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A COMPARISON OF A COMPUTER-BASED AND A LECTURE-BASED COMPUTER LITERACY COURSE: A TURKISH CASE

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ABSTRACT. Computer-based instructional applications are considered an effective alternative to traditional teaching methods and today in numerous educational and training settings, interactive computer programs are used to teach young students and adults computer literacy skills. The purpose of this study is to compare the attitudes and motivations of students who attended a computer-based in-class computer literacy course with the attitudes and motivations of those who participated in a classical lecture-based computer literacy course. The results show that there is no significant difference between computer-based instruction group students' and lecture-based instruction group students' total attitudes scores. However, a significant instructional mode effect on students' motivation was detected.

KEYWORDS. Lecture-Based Instruction, Computer-Based Instruction, Computer Literacy, Motivation, Computer Attitude.

INTRODUCTION

Advances in computer technology have caught the attention of many educators and researchers. Computer-based instructional applications are considered an effective alternative to traditional teaching methods (Pucel & Stertz, 2005; Larkin, 2003; Leigh, 1996). Today in numerous educational and training settings, interactive computer programs are used to teach young students and adults computer literacy skills. However, as indicated in the study by Merchant, Kreie and Cronan (2001), much research is needed to investigate the effectiveness of computer-based interactive computer literacy teaching programs.

Bertz and Johnson (2000) conducted a research study to determine the effectiveness of an innovative approach for teaching basic computer literacy. The innovative approach was web-based which was administered over the internet, self-paced that required students to study on their own without attending a regular classroom instruction and competency-based that compared students' technical skills against certain norms. Based on data gathered from 314 college students, it was found that the new innovative approach for teaching computer literacy was preferred more and had advantages over traditional teaching methods.

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In another study by Desai, Richards and Eddy (2000) the importance of training methods in computer literacy training programs was investigated. Novice computer users, who were employees of a company, attended two different training programs, instructor-based training (IBT) and computer-based training (CBT), to learn word processing skills. The IBT used a combined traditional training which consisted of stand-up lecture and hands-on exploratory method. The CBT was similar to the IBT approach except for that there was not an instructor, and that subjects directly interacted with the computer. It was found that "the CBT group's overall end-of-training and one-month-after-training performances were significantly better than IBT subject's performances." (p.242)

Merchant, Kreie and Cronan (2001) measured and compared three groups of a total of 54 undergraduate students' performance ratings of computer skills and their evaluations of the training methods after they participated in three different training programs, which were lecture, handout, and multimedia CBT, to learn spreadsheet software. In the lecture method, information on spreadsheet software was given in verbal format in a classroom. In the handout method, a booklet of information was given to trainees to study by themselves. Graphic examples and text-based explanations were included in the handout. The multimedia CBT included text and graphic-based information and animated examples with an option of sound. Similar to the handout method, subjects used the CBT program individually. Based on an analysis of variance, subjects' performance scores in multimedia CBT group were significantly less than those in lecture and handout groups and the multimedia CBT group was less satisfied with their instructional method.

Gurbuz, Yildirim and Ozden (2001) studied Turkish college students' attitudes towards two computer literacy courses (one is offered on-line and the other by traditional methods). Sixty nine students attended the on-line computer literacy course, and 140 students attended the traditional computer literacy course. It was found that neither the on-line nor the traditional computer literacy course significantly changed student teachers' attitudes towards computers.

An intensive literature review did not yield much research that investigated and compared subjects' both attitudes towards computers and motivations about computer lessons who participated in computer-based and lecture-based computer literacy course. Moreover, very few studies have been found investigating the same issue in Turkey. Thus, the purpose of this study is to compare the attitudes and motivations of students who attended a computer-based in-class computer literacy course with the attitudes and motivations of those who participated in a classical lecture-based computer literacy course.

There were two central research questions for this study:

1. To what extent are the computer attitudes of subjects, who participated in a computer-based in-class literacy course, improved, as compared to the attitudes of those who attended a classical lecture-based computer literacy course?

2. To what extent are the learning motivations of subjects, who participated in a computer-based in-class computer literacy course, improved, as compared to the motivations of those who attended a classical lecture-based computer literacy course?

METHOD

Participants

The participants of this study were 323 (172 females and 151 males) freshmen and sophomore students, majoring in elementary education, social science education, and preschool education, enrolled in seven sections of the computer literacy course at a university in mid-west Turkey.

