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Effects of the Online Learning Environment Designed with Instruction Activities Model on Academic Achievements, Attitudes, and Retention of Learning

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Abstract
The effect of the online learning environment designed with Gagné's Instructional Activities Model on students' academic achievements, attitudes, and retention of their learning was investigated using a mixed-method design. Purposive sampling was used to select 61 undergraduate students as participants. The participants were divided into two groups: one experimental group with the online learning environment designed with Gagné's Instructional Activities Model and one control group with an online learning environment where the researcher does not intervene. The groups attended the same course content sessions that are suitable for their learning model over six weeks. Data were collected from undergraduates using three instruments which were academic achievement tests, course attitude scales, semi-structured interview form, and from experts using one instrument, which was rating scale. For analysis, descriptive statistics, independent group t-test, ANCOVA tests, and content analyses were performed. According to the findings of the study, students' academic achievements and course attitude levels significantly increased in the online learning environment designed with Gagné's Instructional Activities Model compared with an online learning environment where the researcher does not intervene. The qualitative findings of the study, Gagné's online learning environment, a gradual model that allows learners to learn retention and that allows the learners to transform their learning into life, is a model that students often find useful and will also prefer to apply it in their professional lives. In this respect, the qualitative findings generally support quantitative findings because the experimental research results show that students learning online learning environments with Gagné's principles are more successful, learnings are more permanent, and students' attitudes toward the course are more positive. The results of this study show that various models, such as Gagné's Instruction Activities Model in the online learning environment, have the potential to provide an alternative perspective to the teacher training system.

Keywords: Online learning environment, Gagné's instruction activities model, Gagné's nine events model, Instructional design, Academic achievement, Attitude, Retention.

Introduction

Gagné argued that educational technology is a separate discipline that has a scientific background and systematics, in which research is carried out by using data from the cognitive field and computer science on human learning. In other words, education technology is a wide area dealing with both the concept of technology and teaching theories. All computer programs, visual presentation tools, slides, etc., that are transferred to the computer environment are not

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covered by "educational technology." To be considered as educational technology, these must-have undergone a process based on scientific research (Gagné, Briggs & Wager, 1992). To prepare a technology-assisted learning environment, making use of the data on learning and teaching theories in designing and planning the environment, and then designing computer and internet-based software accordingly can create a quality teaching tool. For this reason, Gagné's Instructional Activities Model (GIAM) comes to the forefront as a model that is suitable for planning the teaching process in computer and internet-based programs in the regulation of this learning environment.

One of the reasons that make GIAM advantageous in a technology-intensive teaching process is that this model is a synthesis of behavioral and cognitive psychology, reflecting the accumulations of these two approaches. GIAM, a learning-oriented, behavioral, and synthesis of cognitive psychology, can be applied to all key areas and can be used in computer-assisted courses. When the literature was reviewed, it was seen that the teaching status model is used in computer or internet-based studies in different fields (Gunduz & Sunbul, 2004; Martin, Klein & Sullivan; Menzi, 2012; Neo, Neo & Teoh, 2010; Ozkok, 2010; Tanyeri, 2004). In this respect, Gagné emphasized that the instructional designers should be supportive of the design of learning. (Gagné & Briggs, 1974). Another way of using GIAM in today's educational setting, which emphasizes learning, is online learning. The application of internet technology in distance education, which allowed people to communicate more easily with each other via information and communication technologies, revealed the concept of online learning. Online learning is defined as structures that provide synchronous and asynchronous communication with faculty members and other students to support the learner in the learning process, configures the personal meaning to obtain information, and enhance the learning experience with learning materials that give students facilities independent from space, access to learning materials, and allows them to interact with the content, tutorials and other learners (Moore & Kearley, 1996; Ally, 2004, as cited in Pala, 2014), is the fastest-growing type of distance education (Perraton, 2005).

In line with these features, it can be argued that online learning has some common features with a constructivist understanding. Similarly, the classroom environment where constructivist teaching is applied allows students to perform group work and benefit from the technology (Durmus, 2001, as cited in Gunes & Asan, 2005). They defend, argue, hypothesize, and share their ideas (Sasan, 2002). Online educational applications increase the interaction of learners with each other through e-mails, forums, virtual classes, and related communication tools, allowing people of different perspectives to discuss with each other, and also allowing the learners to construct knowledge. Also, learners can join online teams and work in groups. On the other hand, the teacher guides the learners communicating to them and giving necessary feedbacks.

Nevertheless, all that aside, individuals can also access what they need to learn on the net (Woo & Reevers, 2007). Briefly, individuals from different parts of the world can share information and thoughts with online learning applications and create constructivist-learning media applying different learning activities. Students who share their knowledge and ideas with other students in a social environment are more prone to discover new information and construct their knowledge (Kwon & Cifuentes, 2009).

Numerous studies have been conducted in the literature on the use of GIAM in technology-based learning processes. When the research and studies related to GIAM were evaluated in general, it could be said that the effectiveness of the model has been tested in many different educational levels and relation to different disciplines, and therefore it is widely accepted. In some of these studies, GIAM was tested in comparison with the current teaching approach (Bas, 2012; Cagirgan, Gulten, Ergin & Avci, 2009); in some studies, it was adapted with additions to the stages of the model (Ilie, 2014). It was adapted with its stages (Akcay, 2011; Gokdemir, 2009).In these studies, GIAM has been employed as a system, process, or method. Another common aspect of GIAM-related studies was that this model was mainly used in computer and online teaching software (Gunduz & Sunbul, 2004; Karabagshiew,

2003; Martin, Klein & Sullivan, 2004; Menzi, 2012; Ozkok, 2010; Neo et al., 2010; Tanyeri, 2004; Taskiran, 2017; Uysal & Yalin, 2012). Accordingly, it can be argued that GIAM is a model suitable for the technology-intensive teaching paradigm of the Information Age and that the model is suitable for further development with new technologies.

In light of this data, in an environment where technology is used extensively in education, especially over the Internet, and where learning is as important as the environment and external factors, GIAM draws attention with its potential to provide an alternative expansion to the teaching of almost all classes. As GIAM is a model combining the principles of behavioral psychology, taking into consideration external variables in learning and the principles of cognitive psychology, it emphasizes the internal variables in this process with the learning theory that is similar to computer processes. In recent years, this model has attracted the attention of educators since it is also suitable for the constructivist approach adopted by the Turkish Education System. It is mentioned in the literature (Kane, 2006) that GIAM is an approach that takes into account mental processes as well as behaviors that can be observed in learning. For this reason, it is important that GIAM's benefits are tested in higher education institutions, which educate teachers and analyze the achievements and attitudes of teacher candidates in the context of this model. This is because a technology-intense training process, which is suitable for the Information Age, can only be applied and sustained by teachers who are trained in line with these requirements.

Literature Review

Gagné's Instruction Activities Model

Gagné, known as a learning Neo-Behaviorist, but who also has many ideas about the cognitive field, tries to understand learning through the student's response to teaching. Gagné, one of the pioneers of Information Processing theorists, treats learning as both a product and a process. Learning, according to Gagné, occurs in the brain and consists of observable behaviors (Senemoglu, 2007), including knowledge, attitudes, values, and skills. In this understanding, performance is an indicator of learning, and Gagné's understanding can be summarized as programming the learning steps. Gagné does not advocate that learning is only being carried out by external factors, as behaviorists have argued, and says that internal factors are as effective as external factors in learning. According to Gagné, the internal factors that are effective in learning are pre-possessed information, mental skills, cognitive strategies, and sensory traits like attention, attitude, and value (Akcay, 2010). According to Reigeluth (2016: 6), however, Gagné's internal conditions of learning refer to the nature of the learner, and external conditions of learning refer to the teaching methods. According to Gagné, learning is both a product and a process; learning occurs in the brain, consisting of observable behaviors. According to Gagné, two basic questions should be asked about teaching:

1. What is the student being asked to know or do at the end of the education process?
2. What should the student's readiness level be, i.e., what a student should know and do to reach the desired result?

