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THE EVALUATION OF LEARNING ENVIRONMENT DESIGNED FOR USING THRE DIMENSIONAL DYNAMIC GEOMETRY SOFTWARE: TEACHER VIEWS

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ABSTRACT

It is an expected situation that education is influenced by the advancement of technology rapidly and we feel it at every stage of life. Thanks to the advancement of technology, three-dimensional dynamic geometry software has emerged and it is thought that they will provide great convenience to math education. Some features of three-dimensional dynamic geometry software like being dynamic, allowing for constructing geometrical structures and looking at them from every aspect, dragging, measuring are very useful. However, some researchers find that teachers have some problems with using this software in spite of all these advantages. The purpose of this study is to find out teachers' views about learning environment which designed with a three-dimensional dynamic geometry software called Cabri 3D. This study was carried out with case study. The sample of the study consisted of two mathematics teachers. One of the teachers works in town center and the other one works in the village. Descriptive analysis was used to investigate the data obtained from the research. Research results show that the teachers have different viewpoints about the computer-aided learning environment although they have similar competence. Based on the results obtained from this study, it can be suggested that more specific in-service training should be organized for the teachers in order to adapt the computer-aided instruction in mathematics education.

Key Words: Three Dimensional Dynamic Geometry Software, Learning Environment, Teachers' Views.

INTRODUCTION

Nowadays technology is progressing rapidly and it makes its presence felt in every aspect of our lives. Education is also inevitably impressed in such a case and technology. Moreover, technology dramatically got into activities of the education and hit it hard (Tutkun, Öztürk and Demirtaş, 2011). One of the most significant effects of the technology on mathematical researches is computer algebra systems and dynamic geometry software developed recently. The number of the computer software, which will enable visual and efficient learning environment to student increased thanks to the development of technology (Zengin and Kutluca,

2011). It is thought that this software will provide great convenience to geometry teaching because three-dimensional geometry software has some important features such as being dynamic, dragging, measuring, leaving a mark, allowing for constructing geometrical structures and looking at them from every aspect. In addition, it is certain that all of these features are very useful in theory.

Cabri 3D being three-dimensional geometry software is one of the computer software used in learning environment. It makes available to teachers and students the all advantages of such dynamic geometry software. The most significant advantages of Cabri 3D are visualization and dynamically dragging geometric objects. Thanks to these advantages, it enables the students to manipulate the structures in a dynamic way and to look geometric structures in the most correct way. At this point, the students require necessary instructions in order to use effectively this software. The teachers who are practitioners of the system play a key role in order that the students can make the most of this software. To provide effective learning by using the software correctly by the students who just encounter with the software is closely related to the attitudes, opinions of the teachers about the software and their guidance to students. In this case, it becomes crucial to reveal the teachers' views about the dynamic geometry software.

It is generally accepted that teacher is the most critical factor of an education period. All kinds of innovation like content, method or technology inserted to education system can be effective to the extent that they can help to teacher (Tutkun ve diğ, 2011). Teachers must use a lot of materials such as blackboard, smart board and dynamic software during their lessons. Being eager about using these materials is essential to set the effective learning environment by teachers.

It is very normal that teachers encounter some problems in period of accepting the changes in education just as the transition from blackboard to smart board (Baki, Aydın, Özpınar, Çalık, 2009). It can be utilized the aid of technology to overcome these problems. Actually, technology enhances the strength of teacher and the quality of education, minimizes the effort and time of the teachers and students in the lessons, reduces the cost without affecting the quality of the education, and dynamises the students in the learning environment (Öğüt, Altun ve Koçer 2003 transferred by Baki and others 2009). The teachers can be successful inasmuch as they believe features of the system. It is not sufficient that they just use the technology in an effective way. At the same time, they must correctly integrate technology into the teaching-learning environment. Baki (2001) has pointed out in his study that the using computers in mathematical study proceeds slowly by reason of poorly training teachers who adopt technology, and being unwilling about computer usage in teachers' lessons although they are enthusiastic about using it in their daily lives. It must be essential to teach their own roles to teachers and teacher candidates during their education so that they can effectually carry out technology utilization in mathematical study.

