



Investigating Pre-service Teachers' Views on Cloud-Based Peer Instruction*

Ayhan KOÇ¹, Oğuz GÜRBÜZTÜRK²

Abstract

The purpose of the study was to analyze pre-service teachers' views on cloud-based peer tutoring. A qualitative research method was used in this study. The study group consisted of students studying in the Department of Computer Education and Instructional Technologies (CEIT) of the Faculty of Education and taking the programming course. Peer groups were interviewed using a semi-structured interview form to understand their opinions regarding the cloud-based peer learning (CBPL) method. Data obtained from the research were analyzed using content analysis. The results of the study suggested that the process was beneficial to peer groups as it provided communication and cooperation, different perspectives, responsibility, and self-confidence, thus turning the learning process into a fun experience. Based on the participants' feedback, the method enabled them to develop professional knowledge, skills, attitudes, and values. In light of the results obtained, various recommendations were made regarding the CBPL method.

Key Words

Peer tutoring
Online Peer tutoring
Programming teaching
Teacher training

About Article

Sending date: 05.09.2023
Acceptance date: 17.04.2024
E-publication date: 30.04.2024

* The research was based on the doctoral thesis titled "The Effect of Cloud-Based Peer Tutoring on Preservice Teachers' Academic Achievement, Communication Skills and Attitudes towards the Course" written by Ayhan Koç under the supervision of Assoc. Prof. Dr. Oğuz Gürbüzürk from İnönü University's Institute of Educational Sciences.

¹ Assit. Prof. Dr., Erzincan Binali Yıldırım University, Faculty of Education, Department of Educational Sciences, Türkiye, ayhankoc@erzincan.edu.tr, <https://orcid.org/0000-0003-0365-3560>

² Assoc. Prof. Dr., İnönü University, Faculty of Education, Department of Educational Sciences, Türkiye, oguz.gurbuzturk@inonu.edu.tr, <https://orcid.org/0000-0002-9950-3139>

Introduction

In today's understanding of education, there is a need for individuals who have the ability to learn on their own by taking responsibility for learning. In order to realize it in the educational process, practices that prioritize learning over tutoring are required. An educational process emphasizing learning requires the teacher to organize educational situations so that the student is at the center while achieving the educational goal (Şahinel, 2005) and to employ methods and techniques that the student will be involved in (Gülçek, 2015).

In an active learning approach (Akpınar, 2015), which encourages students to become active participants in the learning process, students are given the opportunity to perform processes such as reading, speaking, discussing, practicing, and solving problems on their own (Demirel, 2007). Peer tutoring is one of the methods and techniques by which students actively participate in the educational process (Ijeh, 2023; Yaşar, 2016).

Peer tutoring, which is defined as "tutoring students of the same age group or at the same educational level to each other in an educational setting" (Goldschmid and Goldschmid, 1976), is continuously used in education at all levels without anyone realizing it (Yurttaş, 2015). Peer teaching, defined as the act of students helping one another to learn (Loke and Chow, 2007; Saju and Mathew, 2022), can have several benefits, including communication, making what has been taught applicable, and explaining concepts in a way that each other can understand (Can, 2009; Gülçek, 2015). Peer tutoring, which is connected with the instinctive desire to pass on what one has learned to others, enables students to develop their affective characteristics as well as their cognitive abilities (Mirzeoğlu and Özcan, 2015; Sencar Tokgöz, 2007). Particularly for university students, it contributes to their ability to take responsibility for their own learning (Yurttaş, 2015).

With the development of internet technologies and the information age resulting in a new generation of learning culture, traditional learning methods are no longer adequate, and peer learning is becoming more effective and easier as a result of new media opportunities in a rapidly changing environment (Thomas and Brown, 2016). Through the use of internet technologies, synchronous or asynchronous learning environments are created regardless of the location where students can exchange ideas and collaborate on studies (Corrigan, 2012; Gölpek Sarı, 2013). There is no denying the importance of the opportunities offered by internet technologies to educational environments (Gaikwad et al., 2014), which enable everything to be structured in an online and fast-paced manner.

"Cloud computing" is one of the technologies that supports a variety of educational activities in the educational environment, including mobile learning, collaborative learning, and active learning, as well as enabling us to access the applications and services that we require from any device that is connected to the Internet (Sarıtaş and Üner, 2013; Selvi, 2011). Cloud computing is among the most active technologies of the last decade (Batı, 2015). Using cloud computing, users can store their files in an internet environment and access them at any time using an internet-connected device (Gaikwad et al., 2014) and at the same time they can share their files with other users and do synchronous or asynchronous collaborative work (Horzum et al., 2015). These infrastructures and platforms are contributing significantly to educational environments both in terms of management and educational processes, as well as introducing some changes to educational environments and methods.

