], 1996). Computer-based instruction also influenced teacher education that many science teachers reviewed their teaching methods based on theories of student learning. The speed, flexibility, and storage capacity of computers caused science teachers to redefine the meaning of hands-on experience and re-think to teach science concepts with computers. National Science Education Standards (NRC, 1996) clearly indicated that computer-based technology should be integrated in the context of science content and science education should take advantage of the unique features of computer technologies.

Although research favors the use of computers in the classroom instruction, many studies showed that computer technologies are not used efficiently by the majority of teachers (Pepper, 1999; Abdal-Haqq, 1995). Thomas (2001) argues that still little is known about the computer use in science classrooms and its effects on students' learning. Teachers' lack of training and limited access to technology are the main reasons for the low level of computer use in classrooms (Bosh & Cardinale, 1993; Topp, Mortensen, & Grandgenett, 1995). Okinaka (1992) found that teachers are aware of the complexity of computers and when it comes to teach a subject with the computer, many teachers feel uncomfortable. Additionally, Dexter, Anderson, & Becker (1999), in their study with 47 teachers from twenty K -12 schools across the three states, found that teachers must have opportunities to construct pedagogical knowledge in a supportive environment in order for teachers to implement computer technology in instruction. Teachers indicated computers helped them to change but teachers did not acknowledge computer as the cause of the change. On the other hand, Kinzie & Delcourt (1991) found that teachers who use computer technology more efficiently are more likely to be a model for the students, helping students to produce positive attitudes toward the computers.

Results of Halpin (1999)'s study on 73 preservice teachers indicated that the integration of computer literacy in method courses provided prospective teachers confidence to transfer their computer skills into their classrooms based on their own explanatory experiences. Moreover, Guha (2000), in her qualitative study with 10 elementary teachers, found that teachers wanted to be competent in using computers and instruction as they could see positive changes in teaching strategies as a result of using this technology. In addition, over the past decade there has been a great deal of research into gender and science. Studies have indicated that gender significantly influences many attributes related to computer use. Butler (2000) and Woodrow (1992) found that males have a higher degree of computer enthusiasm than do females and concluded that the lower computer confidence among females may restrain female teachers from using computers in science. There may be a certain degree of ability and understanding needed before a science teacher will be interested in using and promoting computers. Indeed,

Gos (1996) suggested that the lack of computer experience among female teachers may be a contributing factor to their passive role toward computer integration.

The literature indicates that gender has a strong impact on teachers` attitudes toward computers in science courses. Some studies suggest that male teachers tend to show slightly more favorable attitude toward computer use than do females (Dupagne, & Krendi, 1992; Ertmer, Addison, Lane, Ross, & Woods, 1999). Other studies, however, report little or no differences in teacher attitudes on the basis of gender (Koszalka, 2001; Kramer, P.E., & Lehman, 1990). In general, age appears to have an impact on attitudes toward computers, the level of knowledge about computers, and willingness to use computers.

PURPOSE OF THE STUDY

The purpose of this study was to further examine associations among science teachers' perceptions about the integration of computer applications as an instructional tool, frequency of their computer use and their level of computer literacy. The literature suggests that gender should be taken into account when examining the integration of computer applications in the instruction. Thus, science teachers' integration of computer applications as an instructional tool was compared based on the gender as a secondary purpose of the study. Based on the purposes of the study, following research questions were formulated and addressed in this study:

1. Is there a relationship between science teachers' level of computer literacy and their frequency of computer use?
2. Is there a relationship between science teachers' level of computer literacy and integration of computer applications as an instructional tool?
3. Is there a relationship between frequency of science teachers' use of computer and integration of computer applications as an instructional tool?
4. How do gender differences play a role in science teachers' integration of computer applications as an instructional tool?

METHOD

Participants

The snowball sampling was utilized to identify participants for the study. Science teachers who worked in the primary schools located in one of the Northwestern provinces of Turkey were selected to collect data. There were 153 science teachers working in the province at the time when the study conducted. Initially face-to-face meetings were arranged with science teachers and their participation to the study was sought. Science teachers were asked to locate other science teachers in the face-to-face meetings. Contact information including phone numbers, emails and mail addresses of prospective participants were obtained in the face-to-face meeting. Participation of other science teachers was sought using obtained contact information. The total of 63 science teachers agreed to participate in the study which is an acceptable sample size when the confidence level is 95% and the confidence interval is 10.

Instrument

A survey developed by Demiraslan and Usluel (2005) was adapted for the data collection in this study. This survey was used in earlier research studies and had an established content validity. The adapted survey had four sections. The first section of the survey was used to collect demographic information. The second part of the survey was used to obtain science teachers' level of using computer applications with ten questions with response categories ranging from "Never" to "Very High". The third section of the survey was used to collect information about the frequency of science teachers' use of computer applications with ten questions. The last section of the survey was used to collect information on science teachers' perceptions about the integration of computer applications as an instructional tool with six questions with response categories ranging from "Strongly Disagree" to "Strongly Agree". Numbers from 1 to 5 were assigned to the scale responses since items were worded in both directions. The survey approximately took 20 minutes to complete.

Data Collection

Surveys were delivered to 63 science teachers agreeing to participate in the study. 30% of the participants preferred to receive and complete the surveys on their schools. Surveys were delivered to and collected from these participants by visiting their schools personally. 44% of the participants preferred to complete the surveys on the phone and remaining participants preferred to receive and complete the surveys via emails.

Data Analysis

Collected surveys were reviewed for any errors and no error was found. Data were ported into the statistical analysis package (SPSS 13) for further analysis. Descriptive analysis, correlational analysis and One-Way

ANOVA were conducted for the data analysis in order to investigate research questions.

RESULTS

Background information of the teachers included gender and computer experiences of participants. Approximately half of the teachers responding to the survey were female (46%). Ninety five percent of the teachers responding to the survey indicated that they were using the computer. Participants' teaching experience varied from 1-3 years to over 15 years. Accordingly, as seen in Table 1, only 6.5% of the teachers indicated that they had experience with computers more than 15 years, while 35% of teachers indicated 4-7 years of computer experience.

Table 1: Computer Experience of Participants

Computer Experience	1-3 years	4-7 years	8-11 years	12-15 years	>15 years
	13%	35%	33.3%	13%	6.5%

As indicated in Table 2, regarding the level of science teachers' use of computer applications, internet (49.2%), email (47.6%), and educational software CDs (14.3%) were scored as high level of use. Other software programs like word processing (34.7%), spread sheets (36.5%), desktop publishing (36.5%), and presentation (30.2%) were scored as medium level of use. Moreover, graphics and drawing programs (47.6%), word processing (28.2%), spread sheets (28.6%), database programs (23.8%) and graphic and drawing programs (23.8%) were indicated as "never been used by science teachers". Results indicated that relationship between level of science teachers' use of computer applications and their frequency seems to be symmetric. That is, regarding the frequency of using computer applications, the Internet (%49.2), emails (%47.6), and educational software CDs (%14.3) were indicated as applications used most frequently by the teachers (see Table 3).

Table 2: Level of Using Computer Applications

	Never		Low		Medium		Medium-high		Very high	
	f	%	f	%	f	%	f	%	f	%
Word processing	18	28.6	16	25.4	20	31.7	8	12.7	1	1.6
Spread sheets	18	28.6	14	22.2	23	36.5	8	12.7	0	0.0
Database programs	15	23.8	22	34.9	17	27	8	12.7	1	1.6
Graphics and drawing programs	15	23.8	14	22.2	21	33.3	12	19.0	1	1.6
Desktop publishing	12	19.0	15	23.8	23	36.5	10	15.9	3	4.8
Presentation programs	8	12.7	8	12.7	19	30.2	21	33.3	7	11.1
Educational CDs	3	4.8	7	11.1	17	27	27	42.9	9	14.3
Email	1	1.6	4	6.3	13	20.6	15	23.8	30	47.6
Internet	1	1.6	2	3.2	12	19.0	17	27	31	49.2
Others	6	9.5	14	22.2	32	50.8	10	15.9	1	1.6

Table 3: Frequency of Using Computer Applications

	Never		Low		Medium		Medium-high		Very high	
	f	%	f	%	f	%	f	%	f	%
Word processing	25	39.7	12	19	22	34.9	4	6.3	0	0
Spread sheets	26	41.3	12	19	14	22.2	10	15.9	1	1.6
Database programs	24	38.1	15	23.8	15	23.8	9	14.3	0	0
Graphics and drawing programs	22	34.9	11	17.5	14	22.2	15	23.8	1	1.6
Desktop publishing	19	30.2	13	20.6	16	25.4	13	20.6	2	3.2
Presentation programs	13	20.6	12	19	16	25.4	17	27	5	7.9
Educational CDs	7	11.1	14	22.2	11	17.5	22	34.9	9	14.3
Email	1	1.6	16	25.4	8	12.7	13	20.6	25	39.7
Internet	2	3.2	10	15.9	14	22.2	8	12.7	29	46
Others	20	30.7	10	15.9	25	39.7	6	9.5	2	3.2

Table 4 shows the analysis of science teachers' perceptions about integration of computer applications as an instructional tool. Accordingly, 49.2% of the teachers indicated that they agree with designing instructional activities by using computer applications and apply them in the classroom. However, 23.8% of the teachers do not agree with this opinion. 38.1% of teachers reported that they review the Internet resources periodically in order to use them in instructional activities, while 23.8% of teachers do not use internet for that purpose. 47.6%

of the teachers reported that if they use computer applications as instructional tool, then they evaluate the classroom activities in computer applications. Almost half of the teachers (50.8%) indicated that they encourage students to use computer applications in science classrooms. Another important finding was that 44.4% of the participants indicated that they disagree with the statement that "they use traditional methods since they do not know how to apply computer applications in instruction". When science teachers were surveyed about being a model to integrate computer applications, 46% indicated that they tried to be a model for the students. 23.8% indicated that they did not make an effort to be a model for the students.

Table 4: Perceptions about Integration of Computer Applications as an Instructional Tool

	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
	f	%	f	%	f	%	f	%	f	%
I design instructional activities using computer applications and apply them in the class.	4	6.3	15	23.8	5	7.9	31	49.2	8	12.7
I evaluate the results of the classes where I used computer applications.	2	3.2	15	23.8	6	9.5	30	47.6	10	15.9
I encourage students to use computer applications in science classes.	1	1.6	17	27	8	12.7	32	50.8	5	7.9
I know how using computer applications will affect students' success and I become a model in this matter.	2	3.2	15	23.8	11	17.5	29	46	6	9.5
I review the internet sources periodically to use in the instruction.	3	4.8	15	23.8	10	15.9	24	38.1	11	17.5
I use traditional methods since I do not know how to apply computer applications in instruction.	28	44.4	9	14.3	9	14.3	17	27	0	0

The Pearson Correlation Coefficients are presented in the Table 5 for the relationships among computer literacy, frequency of computer use, and integration of computer applications. Table 5 and Figure 1 evidently show that relationships between computer literacy and frequency of computer use and the relationship between computer literacy and integration of computer applications are positive. The coefficients of correlations which ranged from +.717 to +.871 showed that about 50% to 70% of the variation computer literacy to integration of computer applications and computer literacy to frequency of computer use can be explained by a positive relationship.

Table 5: Relationship among Computer Literacy, Frequency of Computer Use, And Integration of Computer Applications (CA)

	Computer Literacy	Frequency of Computer use	Integration of CA
Computer Literacy	1	.871	.717*
Frequency of Computer use	.871*	1	.825*
Integration of CA	.717	.825	1

*p< 0.05

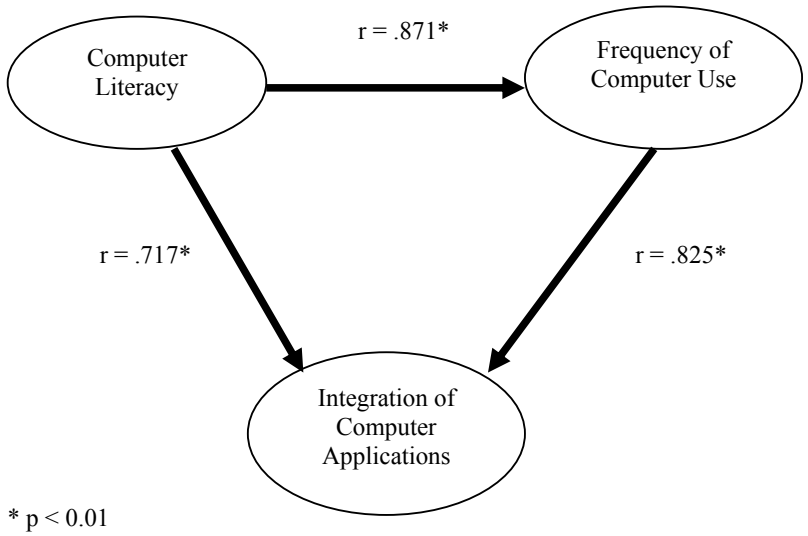

Figure 1: Results of a Correlation Analysis among Computer Literacy, Frequency of Computer Use, and Integration of Computer Applications (CA)

Results of One-way Analysis of Variance investigating the differences in the perceptions about integration of computer applications as an instructional tool for different genders are summarized in Table 5. Means and standard deviations of science teachers with different gender in using computers in the classroom are presented in the Table 6.

Table 5: Source Table for Analysis of Variance

	Between Subject Effects			
Source	SS	Df	MS	F
Between groups	508.820	1	508.820	7.663*
Within groups	4050.609	61	4050.609	
Total	4559.429	62		

*p<0.05

Examination of Table 5 indicated that there is a difference between male science teachers' integration of computer applications and female science teachers' integration of computer applications. Accordingly, as indicated by Table 6, male science teachers' integration of computer applications ($\bar{x}$=32.52) is higher than female science teachers' integration of computer applications ($\bar{x}$=26.82).

Table 6: Means and Standards Deviations for Gender

					95% Confidence Interval			
Gender	N	Mean	SD	Std.Error	L.Bound	U.Bound	Lowest	Highest
Female	29	26.82	9	1.67	23.4	30.25	10	42
Male	34	32.52	7.34	1.25	29.96	35.09	18	47
Total	63	29.9	8.57	1.08	27.74	32.06	10	47

DISCUSSION

Investigating the relationship between science teachers' level of computer literacy and their frequency of computer use, this study found a positive correlation. Science teachers tend to use computers more often as their level of computer literacy increases. Positive correlation was also found between science teachers' level of computer use and the integration of computer applications as an instructional tool. Improving the computer literacy of science teachers seems to increase science teachers' computer use and consequently increase their integration of computer applications as an instructional tool. Teachers' lack of computer literacy seems to be main reason for the low level of computer use as an instructional tool in classrooms (Bosh & Cardinale, 1993; Topp, Mortensen, & Grandgenett, 1995). Literature and positive correlation found in this study showed that improving the computer literacy of science teachers seems to provide more confidence to integrate computer applications as an instructional tool (Halpin, 1999).

23.8% (15) of science teachers disagree with designing instructional activities by using computer applications, while 6.3% (4) of science teachers strongly disagree. By combining "disagree" option with "strongly disagree" option, the ratio of science teachers who do not use computer applications in instructional activities rises to 30.1%. Almost 1/3 of the teachers' negative attitude toward using computer applications in instructional activities indicates that the issue of teachers' use of computers still continues to be a problem. Results of this study showed that most of the Turkish science teachers participated in this study show positive attitude toward using computer applications in instructional activities. These results are contradicted to the results of other researchers' studies conducted in early years (Abdal-Haqq, 1995; Pepper, 1999). The spread of computer applications in schools in recent years could be a reason in the increase of using computer applications in instructional activities.

Consistent with some researchers' findings (Butler, 2000; Woodrow, 1992), this study found that male teachers expressed greater knowledge about computers than female teachers. 23.8% of science teachers indicated that they do not use the Internet resources for their instruction. Results also indicate that many science teachers appear not to have any opportunity to access Internet resources to get updated information or to get alternative resources for their instruction.

CONCLUSION

In general, the findings of this study support the results of other studies conducted in this area (Kramer & Lehman, 1990; Harris & Grandgenatt, 1996). Accordingly, the popular use of computer technology among science teachers is the indicator that science teachers assign computers a crucial role in students' understanding of science. Computers give teachers different opportunities to look at science topics from different aspects. It seems that effective use of computer technology in science classrooms would be expected from all science teachers in the future. Some teachers might think that over-reliance on the computers can be a problem for students. Computers could be used mechanically, and student's understanding might prove superficial in simple science topics. This may explain the lack of computers usage among science teachers (Cooney &Wilson, 1996). However further studies should be conducted to confirm this assumption. According to this study, 50.8% of the teachers reported that they encourage students to use computer applications in science classes. However it should be noted that many teachers may feel that students become too dependent on the computer programs and are thus unable to master basic science topics (Schmidt, & Callahan, 1992). It would be interesting to see how using the computer enables teachers to use the complexity of knowledge in instruction. Therefore, more research comparing the technology use of teachers based on the gender difference is needed to understand how science teachers work with computers and use them as a learning tool in the classroom.

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E-LEARNING AND DISTANCE EDUCATION IN NIGERIA

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ABSTRACT
This paper discusses the relevance of e-learning in the position of distance education in Nigeria. It commences by discussing the meaning of e-learning and distance education. It also discusses the historical background of distance education in Nigeria as well as the operations of National Open University of Nigeria (NOUN) as the first federal University in Nigeria dedicated to the provision of education through distance mode.

Furthermore, the paper highlights the prospects and challenges of e-learning in the operation of National Open University of Nigeria.

Keywords: Distance Education, e-learning, Quality Assurance, Information and Communication Technologies, National Open University of Nigeria.

INTRODUCTION

The e-learning is not a new phenomenon in promoting education in some parts of world. Presently, some institutions in Nigeria are using it to promote distance education (DE) and life long learning. e-learning according to Sale (2002), is the use of electronic technology to deliver education and training applications, monitor learner's performance and report learner's progress. Hedge and Hayward (2004), defined it as an innovative approach for delivering electronically mediated, well-designed, learner-centered and interactive learning environments to anyone, anyplace, anytime by utilizing the internet and digital technologies in concern with instructional design principles. It is all about learning with the use of computers. In this age, learning with the use of computer is simply online ways of acquiring knowledge through the internet or through the offline – CD-ROM. The online involves the use of Internet Explorer/Navigator. It may be in form of Audio, Visual, and or Audio/Visual. The convergence of the internet and learning, or Internet enabled learning is called e-learning. The applications and process of e-learning include computer-based learning, web-based learning, virtual classroom and digital collaboration where contents is delivered via the internet, intranet/extranet, audio and or video tapes, satellite TV and CD-ROM (Islam 1997).

The revolutionary development of Information and Communication Technologies

(ICT's) in education in the developed countries facilitated the establishment of 100% ICT – based University known as Virtual Universities. Here in Nigeria, very few of our conventional universities are now carrying out their academic activities through one form of ICT or the other. While the urge to embark on e-learning is still a dream to some because their infrastructure of ICT's is very weak. The rapid expansion of ICTs in Nigeria offers an opportunity to consider its use in the promotion of DE. It offers students considerable benefits including increase access to learning opportunities, convenience of time, and place, making available a greater variety of learning resources, improve opportunities for individualized learning and emergence of more powerful cognitive tools (Khan, 1996, Pierre, 1998).

Distance Education (DE) is a system of education characterized by physical separation between the teacher and the learner in which instruction is deliver through a variety of media including print and other ICTs to learner who may either have missed the opportunity earlier in life or have been denied the face-to-face formal education due to socio-economic, career, family and other circumstances. Jegede, (2003) defined distance education as education provided by a mode other than the conventional face-to-face method whose goals are similar to and just as noble and practical as those of on-campus full time face-to-face education.

Nigeria is the most populous nation in sub-Saharan Africa with about 140 million people (NPC, 2007), occupying a landmass of about 923,768 square kilometers and with over 274 ethic groups making up the federation. The social and economic dimensions of providing education for the population, within the context of prevailing national circumstances of dwindling financial and other resources in the face of developments needs are heavy. The ever-continuing growth in Nigeria's population, the attendant escalating demand for education at all levels, the difficulty of re-sourcing education through the traditional means of face-to-face classroom bound mode, and the compelling need to provide education for all (EFA) irrespective of environmental, social or cultural circumstances have meant that the country must of necessity find the appropriate and cost effective means to respond adequately to the huge unmet demand for education. All these emerging situations have signal to the need for a comprehensive search for a more viable, robust, reliable, efficient, effective, and cost-beneficial

educational solutions, which according to Jegede, 2003 and Sadeq, 2003 the most logical pathway to achieve these is by embracing distance education method.

Historical Background of Distance Education in Nigeria

The history of distance education in Nigeria dates back to the correspondence education as a means of preparing candidates for General Certificate in Education, a prerequisites for the London Matriculation Examination. The first indigenous distance learning programme was the English by Radio programme of Nigeria Broadcasting Corporation that followed independence in 1960. The programme was primarily targeted at primary and secondary school levels and covered core courses at both levels with more emphasis placed on the teaching and learning of Science, Mathematics and English. The technology driven distance learning came into existence almost the same time with the first indigenous distance learning with the emergent of Educational Television programmes of the then National Television of Nigeria (NTV). There was also Schools Educational Broadcast of the Radio Nigeria stationed in Lagos and relayed all through the federation. All radio stations were required to hook at specific times of the day during school hours for broadcasting of programmes.