The important thing is to determine the objectives to be achieved at the end of the educational process and to organize the teaching activities in this respect (Gokdemir, 2009). The nine steps of GIAM, which is also known as External Events and Teaching Status (Kruse, 2009; Menzi, 2012) are to gain attention, inform learners of objectives, stimulate recall of prior learning, present the content, provide "learning guidance," elicit performance (practice), provide feedback, assess performance, and enhance retention and transfer.

Online Learning Environment (OLE)

Online learning is the fastest-growing type of distance education (Perraton, 2005), providing opportunities independent from time and space(Moore &Kearley, 1996; Aase, 2000, as cited in Usta, 2007). Online learning is defined as the internet-based system of planning, preparation, production, presentation, and evaluation stages of remote education (Brahmawong, 2004). In its simplest sense, online learning is transmitting information, skills, and emotions to the other party by using symbols such as words, images, and graphics (Lean, 2006, as cited in Ridge, 2014: 12). Online learning is a distance education application in which

class content and support materials are presented over the web, student-student, and student-teacher interactions are realized via online discussion media (i.e., forums), e-mail, and other communication tools, and measurement and evaluation are performed with participation rates in online testing and activities (Kuzu, 2011a, as cited in Yilmaz, 2012: 1). According to the description of Elliot Masie (an e-learning guru in the USA), on the other hand, "online learning is not like taking a class, it is a combination of the access to the e-learning tools on the desktop and the resources, communication, performance support, and structural learning activities" (as cited in Akca, Barut &Onder, 2014, 191).

Online learning, which is rapidly becoming widespread as a requirement of the Information and Communication Age, provides very important developments in traditional education and some limitations. Knowing these is important in terms of designing more effective teaching systems. Here, the benefits and limitations of learning compared to traditional face-to-face education are addressed.

The OLE is a media with not only advantages but also disadvantages. The advantages of OLE can be summarized as(Barcelona, 2009; Bozkurt, 2013; Burgstahler, 1997; Harasim, 1990, as cited in Ergul, 2006; Henderson, 2003; Horton, 2000; James, 2002; Kaya, 2005; Kuzu, 2005; Oliver, 1999; Ozcan, 2009; Sahin, Celik&Hebebci, 2014; Aase, 2000, as cited in Usta, 2007; Yaw, 2005): it is a media "offering learners the opportunity to learn at their own pace; allowing learners to cooperate and make discoveries in the world of information; being easily available and economical; allowing learner behaviors can be controlled; allowing the communication of learners with each other and with the instructor a lot; allowing the application of multiple assessment methods; enabling learners to instantly reach the change made by the instructor in the contents."The disadvantages of OLE can be summarized as (Burgstahler, 1997; Celen, Celik&Seferoglu, 2011; Henderson, 2003; Horton, 2000; James, 2002; Kaya, 2005; Kuzu, 2005; Aase, 2000, as cited in Usta, 2007; Yaw, 2005): it is a media "requiring technical infrastructure; being occurred the technical problem; requiring technical knowledge and skills; causing a sense of loneliness for learners and prevents the development of social skills; causing learners to misunderstand each other; being perfect both instructional design and teaching materials must be perfect; being difficult to estimate the costs and costs required for teaching.".

Purpose

The general purpose of this study is to investigate the effect of students' academic achievements, attitudes, and retention of their learning in the Experimental Group (EG) receiving instruction through the OLE designed with Gagné's Instruction Activities Model; and the Control Group (CG), which receives instruction through the OLE where the researcher does not intervene. The research problem is investigated under five sub-problems:

1. Is there a significant difference between EG and CG students considering their achievement post-test mean scores according to their pre-test scores?
2. Is there a significant difference between EG and CG students considering their achievement in retention test mean scores according to their post-test scores?
3. Is there a significant difference between EG and CG students considering their attitudes about course post-test mean scores according to their pre-test scores?
4. What are the opinions of EG and CG students about the OLE?
5. What are the opinions of EG students about GIAM?

Methodology

Research Design

In this study, the exploratory sequential pattern is used among the basic mixed pattern types. The purpose of using the mixed method in the study is to examine the problem from a variety of perspectives because the data provides different perspectives based on the combination of qualitative and quantitative data. In the exploratory sequential pattern, the first stage is the quantitative step directed by the researcher. The second stage is the qualitative stage, which aims to explain the related results more deeply (Morgan, 1998). In this pattern, the qualitative step explains the relationships and orientations within quantitative data (Creswell,

Plano Clark, Gutmann& Hanson, 2003). The data is collected asynchronously, analyzed separately, and the dimensions to which findings are compared and which information to compare between these dimensions are decided. In the final stage, the results are interpreted (Cresswell& Plano Clark, 2007). Figure 1 shows the exploratory sequential pattern used in this study.

Figure 1: Research framework

The pre-test- post-test control group pattern of the experimental model is used as a quantitative research method. Kerlinger (1973) defines this pattern as the pattern in which subjects assigned to the experimental and control groups are measured before and after experimental manipulation (as cited in Buyukozturk, 2013). Figure 2 shows the pre-test-post-test control group pattern used in this study. The case study is used as a qualitative research method. The most prominent feature of case studies is the in-depth investigation of one or several different situations. In case of studies, factors that affect a situation are focused on how they affect the situation and also how the factors are affected (Yildirim & Simsek, 2013).

Figure 2: Experimental research framework

Participants

The participants of the study are sophomore undergraduate students who studied in a faculty of education at a state university in eastern Turkey. In cases where students participating in a study are compared to experimental and control groups, it is essential to form co-level groups. For this purpose, two methods commonly used to divide students into groups are matching and randomly assigned. Random assignment is based on the assumption that groups are equivalent and is the best way to control factors that threaten internal validity (Fraenkel&Wallen, 1996: 267). Participants were randomly assigned to the study groups as EG or CG by lottery. The EG consisted of 31 students, and CG consisted of 30 students.

Table 1: Group Distribution of Participants

Group	N	$\bar{x}$	S	Sd	t	p
EG	30	8.37	3.855	59	.498	.620
CG	31	7.90	3.409			
Toplam	61					

As shown in Table 1, there was no significant difference between the pre-test scores of the EG ($\bar{x}$ = 8.37) and CG ($\bar{x}$ = 7.90) (t=.498, p>.05). For this reason, the groups were considered similar before the implementation processes.

In the qualitative part of the study, the participants were determined using the maximum diversity sampling method. The purpose of the maximum diversity sampling method is to identify a rich and relatively small sample group with different characteristics and to investigate common characteristics and similarities related to the research problem or situation (Yildirim&Simsek, 2013). Therefore, the participants were ranked according to their achievement scores, and volunteer students were selected from the high and low average level groups. For answering OLE questions, students were selected from EG=8 and CG=9. For answering GIAM questions, students were selected from EG=16.

Procedures: OLE Designed with GIAM

The study was used a learning management system (LMS) and Perculus virtual classroom software. This software was preferred because it is more reliable. Online learning was usually done synchronously in a virtual classroom via the LMS. All course records were posted on the system asynchronously.

