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Comparison of the Effects of E-learning Types Designed According to The Expository Teaching Method on Student Achievement

Düz Anlatım Yöntemine Göre Oluşturulan E-Öğrenme Türlerinin Öğrenci Başarısına Etkisinin Karşılaştırılması

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Abstract

In accordance with expository teaching, the aim of the research is to determine the effects of five different e-learning types on student achievement. In order to accomplish this, five different e-learning designs dealing with the same subject were formed within the scope of expository teaching. These designs include two synchronous (Instructor-led, Telementoring and E-coaching) and three asynchronous (Learner-led, Facilitated, Embedded) types of e-learning. The designs were carried out with 250 first-year university students attending the course Computer II (Database), distributed to five different groups. The participants were asked to compile a multiple choice achievement test with 40 items. The findings of the study showed that there were significant differences among groups in terms of student achievement. Instructor-led e-learning groups were more successful than other groups. Differences among the students' achievements were discussed based on the "synchronous instructor effect".

Keywords: Types of e-learning, achievement, Expository teaching method.

Öz

Araştırmanın amacı, düz anlatım yöntemine göre oluşturulan beş farklı e-öğrenme türünün öğrenci başarısına etkisinin karşılaştırılmasıdır. Aynı konuya ilişkin düz anlatım yöntemini gerçekleştiren beş farklı e-öğrenme türü tasarlanmıştır. Bu tasarımlar iki senkron (eğitmen önderliğinde, tele-danışmanlık ve e-koçluk), üç asenkron (öğrenci önderliğinde, yönlendirilmiş, zenginleştirilmiş) e-öğrenme türlerinden oluşmaktadır. Tasarımlar 250 üniversite birinci sınıf öğrencisinin katıldığı Bilgisayar II dersinde beş ayrı gruba uygulanmıştır. Katılımcılara 40 maddeden oluşan çoktan seçmeli başarı testi uygulanmıştır. Bulgular, gruplar arasında öğrenci başarısı açısından anlamlı farklar olduğunu göstermiştir. Eğitmen önderliğinde eğitim yapılan grup diğerlerine göre daha başarılı bulunmuştur. Öğrenci başarısındaki farlılıklar "senkronize eğitmen etkisi" temelinde tartışılmıştır.

Anahtar Sözcükler: E-Öğrenme Türleri, Öğrenci Başarısı, Düz Anlatım Yöntemi.

Introduction

Waller and Wilson (2001) define e-learning as the transfer of learning activities digitally gathered together with learning support services. According to Waterhouse (2003), e-learning is the use of computer-based technologies to enhance the use and application of learning and teaching. Rosenberg (2001) defines e-learning as a network that allows the updating, storage/recall, distribution and sharing of teaching or information. Horton (2006), with a more general definition, describes e-learning as the creation of learning experiences of information and computer technologies. It is observed that in almost all the definitions e-learning comprise computer and communication technologies, network environment and education and training activities. Thus,

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considering e-learning as the practice of educational activities via computer or communications technologies will be appropriate.

E-learning types in the related literature are categorized in five different ways. Among these, the most acknowledged categorization distinguishes five types of e-learning that are

1. Learner-led e-learning;
2. Facilitated e-learning;
3. Instructor-led e-learning;
4. Embedded e-learning;
5. Telementoring and e-coaching (Gulbahar, 2009; Horton & Horton, 2003; Ilie & Pavel, 2006; Kokkosis, Charitopoulos, Prekas, & Athanasopoulou, 2006).

This categorization takes into account the types of tools that are required for e-learning. In addition, learner-led, facilitated and embedded e-learning are asynchronous, whereas instructor-led, telementoring and e-coaching e-learning are synchronous. The types and tools of e-learning are presented in Figure 1 (Horton & Horton, 2003).