Some studies which analyze attitudes and views of the teachers, teacher candidates and students about technology are available in literature (Güven and Karataş, 2003; Baki and others, 2009; Kösa, Baki and Karakuş, 2008; Tatar, Akkaya and Kağızmanlı, 2011). It was seen generally to be studied with the teachers who have different learning platform and experience when it was investigated the studies conducted with teachers. The aim of this study is found out whether teachers having same learning platform, computer usage and similar occupational experience have different views about computer-aided learning, and they are different in what aspects if any.

The Purpose of the Study

The advantages of three dimensional dynamic geometry softwares for teachers and students in learning environments were revealed in various studies. Nevertheless, these softwares have some disadvantages in different usage contrary to theory. Teachers being executives of the system confronted problem as using the software due to various reasons. Numerous factors such as teachers' work environments, their technological infrastructure, and experiences of the teachers and students affected adversely computer-aided learning environment. Managing the computer-aided learning environment and directing their students, teachers' views about the matter are crucial. Therefore, the purpose of the study is to reveal teachers' views about

learning environment that three dimensional dynamic geometry software is designed by enriched with Cabri 3D.

METHOD

The main purpose of the study was to reveal the teachers' opinion about the learning environment which designed with using a three-dimensional dynamic geometry software Cabri 3D. Therefore, to achieve this purpose, the research was conducted using the case study method. Creswell (2002) defined the case study as "*A case study is a problem to be studied, which will reveal an in-depth understanding of a "case" or bounded system, which involves understanding an event, activity, process, or one or more individuals*". It is possible to say that case study is based on "How" and "Why" questions (Yıldırım ve Şimşek, 2013). Case study is one of the most frequently used qualitative research methodologiesin educational researches. The main advantage of the method is to give researchers a chance to focus on an issue or a situation, deeply (Çepni, 2009).

Sample

The sample of the study consists of two elementary school mathematics teachers who have been teaching in different state schools from each other in Trabzon. Teacher 1 (coded as T1) has a 2 years professional experience and teaching at a state school in a town center. Teacher 2 (coded as T2) has a 3 years professional experience and teaching at a state school in a village. Both T1 and T2 took Basic Computer Science and Computer-Aided Mathematics Teaching courses during pre-service training. Both teachers have been using computers actively in their daily life.

Data Collection

Within the scope of the study, interviews with teachers are made after they used Cabri 3D in their lessons. Semi-structured interview forms were used during the interviews. The interview form is a document which has been developed in order to ensure that all aspects related to the research problem and the inclusion of the question. The interviewer can change the structure of the sentence, order of questions during the interview or enter the details of some of the issue (Yıldırım ve Şimşek, 2013). The questions asked during the interviews in this study have been developed by researchers.Interviews were recorded with a digital voice recorder during the interviews.

Procedure

Before the beginning of the study, the worksheets and learning environment (the desire of researchers) were introduced to the teachers. Because the teachers got a course for using Cabri 3D in mathematics education during their pre-service training, both of them knew how to use Cabri 3D. Therefore, an introductory course for Cabri 3D was not organized to teach the software for teachers. After the introduction of the worksheets and desired learning environment, both of the teachers completed the lessons by using the same activities in their classes. There were 5 worksheets. The front page of the first worksheet is shown as an example (see Figure 1). Worksheets were related with to draw two-dimensional views from different directions of three-dimensional objects and to construct the structures which were given the drawings of three-dimensional objects from different aspects. However, students do not need any advanced information to use Cabri 3D to complete the worksheets. Students only used some basic features such as rotating figures on the screen and to view the figures from different aspects. Both teachers have completed worksheets with their students by creating two-person groups in their classes. After implementations semi-structured interviews with teachers were done.