The learning was designed with GIAM using

the LMS. The GIAM consisted of nine events. As an example, the 3rd-week' lesson is given below by considering Gagne's model.

The 3rd Week's Lesson Design

The lesson was started in the virtual classroom for the theory of Multiple Intelligences, Brain-based learning, Constructivism, Cooperative Learning, and 5E-7E models. A PowerPoint presentation was made ready for both lecturers and students to see in the common area.

- Gain attention: A visual was shown that compared the traditional approach and constructivist approach in the common area to attract the attention of students. After the attention of students focused on the visual, questions were asked to the students about which of the teachers might have adopted the traditional approach as opposed to the constructivist approach. Furthermore, the attention of the students was drawn with a similar approach at the beginning of each subject. During the course, a link was established with the previous courses related to this step in different subjects and times. At every stage of the course, it was asked whether a subject was not understood to keep the student's attention alive. They were also provided the opportunity by establishing a microphone connection for any student using the chat panel to answer the question.
- Inform Learners of Objectives: The lecturer listed the targets that students were expected to acquire at the end of the course in the form of understanding the basic foundations of the multi-intelligence theory, understanding the basic foundations of brain-based learning, understanding the basic foundations of constructivist theory, understanding the basic foundations of the 5E/7E models, and understanding the basic foundations of collaborative learning. Also, these targets were presented to the students in the common class.
- Stimulate Recall of Prior Learning: The subject of the previous week was reminded to the students by using a digital story. Moreover, based on the keywords about the subjects of the 3rd-week, they were made to remember the information again.
- Present the Content: A video was made for the lecturer to describe the multiple-intelligence theory as the stimulating material in the presentation of the course contents. Students were asked to match which approach they described by giving two comparative visuals in teaching approaches. The basic structures of each theory, its sub-elements (if any) were included in how to use them by the lecturer and to pay attention when the student used them.
- Provide "learning guidance": Related to guiding learning, the instructor performed activities including reminding the distinguished and obvious characteristics of the theories in the necessary time of the course by giving tips on the theories, focusing on the keywords, and also encouraging the students in incomplete or incorrect answers. The lecturer gave clues when necessary and additional information was provided in cases where tips were insufficient. In addition to the visuals that the instructor considered effective in the course presentation, the lecturer took care to use different situations, such as changes to the tone of voice and gestures from time to time.
- Elicit performance (practice): During the learning, firstly, examples were given by the lecturer, and the students were also asked to give examples. With the help of additional examples, learning was reinforced.
- Provide Feedback: The students gave examples related to the course's subject. The lecturer gave additional examples to the students' examples. According to the questions of the students during the presentation of the subjects, feedback was provided to the students by the lecturer following the answers of the lecturer and other students. In the course flow or at the end of the course, incorrect answers were not corrected immediately. The students were provided with short reminders to find the correct answer.
- Assess Performance: Multiple-choice questions were asked to students at the end of the course to evaluate their performance. The answers of all students were obtained by using both a microphone connection and a chat panel.
- Enhance Retention and Transfer: The lecturer gave plenty of examples and, after each question,

reinforced the answers of the student and asked them to prepare a daybook of learning about the course. In the daybook of learning, the students were asked to summarize the points acquired at the end of the course under one heading, and they were asked to answer the question of what happened in the course and were supported to abstract the course.

All the course contents were taught according to described above the narration of an example subject. During the course, the week's subject was interactively taught in the virtual classroom application of LMS on the Principles and Methods of Teaching course.

Expert Opinions on Presentation of Courses According to GIAM

In the EG, lessons were designed according to GIAM. To determine whether the lessons were conducted by the model, three students during the lesson and two experts who evaluated the lesson by watching the recorded sessions after the lesson was asked to fill in the rating scale consisting of nine items. Each student and expert carried out an evaluation process every week. Table 2 shows the evaluation results of the nine items rating scale of the courses by five rates in three categories.

Table 2: Results from the Rating Scale

	1st week				2nd week				3rd week			
	Yes	Partly	No	*AP	Yes	Partly	No	AP	Yes	Partly	No	AP
1	5	0	0	100	4	1	0	80	5	0	0	100
2	5	0	0	100	5	0	0	100	4	1	0	80
3	5	0	0	100	5	0	0	100	5	0	0	100
4	4	1	0	80	5	0	0	100	4	1	0	80
5	5	0	0	100	5	0	0	100	5	0	0	100
6	4	1	0	80	4	1	0	80	5	0	0	100
7	5	0	0	100	4	1	0	80	5	0	0	100
8	4	1	0	80	5	0	0	100	4	1	0	80
9	4	1	0	80	4	1	0	80	5	0	0	100
	4th week				5th week				6th week			
1	5	0	0	100	5	0	0	100	5	0	0	100
2	5	0	0	100	4	1	0	80	5	0	0	100
3	5	0	0	100	4	1	0	80	5	0	0	100
4	5	0	0	100	5	0	0	100	5	0	0	100
5	5	0	0	100	5	0	0	100	5	0	0	100
6	5	0	0	100	4	1	0	80	5	0	0	100
7	5	0	0	100	5	0	0	100	5	0	0	100
8	5	0	0	100	5	0	0	100	4	1	0	80
9	5	0	0	100	5	0	0	100	4	1	0	80

*AP= Agreement of expert percentage

Fleiss Kappa values calculated according to the data obtained from Table 2 were calculated as .82 for in the 1st week, .82 in the 2nd week, .87 in the 3rd week, 1.00 in the 4th week, .87 in the 5th week, and .91 in the 6th week. According to these values, it can be said that the expert fit regarding the implementation of the model for all weeks is "perfect." Considering the agreement percentage of the model applied each week according to the items, it can be said that the percentage of agreement between experts is between 80-100% at every step of all weeks, and according to these values, the percentage of agreement between experts is reliable in every step of each week.

Instruments

This study utilized both quantitative and

qualitative data. The "Academic Achievement Test" and "Course Attitude Scale" were used to collect quantitative data. In the collection of qualitative data, a "Structured Interview Form" and "Rating Scale" prepared by the researchers were used.

Academic Achievement Test

An Academic Achievement Test (AAT) was developed by the researchers. AAT is a 37-item multiple-choice test with each question having five options. The content of the test was developed with the support of three academic members from the Faculty of Education. The reliability coefficient of KR-20 was determined as .82. The discrimination index values of the items varied between .22 and .49. The difficulty index of the items ranged between .26 and .96, and the average difficulty of the test was calculated as .52. AAT was applied as a pre-test, post-test, and retention test to EG and CG.3.4.2. Course Attitude Scale

The Course Attitude Scale (CAS) developed by Gur Erdogan (2011) uses the five-point Likert scale: "strongly agree," "agree," "neutral," "disagree," and "strongly disagree." The CAS consisted of 40 questions and three dimensions (assimilation, acceptance, and denial). The Cronbach's α of the overall questionnaire is 0.90, and the Cronbach's α for each of the sub-dimensions ranges between 0.84 and 0.96. CAS was applied as a pre-test and post-test to the EG and CG.

Structured Interview Form

Two interview forms were developed by the researchers. The first form consisted of two parts that were personal information and opinions about the OLE. The second form consisted of two parts that included personal information and opinions about the GIAM.

Rating Scale

The rating scale was developed by the researchers and used the three-point rating: "strongly designed," "partially well designed," and "not strongly designed" and consisted of nine questions. This scale was given to three students who took courses in which GIAM was applied and to two Curriculum and Instruction experts, and each week's course was followed by the experts.