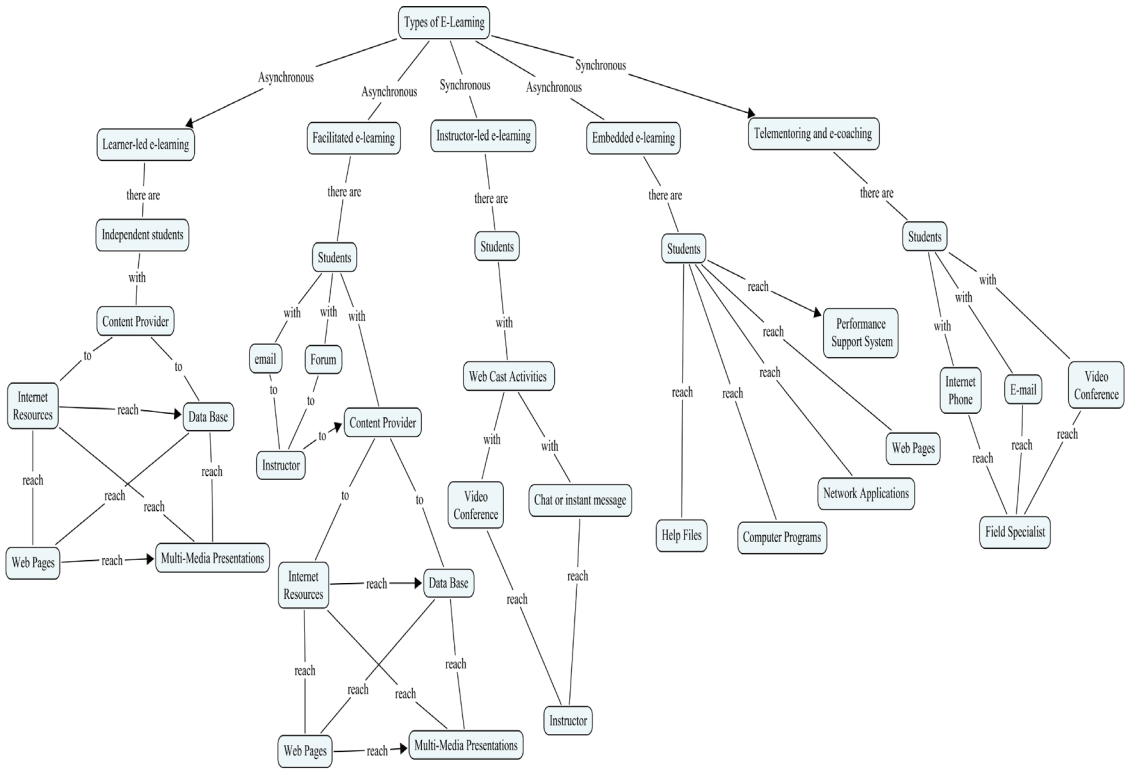


Figure 1 The Types of E-learning

E-learning types often signify the tools and the environment in which the tools are used. The e-learning types were categorized by taking into account the technology and tools used in e-learning environments. Any e-learning design specific to a general learning type could be carried out by employing different e-learning types. For instance, a subject could be designed for learner-led e-learning type in keeping with the constructivist approach or according to other e-learning types. In addition, it is necessary to clarify certain points regarding the classification of e-learning types. For example, instructor-led e-learning is presented as synchronous. This is because it is a webcast activity. However, in spite of its being called instructor-led e-learning style, the learning method is not necessarily required to be an instructor-centric one. In e-learning led by an instructor, as mentioned before, it is possible to create different learning experiences.

This is also valid for other e-learning types. To give another example, if an instructor-led subject as a learning method is offered as asynchronous one within e-learning types, and if forums, chats or utility programs integrated to the system are not employed, this can be considered to be a student led e-learning within e-learning categories.

Learner-led e-learning aims to convey effective learning experiences to independent students. It is sometimes referred as stand-alone or self-directed e-learning. The content is based on Web pages (EATM, 2008). The Web server hosts multimedia presentations and other interactive learning experiences. The content is accessible via a Web browser. In learner-led e-learning, education is based on the provision of course material (Horton, 2006). There is no mechanism that allows the students to share their thoughts or to communicate. There are no restrictions for what regards when and how much a student has to study. Students are completely independent.