Cloud computing, which enriches social learning environments based on both active learning and constructivist approaches in the education process, allows students to study together not only in in-class applications but also in out-of-class activities (Horzum et al., 2015). In this regard, cloud computing is advantageous when it comes to peer-to-peer tutoring practices that incorporate an active learning approach. Peer tutoring provides an environment in which peers have the opportunity to work cooperatively and share both information and documents with one another.

The development of new information and communication technologies attracts the attention of new generations of individuals and reduces their familiarity with technology at a young age. Bringing these interests of students in information and communication technologies into the educational environment can make a significant contribution to attracting their interest in education (Yavuz, 2014). It is essential for teachers to possess these competencies in order to facilitate student success in the information age (Akıllı, 2007). Providing these competencies depends on the pre-service training of

teachers. It is essential for teachers to be familiar with these technologies during their pre-service education, to learn about their advantages and disadvantages, and to understand how to use them effectively in the classroom.

In the studies conducted in Türkiye on peer tutoring, the method has been determined to increase academic achievement (Yaşar, 2016; Akay, 2011; Demirci and Şekercioğlu, 2009; Sencar Tokgöz, 2007; Eryılmaz, 2004), was efficient in gaining skill-oriented behaviors (Mirzeoğlu et al., 2014), improve science process skills (Kocakulah and Savaş, 2013; Savaş, 2011), and develop students' attitudes towards the course (Akay, 2011) and the method (Demirci and Şekercioğlu, 2009; Şekercioğlu 2011; Yiğit and Durukan, 2023). Additionally, it has been determined that it provides gains such as developing tutoring skills, eliminating shortcomings related to the profession, and understanding the ways in which students and teachers can communicate effectively (Can, 2009; Mirzelioglu and Özcan, 2015).

When reviewing the research conducted in Türkiye, no study describing the method to be used in the online environment has been identified, even though peer tutoring has been employed in face-to-face education. Based on the findings of foreign studies that transferred peer tutoring to an online environment, it was determined that the method had a positive effect on student achievement and academic performance (Lin and Yang, 2013; Zulkifli, Halim and Yahaya, 2018; Watcharapunyawong, 2018; Tsuei, 2017; Tsuei, 2012), student participation in the course (Sansone, Ligorio and Buglass, 2018; Van Rosmalen et al., 2008), cooperation (Watcharapunyawong, 2018; Sansone, Ligorio and Buglass, 2018), and communication skills (Lin and Yang, 2013; Evans and Moore, 2013). Additionally, it has been reported that it contributes to students' development of learning/tutoring strategies (Gabarre and Gabarre, 2012) as well as developing a sense of responsibility for their learning (Watcharapunyawong, 2018). There is also an important point that emerges from the studies that it allows students from different countries to participate in this process (O'Donovan and Maruthappu, 2015; Topping et al., 2013) and in this respect, it represents an innovative approach.

In the literature, there are only a limited number of studies on peer tutoring conducted in a cloud-based environment (online). Furthermore, it is essential in order to integrate education and technology to bring the peer tutoring method, which is often unknowingly used in educational settings, to a new platform, so that students are able to experience it and express their opinions. In this context, pre-service teachers' experiences of cloud-based peer tutoring and determining their views on this method will both provide a new and technological approach in shaping educational environments and contribute to the training of pre-service teachers who will educate the students of the future by gaining awareness and skills in this area.

The primary purpose of this study was to assess pre-service teachers' opinions regarding the use of cloud-based peer tutoring in programming teaching. Answers to the following questions were sought within the context of this main purpose:

- What are the contributions of the process?
- What are the most favorable practices, situations, or activities during the process?
- What are the difficulties encountered during the process?
- What are the opinions and suggestions for making the process more effective?

Method

This research was conducted using a case study approach based on a qualitative approach. A case study provides an opportunity for a deeper analysis of an event, situation, or practice, and allows an experimental practice to be examined in its own right under real-life conditions (Yıldırım and Şimşek, 2006). To this end, in the research, the opinions of students who participated in cloud-based peer tutoring were consulted regarding the relevant process.