Data Analysis

The Skewness and Kurtosis coefficients were used to examine whether the data were normally distributed in independent groups (Can, 2013). The value obtained by dividing the skewness and kurtosis coefficients by the standard error was examined between − 1.96 and + 1.96 are acceptable for normal distribution (Can, 2013; Tabachnick & Fidell, 2007). In this study, the skewness and kurtosis coefficients were calculated to ascertain whether group scores showed normal distribution or not for this purpose. In this study, statistical analysis was performed with a parametric test (independent groups t-test). ANCOVA (one-way analysis of covariance) was used to compare CG and EG. ANCOVA was performed for repeated measures in the analysis of quantitative data. ANCOVA was considered suitable to be used to find the effect of the difference between the main effects of the treatment on dependent variables (Can, 2013; Tabachnick & Fidell, 2007). Effect sizes were calculated in addition to statistical significance (Cohen, Manion& Morrison., 2005). The effect size η2 was calculated for the independent groups with significant differences between scores. The value of η2 is considered a high effect if it is greater than 0.14, a medium effect between 0.13 and 0.06, and a low effect if it is between 0.05 and 0.01 (Can, 2013).

The content analysis process determined by Yildirim and Simsek (2013) was considered for the analysis of the qualitative data obtained from the students through structured interviews. First, the participants were coded as EGS1M, …., EGS16W, CGS1W, …, and CGS8W. EGS1M means "EG = Experimental Group, S1= Student 1, M= Man". CGS8W means "CG = Control Group, S8 = Student 8, W = Woman". Second, two researchers independently defined themes for responses from participants. The separately determined themes were compared before a consensus was reached and the themes were finalized. The following formula, developed by Miles and Huberman (1994), was used to measure the reliability of the research: Percentage of Consensus = (Agreement (Na) / (Agreement (Na) + Disagreement)) x100. The six statements were placed in different categories by one of the researchers: with this formula, P = (71 / (71 + 6))

x100) = 92.2%. In qualitative research, reliability is provided for cases where the consensus percentage is 70% and above regarding the evaluation made by the expert and the researcher for reliability (Miles & Huberman, 1994). Third, the themes were put in order, and the numerical data of themes were presented in tables. Finally, the results were interpreted by the researcher, and the data analysis was concluded.

The other qualitative data collection tool of the research is the rating scale. Two types of analysis methods were used in the rating scale analysis. The first is the Fleiss (1971) Kappa statistic, which provides scale-based values and analyses for the compatibility of more than two encoders for the entire scale. Fleiss (1971) stated that when the value of kappa is between 60 and 74, the expert opinion agreement can be described as "good" for the relevant scale. When the opinion is above 75, the expert opinion agreement can be described as "excellent." The second type of analysis was used in the formula of Percentage of Consensus = (Agreement (Na) / Agreement (Na) + Disagreement) x100 developed by Miles and Huberman (1994), where the reconciliation percentage is calculated for each item of the scale. In qualitative research, reliability is provided for cases where the consensus percentage is 70% and above regarding the evaluation made by the expert and the researcher for reliability (Miles & Huberman, 1994).

Results

R.Q.1. Is there a significant difference between EG and CG students considering their achievement post-test mean scores according to their pre-test scores?

ANCOVA was used to compare the academic achievement post-test scores of the EG and CG. Before conducting ANCOVA, four assumptions were tested. According to the first assumption, the data showed a normal distribution. For the second assumption, the variances of the achievement post-test scores were determined to be equal (F=3.276, p=.075). For the third assumption, the slopes of the regression lines were close to each other, and there was a linear relationship between the dependent variable (pre-test) and the common variable (post-test), thus justifying conducting ANCOVA. For the last assumption, the group x pre-test interaction for academic achievement post-test scores was statistically nonsignificant (F=1.628; p=.207). These findings show that the regression lines for testing the post-test scores apply equally to the pre-test scores. This means that the fourth assumption was also met.

After all, assumptions had been tested, ANCOVA was applied. Adjusted academic achievement post-test scores for each group were calculated along with descriptive statistics. The new value for the EG was 33.96, and for the CG was 31.10. ANCOVA was conducted to determine whether this change between academic achievement pre-test and post-test scores was statistically significant. ANCOVA results are shown in Table 3

Table 3: ANCOVA Results Comparing Post Test Achievement of Two Groups While Controlling Pretest Achievement

Source of variance	Sum of squares	sd	Mean of squares	F	p	η2
Pretest	96.223	1	96.223	5.544	.022*	.07
Group	125.006	1	125.006	7.202	.009*	
Error	1006.745	58	17.358			
Total	1243.148	60				

*p < = .005

Academic achievement pre-test scores were included in the analysis as a covariate or control variable. The significance of the difference between the two groups' achievement post-test scores was tested (Table 3). There was a significant difference between the adjusted academic achievement post-test scores according to the pre-test scores, F1-58=7.202; p=.009. This significant difference demonstrates that achievement post-test scores of EG students are higher than achievement post-test scores of CG students. In other words, the methods used in the EG affected students' achievement. The effect size

value (η2) was calculated at .07 and was found to be medium. In other words, instruction based on GIAM had a medium-level effect on the EG students' achievement.

R.Q.2. Is there a significant difference between EG and CG students considering their achievement retention test mean scores according to their post-test scores?

ANCOVA was used to compare the academic achievement retention test scores of the EG and CG. Before conducting ANCOVA, four assumptions were tested. According to the first assumption, the data showed a normal distribution. For the second assumption, the variances of the achievement retention test scores were determined to be equal (F=.897, p=.348). For the third assumption, the slopes of the regression lines were close to each other, and there was a linear relationship between the dependent variable (post-test) and the common variable (retention test), thus justifying conducting ANCOVA. For the last assumption, the group x post-test interaction for academic achievement retention test scores was statistically nonsignificant (F=3.980; p=.051). These findings show that the regression lines for testing the retention test scores apply equally to the post-test scores. This means that the fourth assumption was also met.

After all, assumptions had been tested, ANCOVA was applied. Adjusted academic achievement retention test scores for each group were calculated along with descriptive statistics. The new value for the EG was 24.85, and for the CG was 24.73. ANCOVA was conducted to determine whether this change between academic achievement post-test and retention test scores was statistically significant. ANCOVA results are shown in Table 4.

Table 4: ANCOVA Results Comparing Retention Test Achievement of Two Groups While Controlling Post test Achievement

Source of variance	Sum of squares	sd	Mean of squares	F	p
Pretest	29.207	1	29.207	1.652	.204
Group	.204	1	.204	.012	.915
Error	1025.235	58	17.676		
Total	1060.230	60			

Academic achievement post-test scores were included in the analysis as a covariate or control variable. The significance of the difference between the two groups' achievement retention test scores was tested (Table 4). There was no significant difference between the adjusted academic achievement retention test scores according to the post-test scores, F1-58=.012, p=.915. Although a significant difference between groups was not found according to the achievement retention test mean scores, that the achievement retention scores of EG students are higher than the achievement retention scores of CG students.

R.Q.3. Is there a significant difference between EG and CG students considering their attitude about course post-test mean scores according to their pre-test scores?