Facilitated e-learning, is an e-learning to which a number of independent students participate in web-based education together with forums and e-mail applications organized by instructors. Students can launch discussion topics in forums with other students and instructors and send their completed work. Assignments are carried out through this forum (Ilie & Pavel, 2008). Instructor-led e-learning uses real-time web technologies. These technologies include video and audio conferences, speaking, screen sharing and whiteboard applications. The entire course is based on the presentations of instructors via webcast technology (Ruiz, Mintzer & Leipzig, 2006). Instructors often use slideshows and give presentations. Depending on the technology used, students directly participate in the lessons by audio and video or instant messages.

Embedded e-learning includes just-in-time trainings. Generally, it is obtained by installing computer programs to the design. Help files, Web pages, Web applications and even programs as part of an electronic performance support system could be used in embedded e-learning (Kokkosis, Charitopoulos, Prekas, & Athanasopoulou, 2006). This e-learning aims to solve the problems of students immediately. It is often installed to the students' computers together with the design used. Embedded e-learning could as well be completely web based.

Telementoring and e-coaching are learning types that transform the oldest form of distance learning by using up-to-date technology. Technologies such as video conference, instant messages, and Internet phones are used to provide guidance to the students (Gulbahar, 2009). Students could be given some printed materials. The instructors provide the subjects that are not included in these materials or about which students need further information. In other words, this type of education considers the needs of students. Experts from different fields could be invited in different times. Expository teaching is the oldest, most traditional method of instruction (Hyman, 1970) involving verbal instruction in a lecture mode or combination of lecture, audiovisual, discussion, or demonstration modes. Teaching methods used in the expository teaching are primarily teacher-centered (Fleck, 1974). The expository mode of instruction involves lesson plans which begin with a statement of purpose or an objective, continue with an outline through the body of the lesson, and summarize with a brief review (Gagne, 1985). According to Ausubel, Novak & Hanesian, (1978), "People acquire knowledge primarily through reception rather than through discovery. Concepts, principles, and ideas are presented and understood, not discovered" (p. 28). There exists an intense degree of interaction between the instructor and the student in the expository teaching method. This interaction, basically, takes place between the instructor and the student in synchronous e-learning types (instructor-led , tele-mentoring and e-coaching) and between the student and the instructional computer programme in asynchronous e-learning types (Student- led, Facilitated, Embedded). In addition, The Facilitated e-learning design, by nature, involves applications like forums directed by the instructor. Expository teaching requires giving ample amount of examples. Though the emphasis is on verbal learning, it involves verbal and other types of stimuli (stimulants) such as examples, figures and diagrams. Stimuli that appeal to visual and other senses are used extensively in order to render abstract concepts comprehensible. In the expository teaching method, a hierarchical order is followed from more general to more specific. While more general and comprehensive concepts are included in teaching activities first,

more specific and narrower concepts that these general concepts comprise are included later. The instructor/instructional computer programme makes the introductory presentations, and then students' reactions regarding the examples are taken. These processes continue this way until the end of the education activities. In other words, teaching proceeds step-by-step. At each learning step, horizontal and vertical connections are established between what is formerly and currently learned. Thus, it is targeted for the student to learn meaningfully. The instructor or the instructional computer programme presents the subject related to the teaching activities to students. As indicated, the instructor or the instructional programme asks students questions about the subject and asks them to fulfil an activity related to the subject learned. At the end of the coverage of a subject, in general, an assessment is performed before proceeding further.