In the last 31 years, University education programmes in the country begin to witness a lot of changes in terms of instructional delivery mode in some of our tertiary institutions. The Correspondence and Open Studies Unit (COSU) of University of Lagos that started in 1974, which later changed to Correspondence and Open Studies Institute (COSI) and now known as Distance Learning Institute was the first attempt made to establish a distance education unit as part of a University in Nigeria. It began initially to offer programmes in science education at first degree level in Biology, Chemistry, Mathematics, Physics and Postgraduate Diploma in Education (PGDE) for degree holders that did not possess teaching qualifications. The National Teachers' Institute (NTI) started as a distance education institution in1976 (as the first dedicated distance education institution) with the support of UNESCO. It began by training Grade Two Teachers (TC II). In 1990, the Nigerian Certificate in Education (NCE) programme was introduced when the expectation was that the minimum teaching certificate in Nigeria was expected to be NCE. The Institute also introduced the PGDE programme in the year 2005. Ahmadu Bello University (ABU) also started its distance education through a training programme known as Teachers-in-Service Education Programme (TISEP) for Grades Three and Two teachers and later the Nigerian Certificate in Education (NCE). Also in November, 1972, the University also established a University of the Air Programme for teachers in secondary schools and teacher training colleges. The Distance Learning Institute of the University of Ibadan which started in1979 as External Degree Programme of the university is another institution which adopted the distance learning mode

The National Open University of Nigeria (NOUN), was established in July, 1983, by an Act of the National Assembly as the first distance learning tertiary institution in Nigeria when it became crystal clear to the then Federal Government that the ever growing demand for education by her people cannot be met by the traditional means of face-to-face classroom instructional delivery. The institution was closed down few weeks after its establishment and the Act that established the University was suspended in 1984 by the then Federal Military Government that overthrew the civilian government. Many years after the closure, the compelling reasons that informed the earlier establishment of the university as well as the need to fill the gap created by the Federal Government clamped down on mushroom outreach study centres of many conventional universities all over the country and the need to take advantage of emerging developments in the field of ICTs which have revolutionalized the techniques and methods of instructional deliveries in the distance learning mode necessitated the reactivation of the suspended NOUN Act of 1983 in 2002. This paved the way for the resuscitation of the NOUN.

Development of e-Learning in Nigerian Schools

The development of e-learning in Nigeria could be traced back to the development of telecommunication which began in 1886 when e-cable connections was established by the colonial masters between Lagos and the colonial office in London to transmit information and receive feedback. By 1893, all government offices in Lagos were provided with telephone service for easy communication, feedback and easy access and later all other parts of the country were provided with telephone services.

A lot of changes have been witnessed in the telecommunication industry since 1886. The provision of telecommunication services was initially monopolized by the Nigeria Telecommunication (NITEL) until sometimes in 90's when the federal government of Nigeria commenced the liberalization policy of telecommunication industry. Four (4) private telephone service providers (Mtel – NITEL, Econet Now Vmobile, MTN and Communication Investment Limited – CIL) were initially licensed to provide General System for Mobile Services. CIL license was later revoked for inability to pay the license fee before the prescribed which was later given to Globacom (Glo) Nigeria.

With this development, more companies were licensed to provide internet services in Nigeria, and this led to improved access to the internet by Nigerians. The country has less than 11 ISPs in 2000, but by the year 2006, it has risen to above 100 and many got connected to the information super-highway, through broadband VSAT connection see.

In Nigerian schools, the commonest type of e-learning adopted is in form of lectures note on CD-ROM which can be played as at when the learners desires. The challenge of this method is that the numbers of students per computer in which these facilities are available are un-interactive as compared to when lectures are been received in the classroom. Some institutions adopted the use of intranet facilities; however, this is not well maintained because of incessant power problem and high cost of running generating set. Most students in Nigeria go to the cyber café but because there are people of diverse intension on the net at the same time, and the bandwidth problem, a multimedia interactive can not be done. Despite all these and other challenges facing e-leanring in Nigeria educational institution, institutions such as University of Ibadan, Obafemi Awolowo University, University of Benin, University of Abuja, University of Lagos, National Open University of Nigeria among others has the facilities for e-learning. The number seems very low (compared to other parts of the world and the usefulness of the e-learning in the economy development) because of location of most institutions, bandwidth issue and mostly the challenge of electricity. Though most of the educational institutions (private and public) have started setting up their ICT centres for internet services alone without actually taking into consideration other components of e-learning centre

Need for Open and Distance Education in Nigeria

The need for Open and Distance Education (ODE) in Nigeria is an important issue for several cogent reasons. Firstly, the vast majority of the population lives below poverty level. They are unable to attend urban based institutions and thus remain deprived of higher education despite their superior merit. Secondly, those who joined workforce without completing their studies or education due to family commitments are unable to combine their work with studies and very few of them who have strong desire for higher studies could not do so because of the limited offer in the traditional institution of higher learning. Thirdly, the tradition of childhood, early marriage and religious belief in the country deprives the majority of female population from higher education. Besides, there are some other usual factors like physical disabilities, remoteness of localities, exorbitant tuition fees in most privately owned Universities and so on. These are some of the major issues responsible for why millions of Nigerians are deprived of higher education despite their knee interest and eligibilities. ODE provides avenues for higher education for such a vast under-privileged population. Nigeria is generously endowed with human resources that need to be well equipped with literacy and skills to contribute to economic development, which is badly needed for this country. Thus, it is crystal clear that the way forward is to embrace ODE using both hands and supported by all necessary financial and infrastructural commitments.

Role of National Open University of Nigeria (NOUN) in the Promotion of Distance Education in Nigeria

NOUN, a federal government – owned university, has emerged as the first dedicated University in Nigeria to introduce education through distance learning mode. The vision statement of the University is that the NOUN is to be regarded as the foremost University providing highly accessible and enhanced quality education anchored by social justice, equity, equality and national cohesion through a comprehensive reach that transcends all barriers. While the Mission statement is that NOUN is to provide functional cost-effective, flexible learning, which adds life-long value to quality education for all who seek knowledge. In addition to the broad vision and mission statements, the university has eight major objectives which are listed below:

i. provide a wider access to education generally but specifically in University education in Nigeria.
ii. ensure equity and equality of opportunities in education
iii. enhance education for all and life-long learning
iv. provide the entrenchment of global learning culture
v. provide instructional resources via an intensive use of ICTs
vi. provide flexible, but qualitative education
vii. reduce the cost, inconveniences, hassles of and access to education and its delivery
viii enhance more access to education.

In NOUN, Study Centres are the main contact place for students learning activities. These centres are thus the backbone of the distance learning methodology of the University. Presently, NOUN has 28 study centres spread across the length and breadth of the country as against the initial 18 temporary study centres approved by the Federal Government for take off of the University in the year 2002. In addition, the university has special study centres which cater for specialized groups, such as the Prison inmates and Armed Forces personnel. The

projection of the university is to have a study centre in every state capital and at every local government of the federation. This will enable the university to achieve its stated objectives.

A detailed description of NOUN and its academic programmes are included in this report to understand the current operation of the institution towards achieving its vision and mission statements.

Academic Programmes

NOUN provides higher education and professional training in wide areas, such as arts, business, education, social sciences, sciences and technology. The institution offered several formal academic programmes from Certificate to Masters Level under four academic schools and a Centre for Continuing Education and Workplace Training (CCE&WT).

Table 1: NOUN academic progammes, modes of present and proposed delivery

School	Formal Programmes	Level	Media Used	
			Present	Proposed
CCE & WT	1..Certificate Courses	Certificate	Print	AC,CDR
	2...Diploma Courses	Diploma	Print	AC,CDR
School of Arts and Social Sciences (SASS)	1. Certificate in French	Certificate	Print	AC, CDR
	2. Diploma in French	Diploma	Print	AC, CDR
	3. Postgraduate Diploma in Theology	Diploma	Print	AC, CDR
	4. Bachelor of Arts(BA)	Bachelor	Print	AC, CDR
	5. Masters in Arts (MA)	Masters	Print	AC, CDR
School of Business & Human Resources Management	1.Post-Graduate Diploma	Diploma	Print	AC, CDR
	2.Bachelor of Science (B.Sc) Hotel & Catering Management, Tourism Studies, Co-Operative Management, Entrepreneurial & Small Scale Business Management	Bachelor	Print	AC, CDR
	3. Masters of Science(M.Sc) Business Administration	Master	Print	AC, CDR
	4.Masters of Science(M.Sc)	Master	Print	AC, CDR
School of Education	1. Post-Graduate Diploma in Education	Diploma	Print	AC,CDR
	2. Bachelor of Arts (Education)	Bachelor	Print	AC,CDR
	3. Bachelor o f Science (Education)	Bachelor	Print	AC,CDR
	4. Masters of Education (M.Ed)	Masters	Print	AC,CDR
	5. Masters of Science (M.Sc.Ed.)	Masters	Print	AC,CDR
			Print	AC,CDR
School of Science &Technology	1. Post-Graduate Diploma	Diploma	Print	AC,CDR
	2. Bachelor of Science (B.Sc.) Agric. Extension, Environmental Studies, Computer Studies, Mathematics, Physics/Computer Science, Communication Technology.			
	3. Masters of Science (M.Sc) Information Technology	Bachelor	Print	AC,CDR
			Print	AC,CDR
School of Law	1. LL.B Law	Bachelor	Print	AC,CDR

Source: Learners Support Service unit, NOUN

Note AC Audio Cassette
Pr Print
R Radio
CDR Cd-rom, Internet
INET Internet

The current enrolment of NOUN is Forty-three thousand, two hundred and fifty four (43,254). Ten Thousand and twenty-six students enrolled for the 2003/2004 academic session in various schools as shown below while Sixteen Thousand, Nine Hundred and Eight-Seven (16,987) enrolled for 2005/2006 academic sessions, while Sixteen thousand, Two Hundred and Forty-One (16,241), has enrolled for 2007/2008 academics session as at 9th of June, 2008.

Table 2.1 Distribution of registered students grouped by school 2003/2004 – 1st Admission

Various Schools in the University	Number of students registered
1. School of Arts and Social Sciences(AS)	3,081
2. School of Business and Human Resources (B)	3,106
3. School of Education (E)	1,126
4. School of Science and Technology (S)	2,532
5. Centre for Continuing Education ©	181
Total	**10,026**

Source: Learners Support Services, NOUN Lagos

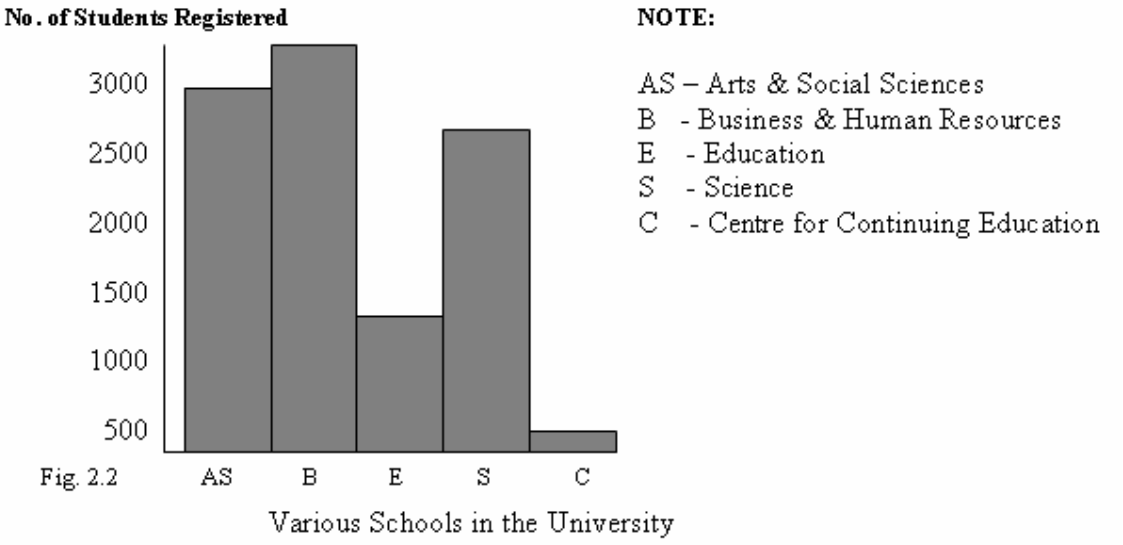

Fig. 2.2

Table 2.2 Distribution of registered students grouped by school 2004/2005 – 2nd Admission

Various Schools in the University	Number of Students registered
1. School of Arts and Social Sciences (AS)	4,221
2. School of Business and Human Resources (B)	3,632
3. School of Education (E)	1,804
4. School of Science and Technology (S)	4,900
5. School of Law (L)	991
6. Centre for Continuing Education ©	1,439
Total	**16,987**

Source: Learner Support Services, NOUN, Lagos

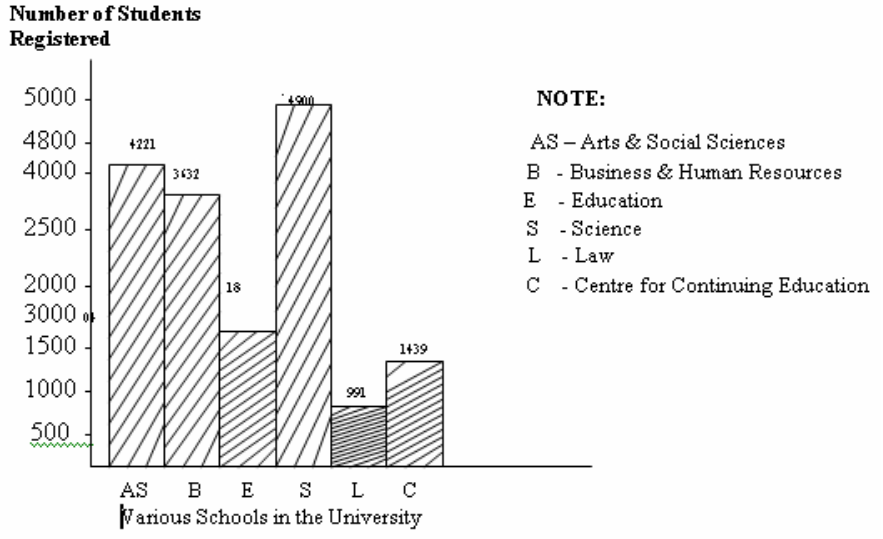

Table 2.3 Distribution of registered students grouped by school 2007/2008 – 3rd Admission

Various Schools in the University	Number of Students registered
1. School of Arts and Social Sciences (AS)	3,239
2. School of Business and Human Resources (B)	4,263
3. School of Education (E)	1,728
4. School of Science and Technology (S)	5,325
5. School of Law (L)	1,361
6. Centre for Continuing Education ©	325
Total	**16,241**

Source: Learners Support Services, NOUN Lagos

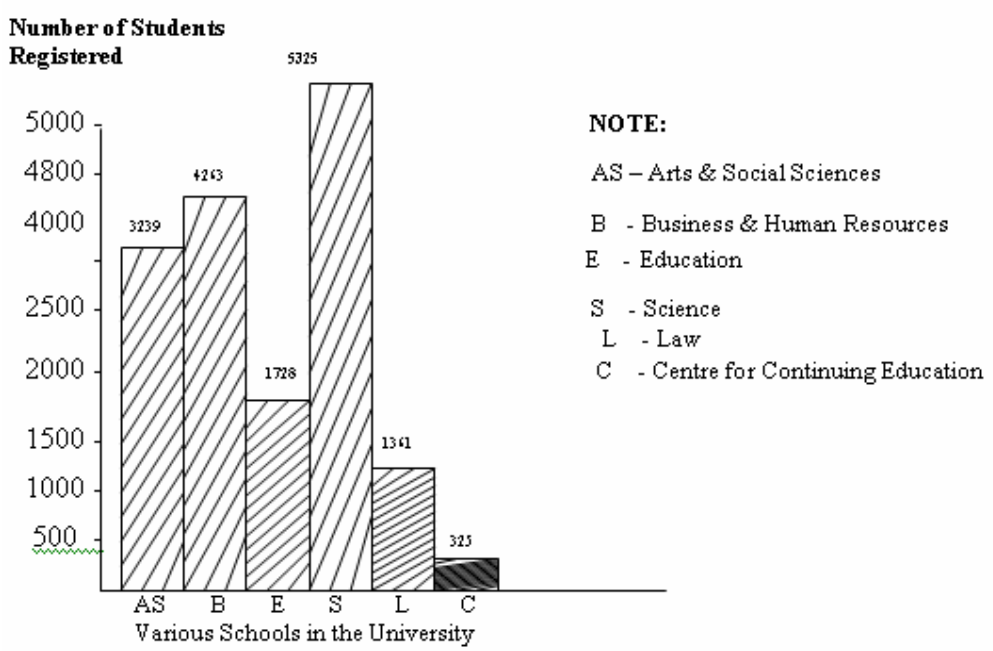

Fig.2

The number of registered learners in NOUN is higher than the enrolment of any conventional university in the country as at today. (Fig. 2.1, 2.2, and 2.3). Considering the importance of life-long education and NOUN in its desire to uphold the principle of flexibility offered concession admission for matured-aged candidates whose age is 35 years and above with work experience in relevant areas. Also fall in this category is the Access Programme which is open to the candidates whose ordinary level results do not qualify them for a direct admission into the 100 or 200 level of a degree programme. The programme enables the candidate to acquire the necessary knowledge and skill in at most any two subjects they are deficient.

Mode of Delivery of Instruction in NOUN

Mode of delivery of instruction is very important for open and distance learning. There are two major types of mode of instruction for open and distance learning:

i Mixed mode of instruction delivery system: this system uses several different media methods or deliveries such as video and e-mail.

ii Single mode of instruction delivery system: this method according to Hirschbuhi (1995)does not provide enough instructional power to ignite student's interest because they fail to provide student involvement.

As a distinct mode of imparting education, NOUN relies heavily on print materials, and face-to-face tutorial services. The use of these techniques helps NOUN to take its academic programmes to the door steps of her students far and wide. It makes room for in-house education. Considering the rapid expansion of ICT's in the country, NOUN has commence plan on the introduction of more electronic media like CD-ROM, e-mail, internet and interactive e-learning systems for its courses delivery (Table 1).

Indeed, NOUN has established its own radio station in its headquarters in Lagos. The radio station is also one of the strategies to disseminate NOUN programmes to its students in Lagos to start with. Efforts are being made by the institution management towards establishing more radio station across the country to further assist in transmitting their programmes to other students in the remaining states of the federation.

Staff in NOUN

New skills must be learned by faculty members to meet the needs of quality distance education (Sherry and Morea, 1995). NOUN has well-trained and skilled academic and management staffs. All academic and higher ranked officers received an advanced training in open and distance learning both at home and abroad funded by both the management of NOUN and Commonwealth of Learning (COL). The staff received training in all aspects of ODE including modern management, computer skill development, information technology, media production, communication skill development, editing, module writing etc. These skilled staffs are able to introduce and run any new technology for e-learning. Presently, some NOUN staff (both academic and non-academic) has completed the Postgraduate Diploma in Open and Distance Education programme and have also commenced their Masters of Arts in Distance Education (MADE) programme under the scholarship scheme offered the university by Indria Ghandi National Open University (IGNOU).

Students Enrolment in NOUN

In the first admission exercise in 2003/2004, NOUN admitted thirty thousand (30,000) applicants out of which, Ten Thousand and Twenty-Six of them registered (10,026), and were distributed to various schools according to their qualifications. During the second admission exercise in 2005/2006, out of Thirty-Six Thousand and Fifty-Seven (36,057) learners that were admitted, Sixteen Thousand, Nine Hundred and Eighty-Seven (16,987) of them registered. So also during the third admission exercise in 2007/2008, out of the forty-Four Thousand, Four Hundred and Eight (44,408) learners that were admitted, Sixteen Thousand, two-Hundred and Forty-One of them have registered as at June 9th, 2008 and were equally distributed to various schools based on their entry qualification. Apart from the various schools, the operations of NOUN are facilitated by five administrative directorates. The five administrative directorates are mentioned below:

1. Regional Training and Research Institute (RETRIDAL)
2. Directorate of Learners Support Services (DLSS)
3. Directorate of Media
4. Directorate of Computer and Networking Services
5. Directorate of Legal and Protocol

Quality Assurance in NOUN

NOUN sees quality assurance as a deliberate and conscious planning, monitoring and evaluation of the sequential process involved in a system operation for efficient and effective performance of the system. Quality is the watch-word at the NOUN and it underpins every aspect of the experiences prepared for a student who has decided to be instructed at the NOUN. All the conventional universities in Nigeria are assessed through accreditation team of the National Universities Commission (NUC), the NOUN too took part in the accreditation. The programmes of the NOUN, its tutorial facilitation and degrees awarded are all subjected to the same quality assurance as all Nigerian universities.

Besides, due to globalization, the NOUN collaborates with the Commonwealth of Learning (COL) in Canada, the International Council for Distance Learning (ICDE), the African Council of Distance Education (ACDE) and some well established open and distance learning universities in the United Kingdom, Hong Kong, India, Australia, South Africa, and the Africa Virtual University in Kenya.

Prospects of e-Learning in NOUN

The e-learning has several advantages in promoting the activities of NOUN as an open and distance learning institution. Some of the important points are listed as follows:

- NOUN students will learn what they need to learn and go at their own pace
- the internet will provide NOUN students with the opportunity to make choices about the type and direction of their learning and gain feedback quickly and efficiently. This has the potential to cater for individual learning and styles and requirement providing information about a topic
- of personal interest.
- the courses provided by NOUN in this model will have wide variety of courses based on IT and non-IT topics, which is an additional benefit to attract large number of learners from all the background.

- e-learning will provide NOUN students courses round the clock i.e. 7 days
- a week and 24 hours a day, which further attracts working class, students and individuals.
- computers with high internet infrastructure will help NOUN management to reduce the overheads cost as there won't be any recruitment, training and up gradation of faculties.
- internet activities will enable NOUN students to discover how the information they gain fits into the real life.
- the internet will provide NOUN students a culturally, racially, physically and gender anonymous medium for communication. Social behaviours can be reduced as students realized that they are judged solely on what they say and how they say it.