ANCOVA was used to compare the course attitudes post-test scores of the EG and CG. Before conducting ANCOVA, four assumptions were tested. According to the first assumption, the data showed a normal distribution. For the second assumption, the variances of the course attitude post-test scores were determined to be equal (F=.250, p=.619). For the third assumption, the slopes of the regression lines were close to each other. There was a linear relationship between the dependent variable (pre-test) and the common variable (post-test), thus justifying conducting ANCOVA. For the last assumption, the group x post-test interaction for course attitudes post-test scores were statistically nonsignificant (F=2.779; p=.101). These findings show that the regression lines for testing the post-test scores apply equally to the pre-test scores. This means that the fourth assumption was also met.

After all, assumptions had been tested, ANCOVA was applied. Adjusted course attitudes post-test scores for each group were calculated along with descriptive statistics. The new value for the EG

was 4.25, and for the CG was 3.82. ANCOVA was conducted to determine whether this change between course attitudes pre-test and post-test scores was statistically significant. ANCOVA results are shown in Table 5.

Table 5: ANCOVA Results Comparing Post test Course Attitudes of Two Groups While Controlling Pretest Course Attitudes

Source of variance	Sum of squares	sd	Mean of squares	F	p	η2
Pretest	1.867	1	1.867	22.540	.000*	.17
Group	2.582	1	2.582	31.174	.000*	
Error	4.804	58	.083			
Total	10.678	60				

*p < = .005

Course attitudes pre-test scores were included in the analysis as a covariate or control variable. The significance of the difference between the two groups' course attitudes post-test scores were tested (Table 5). There was a significant difference between the adjusted course attitudes post-test scores according to the pre-test scores, F1-58=31.174, p=.000. This significant difference demonstrates that course attitudes post-test scores of EG students are higher than course attitudes post-test scores of CG students. In other words, the methods used in the EG affected students' attitudes. The effect size value (η2) was calculated at .17 and was found to be high. In other words, instruction based on GIAM had a high-level effect on the EG students' attitudes.

R.Q.4. What are the opinions of EG and CG students about the OLE?

The qualitative data obtained are grouped under five themes: its remarkable aspects, boring aspects, advantages, disadvantages, and attitudes.

As a result of the data analysis, students' opinions on the remarkable aspects of OLE are summarized in Table 6.

Table 6: Students' Opinions on the Remarkable Aspects of OLE

Codes	f	Participants
A different environment	5	EGS1M, EGS7W, CGS5W, CGS8W, CGS9W
Independence from location	4	EGS3M, EGS6M, EGS8W, CGS2M
Active student participation	4	EGS2W, EGS5W, CGS1W, CGS7M
Number of participants	3	EGS2W, EGS5W, CGS6W
An intimate environment	2	EGS4W, CGS1W
Participation comfort	2	EGS3M, CGS4M
Possibility of repetition	1	CGS3M

As presented in Table 6, five students stated that the OLE was a more different environment than the traditional learning environment. In addition, four students commented on each of the topics of independence from location and active student participation. Interviewee #EGS1M stated that "We faced a very different environment than the learning media we have seen so far." One of the students (interviewee #EGS2W) talked about active student participation as, "...it attracted the most attention that there was more participation in the class."

Students' opinions on boring aspects of OLEare summarized in Table 7.

Table 7.Students' Opinions on Boring Aspects of OLE

Codes	f	Participants
Solitude	10	EGS1M, EGS3M, EGS4W, EGS5W, EGS6M, EGS7W, CGS1W, CGS2M, CGS6W, CGS7M
Course Time	6	EGS8W, CGS1W, CGS2M, CGS5W, CGS8W, CGS9W
Not boring	3	EGS1M, EGS3M, CGS3M
Synchronous course requirement	1	CGS4M
Technical deficiencies	1	EGS2W

According to the interview results, ten students stated that the most boring topic of the OLE was that it was felt the state or situation of being alone. Interviewee #EGS7W stated that "...I listen to the course from where I sit by myself. After some time, I disengage from the course as a result of distraction or boredom." As interviewee CGS1W commented, "... it seemed boring to me when the course times were long."

Students' opinions on the advantage aspects of OLE are summarized in Table 8.

Table 8: Students' Opinions on the Advantage aspects of OLE

Codes	f	Participants
Independence from location	9	EGS1M, EGS3M, EGS8W, CGS1W, CGS2M, CGS5W, CGS6W, CGS7M, CGS9W
Independence from time	5	EGS1M, EGS3M, EGS7W, CGS1W, CGS8W
Freedom of expression	4	EGS4W, EGS8W, CGS4M, CGS9W
Possibility of repetition	3	EGS6M, CGS6W, CGS9W
Equality of opportunity	2	CGS6W, CGS8W
Number of Participants	2	EGS5W, CGS8W
Student-centredapproach	2	EGS3M, CGS8W
Visualizations	1	EGS2W
One-to-one sense of lesson	1	CGS6W
Opportunity of giving more examples	1	CGS3M

As presented in Table 8, nine students stated that the advantage of OLE was independence from the location. In addition, five students commented on the topics of independence from time, and four students commented on the topics of freedom of expression. Interviewee #EGS1M stated that "It brought benefits in terms of location; information could be accessed with a click when requested." One of the students (interviewee #EGS4W) talked about freedom of expression as, "First of all, it taught me not to hesitate. I had the opportunity to express my thoughts more easily."

Students' opinions on the disadvantageous aspects of OLEare summarized in Table 9.

Table 9: Students' Opinions on the Disadvantaged Aspects of OLE

Codes	f	Participants
Technical deficiencies	11	EGS1M, EGS2W, EGS4W, EGS6M, EGS8W, CGS1W, CGS2M, CGS4M, CGS6W, CGS7M, CGS8W
Lack of sense of belonging	4	EGS1M, EGS3M, EGS7W, CGS8W
Not suitable for every course	3	CGS1W, CGS3M, CGS8W
Synchronous course	2	CGS1W, CGS5W
Comfortable	1	EGS1M
Lack of communication	1	CGS5W
Decreased sense of responsibility	1	EGS5W

According to the interview results, 11 students stated that the most disadvantageous topic of the OLE was that it had technical deficiencies. Interviewee #EGS1M stated that "Students and teachers might have problems connecting to the internet and the computer…". As interviewee #CGS8W commented, "…sociological elements like fraternity and cultural interaction cannot be achieved among students in this system."

Students' opinions on changing students' attitudes about are summarized in Table 10.

Table 10: Students' Opinions on Changing Students' Attitudes about OLE

Codes	f	Participants
From negative to positive	15	EGS1M, EGS2W, EGS3M, EGS4W, EGS5W, EGS6M, EGS7W, EGS8W, CGS1W, CGS4M, CGS5W, CGS6W, CGS7M, CGS8W, CGS9W
From Positive to Positive	3	EGS1M, EGS7W, CGS3M
From positive to negative	2	EGS1M, CGS2M
From negative to negative	1	CGS9W

According to the interview results, 15 students who had a negative attitude about OLE commented that they have a positive attitude about OLE after the process. One of the students (interviewee #EGS4W) commented, "When I first heard about it, I thought about what it was like, and I said, "I cannot do that; it is very hard. But then I started to love it more when I saw what it had added to me."

R.Q.5. What are the opinions of EG students about GIAM?

The qualitative data obtained are grouped under four themes: remarkable aspects, advantages, disadvantages, and whether to use in the profession.

As a result of the data analysis, students' opinions on remarkable aspects of the GIAM are summarized in Table 11.