Skylar (2009), in a study conducted with 44 teacher candidates, compared the synchronous video conference (instructor-led e-learning) and asynchronous forum-aided web materials (facilitated e-learning) in terms of student performance. According to the results of the study, there is no significant difference between synchronous and asynchronous environments in terms of student performance. Another study by Somenarain, Akkaraju and Gharbaran (2010) made a comparison of synchronous (instructor-led e-learning), asynchronous (learner-led e-learning) and traditional learning environments within the scope of an undergraduate medical biology course. The two e-learning groups represented the experimental group and the traditional learning group represented the control group in this study. The study found out that there is no difference among the three groups in terms of student achievement. Roblyer, Freeman, Donaldson and Maddox (2007) stated that although there are some differences in students' opinions on asynchronous web-based course design (facilitated e-learning) and synchronous interactive video conference (instructor-led e-learning), there is no significant difference in terms of student achievement. Another study by Hill (2009) compared the achievement levels of 5th grade students who participated in synchronous (instructor-led e-learning) and asynchronous (facilitated e-learning) courses of mathematics within Texas Assessment of Knowledge and Skills (TASK). The study did not find any difference in student achievement. Askun (2007) divided a university student group of 49 individuals into experimental and control group, allowed the control group (learner-led e-learning) to use only the web site and provided the control group (facilitated e-learning) with discussion/forum tools together with the web site. The experimental group was found out to be more successful with respect to the control group. Zuhreih (2009) used a Web-based forum page in one of the two classes which get traditional education at university level and found out that the student achievement of the group which used the forum page was higher than the other group. Barbour and Collins (2005) also stated that there is a positive correlation between web forum use and obtaining higher grades in traditional teaching. Summer and Hustetler (2002) underline that academic consultancy receives the least attention among distant learning concepts. The related literature includes some studies that examine the differences between telementoring and face-to-face consultancy in terms of student achievement. Among these, the empirical study by Johnson, Aragon, Shaik and Palma-Rivas (2002) allocated two groups of graduate students to face-to-face and online academic consultancy and the groups were compared in terms of learning results. The research shows that there was no difference in terms of learning products between the groups. Another study by Summer and Hustetler (2002) focused on students who used video conferences and face-to-face communication. This study did not find a difference between groups in terms of student achievement either. Esgi (2011) reported that Telementoring services delivered using chat with video, chat with instant message, mobile phone, discussion board and video conference, were applied to a group of protégés, composed of 38 university students. The research findings showed that telementoring services designed through using different instruments do not significantly differentiate student achievements between groups.

In almost all studies, tools and conditions were compared without specifying e-learning types the studies belong to (e.g. comparison between synchronous videoconference and asynchronous web activities or between use of asynchronous forum and asynchronous web activities). The

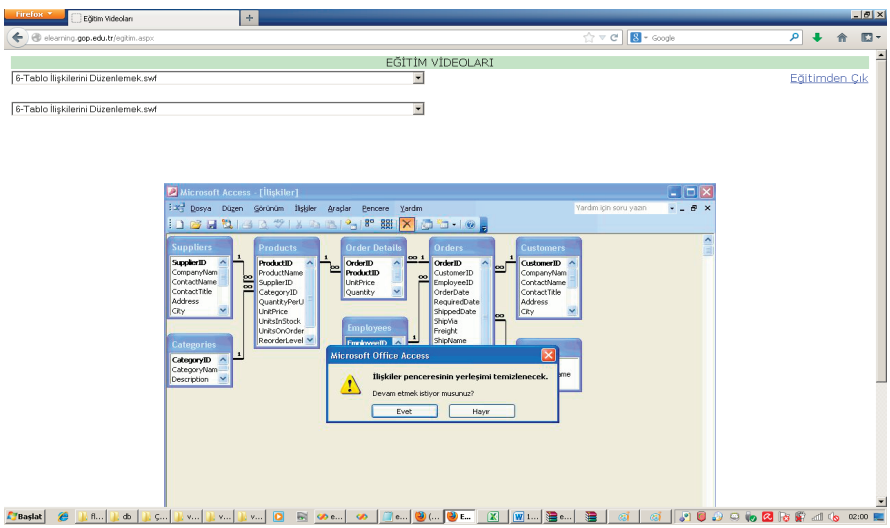
principal reason of these comparisons is to reveal the most efficient, if any, e-learning type(s) within the scope of teaching methods and to give opinions to researchers and designers in their applications to be performed through determining differences among e-learning types in terms of student achievement.