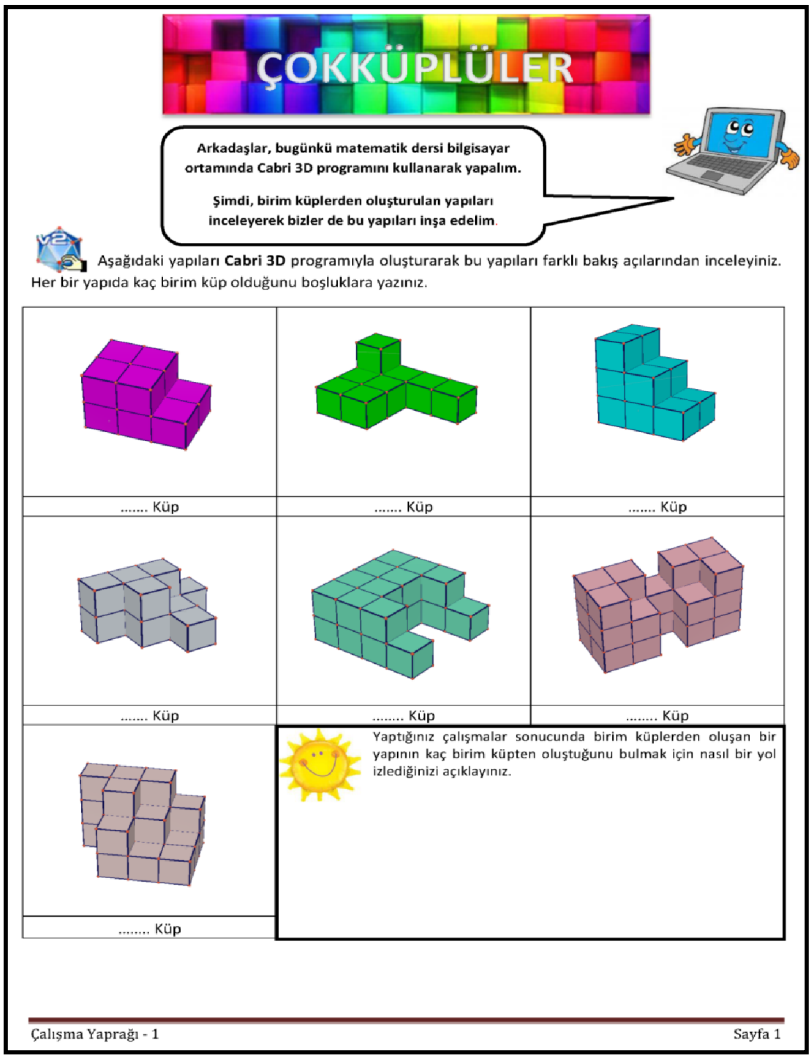

Figure 1: One of the examples of worksheets

Analyzing Data

In the analysis of data, interview records were converted into writing, firstly. This recording has been made in writing by the researchers. Then, a descriptive analysis of the recordings was done. In the finding section, descriptive analysis results are presented under predetermined sub-themes.

FINDINGS

Teachers performed an application in the learning environment which was designed as enriching with Cabri 3D. In this section, findings acquired from the teachers' views about the application are presented in subtitles.

Teachers' Views about Computer-aided Instruction conducted by Using Cabri 3D

Both of the teachers think that Cabri 3D makes easier instruction since the students can correctly look at the structures that they will draw at the computer and the software makes the subject more understandable for them. The teachers' views (T1 and T2) in respect to this are as follows:

T1….Whereas the students could directly look at the structures that they would draw at the computer, they had great difficulty in isometric drawing that was taken a printout. However, they got bored because drawing took a

while. Nevertheless, it made easier the instruction since drawing by looking from the computer was more comfortable.
T2….Cabri 3D made the subject more understandable for students. On the other hand their learning became superficial without using Cabri 3D. Even if I used three dimensional materials in the lesson, I could not waggle the objects, which was resulted in backwardness. However, they were enthusiastic about learning since they constructed structures on their own at the computer.