Table 11: Students' Opinions on Remarkable Aspects of the GIAM

Codes	f	Participants
Retention of Learning	6	EGS1M, EGS2W, EGS4W, EGS9W, EGS11W, EGS16W
Progressivity	5	EGS3M, EGS6M, EGS7W, EGS16W, EGS13M
Transformation into Life Experience	4	EGS1M, EGS2W, EGS7W, EGS10W
Knowing Objectives	3	EGS5W, EGS9W, EGS11W
Considering Individual Differences	3	EGS12M, EGS14W, EGS10W
Student CenteredApproach	2	EGS8W, EGS15W
Using Effective Material	2	EGS9W, EGS15W
Assessing performance	1	EGS10W

According to Table 11, six students stated that retention of learning was the most remarkable aspect of GIAM. In addition, five students stated that the GIAM was a progressivity approach; four students thought that the GIAM was transformation into a life experience. For instance, interviewee # EGS4W indicated that "The course students are most afraid of is math. For this reason, it is obvious that they're not focusing on it; even if they find out, it is not permanent. They pretend that they have learned. If they are not insisted on, they become individuals who say, "I don't understand math." I think it is the biggest factor in ensuring permanence to prevent this thought." Moreover, interviewee #EGS3M thinks that "I think the most remarkable aspect of the model is that the model consists of stages; in other words, it gradually brings the subject up…."

Students' opinions on the advantages of the GIAM are summarized in Table 12.

Table 12: Students' Opinions on the Advantages about the GIAM

Codes	f	Participants
Being multi-stage	7	EGS3M,EGS4W, EGS7W, EGS8W, EGS9W, EGS10W, EGS13M
Ensuring Retention of Learning	5	EGS2W, EGS5W, EGS6M, EGS11W, EGS15W
Creating self-confidence to the student	2	EGS12M, EGS16W
Activating the student	2	EGS6M, EGS10W
Increased teacher-student communication	2	EGS10W, EGS16W
Ensuring the learning	1	EGS1M
Evaluating the Learning	1	EGS1M
Ensuring the concretization of learning	1	EGS5W
Addressing to Many Students	1	EGS10W
Arousing a sense of curiosity in the student	1	EGS12M
Considering Individual Differences	1	EGS4W
Informing the objectives	1	EGS14W

As presented in Table 12, seven students stated that the most advantageous topic of the GIAM was that it had more than one stage. Interviewee #EGS8W stated that "I can say that the benefits of this model are the attention of the learner to make them interested in the subject. I think reminding the information learned previously can keep the previous information alive. I think it is good to have the learner participate in the class and keep them alive. I think the target of achieving permanency is also a benefit. It is a great benefit to have a stage structure." As interviewee #EGS2W commented, "We ensure that learning is permanent, we remember previous information, and create an environment where we can use it in life."

Students' opinions on the disadvantages about the GIAM are summarized in Table 13.

Table 13: Students' Opinions on Disadvantages of the GIAM

Codes	f	Participants
Requiring too much time	11	EGS3M, EGS4W, EGS5W, EGS6M, EGS7W, EGS8W, EGS9W, EGS10W, EGS14W, EGS15W, EGS16W
Increasing the teacher's workload	6	EGS4W, EGS7W, EGS11W, EGS12M, EGS15W, EGS16W
Teacher's inability to use the model	3	EGS10W, EGS13M, EGS14W
Not suitable for all subjects	2	EGS10W, EGS15W

According to the interview results, 11 students stated that the most disadvantageousabout GIAM topic was requiring too much time. One of the students (interviewee #EGS4W) commented,"...it may be left incomplete because of the time limitation. It will not be applied completely during the course hours."

Students' opinions on whether to use the GIAM professionally are summarized in Table 14.

Table14: Students' Opinions on Whether to use the GIAM the Professionally

Codes	f	Participants
To use	14	EGS1M, EGS2W, EGS3M, EGS4W, EGS5W, EGS6M, EGS7W, EGS9W, EGS11W, EGS12M, EGS13M, EGS14W, EGS15W, EGS16W
To use sometimes	1	EGS10W
Not sure	1	EGS8W

As presented in Table 14, 14 students stated that they used the GIAM professionally. As interviewee #EGS13M commented, "If one day I become a teacher, I will adopt this model. Because I think it is an appropriate model for effective teaching and understanding a lesson, in other words, in teaching, and in the learning business. It is like it motivates both the teacher and the student."

Discussion

In the present study, it was found that the academic achievement post-test scores of EG students were statistically higher than the academic achievement post-test scores of CG students. These findings show that OLE prepared based on GIAM have a significant effect on increasing the academic achievements of students. GIAM has a characteristic that manages the learning focus with both internal and external processes by combining the principles of behavioral psychology with external variables in learning and the principles of cognitive psychology emphasizing the intrinsic variables in this process. There are many research results in the literature that GIAM supports academic success with these characteristics. Merrill (1991, as cited in Uysal & Yalin, 2012) argued that computer-assisted teaching design performed according to GIAM would be more effective than the teaching designs made in terms of the first-generation teaching design methods and theories. However, Gagné noted that the teaching design should support learning (Gagné& Briggs, 1974). In this respect, it was found in the study conducted by Uysal and Yalin (2012) that the success was statistically higher in the experimental group, which used GIAM-based software among the groups where teaching with software designed based on GIAM and teaching with software that was traditionally designed was applied, compared to the success in the control group. Also, in many studies in which the effect of GIAM on academic success was examined in comparative groups, the success scores were higher in the experimental groups in which the courses were designed and applied according to GIAM than the success in the control groups (Bas, 2012; Karabagshiew, 2003; Menzi, 2012; Miner, Mallow, Theeke & Barnes, 2015; Ozkok, 2010; Sengül Bircan, 2013; Sunbul, Gunduz & Yilmaz, 2002; Taskiran, 2017; Ullah, Rehman & Bibi, 2015); supporting the results of this study.

When the results of this study and others studied in the literature were evaluated, it was concluded that the academic achievements of the students increased in the groups where the students were taught with GIAM compared to the groups in which the current teaching methods were continued. In light of all this data, it can be claimed that the media prepared based on GIAM are expected to increase success.

In the present study, it was found that the persistence scores of EG students did not differ at statistically significant levels compared to the permanence scores of CG students. It was concluded in the study conducted by Menzi (2012) that the permanence of the experimental group in which the software based on GIAM was used among the groups where traditional teaching was applied with an internet-based teaching application based on GIAM was statistically and significantly higher than the permanence of the control group. In the study conducted by Polat (2015), it was reported that classroom management practices conducted in an OLE did not cause statistically significant differences in terms of permanence. It is seen that both the results of this study and other study results differ in terms of permanence.

In the study, the average of the course post attitude scores of EG students was statistically higher than the average of the course post attitude scores of CG students. In his study, Taskiran (2017) examined the attitudes of GIAM towards social studies class and concluded that the attitudes of experimental group students were higher than the attitudes of the control group students. In his study, Bas (2012) examined the changes in the attitudes of students towards the class when he examined the effects of GIAM in English class. He concluded that the attitudes to the course of the experimental group students using GIAM were statistically higher compared to the control group students. It was also concluded that GIAM increased students' attitudes as a result of the study of Ozkok (2010) that examined the effects of GIAM on the attitudes of students towards mathematics. The results of the studies conducted by Taskiran (2017), Bas (2012), and Ozkok (2010) are parallel to the results of the present study. According to these

results, it can be argued that students who take the class that was taught based on GIAM spend more important, effective, life-oriented, and instructive times compared to the attitudes of the students taking the course based on the current learning fashion.