Methodology, data gathering tools and e-learning designs

In the literature review, no study was found that compares five different e-learning types, which are identified as e-learning types, in terms of student achievement in a single platform and within the scope of the same teaching method. All the designs of the five different e-learning types in this study were based on the expository teaching method. Therefore, the aim of the study is finding out the effects of the five different e-learning types about the same subject and designed according to the same teaching method on student achievement. "Computer II (Database)" was the course to be applied to five separate e-learning groups. The fundamental reasons for selection of Computer II (Database) course for the study of different types of e-learning can be listed as: the course and related units require a distinct knowledge accumulation, the information that need to be learned couldn't be acquired easily online, and dependence to course material by successful isolation of students from the outside influences as much as possible, so to determine clearly whether there were differences between different student groups in terms of achievement.

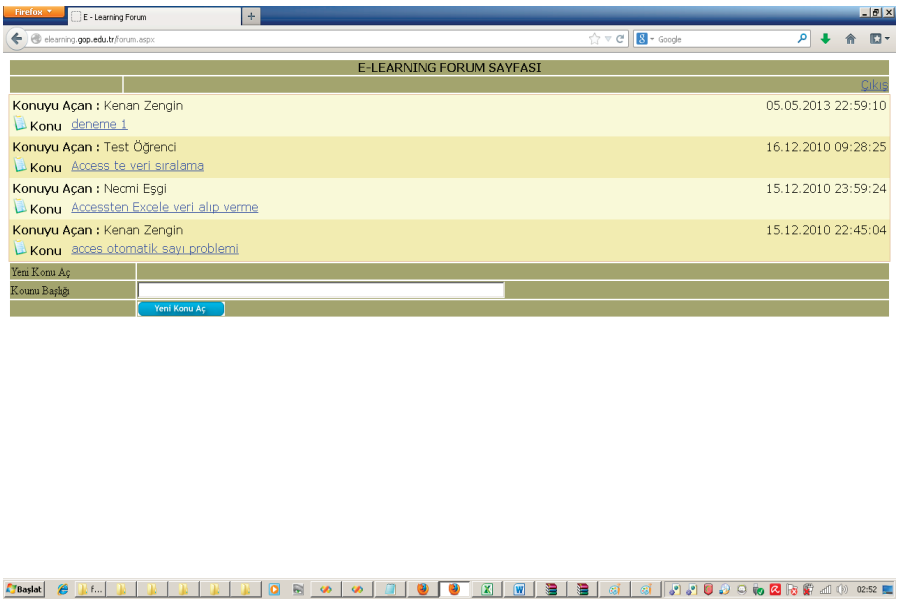
After determining the subjects and contents, these subjects were designed in five different types of e-learning. These designs are then applied to five separate groups, each consisting of 50 students, thus in total to 250 first-year university students (Students who successfully completed Computer I course at Gazi Osman Pasa University School of Education Elementary School Education Department) Researchers randomly determined the groups that students were included.

Each group represents one type of e-learning. For those groups that used Web sites (Learner-led, Facilitated, Embedded) the design was made entirely with Macromedia Flash 8.0. The images and button pictures were transferred from Office Access 2003 medium to Flash by means of slice feature of Adobe Fireworks. Camtasia Studio software is used for voice recordings. All applications, including e-mail and forum, were built using ASP.NET in .NET framework. For applications requiring video conferencing (Instructor-led, Telementoring and E-coaching), Polycom RealPresence Desktop software was used. In addition, 95-page printed material was prepared for the telementoring and e-coaching e-learning group. For embedded e-learning design, the Office help of Office deputy and assistant Internet sites were used. Examples and design specifications for the study are listed below.



Sample 1 Learner led e-Learning practices

In Learner led e-Learning groups students participated with login information (passwords) provided for each of them. Each student participated to learning process independent of previously determined e learning properties. Modules are prepared to include 2 hours of practice for each week. Modules were added each week. In another words students received the material week by week and couldn't access it at once. Progress in each module started with presentation of each part and followed by related practice and evaluation of the student on the unit, after this, students were able to progress to next unit. "Linear model" was chosen for the content. Students couldn't move onto another unit without completing the current one.