Challenges of e-learning in NOUN

e-learning in Nigeria Universities and educational institutions is still a dream because of poor ICT infrastructure and other socio-economic reasons. Due to very high primary cost of infrastructural development and to increase public access to internet and other ICTs, the developing countries are still far behind from getting benefit from the e-learning. The major problems facing the proper implementation of e-learning in Nigerian institutions in general and NOUN in particular are as follows:

- Inequality of access to the technology itself by all the NOUN students the so called digital divide: The cost of a Personal Computer (PC) and Laptop are still very high in Nigeria considering the income level of an average worker in the country. Few of the NOUN students that are privileged to have a PC/Laptop are not connected to the internet as this do attract extra cost which they cannot afford.
- Technophobia: Most of the student admitted by NOUN have no computer education background, hence they are afraid of operating one, some go to the extent of hiring expert at a cost to fill their admission, registration and other document meant for them to fill online. However, the very few who have access to the computer do not know how to use it and maximize it usage.
- Internet Connectivity: The cost of accessing internet is still very high in West Africa. It is as high as $8/Kbps, while it costs a ridiculous amount of $0.52/Kbps in North Africa and even lesser in Europe. Most of NOUN Students make use of Cyber Café who charges between #100.00 and #150.00 per hour despite their poor service and slow rate of their server
- School Curriculum: Most of the students admitted by NOUN have no information technology/computer education knowledge because it was not entrenched in the curriculum at their elementary and secondary education level. Not until recently when computer education is been introduced at elementary level and it is not yet a compulsory subject at the secondary level of our education.
- Attitude of NOUN Students: ICT refutes independent learning and most of NOUN students are reluctant to take responsibility for their own learning. But they preferred to be spoon-fed at all times.
- Software and License cost: It is very expensive to get some of the soft wares because they are not developed locally, they are developed in Europe and other developed countries to suit their own system and make their own living. The cost and even the interpretation of the software put off some of the NOUN students who showed interest.
- Maintenance and Technical Support: There are few technical staff to maintain the system, this make it very expensive for few NOUN students that has a PC to maintain when a technical problem is noticed.
- Electricity: The perennial problem in Nigeria is the problem of electricity instability which has been a major setback for our technological development. Some of NOUN students that reside in cities and towns are faced with the problem of epileptic supply of electricity. While majority of them live in rural areas that are not connected to the national grid

CONCLUSION

The survival of tertiary education institutions in the 21st century will increasingly rely on various forms of electronic delivery and communication inside a market place that requires education to be flexible. e-learning is now widely used in most of the developed countries to promote distance education (DE) and life-long learning in an effective way. In Nigeria, the recent developments and awareness of the Government on ICT have opened an opportunity to adopt e-learning to deliver distance education for educating mass of its uneducated or less educated peoples. Considering the recent expansion of ICTs in the country, NOUN could introduce some

modern ICT like e-mail, web-based learning (e.g. open course wares), CD-ROM for delivering its course materials through e-learning for its learners. However, before going to introduce an advanced ICT in NOUN, it is suggested that enough research be conducted on learner's access, cost and other related parameters essential for it.

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IMPROVING THE TECHNOLOGY INTEGRATION SKILLS OF PROSPECTIVE TEACHERS THROUGH PRACTICE: A CASE STUDY

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ABSTRACT
Rapid developments in invented technologies lead educational institutions to effectively integrate these technologies into the teaching-learning processes. However, both institutions and individuals face different obstacles because of these integration processes. By taking various precautions maybe overcome. Thus, this study was designed to explore to what extend the course "Instructional Technology & Material Development," from a non-thesis graduate teacher's preparation program, contributed to pre-service teachers' perceived computer competencies, attitudes toward computers and technology vision. The participants were 114 pre-service teachers with a degree from the faculty of arts and science. Both quantitative and qualitative measures were used to collect data in order to validate the findings. Participants were asked to fill out a computer attitude scale and a computer competency scale both at the beginning and end of the course, as well as an open-ended questionnaire at the end of the course. Besides, the researcher had observed all the participants during their weekly assignments. The results showed that pre-service teachers developed a positive attitude towards using computers in their future classrooms and enhanced their computer competencies. Furthermore, they became desirous and curious about technology and more willing to use technology in their future careers. Although one can find numerous similar articles in the literature that produced similar results, in Turkish context, this article has valuable information for those teaching in non-theses teaching programs.

Keywords: Pre-service teacher education, computer competencies, technology vision

INTRODUCTION

Educational systems are based on teacher and curriculum concepts. Effectiveness and efficiency of an educational system rely on these two inter-related concepts and the harmony between them. Any problems appearing in either of these concepts will decrease the quality of the educational system, as a result affecting the learners. For this reason, the quality of an educational system should be parallel to the quality of teachers trained. Moreover, the quality of a teacher will be in harmony with the curriculum focused knowledge, skills and the attitudes acquired by the preservice teachers.

Technological and computer competencies of teachers are important dimensions of this quality. Due to large investments of technology in many educational institutions, teachers are required to integrate technology into curriculum and classroom activities. For this reason, teacher education programs are reshaped and enhanced with the courses trying to infuse the use of various technologies. This enhancement includes the knowledge and skills necessary to use and integrate technology effectively. Besides, teachers' attitudes and beliefs toward technology usage should result in a positive one. Therefore, teachers should be designated in such a way that besides knowing how to use technologies effectively, they have to be empowered to use technologies to develop learners understanding and to support constructivism, cooperative learning and problem-based learning (Royer, 2002).

Technology Integration into Teacher Education Programs

Almost all education institutions across the world are rethinking and reorganizing the manner in which they are preparing pre-service and in-service teachers to use technology in order to enhance classroom instruction. Then again, higher education institutions are also seeking new strategies to support the process of technology integration, as they are the leaders and models of technology diffusion. Teacher education programs are intended not only to give occupational and branch of learning expertise but also the vision for integrating technology into the teaching-learning process. Consequently, "…schools, colleges, and departments of education have sought not only to provide courses on educational technology but also to infuse technology into the teacher education curriculum such that preservice teachers experience technology-rich instruction both as students and as teachers,"(Vannatta & Beyerbach, 2000, p. 132).

Higher education institutions are making great efforts to overcome the obstacles posed by information and communication technologies (ICT) and how to disseminate technology into classrooms. Many research studies have been carried out to find the correct pathways for effective integration, each pointing out different variables affecting the integration process. Among these variables, the lack of role-modeling by professors, due to poor

technology competencies of professors, is the one which plays an important role in the effectiveness of the teacher education process (Odabasi, 2000; Hadley, Eisenwine, Hakes & Hines, 2002). Effective integration requires the existence of the necessary hardware and software, effective usage of resources, adequate in-service training opportunities, well-prepared professors and innovative implementation strategies for faculties. Accordingly, the professors' technology-competency levels, perceptions on the use of technology and obstacles they face are the factors which should be investigated carefully in order to propose appropriate strategies for effective technology integration.

Factors Concerning the Technology Integration in Teacher Education Programs

A brief review of the literature indicates that pre-service teachers are not ready to integrate technology into teaching practice or learning processes (Bielefeldt, 2001; Willis & Montes, 2002; Doering, Hughes & Huffman, 2003; Wang, Ertmer & Newby, 2004). This pessimistic scenario may stem from several possible sources. Finley and Hartman (2004, p.328-329) discussed in their study, the issue of vision, skills and knowledge, plus departmental culture as barriers to the integration of technology into teachers' education courses. The researchers concluded that, "The faculty will experiment with technology integration if they feel it is consistent with their teaching style, if they feel they are knowledgeable and competently skilled, if they are supported and rewarded for doing so, and if they can see how it is pedagogically useful." Among many research studies have been carried out to diffuse the technology use or enhance existing levels, Adams (2004) proposed a field-based strategy for training in-service elementary teachers to use technology, where learning from one another was encouraged. Although the teachers' use of technology was limited before the study, research concludes that both the computer skills and technology integration ideas have increased (Adams, 2004, p. 510).

Subsequently, positive attitudes and perceptions towards computers are also important since it leads to increased computer competency (Wang, 2002; Carey, Chisholm & Irwin, 2002). Ertmer (2005), after reviewing the literature, determines that when teachers' uses of technology is considered, it is "…impossible to overestimate the influence of teachers' beliefs" (p. 36). Although many studies showed that pre-service teachers have positive attitudes toward technology and willing to use it, they are not given the opportunities to practice and teachers do not have access to good models of instruction (Breen, Lindsay, Jenkins & Smith, 2001; Iding, Crosby & Speitel, 2002). This fact is mostly due to professors' deficiency of technology usage and integration, since "Educators, the faculty, will play a critical role in the orientation of higher education students towards new learning environments" (Odabasi, 2000, p. 103). Otherwise, preservice teachers will lack the necessary skills to use and integrate technology into their future classrooms.

Another important point is that pre-service teachers should be provided with the opportunities to develop and implement technology-rich instructional activities in order to be able to integrate appropriate technologies into their future classrooms (Brush, Igoe, Brinkerhoff, Glazewski & et. al., 2001; Robyler, 2003). In pre-service teacher education, when prospective teachers experience and practice a variety of computer uses, the increase in the use of technology-enhanced learning practices in PK-12 is more likely to occur (Wheatly, 2003). Consequently, training for technology use should be provided as a component of the courses consistent with this aim as a course goal. Collier, Weinburgh and Rivera (2004) also recommended "…to design programs that provide pre-service teachers with multiple, real-world opportunities to learn and apply technology skills systematically and constructively in order to scaffold the mastery of more sophisticated technologies" (p. 466). Similarly, in their case studies of three urban elementary schools, Staples, Pugach and Himes (2005, p. 285), identified three scaffolds that appear to have a significant influence on technology integration as: "… alignment with the curriculum/mission, teacher leadership, and public/private roles for technology recognition" The researchers also stated the need that teachers should be provided with "…the opportunity to learn the technology well so that it can be used easily and transparently to support the curriculum" (p. 306). Rowley, Dysard and Arnold (2005) developed a technology infusion program for preparing tomorrow's teachers to use technology by providing online technology-enhanced learning topics which also provides practicing. They concluded that the program they developed "… holds promise as a vehicle for helping integrate technology-enhanced learning content across the preservice curriculum" (p. 122).

Hernandez-Ramos (2005) conducted a survey in order to reveal the technology use in K-12 schools. The researcher pointed out the broad context of technology integration process, and concluded that: as well as personality factors, the technological and contextual factors play crucial roles in technology integration decisions and applications. As Hernandez-Ramos pointed out, although barriers to technology integration might differ according to different context, there exist some common topics which all the researchers pointed out. Since without having necessary contribution it is difficult to use and infuse technology, technological and computer skills as required. Without faith, it will be hard to be creative, innovative and curious about technology, so beliefs and attitudes toward new technologies and computers would also be a crucial step in the technology

integration process. Does possessing the necessary skills and donation, having a positive attitude and willingness to learn be enough? Another crucial point is having the opportunity of practicing by the support of a model teacher. These three points are prerequisites for the technology integration process.

Teacher Training Programs in Turkey

Turkey is one of the countries, in which various teacher education programs have been put into application in the last 150 years (Üstüner, 2004; Akyüz, 2004). In the scope of The Council of Higher Education/World Bank Preservice Teacher Education Project, between 1994 and 1998, faculties of education were redesigned (The Council of Higher Education, 1998). The re-designing project aimed to overcome the shortage of available teachers, and together with the graduates of education faculties, the graduates of faculty of arts and sciences have also been employed as teachers. In order to provide the graduates of faculty of arts and sciences with a pedagogical formation, "Non-Thesis Master Program in Secondary Education" has been started. Within the program, courses in relation to pedagogical formation were re-organized, the number of courses and course hours were increased and the parallelism between subject matter areas and pedagogical formation was provided.

Within the framework of re-designing projects, one obligatory computer course has been placed in the curriculum of all teacher education programs (The Council of Higher Education, 1998a). Moreover, one more course "Instructional Technology and Material Development" has been integrated into the curriculum for all programs. This course has been added so that the graduates of those non-thesis master programs have been acquired with a technology in education vision (The Council of Higher Education, 1998; Üstüner, 2004).

The curriculum of "Instructional Technology and Material Development" for Non-Thesis Master Program in Secondary Education has been fulfilled with the following content; the properties of various instructional technologies, their position and use in teaching-learning process, development of instructional materials (worksheets, acetates, slides, videos, computer aided course materials and so on) and the evaluation of instructional materials (The Council of Higher Education, 1998b).

As a summary, preservice teachers are attending only one course aiming to help pre-service teachers be computer-literate on topics like word processing, spreadsheet applications, presentation software and Internet services. As a second and last course for gaining technology vision, they are also attending the course "Instructional Technology and Material Development". Thus, these two courses have thought to offer the preservice teachers the perspective of integrating technology into their subject matter area.

The underlying reason why pre-service teachers are attending the "Instructional Technology and Material Development" course is to contribute to the computer skills and technological perspectives to effectively use with and integrate technology into their classrooms. The purpose of this study is to explore to what extent pre-service teachers are competent in the necessary technology skills and to what extent they are capable of using of technology in their future classrooms.

Hence, this study tries to answer the following research questions:

1. What is the contribution of the course to the pre-service teachers' perceived computer competencies?
2. What is the effect of the course to the teachers' attitudes towards computers?
3. What is the relationship between pre-service teachers' perceived computer competencies and attitudes toward computers with academic attainment?
4. What is the contribution of the course activities to the pre-service teachers' observed computer competencies?
5. What are the overall perceptions of pre-service teachers about the course?
    a. What are the pre-service teachers' expectations about the course?
    b. How pre-service teachers have perceived the processes they experienced during the course?
    c. What do pre-service teachers think they have gained from the course?
    d. How pre-service teachers envision the use of technology within their future classrooms?

METHOD

Participants

The participants of this study were one hundred and fourteen graduate students from four sections enrolling to the "Instructional Technology and Material Preparation" course of a non-thesis teacher preparation program. All the students previously had a bachelor's degree in a content area in the faculty of arts and sciences and were seeking teaching licensure in this program. Of the students, a total of 89 students in three sections were graduates from the field of mathematics. The other section composed of 25 students' where 19 were graduates from the field of biology and 6 were graduates from the field of chemistry. Of the 114 students, 77 were female and 37

were male. None of the students had previously taken a course in instructional technology, but all had taken a basic computer course in their undergraduate education. All of the students were instructed by the same faculty member, namely the researcher.

"Instructional Technology and Material Development" Course Design
One hundred and fourteen pre-service teachers from four different sections attended the course instructed by the same instructor. The main goal of the course was developing teachers' technological skills and their capacity to integrate technology into the curriculum. So, the course was structured in a way that gave the opportunity to practice immediately what they have learned in the computer laboratories. After delivering some introductory concepts in three weeks, the pre-service teachers started their computer laboratory applications. Meanwhile, students were asked to form groups of two or three and decide on a topic in their subject fields guiding their work through computer applications. This will compel each individual to prepare various teaching materials that used technology on selected topic, prior to exposure to theoretical content. Besides, pre-service teachers are required to perform activities like: send by e-mail the weekly assignments as attachments to the instructor, search content-related web sites and educational software. At the beginning of the semester, pre-service teachers were also required to develop lesson plans. By the end of the semester, this lesson plan would be revised and become a technology-rich lesson plan by integrating teaching materials developed throughout the semester. As the final project, students presented their lesson plans and materials to the class. Weekly schedules of the detailed course activities are given in Appendix A.

Research Design
Fifty six voluntary participants (43 female, 13 male) were given a "computer attitude scale" and "computer competency questionnaire" before they began the course and after they completed course. Both of the instruments were completed by the students via Internet. All the sections met three hours a week for fourteen weeks. All of the attending participants were observed for several skills by the researcher for nine weeks while practicing what they had learned. At the end of the course, all the participants filled out an open-ended questionnaire focused on (a) their expectations of the course at the beginning of the semester, (b) their perceptions about the process, (c) their perceptions about learning goals that they attained, and (d) their vision for using computers and technology in their future classrooms.

In order to analyze quantitative data, descriptive, reliability analysis, correlation analysis, homogeneity test and paired sampled t-test were used. On the other hand, qualitative data was analyzed using qualitative techniques (Miles & Huberman, 1994; Yıldırım & Şimşek, 1999). First, the data was grouped according to the answers given to the same questions. After analyzing the data inductively, repeating themes were noted. Finally, conclusions were drawn for achieving a generalization among the categories.

Instruments
Computer Attitude Scale
Originally developed by Lloyd and Gressard (1984), the "Computer Attitude Scale" (CAS) was translated into Turkish and analyzed by Berberoğlu and Çalıkoğlu (1992), (α=0.90). CAS items used a Likert scale of 1-4, in which 1 represented strong disagreement and 4 represented strong agreement. CAS, consisting of totally 40 items, has four sub-scales each having 10 items: 1) computer anxiety or fear of computers, 2) liking of computers, 3) confidence in ability to use or learn about computers, and 4) and usefulness (importance) of computers in life. Positively and negatively worded statements which present attitudes toward computers and the use of computers are included for each of the four sub-scales. For this study, reliability analysis of the scale was found as Cronbach alpha (α) 0.83.

Computer Competency Questionnaire
Computer Competency Questionnaire" was developed by the researcher in order to measure preservice teachers' computer proficiency and integration experiences in courses. This questionnaire consisted of 34 items, asking participants to report current proficiency using word processing programs (6 questions), internet related applications (11 questions), educational software (9 questions) and presentation software (8 questions). These items used a Likert scale of 1-4, in which 1 represented no proficiency and 4 presented high proficiency. For this study, reliability analysis of the questionnaire was found as Cronbach alpha (α) 0.97.

Student Observation Form
An observation form was used by the researcher, in order to keep weekly records of individual competencies. For this purpose, the researcher observed every student for a range of nine weeks while completing their projects on different tasks. For this study, reliability analysis of the observation form was found as Cronbach alpha (α) 0.94.

Observation form consisted of following seven questions developed by the researcher and rated on a four scale (4=very good, 3=good, 2=inefficient and 1=not observed).

- Using software in parallel with/according to the course goals
- Using software without help from instructor
- Using software without help from peer
- Finalizing the activity in given time constraints
- Using all the facilities of the software effectively
- Similarity between the produced and expected product
- Appropriateness of the product to visual design principles

Open-Ended Questionnaire

For gathering data on the perceptions of preservice teachers, four open-ended questions were asked after the completion of the course. These questions addressed the expectations of preservice teachers about the course at the beginning of the semester, perceptions about the processes they experienced during the course, thoughts on what they gained from the course, and envisioned about the use of technology within their future classrooms.

RESULTS

Quantitative Findings

In order to gain a depth understanding about the collected data, various analyses were conducted before focusing on the main questions. First of all, gender differences were analyzed with respect to four dependent variables (pre and post-scores of CAS, pre and post scores of computer competency). Since the number of participants in gender groups was not close enough, a Mann-Whitney U Test was conducted. As the Table 1 shows, there are no significant differences on dependent variables with respect to gender.

Table 1. Gender differences for four dependent variables

Dependent variable*	U	*p*
CAS Pretest	260	.71
CAS Posttest	212.5	.19
Computer Competency Pretest	194	.10
Computer Competency Posttest	265.5	.79

* n= 56

Moreover, differences among sections were analyzed by Kruskal-Wallis Test. Since there were four sections, where three of them were graduates of mathematics field and one section consisted of students from different field areas, namely, biology and chemistry, five groups were formed in order to analyze group homogeneity. Results, as seen in Table 2, demonstrated that there are no significant differences on dependent variables with respect to sections and groups.

Table 2. Group and section differences for four dependent variables

Dependent variable *	X^2	*P*
CAS Pretest	5.71	.22
CAS Posttest	2.61	.63
Computer Competency Pretest	1.35	.85
Computer Competency Posttest	3.70	.45

* df = 4

Correlations among dependent variables were also performed. Results, as seen in Table 3, obtained only one significant correlation between pre and post scores of computer competency questionnaires ($p<.05$).

Table 3. Correlations among four dependent variables

Dependent Variable	1	2	3	4
1. CAS Pretest	--	.20	-.60	.00
2. CAS Posttest		--	.07	-.11
3. Computer Competency Pretest			--	.54*
4. Computer Competency Posttest				--

* p<.05.

Contribution of the course to the pre-service teachers' perceived computer competencies

Pre-service teachers' computer competencies were solicited via "Computer Competency Questionnaire" before and after the course. Paired Samples t-test results revealed a positive significant improvement from pretest scores (M=2.31, SD=.91) to posttest scores (M=3.70, SD=.79).

Effects of the course to the teachers' attitudes towards computers

Pre-service teachers' attitudes toward computers were elaborated via "Computer Attitude Scale" before and after the course. Paired Samples t-test results revealed a significant change from pretest scores (M=2.64, SD=.36) to posttest scores (M=2.53, SD=.16).

Relationship between pre-service teachers' perceived computer competencies and attitudes toward computers with academic achievement

Overall academic achievement level of pre-service teachers was calculated as 89.67 out of 100 (SD=6.11). Differences between pre and post scores of computer competency questionnaire and computer attitude scale were calculated and correlated with an overall academic achievement. The difference between pre and posttest scores of the computer competency questionnaire was found to be significantly correlated with academic achievement ($p<.05$). The reason for correlating data difference was to adjust the amount of improvement made by each individual.

Contribution of the course activities to the preservice teachers' observed computer competencies

Overall performances of pre-service teachers as observed by the researcher was calculated as 3.30 (SD=.24). Summary of weekly performances is shown in Table 4.

Table 4. Weekly observed performance of preservice teachers

Activity	n	*M*	*SD*
First week	57	2.75	.37
Second week	53	2.99	.58
Third week	53	3.72	.62
Fourth week	57	3.88	.38
Fifth week	42	3.12	.42
Sixth week	47	2.85	.36
Seventh week	42	3.26	.63
Eighth week	45	3.67	.47
Ninth week	57	3.42	.83

Qualitative Findings

The open-ended questionnaire, composed of four questions, was administered to preservice teachers in order to understand their perceptions about the course in detail. The questions addressed their expectations from the course at the beginning of the semester, their perceptions on the processes they experienced during the course, their perceptions about the level of improvement they achieved by the end of the course and finally their future plans about the use of technology. The results of the analysis were also presented in the same order.

Pre-service teachers' expectations about the course

Pre-service teachers' answers given to this question were converged under six categories. One of the expectations mentioned by the pre-service teachers was improving computer skills and learning an effective use of computers (21%). One of the preservice teachers expressed that "My prior expectation was to develop my limited skills about computer usage." Other pre-service teacher agreed that "I hoped to become a teacher who knows how to use computers and utilizes them in her future career".