Study group

A convenience sampling method, one of the purposive sampling methods, was used in this study. This method was described as a method that can be used to increase the speed and practicality of the study (Yıldırım and Şimşek, 2013). Specifically, the study group consisted of 31 pre-service teachers who participated in the cloud-based peer teaching method and expressed their opinions voluntarily.

Data Collection Tools

To examine peer group views on cloud-based peer tutoring, a semi-structured interview form was developed. During the preparation of the interview form, relevant literature was reviewed and a form suitable for the research questions was created. A total of three experts were consulted. As a result of expert opinions, the semi-structured interview form was finalized, followed by the suggestions of the experts regarding the contributions of participants to the process, difficulties experienced during the process, the most satisfactory practices, situations, and studies of the process, as well as suggestions for making the process more effective.

Peer groups were created based on the achievement test for the programming course in which the study was conducted. Koç (2020) developed the achievement test as part of his doctoral study. Inter-rater reliability coefficient for the achievement test rubric, which consisted of seven items and was developed as written, was 0.99.

The implementation of data collection tools and conduct of the research

The views of participants on cloud-based peer tutoring were obtained in writing from 21 students by the researcher via an interview form prepared by the researcher, while ten volunteer students were interviewed over the internet via the Hangouts application using written interviews.

The conduct of the research

The timeline for the conduct of the research was presented in Table 1.

Table 1. The timeline for the conduct of the study

Date	Processes
19.02.2018 – 24.02.2018	<ul style="list-style-type: none"> • Identifying the peer groups and roles • Creating peer (Google Classroom) classrooms • Informative meeting about the practice <ul style="list-style-type: none"> ○ Information about the peer tutoring process ○ Introducing cloud-based applications (Google Suite services) and informing the students on how to use these tools in the peer tutoring process. • Giving instructions and information to the students in the role of a tutor about how to manage the process (case study)
24.02.2018 – 03.03.2018	<ul style="list-style-type: none"> • <i>Activity-1</i> Implementation of the Activity Form • Follow-up of peer group activities
03.03.2018– 10.03.2018	<ul style="list-style-type: none"> • <i>Activity-2</i> Implementation of the Activity Form • Follow-up of peer group activities
10.03.2018– 17.03.2018	<ul style="list-style-type: none"> • <i>Activity-3</i> Implementation of the Activity Form • Follow-up of peer group activities
17.03.2018 – 24.03.2018	<ul style="list-style-type: none"> • <i>Activity-4</i> Implementation of the Activity Form • Follow-up of peer group activities
24.03.2018 – 31.03.2018	<ul style="list-style-type: none"> • <i>Activity-5</i> Implementation of the Activity Form • Follow-up of peer group activities
09.04.2018 – 20.04.2018	<ul style="list-style-type: none"> • Receiving participants' opinions on the process

Determination of Peer Groups

The peer groups were formed by grouping the students according to their academic achievement in descending order and by dividing them into upper and lower groups. According to this method proposed by Fuchs, Fuchs, and Kazdan (1999), the student with the highest score in the upper group assumed the role of tutor, while the student with the highest score in the lower group assumed the role of learner. In this study, the achievement test associated with the programming course was used to determine the peer groups, and the students in the study group were divided into two groups (Tutor-Learner) according to their achievement test scores. The students with high scores were assigned to the tutor position, while the students with low scores were assigned to the learner, and each of them was paired with the opposite (1 and 18, 3 and 20, etc.). As a result of the demands of the students and the expert opinions received, in order to make the process more efficient, the students' requests for changes

in their peer groups were taken into consideration, and students whose scores were close to each other were allowed to change groups among themselves, provided that their roles did not change. In addition, students who enrolled in the course for the second time wanted their peers to be from their own classes and were allowed to form peer groups among themselves (14th, 15th, 16th, and 17th groups). The peer groups and pairings were presented in Table 2.