According to the qualitative findings of the study, GIAM is an approach providing permanent learning; it is a progressive model, and allows to transform of what is learned into real life. Students who generally find GIAM useful stated that they would prefer to use this model in the future in their professional lives. Similarly, the experimental quantitative findings of the study indicate that GIAM supports the academic achievements and attitudes of the students positively towards the course. For this reason, when the qualitative and quantitative findings of the study were evaluated together, it can be argued that GIAM brings benefits to both academic and sensory aspects in the teaching process compared to the existing teaching practices. In this respect, the qualitative findings of the study generally support the quantitative findings. In the literature, the data arguing that GIAM-like technology applications in schools performed a revolution like learning (Derin, 2010) supports the results of the qualitative and quantitative findings of the study. A possible reason why technological teaching designs based on GIAM-like learning and teaching theory increase academic success and develop positive attitudes is the evolution that references the internal processes and external events in the teaching process. In this evolution, the share of the approach of Gagné regarding teaching, learning, and teaching design (Esgi&Arslan, 2015) is great by integrating the problems of cognitive psychology into a behavioral approach. This is so because the concepts that are very important in the teaching process become more useful and meaningful in Gagné's combination (Ediger, 1999). In this way, teaching content becomes an interesting learning experience for learners. In this respect, the teaching principles of Gagné, that inspired models like GIAM, provide better learning experience opportunities for students (Larson-Daugherty & Walker, 2010).

Conclusions

The present study extends the current literature from several perspectives. The authors prepared and tested an OLE linked to GIAM. This means the researchers transferred the theoretical knowledge to an OLE. Secondly, the results have concluded that the OLE prepared based on GIAM supports the learning performance and attitudes of students and retention of learning. These findings appear to support the use of GIAM in OLE. Moreover, rather than focusing on just digital material, this study provides an overview of the preparation of an OLE based on GIAM that is a specific theoretical model.

A limitation of the present study is that its sample is not representative of the university student population in Turkey. As a result, all findings are restricted to the current sample. Another limitation concerns the LMS used in the study.

Suggestions

Based on the findings and interpretations by considering the results of the study, the following recommendations were -formulated:

- The use of technology-based models should be encouraged more in practice to support the academic achievements of the learners by using the GIAM and OLE together during the teaching process.
- Models like GIAM should be encouraged during the teaching process to support the attitudes of the learners towards the course by including both academic and sensory features in practice.
- Researchers may apply GIAM together with online learning media to other undergraduate programs in addition to educating teachers.
- Researchers can make the effect of GIAM clearer in online learning media by comparing it with other teaching models.
- Researchers may keep class times shorter in an OLE.
- Researchers may apply pilot studies for a certain period by considering students anxious about the new learning environment, such as an OLE.
- The study environment can be developed to ensure that the necessary infrastructure can minimize related technical problems.
- The research environment can be developed by learning how a sense of a classroom community can be cultivated.

Notes

This study has been derived from the first author's Ph.D. dissertation completed at Fırat University Graduate Institute of educational Sciences.

References

Akca, Mustafa Ali, et al. "Web Based Learning Environment for Science Education." *International Conference on Education in Mathematics, Science & Technology*, 2014, pp. 190-196.

Akcay, Ahmet. "Web Macerası Öğretim Yönteminin Gagné'nin Öğretim Durumları Modeline Uygunluğu." *International Educational Technology Conference*, 2010.

Barcelona, Robert J. "Pressing the Online Learning Advantage: Commitment, Content, and Community." *The Journal of Continuing Higher Education*, vol. 57, no. 3, 2009, pp. 193-197.

Bas, Gokhan. "Effects of Gagné's Model of Events of Instruction on Students' Academic Achievement and Attitudes towards English Course." *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, vol. 25, no. 2, 2012, pp. 433-457.

Bozkurt, Aras. *Açik ve Uzaktan Öğrenmeye Yöneli□k Etki□leşi□mli□ E-Ki□tap Değerlendi□rme Kri□terleri□ni□n Beli□rlenmesi*. Eskişehir Anadolu University, 2013.

Brahmawong, Chaiyong. "Guidelines for İnternet-based Distance Education in Colleges and Universities in Thailand." *International Journal of The Computer, the Internet and Management*, vol. 12, no. 2,2004, pp. 7-13.

Burgstahler, Sheryl. "Teaching on the Net: What's the Difference?." *T.H.E. Journal*, vol. 24, no. 9, 1997, pp. 61-64.

Buyukozturk, Şener. *Deneysel Desenler Öntest - Sontest Kontrol Grubu Desen ve Veri Analizi*. Pegem Akadem, 2013.

Cagirgan Gulten, Dilek, et al. "Bilgiyi Işleme Kuramı ve Anlamlandırmanın Matematik Öğretimi Üzerindeki Etkisi." *HAYEF Journal of Education*, 2009.

Can, Abdullah. *SPSS ile Bilimsel Araştırma Sürecinde Nicel Veri Analizi*. Pegem Publishing, 2013.

Celen, Fatma Kubra, et al. "Yükseköğretimde Çevrim-Içi Öğrenme: Sistemde Yaşanan Sorunlar ve Çözüm Önerileri." *Journal of European Education*, vol. 1, no. 1, 2011, pp. 25-34.

Cohen, Jacob. *Statistical Power Analysis for the Behavioral Sciences*. Lawrence Earlbaum Associates, 1988.

Cohen, Louis, et al. *Research Methods in Education*. Routledge, 2005.

Creswell, John, and Vicki L. Plano Clark. *Designing and Conducting Mixed Methods Research*. Sage Publications, 2007.

Creswell, John, et al. "Advanced Mixed Methods Research Designs." *Handbook on Mixed Methods in Social & Behavioral Sciences*, edited by Abbas Tashakkori and Charles Teddlie, Sage Publications, 2003, pp. 209-240.

Derin, Fatime Banu. *Matematik Öğretmenlerinin Bilgisayar Destekli Öğretim Uygulamalarına Yönelik Görüşleri (Akşehir Örneği)*. Selçuk University, 2010.

Ediger, Marlow. *Psychological Foundations in Teaching Mathematics*. 1999.

Ergul, Hulya. "Çevrimiçi Eğitimde Akademik Basarıyı Etkileyen Güdülenme Yapıları." *The Turkish Online Journal of Educational Technology*, vol. 5, no. 1, 2006, pp. 124-128.

Esgi, Necmi, and Ömer Arslan. "A Conversation on Instructional Design with Robert Gagné and David Merrill No:1-2." *The Journal of Academic Social Sciences*, vol. 3, no. 21, 2015, pp. 561-589.

Fleiss, Joseph L. "Measuring Nominal Scale Agreement among Many Raters." *Psychological Bulletin*, vol. 76, no. 5, 1971, pp. 378-382.

Fraenkel, Jack, and Norman E. Wallen. *How to Design and Evaluate Research ın Education*. McGraw-Hil, 1996.

Gagné, Robert Mills, et al. *Principles of Instructional Design*. Harcourt Brace Jovanovich College Publishers, 1992.

Gagné, Robert M., and Leslie J. Briggs. *Principles of Instructional Design*. Holt, Rinehart & Winston, 1974.

Gokdemir, A. *İnternet Tabanlı Uzaktan Egitim Sistemi Gelistirilmesi: ögrenme Modüllerinin Oluşturulmasında Robert Gagne' nin Ögrenme Adımlarının Kullanılması*. Karaelmas University, 2009.

Gunduz, S., and A. Murat Sunbul. "İlköğretim 6. Sınıf Fen Bilgisi Dersinde, Gagné'nin Öğretim Etkinlikleri Modeline Göre Hazırlanmış Bilgisayar Destekli Öğretim Uygulamasının Öğrencilerin Erişi Düzeylerine Etkisi." *Eğitim Teknolojileri Sempozyumu*, 2004.