Some pre-service teachers, who heard from their friends, had taken this course previously from other programs, noted that they were expecting to learn how to develop hand-made materials and to develop various materials (20%). One of the pre-service teachers pointed that "I did not think that this course would be such a technology-rich one". Another pre-service teacher established "Using computers for developing materials was not in my mind. I thought that we would produce more concrete and hand-made materials".

Although the entire group had taken an introductory computer course previously, 20% of the pre-service teachers expressed their fear, anxiety and worry about computers. One of the pre-service teachers framed that "I hoped to find the answers to such questions like, 'aren't computers things that are really such frightening? will it really help?, if yes, how?, will I learn?". Another pre-service teacher acknowledged that "Before the course, I had been a little bit frightened and felt that it was difficult for me to learn using computers".

Some others sharing similar thoughts were mentioned that they just expected to gain theoretical knowledge like the use of media and innovations in technology (14%) from the course. There were also some pre-service teachers who desired to learn how to teach more effectively (12%).

Finally, 4% of pre-service teachers expressed their wish to learn the ways and methods of making students love the subject matter. One of the pre-service teachers expressed that "I thought that this course would add too much to my teaching profession, learn a lot to practice in my own future courses in order to make my students love mathematics".

Pre-service teachers' perceptions about the processes they experienced during the course

Pre-service teachers' answers given to this question were also converged under six categories. About half of the pre-service teachers pointed out that it was fun to participate in this course (41%). They also believed the course was so beneficial that all they learned was so permanent. Furthermore, they mentioned their willingness to attend the course. One of the pre-service teachers stated that "the course has provided me with a broad repertoire of teaching style". Another pre-service teacher added, "Unless you were afraid of computers and try to understand them, you may speak the same language. The course was informative, enjoyable and remedy where no second has wasted. Even in theoretical parts of the course, I feel that I interact with that knowledge. I did not realize how the entire course has finished. We acquired what we have learned by doing practice."

The pre-service teachers who mentioned that they improved their computer skills were about 20%. "Even though, I had used computer before, I was so amazed to see the possible instructional tasks that I could do with it" was claimed by one student. Another pre-service teacher uttered that "Especially the course project has added so much for me. With the help of this project, we had the opportunity to utilize what we have covered about visual design principles. I benefited from the course on computers in education".

The pre-service teachers concluded that they learned actively by doing (20%). One of the students acknowledged that, "I realized using computer is not a difficult task. It becomes simpler when a facilitator exists as working on the computer. We were demonstrated what is most suitable for our students and how to utilize from computers throughout our prospective teaching profession". Another student expressed his ideas by stating, "I improved myself in the laboratory sessions by activating my theoretical knowledge." Another student commented that, "I believed that the course provided me with permanent knowledge. Having an opportunity to make activities in the computer laboratory has increased my interest and skills."

Most of the pre-service teachers felt fear or anxiety at the beginning of the course, reported that they were not afraid of computers anymore, overcame their anxiety and liked the computers (15%). One of the pre-service teachers argued that "I was frightened at the beginning of the course and I felt that I was pushed due to my lack of knowledge about computer usage. In reality, it was hard for me to complete some of the tasks. Especially, I hated computers as I was preparing a concept map, yet I used them. As the course finished, creating materials became a fun task for me. I learned not to fear computers." Another pre-service teacher posited that "Even though I am not familiar with technology in general, computers in particular, throughout the course my attitude towards computers has evolved regarding computer use and various materials preparation."

The pre-service teachers realizing the importance of instructional material development and the use of technology in teaching-learning process was about 7%. One of the pre-service teachers pointed out that "the course sustained by functioning different teaching materials, and was free from a monotonous atmosphere". Another pre-service teacher stated that "I learned the benefits of instructional materials for students, where and how to use them, by doing, since we were also taught in a similar way".

The course instructor was perceived to be a positive facilitator (5%). One of the pre-service teachers wrote that "It was fun for us to learn on our own and the course turned out to be an enjoyable, self-guided and facilitated one with the help of the course instructor". Another pre-service teacher exclaimed that "The most memorable times in the course were the ones where I learned applicable and simplified knowledge. I achieved my goals straightforwardly with the in-time facilitation of the course instructor". Another pre-service teacher defined that "The most essential factor for me liking this course was the instructors' characteristics such as, being positive, encouraging comments and being patient of our questions." And finally, another stated that "the performance of the course instructor became a model for my future profession".

Pre-service teachers' thoughts on what they gain from the course

Pre-service teachers' answers given to this question were grouped under three categories. The ratio of the pre-service teachers who think that they learned how to use technology in education was 52%. One pre-service

teacher claimed, "I recognized how the use of technology impacts learning", while another stated "this course gained me another dimension in my teaching background on effective teaching". Yet another pre-service teacher added: "We, as pre-service teachers, have to make use of technology in such a modernized era. Or else, we will be disadvantaged in this era".

The participants (44%) have commented that they learned distinct instructional materials and their importance in education. On that topic, one participant wrote that "I became aware that all my thoughts were wrong about the needless use of materials in teaching mathematics". Another participant also wrote, "Before the course, I did not know that computers could be used in mathematics courses, but I realized that prepared materials made our knowledge more stable and created a more interactive environment".

Ten percent of the pre-service teachers agreed that their computer skills have improved. On that issue, one preservice stated, "I learned to use different software", while another pre-service teacher commented that, "I learned how to use computers more effectively." "Throughout the course, I learned how to develop various instructional materials on computers."

Pre-service teachers' visions about the use of technology within their future classrooms

Pre-service teachers' answers given to this question were converged under two categories. The percentage of the pre-service teachers claiming that they will utilize technology in their future classrooms was 87%. One of the students stated that, "computers are the essential part of my professional life", where another noted that, "willingness to use technology in teaching has been formed, at the end of the course." One another student stated that, "a computer is a gift for us to increase the effectiveness of teaching."

Eleven percent of pre-service teachers asserted that they will continue increasing their knowledge and skills on computers in future. From that perspective, one student has noted that, "my aim is to improve myself. Since I acquired a computer at home, I am searching the net in all my spare time." Another student stated that "I am planning on how to integrate technology in mathematics courses. I know that my students will have a greater depth of knowledge than ours in technology, I am aware that I have to adapt myself to technological innovations." Waiting to own a computer, one pre-service teacher noted that, "My priorities have changed after this course. Now, I want to buy a computer, attend a computer course and improve my computer competencies." Another pre-service teacher also commented that, "Buying a computer will be a first step for me. After that, everything will follow upon the knowledge you furnished us with."

DISCUSSION AND CONCLUSION

The research findings from this study describe what pre-service teachers require to integrate technology, especially computers, into classroom activities. Only a small portion of the participants had negative attitudes towards computers and a lack of computer skills at the beginning of the semester. This negative attitude might stem from two reasons, a fear because of a lack of computer skills, and no prior knowledge about how to use technology in their subject fields. However, at the end of the course all of the participants had obtained positive attitudes and enhanced their computer skills. Since all of the pre-service teachers were willing to participate in the course and enhance their knowledge base, the gap among these pre-service teachers disappeared, and most of them successfully completed the entire assignments. Furthermore, pre-service teachers understood how to use technology in their pre, during and post class activities, since they had the opportunities to practice what they had learnt.

As the instructor observed, the mathematics group had more difficulties in altering content in a visual form than the biology-chemistry group preparing materials. This result might be caused by subject field, since mathematics is not as concrete as the other subjects. Moreover, the mathematics group were required to be more creative in order to fulfill the course goals, since the resources and examples of materials in mathematics were more limited in comparison to other subject fields.

Although, the findings of the study showed satisfaction for both pre-service teachers and the instructor, pre-service teachers declared their need for an advanced contribution for integrating technology into their future classrooms. This result revealed that just one goal for achieving the goal of effective teaching via using technology is not enough which is also mentioned in the literature by many researchers (Willis & Montes, 2002; Doering, Hughes & Huffman, 2003). Hence, teachers have to build a knowledge base on how to routinely integrate technology into their classroom (Scheffler & Logan, 1999) and given more opportunities to apply instructional technology prior to their real-life experiences (Wilson, Notar & Yunker, 2003).

This study profoundly showed that the courses and the course content offered to pre-service teachers should constantly be revised to address current technology and its use in educational environment. These courses should be shaped in order to progress from computer competencies to instructional planning and technology integration. Accordingly, "the most important competencies for teachers appear to be the knowledge and skills to make computers a seamless part of the school curriculum" (Scheffler & Logan, 1999, p. 319).

In the process of a course-long intervention, prospective teachers not only increased their skills with computers and technology integration but also demonstrated incorporating changes in technology into their teaching and future plans. In other words, pre-service teachers experienced the power of technology to enhance traditional classroom instruction. Furthermore, this study underlined the need for pre-service teachers to effectively use and integrate technology into instructional processes.

Although the present study concluded with hopeful results, the real question that we have to answer is, "what kind of curriculum will allow pre-service teachers to gain sufficient technology vision?" It is obvious that increasing the number of courses aimed at teachers with the necessary skills and to provide instructional approaches to effectively integrate technology, will probably make a difference. If this increase includes model teachers of the same field, together with various skills to use technology to create constructivist and cooperative learning environments, this would be preferable (Royer, 2002). On the other hand, what if the change in the curriculum should not happen immediately? Then we have to answer the question, "how to use only one 'concrete' course to allow pre-service teachers gain enough technology vision?" Any technology integration process has many barriers to overcome. Trying to overcome these barriers in a very limited time should certainly end with changes in the learners' knowledge, skills, attitudes and vision. But the satisfactoriness of these changes will be an ongoing and never-ending discussion until no technological innovations are proposed. Hence, although one can find numerous similar articles in the literature that produced similar results, in Turkish context, this article has valuable information for those teaching in non-theses teaching programs.

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Appendix A: Content-Specific Technology Applications

WEEK	TOPIC	ACTIVITY
1	Introduction to Educational Technology	-
2	Instructional Technology and Communication	-
3	Introduction to Instructional Design	Searching and investigating lesson plans from Internet
4	Analysis and Planning phase of instructional design	Preparing lesson plans (word processor)
5	Organization of Knowledge-Concept Mapping	Preparing concept-maps (concept-mapping software)
6	Visual Design	Finalizing lesson plans and adding visual details (word processor)
7	Media and Materials	Midterm
8	Nonprojected visuals	Producing a poster (presentation software)
9	Projected visuals	Producing a presentation (presentation software)
10	Computers and Multimedia	Using and investigating multimedia educational software
11	Internet and Distance Education	Searching for content-related Internet sites and educational software on the web Creating a puzzle (http://www.discoveryshool.com)
12	Evaluation phase of instructional design	Producing work-sheets Finalizing technology-rich lesson plans
13	Presentation of the Projects	-
14	Presentation of the Projects	Final Exam

SCHOOL LEADERSHIP AND INFORMATION COMMUNICATION TECHNOLOGY

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ABSTRACT
Leadership is an important component in guiding the teaching-learning process. Principal as school leaders have a major responsibility for initiating and implementing school change through the use of Information and Communication Technology (ICT) and can facilitate complex decision to integrate it into learning, teaching and school administration. Hence, educational leaders must understand, promote and implement the notion that technology integration is not about the technology; it is about focusing on the future generations and leading teachers to a change in pedagogy. However, few studies have empirically examined computer use by principals, their perceived computer competence and their leadership style. This paper will report on these issues from an initial analysis of a baseline data gathered from 30 secondary school principals in Tehran, a large province in Iran. Findings indicate that school principals are using computers for instructional and administrative purposes and they have moderate competency in computer applications. This paper also suggests that the idea of transformational leaders can enhance the computer use in schools. Hence, policy makers must design professional development programs, such as leadership studies, in order to teach the components of transformational leadership; idealized influence, inspirational motivation, intellectual stimulation and individual consideration to future administrators.

Keywords: school principal, Information Communication Technology, technology integration

INTRODUCTION

Technology involves the application of knowledge, resource materials, tools and skills in designing, producing and using products and also it is used to extend human capability to control and modify natural and human-made environments (Raizen et al, 1995). In other words, technology offers new capabilities that lead to significant changes in the organization. It shows the new way of distributing information throughout the organization.

In discussion about the potential role of technology in education, Fiske and Hammond (1997) stated that instructional technology is considered to be a key to educational quality as we enter the new millennium. Many educators believe that computer use for instructional purposes can be employed effectively to enhance teaching and learning. In other words, computer technologies can change the teacher's role from information giver to facilitator, counselor, advisor, guide, coach, co-learner, mentor, resource and technology managers, and mediator to the students (Jonassen et al., 1999). Similarly, Attaran and Vanlaar (2001) pointed out that technology reduces record keeping time in schools and simplifies administrative tasks. Also, computer networking is creating a professional band between teachers and administrators. On the other hand, it offers teachers valuable methods of enhancing successful instructions. Besides, computer use assists students in meeting basic educational requirements and it fulfills an instructional need by individualizing the material to the competency level of the learner. In this way, computer use provides an active cooperative learning environment and offers the flexibility that is now mostly absent in the traditional classroom.

In addition, Otto and Albion (2004) reported that although ICT are now widely available in schools, it does not integrate fully into teaching and learning. In line with this idea, Sheingold and Hadley (1990) pointed out that integrating technology is not about helping people to use computers but it is about helping teachers to integrate technology as a tool for learning. In fact, in the ideal teaching and learning setting, technology should be as transparent a tool as a pencil. Therefore, technology integration in classrooms is more about teaching and learning than it is about technology (Mills & Tincher, 2002).

Based on research studies, a wide range of factors has been found to affect technology integration in the school. Of these, leadership role of principal is the single most important factor affecting the successful integration of technology (Byrom & Bingham, 2001). School principals have a major responsibility for initiating and implementing school change through the use of ICT and therefore facilitate complex decisions about integration of ICT into learning and teaching (Schiller, 2003). Although the role of the principal in supporting ICT integration is critical, much of the ICT literature has tended to overlook the role of the principal (Michael, 1998) and the principal's current technology leadership capabilities and the necessary role the principal must play as technology leader. This gap in the research is rather strange because many studies relating to school effectiveness, school improvement and change show that principals play an important role in creating successful

change in schools (Schiller, 2003). However, little is known about the use of ICT by Iranian principals, their perceived computer competence, and their leadership style that they should play in the area of technology leadership. Therefore there is a need to investigate the role the principal should play in the area of technology leadership.

Ultimately, this paper will provide some preliminary findings on the efficacy of our expectation. The remainder of this article is organized as follows. The next section provides an overview of the relevant literature. Then, the method is discussed followed by presentation of the findings. The final section provides a summary and discussion for future research.

The importance of leadership role of principals in technology integration

Leadership is a key component in guiding the teaching-learning process necessary for preparing today's students with relevant knowledge and skills in today's society to become a productive citizen of the 21st century. According to Dinham (2005), leadership is important in developing effective, innovative schools and in facilitating quality teaching and learning. Today's principals must not only manage the day to day activities of a school but also focus on student learning, standards, data driven decision making and restructuring efforts.

As stated above, the principals play an integral role in technology integration (Wilmore & Betz, 2000). This role is crucial in helping teachers create today's ideal learning environment for students. In line with this idea, Wilmore and Betz (2000) stated that "Information Technology will only be successfully implemented in schools if the principal actively supports it, learns as well, provides adequate professional development and supports his/her staff in the process of change" (p. 15). Hence, principals are one of the key leaders of change at the school level. Their actions, interests and self-efficacy can have a profound impact on program change and instructional practice. Therefore, effective administrators must have knowledge, dispositions, and performance. The knowledge are those things that an effective administrators should know; the dispositions are what an effective administrators should believe or value; and the performance are what an effective administrator should do.

In the age of information, principals must be able to integrate ICT into their daily practice and to provide consistent and positive leadership for technology use in the teaching-learning process. In fact, they must be technology leaders. According to Hope, Kelly and Guyden (2000) technology leadership involves both understanding the technologies and how they can be applied to accomplishing tasks. In a study that examined the role of administrators in the integration of technology into the learning environment of three United States school districts, Gibson (2002) stated that school principals must focus their energies on ten technology categories: existing practice, planning, curriculum, resources, staff issues, communications, support, obstacles, staff development, and implementation. In this way, principals need to understand the capacities of the new technologies, to have a personal proficiency in their use, and be able to promote a school culture which encourages exploration of new techniques in teaching, learning and management (Schiller, 2003). Therefore, schools need leaders who can facilitate the change process and support a learning community for technology integration.

According to Fullan (2003), no successful large-scale change or school reform effort has advanced very far without the support of the school leaders. Similarly, Schiller stated that "principals have a key role to play in the facilitation of educational change" (p. 4). In his studies of the elementary school principal as a change facilitator for ICT, Schiller (2003) concludes that principals who take an active approach to innovation can foster an environment that has greater benefits for their students and staff. Hence, principals' awareness, understanding and use of ICT are essential for effective use of computers in the school (Smith et al., 1999). A school administrator needs to be familiar with ICT and know what to look for in the classroom if effective supervision, evaluation or support for a classroom teacher is to be made (Fleit, 2000). This view is supported by Hope, Kely and Guyden (2000) who noted that school leaders should use technology themselves, developing an awareness of how technology can be used and modeling the practice to the school staff. Similarly, Stegall (1998) stated that it is important for principals to use computers, to seek assistance and advice from experts, from a technology committee, visit other schools, brainstorm ideas and hire and train technology 'savvy' teachers. Therefore, successful ICT development within the school will require the leader to be aware of the possibilities and future development of technology and how the school might integrate these into teaching and learning.

As leaders, the principals must create supportive conditions to foster the integration of technology (MacNeil & Delafield, 1998). According to Yee (2000), successful school principals should inspire a shared vision for comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision. Also, these principals should portray passionate commitment to providing appropriate ICT

professional staff development for their staff members (Yee, 2000). In this way, the principal's role changes as she/he leads technology integration. Similar to Yee's research, Schiller's findings highlight the key role that the principal must play not only in supporting technology, but also facilitating change and intervention strategies in the teaching-learning process (Schiller, 2003). Also, he stated that principals must work collaboratively with the teaching staff to effectively lead the integration of technology in their schools. To lead this integration, they must be trained and continually supported on the use of technology. Hence, administrators who are informed and comfortable with technology become key players in leading and supporting technology into the schools. Then, principal must act as a role model and they should be competent users of ICT tools.

As described above, leaders who are using technology while they are studying theory are much more successful at understanding it and then placing it in the context of teaching and learning. In this way, leaders must know how to use technology to change practice to reach new goals as a catalyst for change and as a tool in creating, implementing, managing, and communicating a new conception of teaching and learning (Johnston & Cooley, 2001). These new models share instructional practices that include active engagement, communication, collaboration, problem solving, critical thinking, independent exploration and real life tasks (Johnston & Cooley, 2001). Hence, leaders must be able to adapt to change as the environment shifts and develops. Then, the question becomes what leadership style is needed for principal to help teachers cope with the demands of this technological and pedagogical change.

According to Northouse (1997), one of the best styles of leadership is transformational leadership that can change and transform individuals. Transformational leadership occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality (Burns, 1978). An important goal of a transformational leader is to develop followers beyond their potential (Lee, 2005). Hence, transformational leaders try to develop and satisfy the higher-order needs of followers to gain their followers' commitment to the organization (Rowden, 2000).

The concept of transformational leadership has acquired wide popularity among leadership researchers during the past decade (Lowe, Kroeck et al., 1996) because of its qualitatively different approach to motivating followers as compared with other leadership styles (Howell & Avolio, 1993). Bass and Avolio (1994) described transformational leadership as being composed of four unique but interrelated behavioral components: inspirational motivation, intellectual stimulation, idealized influence, and individualized consideration. Several empirical and theoretical studies have found that leaders who display these four behaviors are able to realign their followers' values and norms, promote both personal and organizational changes, and help followers to exceed their initial performance expectations (e.g., Jung & Avolio, 2000). Therefore, transformational leader is noted as one of the most important factors affecting the integration of educational technology and has input into all the essential conditions that promote the integration of educational technology (Brooks-Young, 2002; Ross, McGraw & Burdette, 2001).

Also, the importance of transformational leaders regarding ICT use is supported by Jung and his colleagues (2003) who conducted a research on the role of transformational leadership in enhancing organizational innovation. Their findings supported a direct and positive link between a style of leadership that has been labeled as "transformational" and organizational innovation. Also, they indicated that transformational leadership has significant and positive relations with both empowerment and an innovation-supporting organizational climate. Therefore, transformational leader is noted as one of the most important factors affecting the integration of educational technology and has input into all the essential conditions that promote the integration of educational technology (Brooks-Young, 2002; Ross, McGraw & Burdette, 2001).

Similarly, Schepers and Wetzels (2005) found that there is a positive relationship between transformational leadership and technology usage. They added that if a leader encourages creativity and open-mindedness, employees will be more used to experimenting with new technologies and procedure. Hence, a leader should facilitate conditions and events that create a positive environment for technology adoption such as training and education and organizational technical support (Frambach and Schillewaert, 2002; Schillewaert et al., 2005). In this way, we need proactive leaders who see the present as a springboard to achieve future aims (Popper & Zakkai, 1994).

In fact, technology is about change and change requires strong leadership. Leadership "is not mobilizing others to solve problems we already know how to solve, but to help them confront problems that have never yet been successfully addressed" (Fullan, 2001, p. 3). Enthusiasm, patience, hope, compassion, energy, and forgiveness are all needed in the leaders of today and tomorrow. If leaders lead well then the organization will outgrow them. Therefore, the chief role of leadership is to mobilize the collective capacity to challenge difficult circumstances.

THE STUDY

In view of the current state of the literature, this study explores how leadership affects the use of ICT in schools. Specifically, it determines the extent to which Iranian principals use ICT in their schools and identifies their perceived ICT competencies and their leadership style. These are empirical questions, and we provide some preliminary findings for supporting the efficacy of our expectation.

METHOD

To determine the extent of ICT use among principals in their schools and identify their perceived ICT competencies and their leadership style, 30 secondary school principals from 19th educational area in Tehran, a large province in Iran, were invited to complete a set of questionnaire. The questionnaires are divided into two parts. Part A measures the perceived level of computer use by principals. Part B measures the principal's characteristics; perceived computer competence; and leadership style (transformational and transactional leadership).