Independent Variable

The independent variable of this study is the instructional mode of the computer literacy course. There were two categories of the instructional mode: Classical lecture-based instruction and in-class computer-based instruction.

The computer literacy course, regardless of the instructional mode, covered ECDL standards (European Computer Drivers' License). The ECDL standards are a list of internationally accepted computer skills and reflecting minimum competencies to be licensed as a computer user (ECDL, 2001). The ECDL standards include computer skills in seven areas, which are the basic concepts of information technology, file management, word processing, spreadsheet, database, presentation, and the Internet. Each area has several specific subskills. For instance, the basic concepts of information technology have subskills related to general computer concepts, hardware, software, health and safety, computer security etc. Word processing has subskills related to main operations, page formatting, using objects etc.

The classical lecture-based instruction was given by two instructors in a computer lab four hours a week for 12 weeks. The ECDL standards list was given to the instructors and they were asked to strictly follow it. Similarly, the in-class computer-based instruction was given in a computer lab. Students attended the class four hours a week for 12 weeks. However, instead of listening to an instructor, they logged in to a training web site which was commercially prepared. The training web site provided students with a self-paced and interactive computers literacy instruction based on the ECDL standards.

Dependent Measures

There are two dependent measures of the study:

1. Students' attitudes towards computers as measured by the Computer Attitude Scale.
2. Students' motivation towards the computer literacy course as measured by the Course Interest Survey.

Dusick (1998) defined attitude as "an evaluative disposition based upon cognition, effective reactions, behavior intentions, and past behaviors which can influence future cognitions, effective responses, intentions, and behaviors" (p. 127). In this study, the Turkish version of Computer Attitude Scale (CAS) was used to measure changes in attitudes towards computers manifest after the intervention (Loyd & Loyd, 1985).

The CAS has 40 Likert-type items involving statements of attitudes towards computers and the use of computers. The items are divided into four categories, each of which represents one subscale of the CAS: (a) anxiety or fear of computers, represented by the Computer Anxiety subscale, (b) confidence in or ability to use or learn about computers, represented by the Computer Confidence subscale, (c) liking computers or enjoying working with computers, represented by the Computer Liking subscale, and (d) perceived usefulness of computers for present or future work, represented by the Computer Usefulness subscale. Each subscale has ten items and respondents rate items by indicating to what extent they agree or disagree with the expressions in each item (from strongly disagree to strongly agree with four choices).

The estimated total alpha reliability coefficient of the English version of the CAS is .95 with the following coefficients for the subscales: .90 for Computer Anxiety, .89 for Computer Confidence, .89 for Computer Liking, and .82 for Computer Usefulness (Loyd & Loyd, 1985). In a previous study by Varank (2003), the CAS was translated into Turkish and the Turkish version was administered to middle school teachers. The observed alpha reliability coefficients of the Turkish version for Computer Anxiety, Computer Confidence, Computer Liking, Computer Usefulness, and the total scale were .77, .84, .86, .81, and .94, respectively.

Motivation is defined as "deciding to engage in a learning task and persisting in that task" (Driscoll, 1993, p. 295). For our purposes, the Turkish version of Keller's (1995) Course Interest Survey (CIS) was used to measure students' motivation towards in-class computer-based literacy course and lecture-based literacy course. The CIS measures students' motivation to learn in a particular course. The CIS has 34 items divided into four categories: Attention, Relevance, Confidence, and Satisfaction. Survey items in the Attention category measure the extent to which the interest of learners is captured and their curiosity to learn is stimulated by the lesson. Items in the Relevance category serve to measure the extent to which the personal needs and goals of the learner are met in such a way as to affect a positive attitude. Items related to Confidence evaluate the perception of learners about whether they will be able to succeed and

control their success. Finally, the items in the category of Satisfaction measure the extent to which student accomplishments are reinforced. Cronbach's alpha coefficient for the English version of the CIS is .95. Alpha coefficient values for the subscales are: .84 for Attention, .84 for Relevance, .81 for Confidence, and .88 for Satisfaction. Similar to the CAS, the Turkish version of the CIS was administered to 6th, 7th and 8th grade students in Turkey and Crombach's alpha coefficients were calculated for Attention, Relevance, Confidence, Satisfaction, and the total scale as .55, .59, .67, .59, and .83, respectively (Varank, 2003).