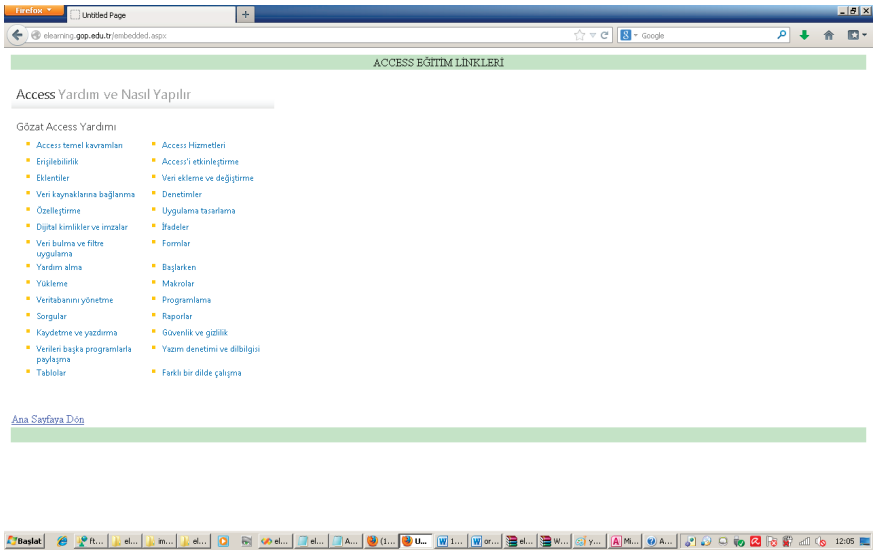
Sample 2 Faciliated e-learning practices

In facilitated e-learning groups students participated in a student led discussions to share information in an administrator controlled discussion forum in addition to e-learning modules. Students posted massages about the issues they had on the modules and things they wanted to share, questions and insights were shared with the moderation of the administrator, or students were directed to previous answers.

Sample 3 Instructor led e-learning practices

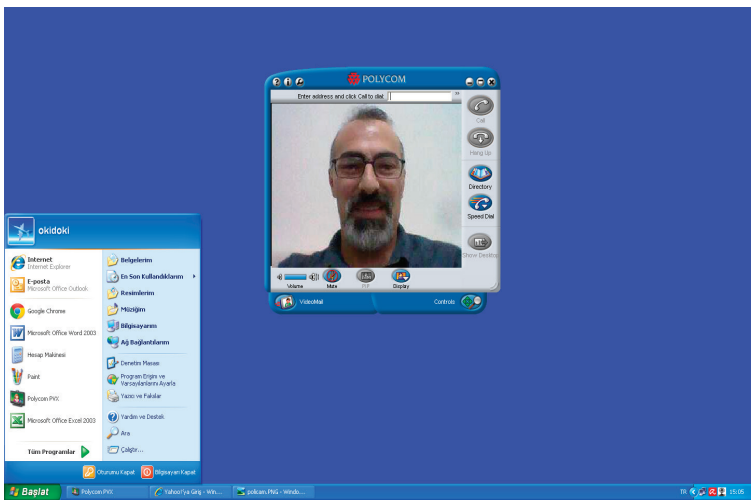
In Instructor led e-learning groups instructor and students were able to communicate online

via synchronous web technologies. Students participated to instruction in five people groups. Similar to instruction in other modules first instructor presented the subject, and then students were asked to practice. Since this was synchronous students were able to receive feedback immediately.



Sample 4 Embedded e-Learning practices

In Embedded e-Learning groups an office help menu was integrated in to the system and used in addition to student led e-learning modules, also various links about database subject that student can benefit were included.