Computer use was measured by 39 items using a five-point Likert scale. Each item was rated by respondents from 1 ("Never use") to 5 ("use daily"). The responses to all 39 items are analyzed using frequency and percentages to determine to what extent principals use the computer for instructional and administrative purposes. This scale was developed by Felton (2006). Also, several items were added to the survey instrument to accommodate the setting of this study. On the other hand, the computer competence scale was used to determine secondary school principals' beliefs about their computer knowledge and computer skills. This scale was developed by Flowers and Algozzine in 2000. A four-point likert-type scale ranging from "no competence" to "much competence" was provided. The responses are reduced to a mean score that demonstrates the level of each respondent's perceived computer competence, with higher scores indicating greater competence. Moreover, leadership style of principals was identified by Multifactor Leadership Questionnaire (MLQ) developed by Bass and Avolio (1997). The MLQ has been extensively used and is considered a well-validated measure of leadership style (Awamleh & Gardner, 1999). Its construct validity has been demonstrated using confirmatory factor analysis (Avolio, Bass, & Jung, 1999).

Although these instruments were valid, a panel of expert reestablished face and content validity of these instruments. Also, the survey was translated from English into Persian using the double back translation method to ensure the accuracy of the Persian version. In addition, Cronbach's alpha was used to measure internal consistency. The Cronbach's alpha coefficients for these scales were: level of computer use= .917, computer competence scale = .973 and leadership style= .813. In addition, demographic variables such as age, gender, experience, types of the school, education, and training were quantified by individual scores on six items. Then, approval was obtained from the Ministry of Education to carry out this study. The questionnaires described above were administrated to thirty Iranian principals. These subjects were volunteers from the target population. Also, descriptive statistics was used to describe and summarize the properties of the mass of data collected from the respondents.

Findings

Of the respondents, 47% were males while 53% were females. About 16% (n= 5) of the respondents were 41 or younger, 43% (n=13) were within the 42-47 age range, 30% (n=9) were within the 48-53 age range, 11% (n=3) were 60 or older. Participants' responses on their work experience showed that 40% of them had less than 19 years of experience, 40% were between 20 and 25 years, 17% had 26-31 years and 3% had more than 32 years. The majority of the respondents, 60% (n=18) worked in private schools, while 40% (n=12) worked in public schools. More than half of the respondents (70%) held bachelor degrees, 27% held Masters' degrees, and about 3% held a Doctorate degree. Nearly 90% respondents owned a home computer. Moreover, all of the respondents reported that they had had computer training.

Use of computers by principals

Participants were asked to respond to 39, Likert-type statements dealing with their use of computer. According to this questionnaire, four domains of computer use such as Internet use, hardware and software use, instructional use, and administrative use were measured. A mean score on a 5-point scale represented computer use by principals, where 5 (use daily) represents the maximum score of the scale and 1 (never use) represents the minimum score. Higher scores indicate higher level of computer use and lower scores indicate lower level of computer use.

Table 1. Distribution of mean scores on the computer use scale

Scale	Percent (%)					Mean	S.D.
	Never use	Use a few times a month	Use a few times a week	Use 2 or 3 times a week	Use daily		
Internet use	0.0	16.7	20.0	43.3	20	3.67	0.99
Hardware and software use	0.0	6.7	23.3	56.7	13.3	3.77	0.77
Instructional use	0.0	13.3	40	40	6.7	3.4	0.81
Administrative use	0.0	20	56.7	23.3	0.0	3.03	0.67
Overall Computer Use	0.0	13.3	36.7	43.3	6.7	3.43	0.817

As shown in Table 1, principals' overall computer use was moderate with an overall mean score of 3.43 and a standard deviation of 0.81. The level of computer use by principals were evident within the Internet use (M= 3.57), hardware and software use (M= 3.77), instructional use (M= 3.4), and administrative use (M= 3.03) domains. Also, the results showed that 43.3 percent of principals use computers 2 or 3 times a week while only 6.7 percent of them apply computer daily for doing their tasks.

Based on these findings, the number of principals who used Internet daily at school was more than those who used it at home. Besides, most of the principals indicated that they used the Internet daily for sending and receiving e-mail. They also used search engines to conduct Internet searches, whereas using a web browser to explore educational and professional resources was either in the category of "never use" or "a few times a month". Moreover, the main use of computer was in the application of hardware and software. Also, the majority of principals (60%) reported that they used word processing daily for their professional work while only 3% stated that they used computer to construct spreadsheets, databases and presentations (such as PowerPoint). By increasing the availability of computers at school and home, it is not surprising that basic computer operation skills and word processing are skills that most principals are competent in. These skills are not seen as critical for principals as other staff can assist them and therefore the principals can spend more time on other aspects of ICT. However, the relatively low proficiency of principals in creating and using spreadsheets and databases are essential for those in leadership positions where use and interpretation of data is increasingly becoming a critical skill. Hence, considerable ongoing, professional development opportunities need to be provided for principals to fulfill their role as technology leader. Training needs to be ongoing so principals can continue to learn how to use hardware and software applications within the context of their administrative and instructional responsibilities.

Regarding the instructional use domain, about 40 % of the respondents used computer "2 or 3 times a week" or "a few times a week". Majority of respondents stated that they used computers for recording discipline referrals, monitoring student achievement for specific objectives, monitoring students' grades, creating a master schedule, and developing or writing curriculum.

According to Table 1, 23.3% of principals used computers "2 or 3 times a week" for administrative tasks. This amount is less than the amount of computer use in other domains. Moreover, most of the principals applied technology to communicate with their staff, members of the wider school, initiate and sustain collaborative activities with colleagues within and outside their school, whereas about 36% of principals stated that they did not use a program to analyze information for solving problems. Also, nearly 50% reported that they have never used technology to participate new kinds of professional development such as collaborative work groups and online study groups.

Perceived ICT competencies of principals

The survey provided an opportunity for each principal to rate themselves on a range of ICT competencies. Table 2 demonstrates the eight domains of the perceived ICT competencies of principals. The scales ranged from a low of 1 (no competence) to a high of 4 (much competence).

Table 2. Distribution of mean scores on the computer competence scale

Scale	Percent (%)				Mean	S.D.
	No competence	Little competence	Moderate competence	Much competence		
Basic computer operation skills	0.0	3.3	30.0	66.7	3.63	0.56
Set up, maintenance, and troubleshooting of equipment	0.0	30.0	46.7	23.3	2.93	0.74
Word processing	0.0	10.0	30.0	60.0	3.5	0.68
Spreadsheets	3.3	40.0	46.7	10.0	2.63	0.72
Database	3.3	40.0	50.0	6.7	2.6	0.68
Networking	3.3	26.7	50.0	20.0	2.87	0.78
Telecommunication	0.0	26.7	43.3	30.0	3.10	0.77
Media communication	0.0	16.7	56.7	26.7	3.10	0.66
Overall computer competence	0.0	14.3	50.0	35.7	3.21	0.69

As can be seen from Table 2, the majority of the respondents (50%) possessed moderate competence in handling most of the computer functions needed by principals. Also about 35.7% of principals had much competence and approximately 14.3% of them had little competence in computer use. The mean of principals' computer competence was 3.21, indicating that these principals perceived themselves to be moderately competent in computer technologies. The standard deviation of principals perceived computer competence was 0.69 which means that their responses clustered around the mean. In addition, more than half of the respondents indicated that they had much competence in handling basic computer operation skills (66.7%) and word processing (60%) while only 6.7% of principals reported that they had much competence in entering data, searching, producing a report and queries in a database. To improve the computer competency among school principals; policy makers should plan computer programs to train principals. They should emphasize on training for principals to effectively use technology in their work. Therefore, principals must be given support to help them understand the use of computers for complex tasks of their jobs.

Leadership style of principals

Leadership style of principals was measured by the Multifactor Leadership Questionnaire. The instrument used in this study provided two scores: transformational leadership and transactional leadership. The transformational leadership score is the average score of 20 items making up transformational leadership. The transactional score is the average score of the 12 items encompassing transactional leadership. Leadership style was measured by a mean score on a five-point Likert scale, where 0 (not at all) represents the minimum score of the scale and 4 (frequently, if not always) represents the maximum score.

Table 3. Distribution of mean scores on the leadership style scale

Scale	Percent (%)					Mean	S.D.
	Not at all	Once in a while	Sometimes	Fairly often	Frequently if not always		
Transformational leadership	0.0	6.7	20.0	56.7	16.7	2.83	0.79
Idealized influence (attributed)	0.0	16.7	20.0	50.0	13.3	2.60	0.93
Idealized influence (behavior)	6.7	16.7	26.7	43.3	6.7	2.27	1.04
Inspirational motivation	6.7	16.7	26.7	43.3	6.7	2.27	1.04
Intellectual stimulation	3.3	13.3	33.3	36.7	13.3	2.43	1.0
Individualized considerations	0.0	6.7	40.0	46.7	6.7	2.53	0.73
Transactional leadership	0.0	10.0	66.7	23.3	0.0	2.13	0.57

Contingent reward	0.0	13.3	23.3	40.0	23.3	2.73	0.98
Management by-exception-active	0.0	13.3	36.7	40.0	10.0	2.47	0.86
Management by-exception-passive	0.0	16.7	43.3	20.0	20.0	2.43	1.0
Overall leadership style	0.0	16.7	50.0	30.0	3.3	2.20	0.76

Table 3 reports the percentage, mean scores and standard deviations of responses for each set of items measuring transformational and transactional leadership. As a composite variable, transformational leadership received a mean rating of 2.83 (on a five- point scale). In addition, all of the five dimensions of transformational leadership received very similar mean ratings (2.27-2.60). Also, the standard deviations associated with all five transformational leadership dimensions were relatively large, ranging from 0.73-1.04. This indicates at least moderate variation in the perceptions of respondents. In all, the areas where most improvement is needed are individualized consideration (behavior) and inspirational motivation. Individualized consideration (behavior) and inspirational motivation had the lowest total mean score of 2.27. Transactional leadership however received a mean score of 2.13. Among the three dimensions measuring transactional leadership, contingent rewards received a larger mean score (2.73). The overall mean score of principals' responses on the leadership style scale was 2.20 with a standard deviation of 0.76.

DISCUSSION AND CONCLUSION

This paper raises some issues about the role of principals in technology integration, determines the extent to which Iranian principals use ICT in their schools and identifies their perceived ICT competencies and their leadership style. Findings indicate that principals are using computers two or three times a week for a variety of instructional and administrative tasks. In fact, if Iranian principals want to be successful for their new role as technology leaders, they must understand the role of ICT in their work life and acquire appropriate skills to use this knowledge. In other words, they must be proficient in utilizing the computer to assist in administrative and instructional functions. For example, they should understand word processing, how to construct and report from a data base, how to use a spreadsheet to solve financial problems, how to create reports and link them with a mail-merge package, how to create and maintain files on a disk, how to use hardware available in their district, and how to use specific applications programs in use in their school. Hence, principals should use of technology and realize the role that technology can play in teaching and learning process. Successful adoption of computer is important for school principals who must use computers and model their use for their staff (Tiede, 1992). If this modeling is successful, the staff may then model the use of computers for students. In this way, principals who do not have positive expectations for computer use or do not instill or support a culture of technology use; integration is inhibited (Anderson & Dexter, 2000). Therefore, principals should have knowledge, skill and positive attitudes towards implementing ICT in schools and also they must know new administrative techniques to manage their schools effectively.

In line with this idea, Thomas (2001) stated that administrators should understand (a)the elements and characteristics of long-range planning for the use of current and emerging technology; (b) demonstrate an ability to analyze and react to technology issues, concepts and proposals; (c) possess a " big-picture" vision of technology in education and schools; (d) use technology to communicate efficiently with staff, parents and the community; (e) use technology directly to collect and analyze data and other information that can improve decision-making and other management functions; (f)understand how current and available technologies can be integrated effectively into all aspects of the teaching and learning process; (g) understand the legal and ethical issues related to technology licensing and usage; and (h) use technology appropriately in leading and communicating about school programs and activities. Hence, meaningful opportunities must be provided for Iranian principals to develop their skills and dispositions necessary for leadership in the current educational milieu. In this way, they will understand that technology use can enhance their professional practice and increase their own productivity.

As indicated above, improved technology leadership will only occur if the principal becomes proficient in the use of technology and then provide leadership in the use technology for administrative, instructional, and learning functions. In fact, the principal needs to have up-to-date knowledge on areas of education. The best way to do this is by committing themselves to the process of learning every day throughout their lives (Coughlin, 1994). It means that leaders should never stop learning and honing their skills. In addition they must be familiar with current research and best practice. They must maintain a personal plan for self- improvement and continuous learning (Bennis, 1999). Therefore, such leaders can inspire others and create shared vision;

demonstrate effective uses of technology in the areas of learning and teaching; incorporate technology as they support, manage, and operate the school; and actively involve themselves in the assessment and evaluation of technology in the school.

The pace of change confronting organizations today has resulted in calls for more adaptive, flexible leadership. Adaptive leaders work more effectively in rapidly changing environments by helping to make sense of the challenges confronted by both leaders and followers and then appropriately responding to those challenges (Bass et al.,2003). In other words, such leaders are influential in approving or disapproving new ideas. They play an important role in the diffusion and adoption of innovations. Adaptive leaders work with their followers to generate creative solutions to complex problems, while also developing them to handle a broader range of leadership responsibilities (Bennis, 2001). Bass (1985) labeled the type of adaptive leadership described above transformational leadership. This study shows that a representative sample of Iranian secondary school principals provided fairly often some elements of transformational leadership. Principals should be eager to model the transformational components of charisma (idealized influence), inspirational motivation, intellectual stimulation and individualized consideration in their schools. As charismatic leaders, these principals must talk about values and beliefs, emphasize the sense of mission and promote the good of the group (Bass & Avolio, 2000). As a part of inspirational motivation, principals must create a vision and enlist others to share this vision by making them feel a part of something bigger than themselves (Kouzes & Posner, 1989). Principals should provide intellectual stimulation by challenging teachers to reconsider and rethink assumptions about their work (Leithwood, 1994). According to Bass and Avolio (2000), transformational leaders were not born; rather, transformational leadership could be taught. Hence, principals must develop and display transformational leadership behaviors through training to improve creative and innovativeness in their schools.

Although we have found several encouraging results, it is important to recognize that the current findings also have limitations. First, the sample size should be increased because using data from a larger number of respondents will permit more powerful findings. Second, participants of this study completed a self-reported instrument. Given the self-reporting nature of this instrument, it was quite possible that principals overrated their proficiency or underrated their proficiency. These ratings may not reflect the true proficiency levels of the principals. In spite of these limitations, this study will be useful for policy makers, providers of professional development programs for principals and for system level decision makers to support mechanism and strategies to assist principals to develop their knowledge, skills and their leadership style. Thus, principals will understand the critical role that they play in facilitating the implementation of ICT in schools to improve teaching, learning and administrative processes. Therefore, we need leaders, not bosses, who help us develop a clearer vision and shed light in the moments of dark confusion (Wheatley & Margaret, 1992).

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THE EFFECT OF CLASSIC AND WEB BASED EDUCATIONAL APPLICATION, APPLIED FOR TURBO PASCAL LESSON, ON STUDENT SUCCESS LEVEL

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ABSTRACT
The aim of research is to compare difference between tenth class students and determine their level of success about classic and web based educational applications of Turbo Pascal lesson.

This research was applied to 10 A and 10 TLB students of İzmir Karşıkaya Anatolian Technical and industrial high school computer department in second term of 2004-2005. In this research in order to apply web based education the program named "Pascal Öğreniyorum" was planned using PHP language for control group on TLB and for experiment group on A classes were choose. The equivalents of these groups were scaled with pre-test . Then the program prepared for experiment group, subjects were told and applied in the environment of the post-test lab. For controlled group the subjects were taught in classical method and post test was applied as in written exam. The success paints which were collected by the help of pre test and post test. I were transferred to SPSS analyzing program and program and interpreted. As a result of this analysis it was determined that there was a significant difference in favor of web based education

Keyword: Web Based Education, Computers, Turbo Pascal

1. INTRODUCTION

Traditional learning–teaching environment, crowded classes, time and limited places affect in a bad way the students' participation to learning duration. As a result of this, individualized learning which is one of effective circumstances occurs.

In order to individualize teaching, various methods have been claimed and while some of them are accepted, some of them are refused. Data age, affects our educational system mostly. New developments in data technology form some new concepts for education. These new educational concepts bring reach learning areas which are supported by well planned resources. Web based education can be used as a new learning and teaching material in forming this kind of rich teaching environment. (Hacker, R. G, & Sova, B. 1998).

We come across rapid growing communication and computer technology in every area and make our lives easier. In order the catch contemporary education, level of the developments in data and communication areas, it is inevitable to complete education program one of the technologies used effectively in educational system is computer based learning. The works have been done in this area, when computer based education is compared with traditional education method, the success in computer based education is found to be higher. (Chang, 2002; Hacker ve Sova, 1998; Yalçınalp, Geban, ve Özkan, 1995).

It is necessary for all students to learn individually in each learning. Because, in life, it is necessary for all people to solve the problems they come face to face by their efforts. The importance of learning individual working is hidden in the fact that learning is all about the person himself or any one else can't make learning for another one. But, on the other hand, he can help another one to make learning.

Students in web based computer learning environment can be more effective then the traditional class environment and they benefit from individualized teaching opportunities.

Thanks to teaching and learning activities with computer, students can intensify the subjects they have learnt and while doing that they can progress at their speed. (Rushby, 1989, p150). Web based education is an a appropriate environment for multiple environment application that shelter the elements like text, graphic, animated picture, audio video clips, etc...by the help of multiple environment applications, concepts can be given more effectively this kind of interacted environments transform individuals' learning activities to a more enjoyable and qualified type so learning can come true in a higher level.

Computer based education applications are getting wider and wider in Turkey. In government program published in official newspaper on the 31st of December 1987, it has been mentioned to use also a computer in new technology in education. In the same year "one million computers"- slogan forms the basic of these applications

and it has been determined the concepts and scope of computers under the name of new technologies in the thirteenth article of The Ministry of Education. (MEGSB.I987, p.26 and p.31).

Up to now used of computer in education goes on increasingly its importance, today governments points the importance of computer in education again and again by producing this kind of projects. In 1996 computer and teaching technology department was opened as a result of these works. In the near past the project "giving fast internet to 40.000 schools" is an indicator for how much importance is given for this project.

In this research, problem condition; as a result of classical and web based education applications in turbo pascal lesson in curriculum which is applied in İzmir Karşıkaya Anatolian Technical and industrial high school computer department 10 A and 10 Tlb class students, it is asked if there is a significant difference in "Turbo Pascal" class between 10 A and 10 Tlb classes' students.

The aim of this research is to decide whether the classical education or web based education is more effective after applying them to students of 10 A and 10 Tlb students in Izmir Karşıkaya Anatolian Technical and industrial high school computer department. This research shows that in which education method the students in İzmir Karşıkaya Anatolian Technical and industrial high school computer department 10 A and 10 Tlb are more successful. Besides, it shows that in successful education methods what they should do for success and how they can be successful with individual learning methods.

This research is applied under these limited conditions.

- With the students İzmir Karşıkaya Anatolian Technical and Industrial High School Computer Department 10 A and 10 Tlb.
- With students' pre and post test.
- It is restricted by a web site "Pascal Öğreniyorum" developed by the researcher.

2. METHOD

In this part of research it is given place to the method that is used to solve the problem, research model, universe and determining the models, data gathering materials and the statistical method and techniques that used for solving gathered data and interpreting.

2.1 The Model of Research

In this research that examined the effectiveness of learning method which is web based in Turbo Pascal teaching, it is applied pre-test and post-test control grouped model which is the real experiment model.

2.2 The universe of The Research

The universe of the research is 54 students who have been studying in İzmir Karşıkaya Anatolian Technical and industrial high school computer department in 2004-2005 spring learning – teaching term in 10 A and 10 Tlb.

2.3 The Illustration of The Research

The illustration of the research is the all students who have been studying in İzmir Karşıkaya Anatolian Technical and industrial high school computer department 10 A and 10 Tlb.

2.4 Data Gathering Techniques

The reasons of doing experiments of the research with students of İzmir Karşıkaya Anatolian Technical and industrial high school computer department 10 A and 10 Tlb is that in this school there is a lab which has internet and web and students are this department's students so students know how to use computer and web site. Besides, this school is in the institution area that researcher of the school can research easily. That is why this school has been chosen.

By this research it is tried to determine the effectiveness of web based computer based learning method (independent variable) so experiment and control groups are compared according to pre-test results.(Table 1).

Table 1 : Groups Distribution According To Pre Test Scores

	Arithmetical Average
Experiment Group 10 A	52.19
Control Group 10 TLB	60.17

As it is seen in table 1, it is fixed that according to pre-test average; the success of experiment group is less than the success of control group.

2.4.1- Data Gathering Materials

In order to support research's institutional dimension, it is tried to reach local and foreign resources, it is benefited from experts' thoughts on this subject.

In order to gather the data to answer the problem it is formed data based computer lesson software to be used in experiment group, and it is develop two lesson materials to measure students' success in turbo pascal lesson, named pre-test and post-test.

Web Based Computer Lesson Software

For selecting the software used in application this way is followed; the research is determined according to in which subject of Turbo Pascal it will be applied by getting opinions of teachers and the experts that are on duty at the school of applications. Pascal lesson book (Akgöbek, Ö, 2000) investigated by its content and filing subject which is found in "Turbo Pascal" lesson book is decided. Later, they tried to reach education teaching institutions which have materials or apply web based computer supported Turbo Pascal learning.

From the investigated software which seems suitable are presented to the opinions of expert and teacher in the school in which the application made.

Taking the teacher and expert opinions the decided content, later, is prepared as PowerPoint presentation in computer environment. Besides a web site is prepared for students to be able to reach this lesson teachings. The students become user of this side as registration to web site. Moreover, it is supplied that the students can reach PowerPoint demand which includes subject teaching about filing of Turbo Pascal. "Pascal Öğreniyorum" is a dynamic web site prepared with PHP in which subject teaching is published.