Some of the items in the CIS, such as "you have to be lucky to get good grades in this course", "it is difficult to predict what grade the instructor will give my assignments", and "I am pleased with the instructor's evaluations of my work compared to how well I think I have done", were specifically designed to collect information about students' motivation in courses in which an instructor performs the teaching and student evaluation. Those items were not appropriate for the students in the computer-based instruction group of this study. Therefore, those items were removed from the CIS and the total number of items was reduced to 29.

The literature indicates that there is a strong relationship between computer skills and computer attitudes (Gayle & Thompson, 1995; Kay, 1993; Dori & Barnea, 1994; Geissler & Horridge, 1993; Garland & Noyes, 2003). A significant initial difference in students' computer skills may affect the post-survey computer attitudes results. Therefore, although it was not intended to measure the effects of the instructional modes on students' learning performance in this study, a perceived computer skills survey was administered before the study to ensure that characteristics of the students in both lecture-based instruction group and in-class computer-based instruction group were not different.

Perceived computer skills can be described as students' believes or perceptions about to what extent they can use the computer. Information on the students' perceived computer skills was collected by a self-evaluation questionnaire called Perceived Computer Skills Scale (PCSS) developed by the researcher. The questionnaire included 55 items randomly selected from ECDL (European Computer Drivers' License) standards list and intended to measure computer skills in five areas, file management, word processing, spreadsheet, presentation, and the Internet. Some sample items in the Perceived Computer Skills Scale were as follow: creating a shortcut icon on the desktop, copying and pasting files in folders, changing text colors, creating standard tables, sorting values in cells in alphabetical order, previewing a worksheet, copying and pasting slayts, accessing a website, and creating an e-mail message. Using a four-point Likert scale (4 = definitely I can do it, 3 = I can do it, 2 = I am not sure and 1 = I can't do it) the students indicated to what extent they believed they could perform each computer skill. Because it was not used in any research study before, no data was available concerning the reliability of the Perceived Computer Skills Scale prior to this study. However, the alpha reliability coefficient of the survey was calculated after the survey was administered.

Procedure

Using a random sampling method, each of seven sections of the computer literacy course was randomly assigned to either classical lecture-based computer literacy instruction group or in-class computer-based computer literacy instruction group. The assignment resulted in two sections of social science education students and one section of elementary education students with a total of 141 students (57 females and 84 males) in classical lecture-based computer literacy instruction group and three classes of elementary education students and one class of pre-school education students with a total of 182 students (115 females and 67 males) in computer-based computer literacy instruction group.

The students, at the beginning of the study, completed the Computer Attitude Scale (CAS) and Perceived Computer Skills Scale (PCSS). Both the lecture-based instruction group and computer-based instruction group attended the computer literacy course four hours a week for 12 weeks in a computer lab on campus. At the end of the study, students completed the CAS and the CIS.

The CIS, as indicated above, measures students' motivation to learn in a particular course, e.g. lecture-based computer literacy course and computer-based computer literacy course in this study. However, the students did not attend these particular courses before and it should not be expected that the students had a motivation to learn in those particular courses. Therefore, the CIS was not administered as a pre-survey at the beginning of the study.

Research Design and Data Analysis

A pre-survey/post-survey control group design was used for the first research question. For the second research question, post-survey only control group design was used. To determine whether there were significant attitudinal and motivational difference between the computer-based and the lecture-based groups, t-test was used.

RESULTS

The total alpha calculated reliability coefficient of the CAS in this study was .94; the reliability coefficients for Computer Anxiety, Computer Confidence, Computer Liking, and Computer Usefulness were .84, .82, .84, and .70, respectively. The alpha reliability coefficient for the PCSS was .98 with the following coefficients of the subscales: .93 for file management, .96 for word processing, .96 for spreadsheet, .95 for presentation, and .94 for the Internet. The Cronbach alpha coefficients of the CIS were .27, .55, .71, .30, and .78 for Attention, Relevance, Confidence, Satisfaction subscales, and the total scale, respectively.

As can be seen above, reliabilities of Attention and Satisfaction subscales are low. The alpha reliability coefficient is a function of test length. Therefore, the reliability of a given

subscale should be expected to be lower than the total reliability of the scale because subscales have fewer items than the total scale (Gay, 1996). However, students' Attention and Satisfaction subscales were excluded from the analysis, due to their low reliability coefficients, and intervention groups were compared based on their Relevance and Confidence scores and total motivation scores.