Sample 5 Telementoring and E-coaching practices

In telementoring and E-coaching groups synchronous web technologies were used. Just like in instructor-led e-learning group students participated (randomly assigned) in groups of 5 to sessions. However, mentor did not present the subject directly like it was done in the instructor-led e-learning sessions. In this group, students were presented with printed materials (95 page printed material) before the mentoring. After completing these materials and practices, student asked questions and requested solutions from the mentor during the telementoring sessions (2 hours each week). In other words, this synchronous telementoring sessions aimed to complete

the students' learning that they gained before these activities, and adjusted based on the students' needs.

The validity and the reliability studies of the achievement test of the research were conducted in line with the evidence obtained from Trochim (2001). Five subject matter experts with PhDs in educational technology area confirmed the measurement instrument's validity considering the goals of the study. Achievement test for the Database II course was prepared as a multiple choice test and consists of 40 items. The Cronbach's alpha coefficient of .92 was calculated for the sample groups. Achievement test was used bot as pretest before the interventions and post-test after the interventions. Interventions took 10 weeks of instruction. During the intervention period students received the modules each week in a progressive fashion and not permitted to view upcoming weeks' instructions.

Results and interpretation

In analyzing the research data, Two Way ANOVA for Mixed Measures was used. Here, the first factor represents the five different e-learning groups, whereas the second the pre-test and final test results.

Table 1.

Mean and Standard Deviation Values of the Groups for Student Achievement

Groups	PRE-TEST			POST- TEST		
	N	$\overline{X}$	s	N	$\overline{X}$	s
Learner-led	50	17.96	3.41	50	57.46	4.30
Facilitated	50	16.42	3.03	50	58.64	3.45
Instructor-led	50	17.10	3.39	50	64.80	2.33
Embedded	50	17.70	3.19	50	57.64	4.61
Telementoring and e-coaching	50	17.38	3.42	50	61.78	2.18

As Table 1 shows that there is an increase in student achievement in all e-learning groups. The results of the Two Way Variance Analysis about whether the change in student achievement of students who got training in five different e-learning types before and after the experiment poses a significant difference are presented in Table 2.

Table 2.

Results of the Variance Analysis of the Achievement Points of the Groups

Source of Variance	Sum of Squares	df	Mean Square	F	p
Inter-students	4121.328	249			
Group (Individual/ Group)	924.608	4	231.152	17.716	.000
Error	3196.720	245	13.048		
Intra-students	231846	250			
Measure (Pre-test-Final test)	228466.688	1	228466.688	25098.349	.000
Group* Measure	1149.112	4	287.278	31.559	.000
Error	2230.200	245	9.103		
Total	235967.38	499			

As Table 2 show, that the achievement of the students who participated in five different groups of e-learning does show a significant difference after the experiment; that is, the mutual effect of being in different e-learning groups and repeated measurement factors on students

achievement is significant [F_{4-245}=31.55, P<.001]. Tukey HSD was used in order to determine the source of significant differences and the groups between which these differences emerged.

Table 3.

Tukey HSD for Multiple Comparisons

Tests	Groups	Learner-led	Facilitated	Instructor-led	Embedded	Telementoring and e-coaching
Pre-test	Learner-led		,100	.641	.994	.886
	Facilitated			.881	.243	.537
	Instructor-led				.871	.992
	Embedded					.986
	Telementoring and e-coaching					
Final test	Learner-led		.453	.000	.999	.000
	Facilitated			.000	.617	.000
	Instructor-led				.000	.000
	Embedded					.000
	Telementoring and e-coaching					