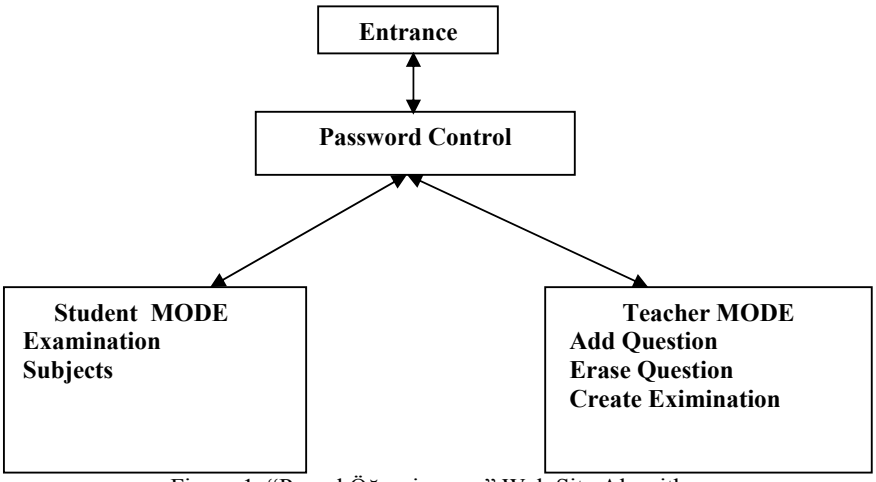

Figure 1: "Pascal Öğreniyorum" Web Site Algorithm

"Pascal Öğreniyorum" web site is consist of two different modes.

* Teacher Mode * Student Mode

Entrance Page: It is the part the users meet first and enter. In order to make entrance for users, a student should code his password and number totally. For this entrance page should be used. (Figure 2)

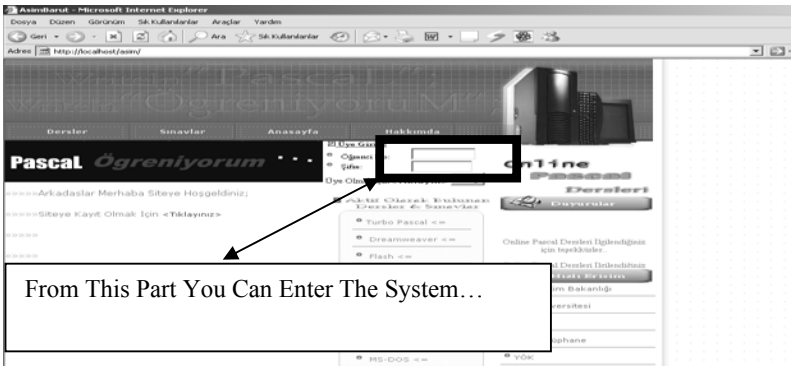

Figure 2: "Pascal Öğreniyorum" Web Site Entrance Page

- **Student Page:** It is part that students can have examination, reach lesson subject and enter with password and user name (Figure 3).

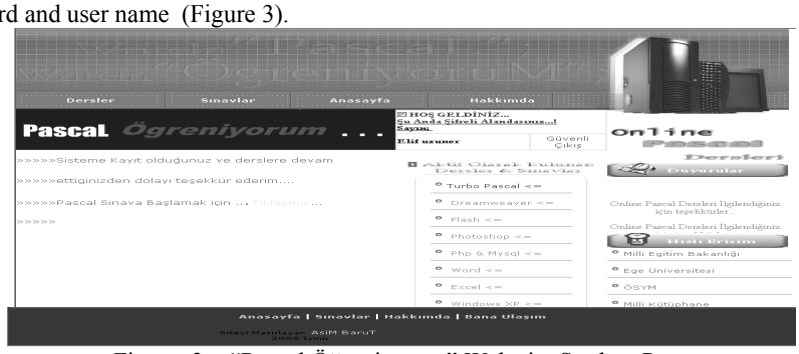

Figure 3 : "Pascal Öğreniyorum" Web site Student Page

- **Teacher Page:** It is the part that teachers prepare exams, they add and take out the subject. (Figure 4).

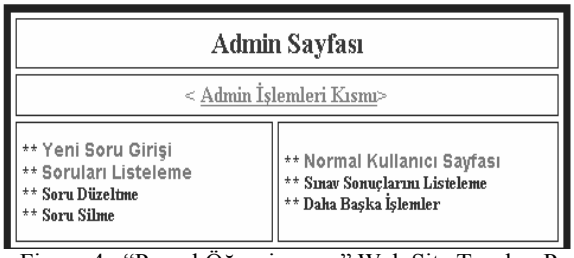

Figure 4 : "Pascal Öğreniyorum" Web Site Teacher Page

Question Entrance: It is the page that teachers enter the multiple choice questions to system.(Figure 5).

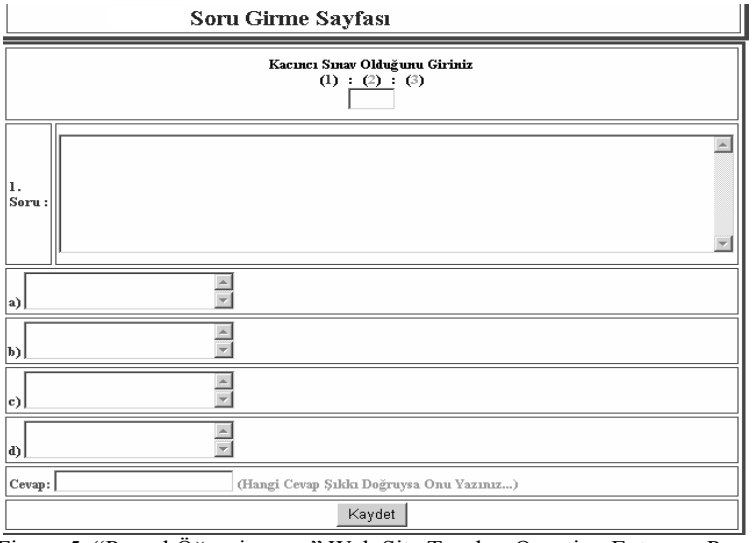

Figure 5: "Pascal Öğreniyorum" Web Site Teacher Question Entrance Page

Subject Success Test (Measure Instrument)

In this research two tests which are named pre-test and post-test are prepared. The subjects in Turbo Pascal lesson books taught in İzmir Karşıkaya Anatolian Technical and industrial high school computer department and aims are determined by taking lesson teachers' ideas. In order to measure the determined aims, a pre-test (With Indicator Table) consist of twenty five question is prepared and presented to experts' ideas. While preparing the questions, they benefit from teachers' questions and lesson books. Measure instrument is created by chosen questions which are convenient for tried' levels. Post test is prepared with the same conditions but at this time it is together with twenty – questions post test which includes filing and subprogram subjects chosen before and submitted to expert views.

Application

The web page (software) used in application is created by the investigator by taking expert's views. It has been applied for a mount to the student İzmir Karşıkaya Anatolian Technical and industrial high school computer department 10 A and 10 Tlb classes students. Before beginning to Turbo Pascal lesson which taught before, generally the pre-test which is prepared to measure Turbo Pascal levels is applied to both groups. So, groups entrance levels are determined after pre-test is applied, the control group is taught with traditional method, experiment group is taught with web based and computer assisted method. After finishing the subject, multiple chose post test which includes the subject is applied.

Turbo Pascal's filing subject is taught by the teachers to the students in control group. During the works about the subject, the teacher uses lesson book and bored. The teacher is set free about the works but, they should be according to determined aims. Two lesson hour in a week, after twelve-hour lessons in total, the post test is applied to the students. Turbo Pascal's filling subject prepared with web based computer software has been done by internet to the student in experiment group. It is seen that the students in experiment group participate in works more willingly and they like the software. Generally, when they are compared with the control group students, they do the works more quickly and they work more. The post test is applied to control group with classical method and for experiment group, it is applied by internet as a multiple choice test.

The Solution of Datum

After experiment and control group take points related to pre test and post test, the students' group numbers in each group are less then thirty. It is tested by applying "2 related Samples" from nonparametric tests if there is a significant difference about arithmetic average of the pre test and post test points of the students in each group. The reason of using this test is to take healthy datum and numbers of the groups are less then thirty. Following this, between groups, by using "2 independent T" test from nonparametric test, and it is tested if difference of arithmetic averages of pre test and post test points are significant or not. The statistical process and analysis in the solution of datum is come true with SPSS analysis program.

3. EVIDENCES AND INTERPRETATION

The school of İzmir Karşıkaya Anatolian Technical and industrial high school computer department 10 A and 10 Tlb classes fifty four students are applied pre test, then post test is applied. According to the purpose of the research, in order to answer the problem in the second section as it is explained with the method after gathering the data as a result of statistical result, it gives place to evidences and the interpretations of the evidences. The results pre test of experiment and control groups are given in table 2.

Table 2 : Experiment and Control Groups Pre Test Result

	GROUP	N	Average Level	Total Level
PRE TEST	Experiment Group 10 A	31	23.29	722.00
	Control Group 10 TLB	23	33.17	763.00
	Total	54		

While comparing pre test, as element scores are smaller then thirty, it is used "2 Independent T" test which is one of nonparametric tests. This test is used to get correct data and the table above is obtained as a result of students' marks analysis. According to this test the average of experiment group's pre test is 23.29; the average of control group's pre test is 33.17. Significant difference of test analysis is seen in table 2.1.

Table 2.1. Significant Difference Of " 2 independent T" Test Analysis According To Pre Test Results.

	PRE TEST
Mann-Whitney U	226.000
Wilcoxon W	722.000
Z	-2.296
Importance Control	p=.022 p<0.05 Importance of difference

The degree of p is found as 0.022 according to the result of analysis and as degree is p<0.05, the difference is significant. It occurs a significant difference between experiment and control groups of Turbo Pascal info. The post test results of experiment and control groups are given in table 3.

Table 3 : The Results Of Post Test Of Experiment And Control Groups

	GROUP	N	Average Level	Total Level
POST TEST	Experiment Group 10 A	31	29.68	920.00
	Control Group 10 TLB	23	24.57	565.00
	Total	54		

The average of post test of experiment group is 29.68; the average of post test of control group is 24.57. According to the average of pre test of experiment group it is obtained as significant increase but it is realized decrease in control group. The reason of this increase is that "Pascal Öğreniyorum" program affects students in positive way to get the subject and have positive attitudes. The significant difference of test analysis is seen in table 3.1.

Table 3.1. Significant Difference of Test Analysis of "2 Independent T", One Of nonparametric test, according to post test results of groups.

	POSTTEST
Mann-Whitney U	289.000
Wilcoxon W	565.000
Z	-1.208
Importance Control	p=.227 p>0.05 Unimportant Difference

After the result of analysis the degree of p is found as 0.227 and as the degree is p>0.05, the difference is insignificant. But when it is looked at the average of experiment and control groups, it is deduced that web-based education that is applied to experiment group is more effective than the classic education that is a applied to control group.

Table 4 : Comparison Of Pre Test and Post Test Results Of Control Group

		N	Average Level	Total Level
POST TEST – PRE TEST	POST TEST < PRE TEST	10	10.70	107.00
	POST TEST > PRE TEST	12	12.17	146.00
	PRE TEST = POST TEST	1		
	Total	23		

While comparing the results of pre test and post test control group it is used "2 Related Samples" test which is used for comparing different to features of the same group and which is the equivalent of nonparametric tests of Paired Samples. The results of analysis is given in table 4.1.

Table 4.1 : Test Analysis significant difference of "2 Related Samples", One Of Nonparametric Tests, According To Pre Test And Post Test Results.

	POSTTEST – PRETEST
Z	-.634
Importance Control	.526 p>0.05 Unimportant Difference

There is no significant difference between pre test points and post test points of control group. The comparison of results of pre test and post test of experiment group is given in table 5.

Table 5 : The comparison of the results of pre test and post test of experiment.

		N	Average Level	Total Level
POSTTEST - ÖNTEST	POSTTEST < PRETEST	6	10.50	63.00
	POSTTEST > PRETEST	24	16.75	402.00
	PRETEST = POSTTEST	1		
	Total	31		

As a result of comparing experiment group pre test with post test the number of the members who take high point in pre test and take low point in post test are 6. The number of the members who take low in pre test and high in post test are 24. Only one member takes the same points in both pre test and post test. It is seen in table 5 that there is a significant difference between pre test and post test points of experiment group.

Table 5.1 : Significant Difference of test analysis of "2 Related Samples", one of nonparametric tests, According to pre test post test result

	POSTTEST- PRETEST
Z	-3.488
Importance Control	.000 p<0,05 Difference is Important

As a result of analysis p degree comes out 0,000 and since it is p<0,05, it means there is a significant difference. This difference is indicator for that "Pascal Öğreniyorum" web based education is effective for the experiment group student.

4. DISCUSSION AND RESULTS

İzmir Karşıkaya Anatolian Technical and Industrial High School computer department 10 A and 10 Tlb is determined as a control group, class 10 A is determined as experiment group. In the class of experiment group 10A it is applied web based education program named "Pascal Öğreniyorum" in the class of control group 10 Tlb it is applied classic education.

As a result of analyses in control group it is determined that there is no improvement between pre test and post test, but in experiment group which is applied web based education program named "Pascal Öğreniyorum" it is observed that comparing to pre test, in post test the success increases so it can be said easily that web based education is more effective than classic education.

If the technology is used with its all sides it can enhance learning at two points. It can direct students' personal choices and it can supply rich learning which help students to use different methods. Therefore students can benefit from a richer environment in web based learning environments. With the fact producing such materials requires time, there is like no other way to make environments more effective. Hence, it must be done necessary arrangements to create rich various environments (Renshaw, C. E, & Taylor, H. A 2000).

The results of the research shows that in order to use that web based environments more effective it can be benefited from its technical features and the knowledge should be presented in different forms. In addition to visual supports the content should be given as a digest or it should be given in an easy way while reading on the screen. As a visual image every web page should be represented with minimal knowledge in it. With all these opportunities it should be presented some opportunities to help students to make self-evaluation, motivation, and also interaction plays an important role. As different authors explain, interaction is the key of success in a web based environment(Hacker, R. G, & Sova, B. 1998). As the user is alone in computer atmosphere, it enhances the learning, motivation and interaction by using different techniques.

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THE EFFECT OF DYNAMIC GEOMETRY SOFTWARE ON STUDENT MATHEMATICS TEACHERS' SPATIAL VISUALIZATION SKILLS

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ABSTRACT
Geometry is the study of shape and space. Without spatial ability, students cannot fully appreciate the natural world. Spatial ability is also very important for work in various fields such as computer graphics, engineering, architecture, and cartography. A number of studies have demonstrated that technology has an important potential to develop spatial skills. In the present study, the effect of dynamic geometry software (DGS) Cabri 3D on student mathematics teachers' spatial skills was examined. The study used a one-group pretest–intervention–posttest experimental design. In this context, 40 student mathematics teachers took "Purdue Spatial Visualization" (PSV) test as pretest at the beginning of the study, and then some implementations were carried out with these students by using Cabri 3D software for 8 weeks. The PSV test was retaken by students at the end of the study. That if there was a meaningful difference between the pretest and posttest results was examined by using paired sample t test. The findings demonstrated that these computer supported activities contributed to development student mathematics teachers' spatial skills.

Keywords: Spatial Ability, 3D Dynamic Geometry Software, Spatial Visualization

INTRODUCTION

The general objectives of geometry education can be summarized as: student should use geometry within the process of problem solving, understanding and explaining the physical world around them (Baki, 2001). The physical world around us cannot be explained by only two-dimensional Euclidean geometry. Because everything which we use, produce and buy has a three-dimensional geometric shape. Therefore, NCTM (2000) recommends that geometry instruction should include the study of three-dimensional geometry and provide students opportunities to use spatial abilities to solve problems.

Various authors including psychologists and educators have identified distinct components of spatial ability. According to McGee (1976), spatial ability consists of spatial skills as changing, rotating, bending and reversing of an object presented for stimulating in the mind. Linn and Petersen (1985) define spatial ability with mental processes being used in perceiving, storing, recalling, creating, arranging and making related spatial images. Spatial ability have identified several different spatial ability factors as understanding relations visually, making changes on shapes, rearrangement and interpreting them (Tartre, 1990). While some researchers examined spatial ability in two sub-dimension, spatial relations and spatial visualization (Burnett & Lane, 1980; Elliot & Smith, 1983; Pellegrino, Alderton, Shute, 1984; Clements & Battista, 1992), others examined it in three spatial factors (Thurstone, 1938): The ability to recognize the identity of an object when it is seen from different sights, the ability to imagine the movement or internal displacement among the parts of a configuration, the ability to think about those spatial relations in which the body orientation of the observer is an essential part of the problem. However, Maier (1996) examined spatial ability in five factors as spatial perception, visualization, mental rotation, spatial relations and spatial orientation. According to Maccoby and Jacklin, spatial ability consists of two important factors: Analytic and non-analytic factors. Analytic factor contains complex processes such as estimating close state of an object given as open. Non- analytic factor contains rotating an object (Maccoby and Jacklin, 1974). Olkun(2003), examined spatial ability in two major components; spatial visualization and spatial relations. Table 1 shows the definitions of the components, tests that can be used to measure related components, typical test items and their complexity (Olkun, 2003).

Table 1: Spatial Ability and its components

SPATIAL ABILITY		
Component	**Spatial Relations**	**Spatial Visualization**
Definition	Imagining the rotations of 2D and 3D objects as a whole body	Imagining the rotations of objects and their parts in 3D space in a holistic as well piece by piece fashion
Associated test	MGMP, Spatial Visualization Test, Primary Mental Abilities Test, French Reference Kit	MGMP, Spatial Visualization Test, Purdue Spatial Visualization Test, Minnesota Paper Form Board, Differential Aptitude Test, French

		Reference Kit
Typical test items	2D mental rotation, Cube comparison, 3D mental rotation.	Form board, Paper folding, Surface development, 2D-3D transformations
Complexity	Relatively simple tasks	Relatively complex tasks

As been in most of the studies, which were done about human mind, it is seen in the expressions above that it is not an easy task to define spatial ability and determine its factors. However, it may be said that spatial ability generally contains the skills such as rotating of an object, estimating its views from different aspects, changing its view according to the position of the spectator, estimating the folding of developments into three-dimensional object. Whatever its definition and content, it is clear that this skill has an important position in human thought. Because there is strong evidence to suggest that spatial ability plays an important role in the work of various fields such as computer graphics, engineering. In addition this, numerous studies have shown that spatial ability is positively related to problem solving ability as well as success in geometry and mathematics (Fennema & Sherman, 1977; Battista, Wheatley & Talsma, 1982, Battista, et al 1982; Fennema & Tartre, 1985, Moses, 1977).

A number of studies suggest that spatial skills can be developed through instruction (Bishop, 1980). For example, Ben Chaim et al (1989) found that spatial skills could be thought and thus learned by students. In his study of approximately 1000 middle grade students, scores on the Middle Grade Mathematics Project Spatial Visualization Test improved significantly after a three-week unit. Studies have also used computer environments to determine the effect of instruction on spatial skills. Travis and Lenon (1997) used MAPPLE – a computer software package with sophisticated graphing capabilities – in a pilot program developed use MAPPLE to enhance spatial skills. It was found that students in the experimental class scored better on the spatial skills test developed by the researchers. In contrast, some studies have not reported the same success. For example, Ferrini-Mundy (1987) found that an experimental group of calculus students drawn from a random sample of 334 students did not benefit from instruction that included spatial training modules.

The Dynamic Geometry Software Cabri 3D for exploring three-dimensional geometry was launched in 2004. It promises to revolutionize computer assisted visualization and reasoning in 3D geometry in much the same way as the earlier `dynamic geometry software' (DGS) has done for plane geometry. The expression of DGS is common name of the special geometry software such as Cabri Geometry, Geometers' Sketchpad and Cinderella. DGS provides an environment in which students can explore geometric relationships and make and test conjectures. One of the distinguishing features of a DGS is the ability to construct geometrical objects and specify relationships between them. Within the computer environment, geometrical objects created on the screen can be manipulated by means of the mouse (generally referred to as 'dragging'). What is particular to DGS is that when elements of a construction are dragged, all the geometric properties employed in constructing the figure are preserved (Jones, 1999). It can be said that these software have brought revolutionist innovations to geometry education and it is the most important step in geometry instruction since Euclid (De Villiers, 1996). It may be said that parallel to the reformist developments in plane geometry, the revolutionist developments have also existed in three-dimensional geometry especially after the Cabri 3D. Three-dimensional objects such as prism, cylinder and cone can be constructed, rotated and seen from a certain aspect on the screen and also prisms can be opened on the screen. Prisms and half plane can be intersected and thus, new three-dimensional objects may be formed. These features offer incredible opportunities to the student to develop their spatial skills. Also, because some measurements such as angle, length and surface area may be obtained on the screen via this software, the students have the opportunities to learn three-dimensional geometry by explorations. We may give the theorem about three perpendiculars as an example for it:

The Theorem About Three Perpendiculars: A straight line, that lies in a plane and is perpendicular to a projection of straight line inclined to this plane, is perpendicular to this straight line inclined to plane.

The students may explore the theorem themselves by following the steps as shown below using Cabri 3D. The students are asked to form a straight line on the plane and to take a point named A over this straight line. Then, they are asked to draw a perpendicular line from point A to this straight line on the plane. Then, they are asked to draw a perpendicular line from B point to the plane and to take a point named C on this perpendicular line. They can observe that the segment connecting the two perpendicular feet is vertical to the straight on the plane as seen in figure 1.