The probability of Type 1 error increases when there is more than one hypothesis being tested. In general, if there are K multiple comparison tests at á/K level, the probability of a Type 1 error for the total of multiple tests will not exceed á (Myers & Well, 1995). The Computer Attitude Scale, Perceives Computer Skills Scale, and Course Interest Survey used in this study had subscales and those subscales were compared individually. Therefore, the subscales of the CAS and the CIS were tested with an alpha set at the level of 0.0125 (0.05 divided by 4) and the subscales of PCSS were tested with an alpha set at the level of 0.01 (0.05 divided by 5)

Some students were absent from the class when the surveys were administered either at the beginning or at the end of the study. Some students also were not able to properly complete the surveys. Thus, the data from all of these students was disqualified. Survey data from 270 students were used to analyze students' attitudes and perceived computer skills and 259 students' CIS results were used to analyze students' motivation.

The descriptive data for students' pre-survey attitudes scores show that computer-based instruction group's (M = 125.5, SD = 15.4) and lecture-based instruction group's (M = 124.0, SD = 17.5) total attitudes scores are similar and the difference between those scores is not significant ($p > .05$). Furthermore, as can be seen in Table 1, none of the difference between computer-based instruction group's and lecture-based instruction group's subscale scores of attitudes (Computer Anxiety, Computer Confidence, Computer Liking, and Computer Usefulness) are significant ($p > .0125$).

Table 1. t-test Summary Table for Students' Pretest Attitudes Scores

Attitudes	Groups	N	Mean	SD	df	t	p
Computer Anxiety	Comp.-based	174	33.2	4.6	268	1.73	.08
	Lect.-based	96	32.2	5.2			
Computer Confidence	Comp.-based	174	29.9	4.5	268	1.22	.22
	Lect.-based	96	29.0	5.5			
Computer Liking	Comp.-based	174	29.7	4.6	268	.35	.73
	Lect.-based	96	29.4	5.3			
Computer Usefulness	Comp.-based	174	32.8	3.8	268	-1.16	.24
	Lect.-based	96	33.4	3.9			
Total Attitudes Score	Comp.-based	174	125.5	15.4	268	.71	.48
	Lect.-based	96	124.0	17.5			

Table 2 shows t-test results for students' perceived computer skills. The computer-based instruction group's total perceived computer skills score is not significantly different from the lecture-based instruction group's score ($p > .05$) and this is true of all of the perceived computer skills subscales ($p > .01$).

Table 2. t-test Summary Table for Students' Computer Skills Scores

Skills	Groups	N	Mean	SD	df	t	p
File Management	Comp.-based	174	21.8	6.6	268	-.54	.59
	Lect.-based	96	22.3	6.5			
Word Processing	Comp.-based	174	32.4	12.3	268	-1.06	.29
	Lect.-based	96	34.1	12.7			
Spreadsheet	Comp.-based	174	26.4	11.2	268	-.45	.66
	Lect.-based	96	27.0	11.2			
Presentation	Comp.-based	174	19.3	8.3	268	-.82	.42
	Lect.-based	96	20.1	8.9			
Internet Applications	Comp.-based	174	25.4	9.0	268	-2.30	.02
	Lect.-based	96	27.9	8.7			
Total Compt. Skills	Comp.-based	174	125.3	43.0	268	-1.13	.26
	Lect.-based	96	131.5	44.1			

To assess the overall effects of instructional modes of the computer literacy course on attitudes, t-test was performed. No significant instructional mode effect on students' post-survey attitudes scores was detected. The computer-based instruction group students did not have significantly higher score in neither the total attitude scale ($p > .05$) nor the subscales ($p > .0125$) than the students in the lecture-based instruction group (see Table 3).

Table 3. t-test Summary Table for Students' Posttest Attitudes Scores

Attitudes	Groups	N	Mean	SD	df	t	p
Computer Anxiety	Comp.-based	174	31.4	5.4	268	-.58	.57
	Lect.-based	96	31.8	6.0			
Computer Confidence	Comp.-based	174	28.0	5.6	268	-.15	.88
	Lect.-based	96	29.1	6.1			
Computer Liking	Comp.-based	174	29.2	5.5	268	-.07	.95
	Lect.-based	96	29.3	6.2			
Computer Usefulness	Comp.-based	174	32.0	4.1	268	-.91	.36
	Lect.-based	96	32.5	5.1			
Total Attitudes Score	Comp.-based	174	121.5	18.6	268	.44	.66
	Lect.-based	96	122.6	21.4			

Conversely, there was a significant instructional mode effect on students' motivation. Students' Relevance ($M = 30.0$, $SD = 5.4$) and Confidence ($M = 21.8$, $SD = 5.2$) subscores and

total motivation score (M = 92.3, SD = 14.4) in the lecture-based instruction group did significantly change when compared to Relevance (M = 28.6, SD = 3.7) and Confidence (M = 16.0, SD = 2.3) subscores and total motivation score (M = 88.1, SD = 9.1) of those in the computer-based instruction group.