Both of the teachers think that Cabri 3D dynamizes the students and enables to them to visualize the structures. So, teachers agree that it affects positively the lessons. Their views in respect to this are as follows:

T1….Students could only make some drawing in the normal classroom environment and so they could disremember later, but they had a mental picture of drawings which they had drew at the computer. In this way, they could comprehend the image when the object was rotated. That's way; I could say that studies with computer made difference positively.
T2….Cabri 3D did not make monotonous the lesson. The students showed great interest to the software that was new for them. They tried to learn and practice. So, I thought this practice brought different experience to the students. They tried to make out following my clues as well as they listened to me. They appeared like solving puzzle. I observed that they were so curious, interested in the new atmosphere and the lesson was more fun and different for them.

According to the interviews, whereas teachers agree to lean towards to computer-aided instruction, their opinions about the topic differentiate. While T1 mentions that guiding to students in a crowded classroom was not difficult for her, T2 had many problems to usual lesson in spite of having fewer students. It was understood that T1 set free students in comparison to T2, and T2 got involved personally with students. The teachers' views in respect to this are as follows:

T1…. I just showed students to cube's place and how they could rotate it since Cabri is Turkish. I lead to students and they completed by themselves. This was better for me because they lightened my load at the lesson. Ordinary lecturing was more troubled because I thought continuously how I would lecture and how they would comprehend better. Moreover, why do we waste our breath in the lesson? The students carried off since they were computer worm. There was no necessary to teacher since the students rotated and saw the objects on their own.

T2…. I felt safer myself in the usual learning environment because I could estimate what it would be there. I hesitated to use this software in spite of my proficiency for computer usage and my knowledge about dynamic software to a certain extent. Taking the lead to students became more difficult when they asked something at the same time, and then I had to run around. Nevertheless, I observed that students learned effectively in the computer-aided learning environment. It cannot be ignored its advantages on the students even if it is tiring for the teacher. Therefore, I want to use computer in my geometry lessons.

Teachers' Views about Classroom Management in Computer-Aided Platform

Both teachers state that they do not have any problems about classroom management in this new platform. The teachers' views in respect to this are as follows:

T1….Classroom management was easier. After children, computer worm, finished their studies, I had a break for their motivation. They listened to me carefully during the lesson since they knew that they could play with computer in the break time. However, I was bored with their complaints since the students did not want to draw. Moreover, they secretly tried to play computer games, and so I had to close the games as controlling on the main computer. The students got bored quickly.

T2….It was not confronted by a problem in classroom management because half the battle won was not to prevent noise or nothing else. To clarify the subject to the students and conduct activities properly was more difficult thing. Since computer-aided instruction enables to individualization, the students was more active in

the lesson. However, they caused to lose time in the lesson owing to their different wishes when the students listen quietly to the teacher normally. Apart from this, it was not anything which affect adversely to classroom management because my all students tried their best.

Teachers' Views about Teamwork in Computer-Aided Platform

Teachers hold similar views about lecturing with teamwork. According to them, teamwork provides to learn from each other. The students get for effort within this period and so they are in unity in the classroom. The teachers' views in respect to this are as follows:

T1….My guidance did not influence to lesson. Students could sit with their close friend and they supported each other when they had problem. They learned each other in this way, but they called me when they could not solve it. They learned by experience and arguing. Therefore, I did not confront problem with lead to the group. I only helped them when they conflicted.

T2….Teamwork in lesson was beautiful in terms of learning each other. I thought it affected positively to learning environment. The students tried to assist each other, which influenced positively with regard to social aspects. They got satisfied when they overcame problem. The students being capable tried to show the others how to solve the problem. The class turned into a big group as well as small groups. It was progressed unity in the classroom.