Gunes, Gonul, and Askin Asan. "The Effects of Learning Environment designed by Constructivist Approach on Success in Mathematics." *Gazi University Journal of Gazi Educational Faculty*, vol. 25, no. 1, 2005, pp. 105-121.

Henderson, Allan J. *The E-learning Question and Answer Book: A Survival Guide for Trainers and Business Managers*. 2003.

Horton, William. *Designing Web-Based Training: How to Teach Anyone Anything Anywhere Anytime*. John Wiley & Sons, 2000.

Ilie, Marian D. "An Adaption of Gagné's Instructional Model to Increase the Teaching Effectiveness in the Classroom: The Impact in Romanian Universities." *Education Techology Research Development*, vol. 62, 2014, pp. 767-794.

James, Gary. *Advantages and Disadvantages of Online Learning*, 2002.

Kane, Gregory J. *Employing Cognitivist Learning Theories as a Way to Provide Meaningful Musical Experiences within an Instrumental Music Program*, 2006.

Karabagshiew, A. *Gagne'nin Öğretim Tasarımına Uygun Hazırlanan Öğretim Yazılımının Ilköğretim 6. Sınıf Öğrencilerinin İngilizce Dersindeki Akademik Başarıya Etkisi*. Gazi University, 2003.

Kaya, Zeki. *Uzaktan eğitim*. Pegem Press, 2005.

Kruse, Kevin. *Gagne's Nine Events of Instruction: An Introduction*. 2009.

Kuzu, A. *Oluşturmacılığa Dayalı Çevrimiçi Destekli Öğretim: Bir Eylem Araştırması*. Anadolu University, 2005.

Kwon, So Young, and Lauren Cifuentes. "The Comparative Effect of Individually-Constructed vs. Collaboratively-Constructed computer-based Concept Maps." *Computers & Education*, vol. 52, no. 2, 2009, pp. 365-375.

Larson-Daugherty, Cynthia, and Coleman Walker. "From Evolution to Revolution: Updates to Effective E-learning Model Help Facilitate Better Learning." *Journal of Research in Innovative Teaching*, vol. 3, no. 1, 2010, pp. 52-61. .

Martin, Florence, et al. "Effects of Instructional Events in Computer-based Instruction." *Association for Educational Communications and Technology*, 2004.

Menzi, N. *Gagne'nin Öğretim Durumları Modeli'ne Göre Hazırlanan Internet Temelli Öğretim Uygulamasının Ilköğretim Bilişim Teknolojileri Dersinde Öğrencilerin Akademik Başarılarına ve Kalıcılığa Etkisi*. Çukurova University, 2012.

Miles, Matthew B., and A. Michael Huberman. *Qualitative Data Analysis: An Expanded Sourcebook*. Sage Publication, 1994.

Miner, Amy, et al. "Using Gagné's 9 Events of Instruction to Enhance Student Performance and Course Evaluations in Undergraduate Nursing Course." *Nurse Education*, vol. 40, no. 3, 2015, pp. 152-154.

Moore, Michael G., and Greg Kearley. *Distance Education: A System View*. Thomson Wadsworth, 2005.

Morgan, David L. *The Focus Group Guidebook*. Sage Publication, 1998.

Neo, Tse-Kian, et al. "Assessing the Effects of Using Gagné's Events of Instructions in a Multimedia Student-Centered Environment: A Malaysian Experience." *Turkish Online Journal of Distance Education,* vol. 11, no. 1, 2010, pp. 20-34.

Oliver, Ron. "Exploring Strategies for Online Teaching and Learning." *Distance Education*, vol. 20, no. 2, 1999, pp. 240-254.

Ozkok, E. *Gagne'nin Öğretim Modeliyle Hazırlanan Öğretim Yazılımının Ilköğretim 8. Sınıf Öğrencilerinin Matematik Dersi Kareköklü Sayılar Konusundaki Akademik Başarısına ve Öğrenci Tutumlarına Etkisi*. Gazi University, 2010.

Pala, Ferhat Kadir. *Development and Investigation of Effects of Multimedia based Discussions Supported Online Learning Environment*. Hacettepe University, 2014.

Perraton, Hilary. *Open and Distance Learning in the Developing World*. Routledge, 2005.

Polat, Hakan. *Investigation of Classroom Management in Online Learning Environments in terms of Various Variables*. Firat University, 2016.

Reigeluth, Charles M. "Öğretim Tasarımı Teorisi Nedir ve Nasıl Değişiyor?." *Öğretim Teknolojilerinin Temelleri*, edited by Kürşat Çağıltay and Yüksel Göktaş, Pegem A Press, 2016, pp. 3-24.

Senemoglu, Nuray. *Gelişim Öğrenme ve Öğretim: Kuramdan Uygulamaya*. Gönül Press, 2007.

Sunbul, Ali Murat, et al. "Effect of 'Computer Assisted Instruction' Prepared According to Gagne's Instruction Theory on Students." *Selçuk University Journal of Education Faculty*, vol. 14, 2002, pp. 379-404.

Bircan, Tuba Şengül. *Animasyon Destekli Haritalarla Tarih Öğretiminin Öğrencilerin Akademik Başarılarına ve Mekân Algılarına Etkisi*. Gazi University, 2013.

Sahin, İsmail, et al. "Usability in the Online Learning Environments: A Literature Review Study." *International Conference on Education in Mathematics, Science & Technology*, 2014.

Sasan, Hasan H. "Yapılandırmacı Öğrenme." *Yaşadıkça Eğitim*, 2002.

Tabachnick, Barbara G., and Linda S. Fidell. *Using Multivariate Statistics*. Pearson Education, 2007.

Taskiran, Cengiz. *Gagne'nin Öğretim Etkinlikleri Modeline Göre Hazirlanan Öğretim Yaziliminin Sosyal Bilgiler Dersinde Öğrencilerin Akademik Başari ve Tutumlarina Etkisi*. Firat University, 2017.

Ullah, Hidayat, et al. "Gagné's 9 Events of Instruction - A Time Tested Way to Improve Teaching." *Pak Armed Forces Med Journal*, vol. 65, no. 4, 2015, pp. 535-539.

Usta, E. *Harmanlanmış Öğrenme ve Çevrimiçi Öğrenme Ortamlarının Akademik Basari ve Doyuma Etkisi*. Gazi University, 2007.

Uysal, Murat Pasa, and Halil İbrahim Yalın. "The Effects of Instructional Software Designed in Accordance with Instructional Transaction Theory on Achievements of Students." *International Journal of Human Sciences*, vol. 9, no. 1, 2012, pp. 187-204.

Woo, Younghee, and Thomas C. Reeves. "Meaningful Interaction in Web-Based Learning: A Social Constructivist Interpretation." *The Internet and Higher Education*, vol. 10, no. 1, 2007, pp. 15-25.

Yaw, Dorothy Carole. *An Evaluation of e-learning in Industry at Level Three based upon the Kirkpatrick Model*. Indiana State University, 2005.

Yildirim, Ali, and Hasan Şimsek. *Sosyal Bilimlerde Nitel Araştırma Yöntemleri*. Seçkin Yayınevi, 2013.

Yilmaz, Erdi Okan. *Çevrimiçi Öğrenmede Bütünleşik Kavram Odaklı Tartışma Ortamları Üzerine Bir Inceleme*. Hacettepe University, 2012.

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