Table 4. t-test Summary Table for Students' Motivation Scores

Scales	Group	N	Mean	SD	df	t	p
Relevance	Comp.-based	154	28.6	3.7	257	-2.48	.01 [b]
	Lect.-based	105	30.0	5.4			
Confidence	Comp.-based	154	16.0	2.3	257	-12.40	.00 [b]
	Lect.-based	105	21.8	5.2			
Total	Comp.-based	154	88.1	9.1	257	-2.90	.00 [a]
	Lect.-based	105	92.3	14.4			

[a] $p < .05$, [b] $p < .0125$

DISCUSSION

The results of this study show that neither computer-based instruction nor lecture-based instruction significantly changed students' attitudes towards computers. Thus, it could be concluded that computer-based instruction and lecture-based instruction are similar in terms of improving computer attitudes.

As indicated above, attitude is an evaluative disposition related to past behaviors or behavior intentions (Dusick, 1998). Therefore, the non-significant difference in the computer attitudes could be attributed to the subjects' computer-related past behaviors or experiences. As education level increases, people tend to utilize computers more, even with limited skills, for a variety of purposes. The subjects of this study, in both computer-based and lecture-based instruction groups, were university students and they could have used computers in school, at home or even at work for different purposes such as writing assignments, searching databases, filling out forms, playing games or communicating with others, which could make them experienced about and familiar with computers. The experience and familiarity might improve people's perceptions about their computer skills and consequently improve their computer attitudes (Rozell & Gardner, 1999). Accordingly, because they might have already had as high computer attitudes as it could be, the instructional modes might not have changed students' attitudes towards computers significantly.

The computer software used in this study for teaching the students computer literacy skills was a self-paced interactive instructional module designed to change the typical computer literacy instruction where teachers directly teach students computer skills and than the students practice those skills on the computer. The software had a variety of motivational factors which

could potentially kindle students' interests in the subject. However, the students in the lecture-based instruction group more believed that the computer literacy course is relevant to their personal needs and goals and they felt more confident about their success in the course. In general, the lecture-based instruction students felt more motivated towards the computer literacy course than the computer-based instruction students.

The Relevance aspect of motivation is related to the extent to which personal needs and goals of learners are met in such a way as to affect a positive attitude. The main instructional tactics supporting the Relevance aspect of motivation is to tie instruction to learners' experiences, to link instruction to personal interests of learners, and to meet learners' needs (Keller, 1995). Those tactics could be achieved through using different materials and analogies related to individual learners' backgrounds, modifying goals of instruction to individual students' expectations and providing students with various opportunities for personal achievements (p 4-10). However, the computer software used in this study employed a single instructional strategy. First, step by step, it taught students computer skills and than provided an interactive environment in which the students practiced the skills they learned. The software did not use any alternative instructional strategy for those who were not able to successfully attain the computer skills. On the other hand, in the classical lecture-based instruction given in this study, the instructors might have used different teaching strategies or given satisfying responses when students encountered learning problems or asked questions. Thus, as compared to the students in the classical lecture-based instruction group, it is possible that the students in the computer-based instruction group might have not believed or felt that their personal learning needs and goals were met.

One explanation of the significant difference in Confidence between student groups might be that lecture-based instruction students more felt they received adequate feedback during the instruction. To build Confidence about lessons, students should be provided with confirmational and corrective feedback about their learning performances (Keller, 1995). Due to the fact that the students had better chances to interact with teachers during the lecture-based instruction, they might have felt they received better responses and feedbacks about how they did in the course. However, in the computer-based instruction, no explicit feedback system was embedded in the software. Thus, the students might not feel they got adequate feedback from the computer about their course performance. In light of this view, the lecture-based instruction students' significantly higher Confidence score should not be considered surprising.

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