Teachers' Views about Positive Sides of Computer-Aided Platform

Teachers hold both similar and different views about positive sides of the studies according to the interview. While T1 thinks that the study opens a few doors for the teacher, T2 focuses to acquisitions that the students achieve without struggling. On the other hand, both teachers find useful the study in terms of making drawing easy. The teachers' views in respect to this are as follows:

T1….Since the students drew themselves, it was only necessary to teachers' guidance. The teacher was only assistant, but not a leading role, which was more comfortable for the teacher. My drawing was not good and so I did not lecture by drawing to my students last year. I had got three dimensional materials. I put them on the table and I had students draw objects to their notebooks in every aspect.

T2….It was fine that this study enabled to deal with the students one by one for their personal development. Everyone consulted me their problems and they tried to do activities together. So, I can say that they learned on their own. The software did not cause to mislearn arising from drawing, which is a terrific feature. In addition to this, it enabled that students could construct the structures easily and could look at the objects in every aspect. I think this is a particular importance factor. Teamwork was also beneficial to strengthen friendly relations.

Teachers' Views about Negative Sides of Computer-Aided Instruction

Both teachers complain similar problems about negative sides of the learning environment. They stated that they got tired of some problems with related to technical infrastructure of the school. They confronted problems because of fewer and old computers. The teachers' views in respect to this are as follows:

T1…. I had trouble due to mouse. They locked and turned continuously when the students were rotating the objects. So, they had to reconstruct shapes by opening a new file. The school did not have sufficient equipment and the number of computers was inadequate. I wanted to take my students to computer laboratory, but we coincidenced with the other lessons. In short, most of the problems resulted from technical infrastructure…. When I thought in terms of the students, uninterested students tried to play game. However, they had to listen to me as I lectured in the class. They could not play game but they did otherwise since they got bored. It was so bad that the students did not have the program because permanent learning could not occur without revising at their home.

T2…. The problems encountered in the learning environment exhausted us. There was no computer teacher in our school, and also our computers were out of repair and corrupted. I could use computer in my way but I was

not capable of solving the technical problem and treating the program. But I had to re-establish Cabri every morning. I coped with the computers that shut off themselves. All these problems occupied my time in the lesson. In the matter of Cabri, since my students met with a new program, the problems encountered resulted from my students. They did not have full knowledge of Cabri and so they made minor mistakes such as deleting all construction. These problems retarded the students' learning. Nevertheless, the problems reduced when my students got used to the software.

As is seen from the findings, teachers' views about computer-aided instruction can differentiate in spite of their similar professional and technical competence. Both teachers attending the study got same training and had similar proficiency in the use of computers. The numbers of students differed by type of the school. T2 had an advantage over T1 because T2 had slightly fewer students, but it was stated that computer-aided instruction was more difficult work. The teachers think different about the guide role of them in learning environment. T1 supposed that lecturing with prepared worksheets in advance was easier in terms of being planned lesson. Being guide to students was defined by T1 as waiting to develop their learning after the teacher shows what they would do. On the other hand, T2 indicated that she made so effort in her lesson considering traditional lecturing although she had fewer students and tried to answer the questions of each student. As far as T2 was concerned, guiding to the students was more difficult and laborious task than lecturing directly. It caused teachers to overwork when students were more active in computer-aided platform. Nevertheless, both teachers were pleased with computer-aided instruction for all intents and purposes even tough they were affected negatively by inadequate technical infrastructure of the schools.

DISCUSSION AND RESULTS

In this study, it is aimed to reveal views of the teachers having similar professional and technical competence about performed applications in learning environment enriched with Cabri 3D. It is emerged after performed applications that the teachers consider the study from a different angle whereas they agree in some places. It is thematically clarified the results from similarities and distinctness in teacher views in this section.