As is seen in Table 3, a significant difference at the .001 level was not found between the groups' pre-test mean scores. In the final test, on the other hand, significant differences at the .001 level were observed between the 1st group of learner-led e-learning and the 3rd group of instructor-led e-learning in the favour of the 3rd group, between the 1st group of learner-led e-learning and the 5th group of telementoring and e-coaching in the favour of the 5th group, between the 2nd group of facilitated e-learning and the 3rd group of instructor-led e-learning in the favour of the 3rd group, between the 2nd group of facilitated e-learning and the 5th group of telementoring and e-coaching in the favour of the 5th group, between the 3rd group of instructor-led e-learning and the 4th group of embedded e-learning in the favour of the 3rd group, between the 3rd group of instructor-led e-learning and the 5th group of telementoring and e-coaching in the favour of the 3rd group, between the 4th group of embedded e-learning and the 5th group of telementoring and e-coaching in the favour of the 5th group. When considered the differences between the groups, it could be concluded that the mean score of the group in which instructor-led e-learning was performed is higher than the mean scores of the other four groups, that significant differences emerged between them in the favour of this group, and thus that this group is the most successful group. In addition, it could be stated that the telementoring and e-coaching group followed the instructor-led e-learning group in terms of achievement and it is more successful than the other three groups (learner-led e-learning, facilitated e-learning, embedded e-learning). On the other hand, no significant differences were observed between the final test mean scores of learner-led e-learning, facilitated e-learning and embedded e-learning groups and thus achievement levels of these groups were regarded as closer to one another.

The findings demonstrate that the expository teaching method makes student achievement different with respect to e-learning types. The reason lying behind this impact can be explained with "the synchronized instructor effect of the expository teaching method on e-learning types". It is noted in the instructor-led e-learning type that the instructor teaches a course according to his/her own plan in a synchronized way, s/he has the chance to ask questions directly, and s/he can make alternations in the course and in its running according to the characteristics of the group. Synchronized instructor support is also present in e-learning types of telementoring and e-coaching; however, this support is given in the form of counselling or guidance according to the need defined by the student himself/herself, unlike it is in the instructor-led e-learning. The reason the students achievement is lower in telementoring compared to instructor-led e-learning

might be the fact that students receiving education in the telementoring e-learning type do not fully realize their deficiencies and demand counselling accordingly. As these deficiencies are not eliminated, the increase in the student achievement in this group might have lagged behind the rise in the instructor-led e-learning group. Another finding that supports the synchronized instructor effect is the significant difference of student achievement found between asynchronized (learner-led e-learning, facilitated e-learning, embedded e-learning) and synchronized (instructor-led and telementoring) types. In asynchronized types, students' achievement was found much lower than that in synchronized types. The reason behind this finding might be that students, in asynchronized types, follow a fixed curriculum and benefit from web pages and forums, and that they are away from the synchronized instructor effect.

Conclusions and Suggestions

Regarding with the general limitation of the research, it was determined that the expository teaching method influenced students achievement in the groups in which education was given according to e-learning types to varying degrees. It could be stated that the instructor-led e-learning type works better than the other types in the expository teaching method and influences students' achievement more than the other e-learning types. This influence was named "the synchronized instructor effect of the expository teaching method on e-learning types". It is thought that this effect was the main reason lying beneath the differences between the groups in terms of achievement. Although it wasn't named directly as "synchronized instructor effect", papers comparing synchronous and asynchronous e-learning such as Roblyer, Freeman, Donaldson and Maddox (2007); Somenarain, Akkaraju and Gharbaran (2010), mentions about the effect of synchronous instructors with a different wording, and importance and benefits of synchronous instructors for the students are emphasized in these papers. Also in studies comparing different types of synchronous e-learning methods Hustetler (2002) ; Johnson, Aragon, Shaik and Palma-Rivas (2002), Summer and argue about possible positive effect of synchronous mentors on student achievement.

It is believed that preferring the instructor-led e-learning type in e-learning environments in which the expository teaching method will be employed is an important factor for student achievement. Whenever this type cannot be employed, telementoring and e-coaching might be considered as the alternatives. However, when these types are employed with the expository teaching method, it should be ensured that students have the opportunity to fully realize their deficiencies and convey then to the counsellor in a healthy manner. In the expository teaching method, asynchronized e-learning types (learner-led e-learning, facilitated e-learning, embedded e-learning) should not be preferred if possible.

In the study, the differentiation of a certain teaching method through the e-learning type was investigated by considering student achievement. It is thought that comparison of the impacts of other teaching methods (discovery teaching, project-based teaching etc.) on e-learning types based on student achievement will contribute to the relevant literature.

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