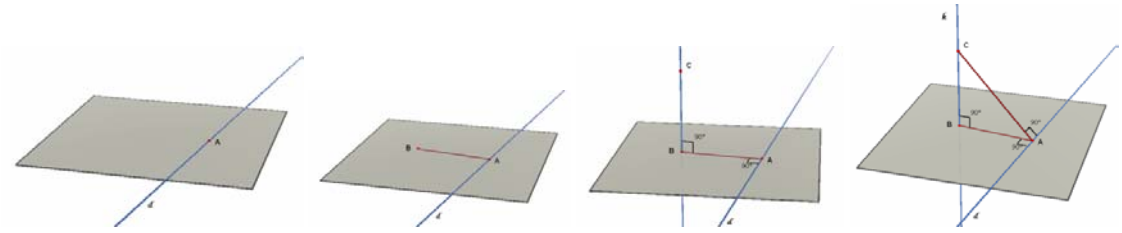

Figure 1. Screenshots of constructing the theorem about three perpendiculars

The Purpose of Study

Despite mathematics educators have optimistic ideas about Cabri 3D, we need more evidence to show possible effect of this software on student performance. Therefore, we should examine the effect of software on students' spatial skills.

The purpose of the present study is to determine the effect of the computer based activities designed by DGS Cabri 3D on the development of students mathematics teachers' spatial skills.

METHOD

Research Design

Pretest-intervention-posttest designs are uniquely appropriate for investigating the effects of educational innovations and are commonly used in educational research (Dugard & Todman, 1995). In this paper, it is not aimed to investigate the advantages or disadvantages of DGS environment rather than traditional environment. Therefore, true or quasi-experimental designs are not used in this study. So, in the present study, a one-group (no control) pretest-intervention-posttest experimental design was utilized to examine the effect of DGS Cabri 3D on the development of students mathematics teachers' spatial skills in Karadeniz Technical University.

Procedure and Intervention

At the beginning of the study, the students took PSV test as pretest. Then, various activities developed with Cabri 3D software were implemented at least 1.5 hours in a week along 8 weeks. During the treatment, the researchers were the teachers of the classroom. After 8 weeks, the students took the same test as posttest again. The schedule of the course activities is shown in table 1.

Table 1: The schedule of the course activities

Week	Course content
1st week	Learning about Cabri 3D Forming basic geometric objects (prisms, sphere, cylinder, cone etc)
2nd week	Obtaining point, circle, ellipse and hyperbole with the help of cone intersections
3rd week	Vertical projection and trigonometric relations
4th week	Reflection, transition and rotation conversions in three-dimensional environment
5th week	Forming various objects by cutting prisms on various surfaces, explanations by using the software and drawing them in their open states
6th week	Estimating close states of the objects given as open in Cabri and drawing the object by closing by the software
7th week	Making the objects intersected with surfaces and obtaining intersection curves
8th week	Free exercises

One of the activities students took during 6th week is seen below.

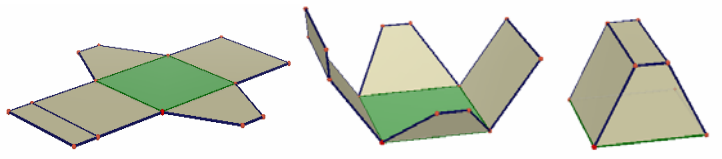

Figure 2. Screenshots of one of the activities step by step

Sample

This study took place during the fall of 2007 and consists of 40 student mathematics teachers with 22 male and

18 female in Karadeniz Technical University. The pretest and posttest (as the same test) implemented all the students but approximately 35-40 students attended the course weekly.

Instrument

In the study, PSV test was used as pretest and posttest for data collection. The test was developed by Roland Guay in 1976 and consists of 36 multiple-choice items in three sections (Developments, Rotations, and Views). Each section contains 12 questions. The explanation of each section of the test is seen below.

Developments: This section requires the student to study a pattern of three-dimensional objects and determine the correct answer from five possible shapes listed below it. A sample question from this section is seen below.

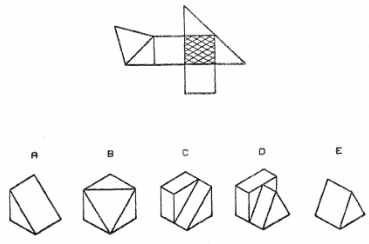

Figure 3: Sample question in Developments section of PSVT

Rotations: This section shows an object in two different positions. Shape one is rotated on the X, Y or Z axis to shape two, which is provided to show the rotation pattern. The student is required to select the object whose position represents the next rotation in the pattern. A sample question from this section is seen below.

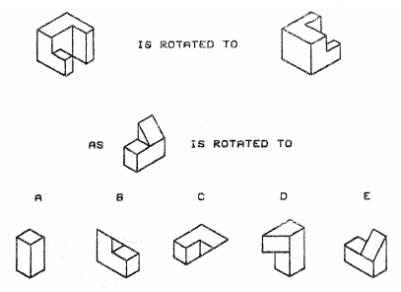

Figure 4: The sample question in Rotations section of PSVT

Views: This section tests a student's ability to visualize a three-dimensional object from various perspectives. In this section, an object is placed in a cube and one of the corners of the cube is marked. The student is asked to imagine that he looks at the object in a way that the marked corner will be between the object and the eye and then, to guess the view of the object. A sample question from this chapter is seen below.

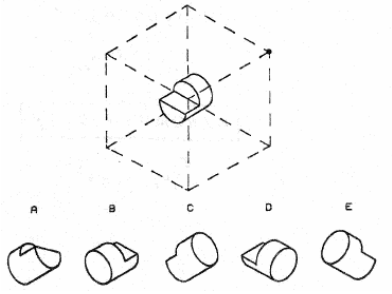

Figure 5: The sample question of the views section of PSVT

The PSVT was shown to be a valid and reliable instrument in different studies. Branoff (1998) calculated the internal consistency coefficients of .82 and .80. Battista, Wheatley and Talsma (1982) administered the PSVT to 82 pre-service teachers enrolled in an undergraduate geometry course and reported a KR-20 of .80. Guay (1980)

used the PSVT on 217 university students, 51 skilled machinist, and 101 university students on three different occasions and reported an internal consistency coefficients (KR-20) of .87, .89 and .92.

The same test was employed as both pretest and posttest, may be seen an important problem for the study. However, Bertoline and Miller (1990) recommended that this test can be used as pretest and posttest to determine the spatial skills.

Data Analysis
Two types of analyses were conducted. First, descriptive statistics were employed to take a general photograph of students' spatial skills before and after the intervention. Thus, the researchers had an overall view about the effectiveness of the implementations. Second, in order to determine the effects of the treatment on the student mathematics teachers' spatial skills, Paired samples t test was used to compare the pretest and posttest scores.

RESULTS
In this chapter, student mathematics teachers' PSVT results are presented to examine the changes in their spatial skills before and after the intervention.

Descriptive statistic of the data obtained from PSVT before and after the intervention is seen in Table 2.

Table 2: Descriptive statistics of the students' PSVT scores before and after the intervention

	Before Intervention				**After Intervention**			
	Min.	Max.	Mean	SD	Min.	Max.	Mean	SD
Developments	2	10	6,2	2,0	2	12	7,9	2,9
Rotations	2	10	5,7	2,1	2	12	7,8	2,8
Views	0	7	3,8	1,4	1	10	5,7	2,0
Total	8	25	15,7	4,2	7	34	21,4	6,4

Figure 6 displays the results of the average scores of pre and posttest

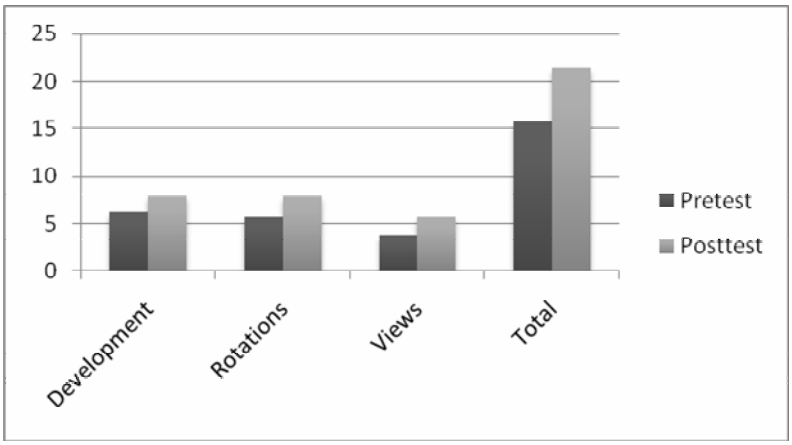

Figure 6: Average scores of pre and posttest

As seen on the average scores on Table 2 and Figure 6, the students gave the least correct answers in "Views" section and the most correct answers in "Developments" section before the intervention. Similar results were obtained in posttest, too.

As seen easily on the Figure 6, an increase in students' correct answer averages at each section of the test was emerged. From the Table 2, the increases in average scores are 1,7 in Developments section, 2,1 in Rotations section and 1,9 in Views section. Although the increases are close to each other, the highest one occurred in Rotations section. Average increase in the whole of the test is 5,7. These data demonstrate that the course caused an increase in the number of student' correct answers.

Paired sample t-test was applied to the data obtained from the whole of the test and its sections at a significant level of .05 to determine if this difference occurred in averages of the students' scores has a statistical meaning or not. Table 3 summarizes the results of the paired sample t-test analysis performed on the pretest and posttest.

Table 3: Mean Difference between Pre- and Post-tests

		N	df	t	p
1st pair	Developments	40	39	4,479	0,000
2nd pair	Rotations			4,910	0,000
3rd pair	Views			6,493	0,000
4th pair	Total			7,709	0,000

This evaluation suggested that as a result of the intervention program, there was a significant difference on student' spatial skills. This difference has occurred not only whole of the test results but also each section of the test results ($p < .05$ for all).

This result shows intervention designed by DGS Cabri 3D has a positive effect on spatial skills.

DISCUSSION

The present study aimed to determine whether the three-dimensional computer supported activities designed by DGS Cabri 3D have effects on developing student mathematics teachers' spatial skills or not. The results of PSVT students took at the beginning of the course showed that the students' spatial skills are quite low. Especially the average of 12 questions in Views section, 3.8 and in general the average of 36 questions, 15.7, shows the insufficiency of students' spatial skills. It is surprising that although the students learn three-dimensional objects and their features in early stages of elementary school and study three-dimensional objects in various lessons in Turkey, the averages are low. Because the research carried with student mathematics teachers, the researchers assumed that students' spatial skills might be high at the beginning of the study. However, it is an interesting point to see that students' spatial skills are low. Many factors may cause this unsuccessful result. We can summarize the most important two of them as below:

- One of the reasons of low scores is presenting three-dimensional spatial information in a 2 dimensional format on the blackboard in traditional geometry lessons in Turkey. Because of this limitation students don't have opportunities to create and manipulate 3D models that have vital importance of developing spatial skills. Cabri 3D has a great potential to remove this limitation. We can illustrate this as following blackboard drawing and Cabri 3D diagram.

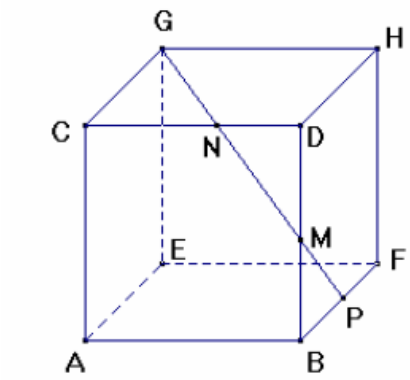

Figure 7. An example of blackboard drawing (static)

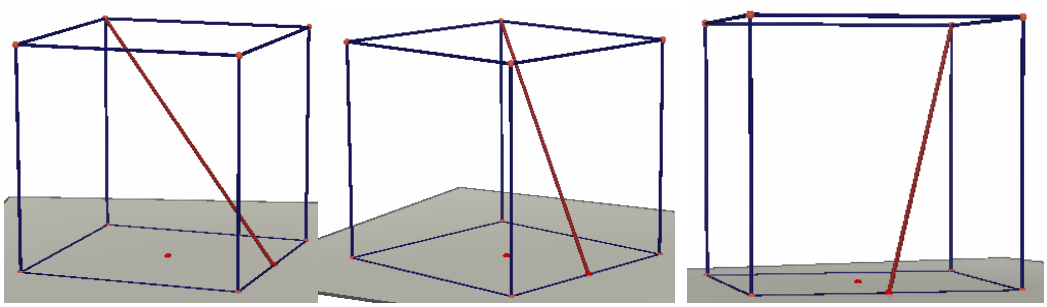

Figure 8. A Cabri 3D diagram (Students easily rotate the cube dynamically)

- Because of university entrance exam with multiple choose questions, geometry teaching in Turkey is largely based on procedural teaching. For example, surface area and volume formulas of basic 3 dimensional geometric objects, frequently asked in this entrance exam, are learned parrot fashion by Turkish students. But this cannot develop students' spatial skills. For changing this negative result, we should enrich the education programs with various spatial skills activities.

The ability of individuals to visualize and manipulate mental images has been recognized as an important cognitive ability in both mundane activities and academic endeavors. Therefore, students' spatial skills should be generally determined and the other reasons of the fail should be examined in Turkey with comprehensive researches.

After the intervention, there has been a development on the students' spatial skills. When the results are examined, it is seen that the most increase on students' scores is in the Rotations section. Beside other features, the characteristic of DGS Cabri 3D which allows rotating 3 dimensional geometric object on the screen by movements of mouse made the increase in Rotations be the highest level.

The dynamic nature of DGS provides students to learn geometric concepts and to explore geometric relationships easily. And also, it is a clear conclusion from this study that DGS especially Cabri 3D assist students to develop their spatial skills. Therefore, it can be recommended to mathematics teachers to use DGS Cabri 3D for developing their students' spatial skills.

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THE TURKISH ADAPTATION STUDY OF MOTIVATED STRATEGIES FOR LEARNING QUESTIONNAIRE (MSLQ) FOR 12–18 YEAR OLD CHILDREN: RESULTS OF CONFIRMATORY FACTOR ANALYSIS [1]

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ABSTRACT
This study gives results of the first phase of the 12-18 year old Turkish students' norm study of The Motivated Strategies for Learning Questionnaire (MSLQ), which deveoped by Pintrich, Smith, Garcia & McKeachie (1993). The scale was administrated to 1114 students from 3 primary schools and 3 high schools in Ankara in Turkish language, science, mathematics and social science courses. After eliminating the questionnaires which have missing and extreme values, the analyses were done on 762 valid questionnaires for motivation subscale and 1100 valid questionnaires for learning strategies subscale. Results of the confirmatory factor analyses show that the first subscale, Motivation, has six factors, and the second subscale, Learning Strategies, has nine factors according to original scale's factor structures. Depending on the results of the confirmatory factor analysis; 6 items from motivation subscale and 5 items from learning strategies subscale were removed due to their low factor loadings. The corrected item total correlations ranged 0.58 to 0.15 for motivation subscale, and 0.68 to 0.19 for learning strategies subscale.

Keywords : MSLQ, motivation, learning strategies, confirmatory factor analysis, adaptation of MSLQ

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INTRODUCTION

There is a considerable number of studies on the factors that affecting students' success and majority of them focus on students' motivation and use of learning strategies (Pintrich, Smith, Garcia & McKeachie, 1991, 1993; Garcia & Pintrich, 1996; Pintrich & De Groot, 1990; Zimmerman & Martinez-Pans, 1990). According to these studies, students who have high motivation and exploit learning strategies are more likely to perform better and be more successful. Also these students would develop lifelong learning skills more efficiently.

When students organize and manage their learning goals efficiently, they use cognitive and metacognitive strategies frequently (Eccles, 1983; Pintrich, 1988; Pintrich, 1988). They also manage more efficiently their learning effort when learning. Additionally, higher level motivated students' uses of cognitive and metacognitive strategies are higher and they completed their learning tasks better (Pintrich & De Groot, 1990).

In order to find the factors that affect the academic achievement of the university students and to increase the academic achievement of the university students by controlling these variables, a model and MSLQ were developed carried on during 10 years (Pintrich et al., 1993). Motivation in this model is gathered under the components of value, expectation and affective; and also learning strategies are gathered under the cognitive-metacognitive strategies and resource management strategies. The structured handled within the context of this model introduces in which level the students can success "learning the learning", and exposes the subjects in which they are successful and they need any support.

Whole of the MSLQ or its subscales is/are widely used in different student groups, in different fields in many countries. MSLQ has been widely used in the motivation and the determination of learning strategies of secondary school, high school and university students or adult learner in various companies. The scale is also used in different fields such as motivation and performance, learning strategies and success, self-efficacy, self-organization, web and internet based learning and distance learning. At the same time the scale has been used in several disciplines such as education psychology, social sciences, accounting, nutrition and teacher training (Chen, 2002; Duncan & McKeachie, 2005).

Also used in the primary and secondary school level in the world and in order to determine the factors that affect the academic achievement of students, it's seen that the preparation of a suitable form of a means like MSLQ for the primary school second section and the secondary schools students in Turkey population and after, by fixing the state, the evaluation of the results are up-to-date and important. It's seen that, except English, MSLQ or JHS MSLQ (Junior High School MSLQ) is also used in Greek (Andreo & Metallidou, 2004) for the 4. and 6. grade students, Hebrew (Eshel & Kohavi, 2003) for the 6. grade students, the Korean language (Bong, 2001) and the Norwegian language (Ommundsen, 2003) for the secondary school students, German (Neber & Heler, 2002) for high school students, Chinese (Rao & Sachs, 1999, Rao, Moely & Sachs, 2000; Sachs, Law, Chan & Rao, 2001; Sachs, Law & Chan, 2002) and the Korean language (Bong & Hocevar, 2002). Similarly, it's thought that to determine the factors that affect the academic achievement of students at the primary and secondary education level, and that's why; to adapt a suitable form of MSLQ, which is found acceptance in the world, in conformity with this level's students are up-to-date, necessary and also an important subject.

In the PISA (Programme for International Student Assessment) examination that was applied to children at the age of 15 in 26 countries in 2000, MSLQ was used for measuring the learning control in the research that was carried out by Artelt (2005) to determine the effects of cultural similarities and differences of countries on reading performance, strategies of motivation and learning. At the end of the research, it was found out that the students who motivate theirselves by the material they read were the ones who frequently use the control strategies in the learning process and that there were similarities and differences between countries in the use of these strategies.

Presently, in order to determine the motivation levels and the usage level of learning strategies of the primary education second section and secondary education students who continue their education, the Motivated Strategies for Learning Questionnaire (MSLQ)'s norm study for 12-18 ages is conducted within a project. This project, called SOBAG (Social Sciences and Humanities Research Group) 104KD97, is supported by TUBITAK (The Scientific and Technological Research Council of Turkey) and Ministry of National Education EARGED (Educational Research and Development Department). The first phase of this project that takes the specified norm study in hand is to realize the adaptation study of MSLQ for 12-18 age students in Turkey. In this research, it's emphasized the first phase results of this norm study and the results in the adaptation study of MSLQ to the Turkish Culture.

METHOD

This is a scale adaptation study. Within the context of the study, first of all, the preliminary application of the scale that has been tested its Turkish equivalence by experts, afterwards validity and a reliability analysis has been applied to the gained data. The information concerning this process is presented in the relevant subtitles.

Sample

The subjects of the research consist of 1114 students from 3 primary schools and 3 high schools in Ankara. The scale forms were applied in Turkish education, science, mathematics and social studies courses. After eliminating the questionnaires which have missing and extreme values, the analyses were done on 762 valid questionnaires for motivation subscale and 1100 valid questionnaires for learning strategies subscale.

For the motivation subscale; 47.2% of the students were female and 52.8% of the students were male. 21.2% of the students attend to 6th grade, 17.2% attend to 7th grade, 23% attend to 8th grade, 17.8% attend to 9th grade, 9.8% attend to 10th grade and 11% attend to 11th grade. 52.7% of the students responded to the motivation subscale for science and mathematics courses, %26.8 for social courses and 20.6% for Turkish language courses. 3.7% of the students did not answer the question about their continuing education programme. 61.5% of the students go to primary school and 38.5% go to high school. For the learning strategies subscale; 46% of the students were female and 54% of the students were male. 7 students did not answer the question about gender. 17% of the students attend to 6th grade, 16.7% attend to 7th grade, 20.6% attend to 8th grade, 19.7% attend to 9th grade, 10.8% attend to 10th grade and 15.2% attend to 11th grade. 4 students did not answer the question about grade. 52.19% of the students responded to the learning strategies subscale for science and mathematics courses, 25.92% for social courses and 21.9% for Turkish language courses. 54.32% of the students go to primary school and 35.68% go to high school.

Measurement Instrument

The Motivated Strategies for Learning Questionnaire (MSLQ) was developed to assess university students' motivational orientations and their use of different learning strategies (Pintrich et al., 1991). Two essential sections of the scale are the motivation and the learning strategies sections. The Motivation section has 6 factors and the learning strategies section has 9 factors, which subscales are modular and can be used single or together depending on the researchers' purpose.

The motivational scales are based on general social-cognitive model of motivation. The structure of these scales consists of expectancy, value and affect. Expectancy components refer to students' beliefs that they can accomplish a task. Two subscales of these components are students' perceptions of self efficacy and control beliefs for learning. Value components focus on the reasons why students engage in an academic task. Three subscales measuring the value beliefs are intrinsic goal orientation, extrinsic goal orientation and task value. The third motivational construct is affect and measured by scale of test anxiety, which taps into students' worries and concern over taking exams.

The learning strategies section of the instrument is based on a general cognitive model of learning and information processing. Three types of scales included in this section are cognitive, metacognitive and resource management. Cognitive strategies include students' use of basic and complex strategies for the processing of information from texts and lectures. The scales measuring use of cognitive strategies are rehearsal, elaboration, organization and critical thinking. The second general category is metacognitive control strategies which is measured by one subscale concerning the use of strategies that help students control and regulate their own cognition. The third general strategy category is resource management. These strategies include managing study environment and time as well as students' regulation of their own effort. Finally the remaining two subscales are peer learning and help seeking.

The 81 items of the MSLQ-TR are scored on a 7 point Likert scale, from 1 (not at all true of me) to 7 (very true of me). The motivation section consists of 31 items and the learning strategy section includes 50 questions. Administering the instrument takes approximately 20-30 minutes.