Both teachers think that the use of Cabri 3D affects positively to instruction, makes easier students' learning, activates the students, and enables them to visualize the structures. Kösa, Baki and Karakuş (2008) obtained similar results when in their studies, they found out teacher views related to the usage of three-dimensional geometry software in solid geometry instruction. Kösa, Baki and Karakuş (2008) pointed out that their comprehension would get easy if the teachers instructed via the software in the sections which the students had difficulty in visualizing. Yeşilyurt (2006) stated in his study that teachers agreed with regards to being beneficial to use instructional technology. At the same time, they leaned towards computer-aided instruction. However, the teachers' views about it differ in some respects. This distinctness results from their point of view to computer-aided instruction. Their viewpoint can take shape to instruction platform. For this reason, it is necessary an ideal classroom platform so that the teachers can lean towards to computer-aided instruction and use this platform in the most correct way.

Both teachers did not have difficulty in classroom management in general although they did not actively lecture in computer-aided platform. This situation can be connected that the numbers of students is available to computer-aided instruction. Nevertheless, it is seen the teachers' viewpoint about classroom management differ. The teacher tried to make available to silence in the classroom in case that it was given the students their heads in lesson activities and the teacher was passive in the lesson. It was expected that classroom management made easier in this case according to the other case which teacher and students were more active and students asked questions continuously.

The teachers approved teamwork in computer-aided learning environment because by this means, students learned each other and put together their learning by trial and error. Tutak (2008) inferred from in his study that using materials of computer-aided instruction affected positively the students' attitudes towards geometry. Moreover, he stated that putting into practice with the teamwork developed the sense of

responsibility, strengthened solidarity among the students; appreciating fulfilled the study boosted their self-confidence and made them feel sense of achievement.

The teachers agree with positive sides of the study since incorrectness resulted from drawings of the teachers and the students decreases. Indeed, drawing in geometry lesson is a difficult matter for both teachers and students. It was stated by the teacher that Cabri 3D prevented mislearning resulted from wrong drawings. Furthermore, whereas one of the teachers found useful computer-aided instruction in terms of the teacher, the other considered it significant for the students as well as finding tiring it for teacher. This distinctness resulted from the teachers' viewpoint about computer-aided instruction and the applications which teachers performed during the instruction. The former teacher gave the students all responsibility during computer-aided instruction and so teacher remained passive with regards to leading the students. The other teacher did the opposite. From this point of view, even if the teachers have similar technical competence, their different opinions about the applications can be based on their attitudes and viewpoints, environmental conditions, feasibilities of the school, students' behaviors and some other factors.

The teachers agreed with negative sides of the study. Both teachers had difficulty in similar technical infrastructures although they were at different locations. Technological incompetence of the schools forced both the teachers in town center and the teachers in village. In both schools, the teachers lost time because of insufficient, out of order and fewer computers, and so instruction was unsatisfactory. Çağıltay and Çakıroğlu (2001) indicated that the most crucial problem of computer-aided learning environment was inadequate materials. These problems could cause to lose the teachers' desires with the usage of technology. It was revealed by Genç (2010) that these negative thoughts distracted the teachers from using computer in their lesson.

RECOMMENDATIONS

In accordance with the results obtained from this study, it is recommended to prepare computer aided learning environment where they can move comfortably so that teachers can look at the new platform in a positive light. Also it is suggested that the physical conditions of the classroom and some conditions like classroom size must be suitable for computer aided learning environment. Teachers, the most important factor of the learning environment, must get the facts straight for their management of the learning environment efficiently. Teachers who passed similar education levels basically have very different opinions from each other. So this discrepancy is originated from incapable of comprehending the new system sufficiently by either or both the teachers. That's why; the essence of the subject must be comprehended to the teachers theoretically and practically. It is not only taught to the teachers "how" they will use computers in lessons, but also showed "why" it must be used and "what" the students will gain with this approach by way of pre-service training when they study university. Thus, they can understand the benefits of proper use of dynamic geometry software in their lessons and use it correctly when they become a teacher. In addition, being provided special in-service training activities for teachers is recommended in order to put into practice computer aided instruction and perform their application in this direction.

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PREFERENCES

Baki, A. (2001). Bilişim Teknolojisi Işığı Altında Matematik Eğitiminin Değerlendirilmesi, Milli Eğitim Dergisi, 149, 26-31

Baki, A., Kösa, T. ve Karakuş F. (2008). Uzay geometri öğretiminde 3D dinamik geometri yazılımı kullanımı: öğretmen görüşleri. İntenational Educational Technology Conference (IETC), 6-9 Mayıs 2008, Eskişehir, Turkey.

Baki, A., Yalçınkaya, H., Özpınar, İ. ve Uzun, S. (2009). İlköğretim Matematik Öğretmenleri ve Öğretmen Adaylarının Öğretim Teknolojilerine Bakışlarının Karşılaştırılması. Turkish Journal of Computer and Mathematics Education, Vol.1 No.1, 65-83

Can, R.(2010). Cabri Geometri ile Hazırlanan Bir Ders Tasarımının Öğretmen Adaylarının Gelişimine Etkisinin İncelenmesi. Yüksek Lisans Tezi, Marmara Üniversitesi, Eğitim Bilimleri Enstitüsü, İstanbul.

Creswell, J. (2002). Research design: Qualitative, quantitative and mixed method approaches. London: Sage.

Çağıltay, K., Çakıroğlu, J., Çağıltay, N. ve Çakıroğlu, E. (2001). Öğretimde Bilgisayar Kullanımına İlişkin Öğretmen Görüşleri, Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 21: 19-28.

Çepni, S. (2009). Araştırma ve proje çalışmalarına giriş. Trabzon: Üçyol Kültür Merkezi.

Genç, G. (2010). Dinamik geometri yazılımı ile 5. sınıf çokgenler ve dörtgenler konularının kavratılması. Yayımlanmamış yüksek lisans tezi, Adnan Menderes Üniversitesi.

Güven, B. ve Karataş, İ. (2002). Dinamik geometri yazılımı Cabri ile geometri öğrenme: öğrenci görüşleri. The Turkish Online Journal of Educational Technology, 2(2), 67-78.

Kutluca, T. ve Zengin, Y. (2011). Ortaöğretim matematik dersinde geogebra kullanımı üzerine öğretmen adaylarının görüşleri. 5th International Computer & Instructional Technologies Symposium, 22-24 September 2011, Fırat University, ELAZIĞ- TURKEY

Tatar, E., Akkaya, A. ve Kağızmanlı, T. (2011). İlköğretim Matematik Öğretmeni Adaylarının geogebra ile Oluşturdukları Materyallerin ve Dinamik Matematik Yazılımı Hakkındaki Görüşlerinin Analizi. Turkish Journal of Computer and Mathematics Education, Vol.2 No.3, 181-197

Tutak, T. (2008). Somut nesneler ve dinamik geometri yazılımı kullanımının öğrencilerin bilişsel öğrenmelerine, tutumlarına ve van Hiele geometri anlama düzeylerine etkisi. Yayımlanmamış doktora tezi, Karadeniz Teknik Üniversitesi. Trabzon.

Tutkun, Ö., Öztürk, B. ve Demirtaş, Z. (2011). Matematik öğretiminde bilgisayar yazılımları ve etkililiği. Journal Of Educatıonal And Instructıonal Studıes In The World, Volume 1 Issue 1 Article 17

Yeşilyurt, E. (2006). Öğretmenlerin Öğretim Araç ve Gereçlerini Kullanma Durumlarını Etkileyen Faktörler. Yayınlanmamış Yüksek Lisans Tezi, Fırat Üniversitesi Sosyal Bilimler Enstitüsü, Elazığ.

Yıldırım, A. ve Şimşek, H. (2013). Sosyal bilimlerde nitel araştırma yöntemleri. Ankara: Seçkin Yayıncılık.