Tranlation and Turkish-English Equivalency of The Scale

MSLQ was translated into Turkish by the authors with the supervision of two experts in English language. After that, items of the scales were examined by a Turkish language expert related to Turkish language and two assessment and evaluation experts related to design (introduction information, instructions of the scale, format, order of the items, etc.), construction of the scale and rating points. Needed corrections were made according to these views.

To verify Turkish content approval of the scale an expert review form (ERF) was developed and used by the researchers. ERF intended to measure appropriatenes of the scale factor construction there fore face validity by the means of meanings, conceptializations , experiences and used terminology related to items and the factors of the scale. According to views and suggestions of the nine experts, a preliminary form of the scale was prepared. After that, items of the Turkish form of the scale were translated to English by two bilinguals to compare Turkish-English eguivalency of the scale by item by item back translation. According to item by item comparing results it can be said that two forms are identical in items' meaning. These results confirm that Turkish and English versions of the scales might be regarded equivalent

Statistical Analysis
Before the analyses of the gathered data, the forms which were filled incomplete or wrong, or which has extreme values have been removed from the data set. In the determination of extreme values, the scale scores have been transformed to z-standard scores and in the right and left of the mean, the scores that were outside of the 3.00 standard deviation have been accepted as the extreme values.

The confirmatory factor analysis was used in order to test the scale's factor structure (construct validity). For performing confirmatory factor analysis (CFA), Lisrel 8.30 was used. Corrected item-total correlation was calculated in order to examine the item validity.

RESULTS
Because MSLQ-TR is a scale where two different scales (Motivation Subscale and Learning Strategy Subscale) are used together, the findings are given as separate subheadings for these two scales.

MSLQ-TR Motivation Subscale (MS)
Factorial Structure of MSLQ-TR Motivation Subscale. It was used CFA in order to test the factor structure that shows the Motivation Subscale (MS) of MSLQ-TR over the data gathered from 12 -18-age students. Firstly, for a model with 6 factors set in the original scale, goodness of fit (GOF) statistics were figured out. As a result of the analysis, χ^2 (df=419, p=.000)=1712.77, χ^2/df =4.09, RMR (Root Mean-Square Residual)=0.18, SRMR (Standardized Root Mean-Square Residual)=0.07, GFI (Goodness-of-Fit Index)=0.88, AGFI (Adjusted Goodness-of-Fit Index)=0.85, RMSEA (Root Mean Square Error of Approximation)=0.06, CFI (Comparative Fit Index)=0.82, NNFI (Non-Normed Fit Index)=0.80 pointed out that the model were not fit with the expected level. Concerning these results, when modification index values reduced, it was stated precisely that there was a notable relation, especially, between the error covariances of item 6 with item 15, item 9 with item 25 and item 17 with item 26. When these item couples were analyzed, it was realized that they existed under the same potential variable in the original scale and also they were close to each other with respect to meaning.

When considering that they measured the same feature, by taking expert's opinion it was decided that one each item would be removed from the said item couples. In the removal processing, among the item couples, the items which measured the same feature and whose item-factor correlation was lower were removed from the model after consulting to the expert's opinion. In order to test the new model, again CFA was used. According to the results of second analyses, χ^2 =1174.55, p=.000, df=335, χ^2/df =3.51 and their GOF indexes RMR=0.15, SRMR=0.07, GFI=0.90, AGFI=0.88, RMSEA=0.06, CFI=0.85, NNFI=0.83 values pointed out that the model fit in a satisfactory level. But, when the modification index values were considered, since the item 13 which was expected to exist in the extrinsic goal orientation factor had a high correlation with the intrinsic goal orientation, control belief, self-efficacy perception and task value factors, and also since the factor loading was low (0.19) in its own factor, this item was taken out of the model and analyzed again.

The third CFA results were as χ^2 =1058.87, p=.000, df=309, χ^2/df =3.21 and GOF indexes RMR=0.15, SRMR=0.07, GFI=0.91, AGFI=0.89, RMSEA=0.06, CFI=0.86, NNFI=0.84. When these values were handled together, this showed that the model would be fit again in a satisfactory level. However, when its modification index was analyzed, there was a notable relation between the error covariances of the items 12 with 15 and items 5 with 21 that existed under the same factor in this model. By taking expert's opinion, considering the the factor loadings, and also the items 12 with 21 have been removed from the model and the analysis have been made again.

The values rated according the fourth CFA results, χ^2 =871.00, p=.000, df=260, χ^2/df =3.20 and GOF indexes are as RMR=0.16, SRMR=0.068, GFI=0.92, AGFI=0.90, RMSEA=0.055, CFI=0.86 NNFI=0.84. These values show that the tested model is coherent at a satisfactory level.

Analysis results of the fourth CFA point out that the model is coherent. The diagram regarding these results is given in the Figure 1. As it's seen in the figure, the factor loadings of the items change between 0.23 (item 9) and 0.70 (item 7) and all the loadings are statistically significant ($p<.05$). On the other hand, in the Table 1, the mean and standard deviation values of the factors of MS, and also the interfactors and factor-total points correlations are given.

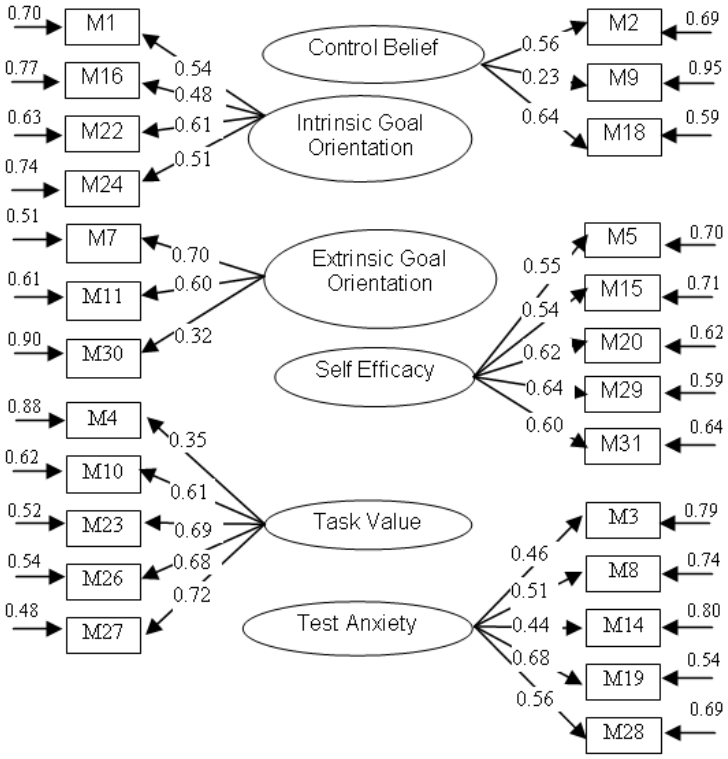

Figure 1. CFA Results of Motivation Subscale

As seen in Table 1, the correlations between the total scores and the factors scores of the scale are between 0.74 and 0.10; and the significant correlations among the factor points change between 0.10 and 0.58. The mean points taken from the scale is 133.38 (S=12.75) for total, 22.75 (S=3.85) for Intrinsic Goal Orientation factor, 15.31 (S=4.10) for Extrinsic Goal Orientation factor, 29.58 (S=4.25) for Task Value factor, 29.13 (S=4.02) for Self-efficacy factor concerning learning and performance, and 17.98 for the Control Belief factor. It's 18.63 (S=6.36) for Test Anxiety factor. The positive motivational factors; Intrinsic goal orientation, task value, self efficacy and control beliefs for learning are all positively correlated with one another with ranging from 0.27 to 0.58. This correlations show that students scores gathered from this subscales positively change together. For instance if one of the students score of intrinsic goal orientation is high, task value, self efficacy and control believes scores of the same student are most probably high too. There is also significant correlation between extrinsic goal orientation and test anxiety (r=0.35).

Table 1: ***Pearson Correlation Coefficients between Motivation Subscales' Points and Their Descriptive Statistics***

Factors	$\overline{X}$	S	Pearson Coefficients					
			1	2	3	4	5	6
1.Intrinsic Goal Orientation	22.75	3.85	-	-0.06	0.58*	0.47*	-0.05	0.33*
2.Extrinsic Goal Orientation	15.31	4.10		-	-0.02	0.10*	0.35*	0.04

3.Task Value Beliefs	29.58	4.25			-	0.47*	0.04	0.27*
4.Students' Perceptions of Self Efficacy	29.13	4.02				-	0.21*	0.29*
5. Test Anxiety	18.63	6.36					-	0.10*
6. Control Beliefs for Learning	17.98	2.36						-
Total	133.38	12.75	0.66*	0.10*	0.72*	0.74*	0.43*	0.43*

* p<.01

MSLQ-TR Learning Strategy Subscale (LSS)

Factorial structure of MSLQ-TR Learning Strategy Subscale. How much MSLQ-TR Learning Strategy Subscale (LSS) data supports the structure supported by expert opinion was analyzed by CFA. First of all, the goodness fit statistics have been calculated for the model with 9 potential variables (factors) set in the original scale.

As a result of the analysis, as being the first; Chi-Square (χ^2=5617.81, p=.000, df=1139, χ^2/df=4.93) value and GOF indexes (RMR=0.24, SRMR=0.06, GFI=0.83, AGFI=0.81, RMSEA=0.06, CFI=0.83, NNFI=0.81) pointed out that the model were not cohere with the expected level. But, when analyzed its modification indexes, it was determined that there was a notable relation between the error covariances of item 32 with item 63, item 37 with item 60 and item 77 with item 80 which existed in the same latent variable. When analyzed these item couples, it has been seen that they were close as expression, but even if they were small, there were differences with respect to the meaning. That's why; again it was made CFA by being added to the model in order to make the error covariances free of these item couples.

According the second analysis results; Chi-Square χ^2=4948.60, p=.000, df=1136, χ^2/df=4.35 and their GOF indexes RMR=0.23, SRMR=0.06, GFI=0.85, AGFI=0.83, RMSEA=0.06, CFI=0.84, NNFI=0.83 values pointed out that the model were cohere better. When analyzed the modification index values, it has been seen that there was a very high relation between the error covariances of the items 38 and 47 that exist in the critical thinking, 59 and 72 that take place in the rehearsal strategy factor and 68 and 75 that existing the help seeking factor. When these items were analyzed upon the expert opinion, because it was considered that they measured different features, in order to make the error covariance free between these two items, a model has been revised. Furthermore, CFA has been made by deciding the removal of item 57, because the items 33 and 57 which their error covariances were high according to the modification indexes were close to each other with respect to the expression and the meaning and its factor loading was low, and because the item was also bad according to the expert's opinions.

According to the results of the third CFA, Chi-Square is χ^2=4020.36, p=.000, df=1085, χ^2/df=3.71 and their GOF indexes were RMR=0.20, SRMR=0.05, GFI=0.87, AGFI=0.85, RMSEA=0.05, CFI=0.87, NNFI=0.86. These values were more coherent according to the previous model. When considered the factor loadings, the values of the item 40 (r=0.9) in the help seeking factor, items 77 (r=.16) and 80 (r=.17) in the time-work environment factor were too low. When analyzed these items, taking into consideration that there were items, which measured the same feature, they have been removed. This model was also tested with CFA.

The results achieved at the end of the fourth CFA, Chi-Square is χ^2=3288.17, p=.000, df=948, χ^2/df=3.47 and the GOF indexes were RMR=0.18, SRMR=0.045, GFI=0.89, AGFI=0.87, RMSEA=0.05, CFI=0.89, NNFI=0.88. The fact that the analysis gave better results according to the previous analysis could be interpreted as a better model was formed. When analyzed Chi-Square and the GOF index values prior to the reliability analysis, it could be said that learning strategies scales have an acceptable validity level.

As a result of the analyses that were realized for the reliability of the dimensions in the model which was formed, when Cronbach alpha coefficients and corrected item-total correlations were analyzed, it was obviously seen that the item 52, which takes place in the time and work environment, had a negative correlation at the medium level (0.29) with the factor and if this item was removed, the reliability coefficient will increase from 0.51 to 0.74. That's why; after the removal of the item 52, it has been made again a CFA.

The results achieved at the end of the fifth CFA, Chi-Square is χ^2=3094.61, p=.000, df=904, χ^2/df =3.42 and the GOF indexes are RMR=0.17, SRMR=0.044, GFI=0.89, AGFI=0.87, RMSEA=0.047, CFI=0.89, NNFI=0.88. The results show that this model has a relatively better accordance. The factor loadings of the scale change between 0.24 and 0.79. According to this result, it can be said that the scale has a valid structure (Figure 2).

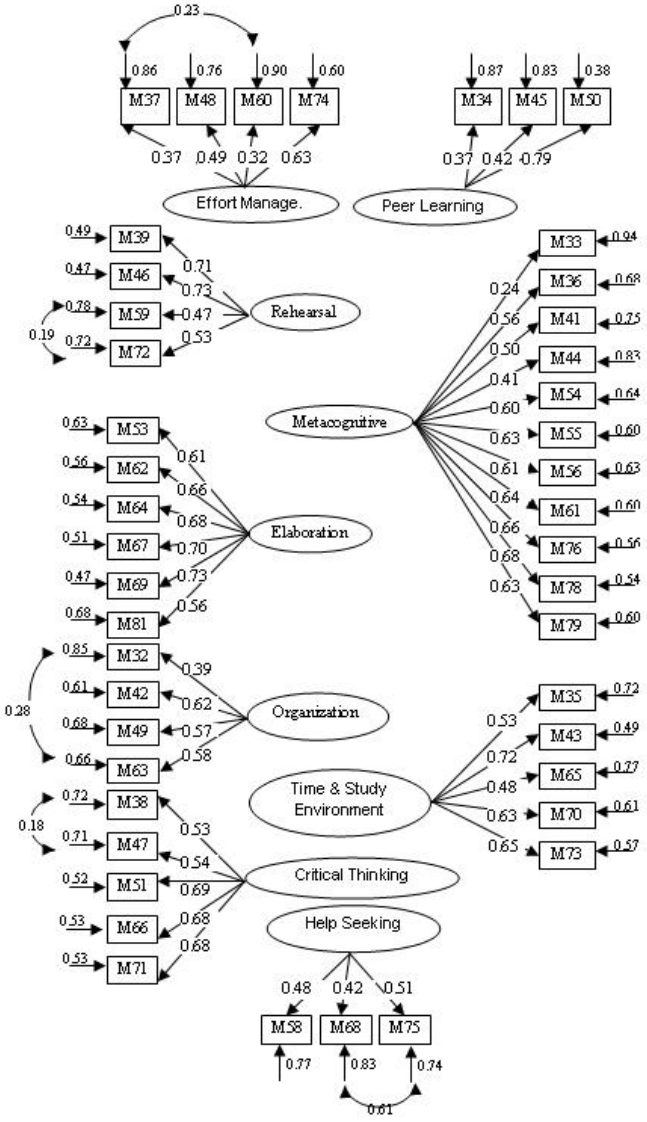

Figure 2. **CFA Results of Learning Strategy Scale**

Because the original scale and Cronbach alpha value of the effort management factor were low, the sixth CFA has been made in order to analyze the accordance of the strategy scale with the respect of the structure validity. According to the sixth CFA results, it can be reached to the values Chi-Square χ^2=2464.84, p=.000, df=747, χ^2/df =3.30 and the accordance indexes RMR=0.15, SRMR=0.042, GFI=0.90, AGFI=0.89, RMSEA=0.046, CFI=0.91, NNFI=0.90.

The factor loadings of the scale change between 0.24 to 0.79. These results can be commented as the model that is in the case of the removal of the effort management factor from the scale is acceptable and also more coherent according to the previous. But, in order to give the final decision, because of the fact that the results in Turkey samplings are wanted, the results related to the effort management factor are given in this report and also if it isn't reached to the reliable results in an acceptable level, the removal of this factor will be evaluated.

The correlations and descriptive statistics regarding MSLQ-TR factors and factor points are given in Table 2. According to this, the correlations between the factor points of MSLQ-TR change 0.16 to 0.77; the correlations between the factors and the total scores change 0.59 to 0.93. The mean points taken from the scale is 4.78 (S=1.02) for total, 4.69 (S=1.45) for the Rehearsal factor, 4.56 (S=1.42) for the Organization factor, 4.88 (S=1.33) for the Elaboration factor, 4.83 (S=1.33) for Critical Thinking factor, 4.64 (S=1.48) for ,Help Seeking factor, 3.81 (S=1.47) for Peer Learning factor, 4.95 (S=1.11) for Metacognitive Strategies factor, 4.65 (S=1.33) for Effort management factor and 5.26 (S=1.28) for Time and Study Environment factor.

As seen in Table 2 except for the relatively lower correlations for effort management, all cognitive strategies, metacognitive strategy and resource management subscales' scores were positively related to one another with Pearson correlation coefficients ranging from 0.16 (0.23 for second lowest) to 0.77. Additionally, these coefficients were relatively higher for rehearsal, elaboration, critical thinking and metacognitive self regulation strategies. Considering these results, it can be said that students who use any of these strategies, use other strategies similarly.

Table 2: *Pearson Correlation Coefficients between MSLQ-TR Learning Strategy Subscales' Points and Their Descriptive Statistics*

Factors	$\bar{X}$	S	Pearson Coefficients*								
			1	2	3	4	5	6	7	8	9
1 Rehearsal	4.69	1.45	-	.617	.565	.493	.398	.391	.708	.156	.593
2 Organization	4.56	1.42		-	.584	.521	.326	.393	.660	.403	.538
3 Elaboration	4.88	1.33			-	.765	.480	.443	.743	.463	.602
4 Critical Thinking	4.83	1.33				-	.411	.424	.688	.420	.539
5 Help Seeking	4.64	1.48					-	.435	.487	.282	.406
6 Peer Learning	3.81	1.47						-	.433	.233	.330
7 Metacognitive Self Regulation	4.95	1.11							-	.572	.725
8 Effort Management	4.65	1.33								-	.574
9 Time and Study Environment Management	5.26	1.28									-
Toplam	4.78	1.02	.771	.747	.855	.794	.613	.593	.925	.645	.797

* p<.01.

There are relatively strong correlations between; critical thinking – elaboration (r=0.77), metacognitive – elaboration (r=0.74), rehearsal – organization (r=0.617), rehearsal – metacognitive (r=0.70), organization – metacognitive (r=0.66), critical thinking – metacognitive (r=0.68) and metacognitive-time and study environment management (r=0.73). These correlations show that students' scores gathered from these subscales change positively together, for instance, if one of the students' score of elaboration is high, critical thinking scores of the same student are most probably high too.

DISCUSSION

In this study, it's examined the confirmatory factor analysis results of the data gained from Ankara sampling which is the first phase of the Turkey adaptation study of MSLQ for 12-18 age. The application has been realized on totally 1114 students, in 3 primary schools and 3 high schools, in different courses. The analyses have been realized through 762 data set for the motivation scale, 1100 for learning strategies scale.

When tested with CFA, the models relevant to the motivation scale (MS), the calculation with analysis is χ^2/df =3.20. Being smaller than 5 of this rate shows that the model is acceptable (Marsh & Hocevar, 1988). Of the GOF indexes, they are RMSEA=0.055 and RMR=0.16. Being close to 0 of these values and even the values which are equal to or smaller than 0.05 show a very good fit. Taking into account the complexity of the model, the values under 0.10 are also accepted (Anderson & Gerbing, 1984; Cole, 1987; March, Balla & McDonald, 1988). The fact that the model tested here is formed a very complex structure and because RMSE and SRMR (0.068) are between 0.05 and 0.08, it can be said that it isn't very good but there is a fit at an acceptable level. In the model, it is GFI=0.92 and AGFI=0.90.The cases that GFI value is over 0.85 and AGFI value is over 0.80 are acceptable levels for the fit (Anderson & Gerbing, 1984; Cole, 1987; March, Balla & McDonald, 1988). With regard to GFI and AGFI values, there is an acceptable accordance. CFI=0.86 NNFI=0.84 which are the increasing GOF indexes are like this. Because of being close to 0.90 of CFI and NNFI, when taking into account the complexity of the model it can be said that there is an acceptable fit.

It's seen that 6 items have got out in the study of adaptation of the motivation scale to Turkish Culture for 12-18 ages. Three of them have got out from self-efficacy factor, the others have got out from extrinsic goal orientation, task value and control belief factors. It's seen that the items which take place in the self-efficacy factor and also have a notable among the error covariances are close to eachothers with respect to the meaning for Turkish students. From this aspect, 17. ('I am very interested in the content area of this course') and 26. (I like the subject matter of this course items can be given as examples. Even if, when they are translated into Turkish, it's found two different meanings that are the equivalences of the words "interest" and "like", these two items consequently give very similar meanings with respect to Turkish language. Because, according to Turkish Culture structure when they are interested in the subjects of the course, students like the subjects of that course, but when they aren't interested, they don't like.

When the models relevant to LSS are tested with CFA, the calculation with the analysis is χ^2/df =3.42. Being lower than this rate shows that the model is acceptable (Marsh & Hocevar, 1988). From the GOF indexes, they are RMSEA=0.047, SRMR=0.044 and RMR=0.17. As RMSEA and SRMR values are lower than 0.05, it can be said that there is a good fit. In the model, being GFI=0.89 and AGFI=0.87 shows that there is an acceptable fit. Because of being close to 0.90 of CFI=0.89 and NNFI=0.88 values, when taking into account the complexity of the model it can be said that there is an acceptable accordance.

It's seen that 5 items (40, 52, 57, 77, 80) have got out in the study of adaptation of the motivation scale to Turkish Culture for 12-18 age. Three of them have got out from time and work environment factor, the others have got out from help seeking and metacognitive factors. They are removed from the scale because these items' factor loadings are too low, there are other items that are also close to these items with respect to the meaning and when they are removed, the GOF indexes become better with the original model.

In contrast to the evaluation that MSLQ-TR's CFA results which are realized in Ankara sampling for 12-18 age students are coherent with the real data, it can be said that it's necessary to be improved in the adaptation processing. That's why; the researchers continue the studies of MSLQ-TR application and the realization of its analysis on 24.000 students in order to develop the model and determine the norms of the scale in Turkish culture regarding in Turkey population.

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