Table 2. Creating peer groups and pairing

Groups	Student	Score	Role	Student	Score	Role
1 st Group	OGR1	100	Tutor	OGR18	56	Learner
2 nd Group	OGR2	91	Tutor	OGR19	56	Learner
3 rd Group	OGR3	87	Tutor	OGR20	32	Learner
4 th Group	OGR4	85	Tutor	OGR21	49	Learner
5 th Group	OGR5	84	Tutor	OGR22	43	Learner
6 th Group	OGR6	76	Tutor	OGR23	41	Learner
7 th Group	OGR7	74	Tutor	OGR24	53	Learner
8 th Group	OGR8	68	Tutor	OGR25	43	Learner
9 th Group	OGR9	67	Tutor	OGR26	29	Learner
10 th Group	OGR10	67	Tutor	OGR27	28	Learner
11 th Group	OGR11	60	Tutor	OGR28	26	Learner
12 th Group	OGR12	58	Tutor	OGR29	24	Learner
13 th Group	OGR13	58	Tutor	OGR30	17	Learner
14 th Group	OGR14	30	Tutor	OGR31	23	Learner
15 th Group	OGR15	27	Tutor	OGR32	9	Learner
16 th Group	OGR16	23	Tutor	OGR33	3	Learner
17 th Group	OGR17	20	Tutor	OGR34	6	Learner

Delivering the necessary trainings

Users with the extension "@edutek.xxxx.edu.tr" were created on the Google Suite platform, which included cloud-based applications, before the application was submitted, and virtual classes were established for the peer groups determined for the application using the Google Classroom application. Each student attended the predetermined classroom in accordance with their role as a tutor or a student in the peer tutoring process.

After the participants activated their accounts, information about cloud-based applications, Google Suite applications (YouTube, Email, Drive, Hangouts, Docs, Sheets, Slides, Sites, Calendar, Keep, Groups, Classroom) was provided. Then, they were informed about the peer tutoring activity to be conducted and the tasks related to their roles in this process, and they were trained on how to use cloud-based applications in the process. The process was practiced using sample activities.

In order to facilitate communication within the peer groups, Hangouts interview groups were created with the instructor as a participant. Additionally, a separate virtual classroom was created for the communication of peers serving as tutors. During the implementation process, peers who had the role of tutors assisted each other in solving sample activities as deemed necessary. In cases where peer feedback was insufficient, the instructor (researcher) stepped in and provided guidance.

Conducting the CBPT process

Each peer group studied the practices in the activity examples in three stages (preparation, implementation and evaluation). As part of this process, peer groups were asked guiding questions (appropriate to the problem-solving process) and given tips on how to organize the process.

Preparation

Peer groups were asked to respond to the following questions in the applications they were assigned during the preparation phase. In answering the questions, peers in the role of tutor were active, peers in the role of learner were acting as guides, and peers in the role of tutor should provide hints and

instructions to guide their peers to the correct answer rather than providing the answers to the questions themselves. As part of this process, the following questions were to be answered;

- 1) Examine the given problem
- 2) Are there parts of the problem you don't understand?
 - a) First of all, try to find out why the point is not understood (question text, mathematical operations, logical operations, design).
 - b) When unclear points are not understood, get help from the instructor.
- 3) What is necessary for problem solving?
 - a) For Form Design;
 - i) Are there any properties you need to set for controls in the form design?
 - ii) If yes, will you set these features in the code section or in the design section (note or set them)?
 - b) To which event(s) will you write the codes (determine according to the given problem)?
- 4) Create the algorithm of the solution before proceeding to the code.
 - a) What should our variables be and where should they be defined? (Decide according to the problem structure)
 - b) What operations should we take?
 - c) What should be the order of operations?
- 5) Start solving the problem by choosing the simplest and most straightforward way. "Remember that there is more than one solution to a problem."
- 6) After this stage, our algorithm for problem solving will be created. You can proceed to the implementation phase.

Implementation

Following the preparation phase, the algorithm for solving the problem was developed. The peer in the learner role was expected to answer the following questions during the implementation phase. In the learner role, peers were allowed to seek assistance from their peers in the tutor role when they were unsure or incomplete when answering the questions. It was the peers who acted as tutors who checked the answers given and provided feedback by adding comments where necessary.

- 1) The problem is thoroughly examined, what is the preliminary information required for its solution (mathematical, logical operations or structures, form design, etc.)?
- 2) What do we need to know about the controls we use?
 - a) Which features of the controls will we use to solve the problem?
 - b) Is it enough to set these properties once in the design (Properties), should we use them in the code section (it varies)?
- 3) What are the variables, operations and structures required for the solution (Let's list them - Algorithm).
- 4) What are variables and where should they be defined?
- 5) Which event (method) should we write our code to (when will the code run?)
- 6) We can move on to code writing.

Evaluation

In the evaluation phase, the peer groups discovered where their deficiencies were, and worked on improving the subjects/skills they lacked. The questions / instructions that peer groups should answer in this process were as follows.

- 1) Note and discuss the different types of (Syntax) errors you may encounter in writing code.
- 2) Discuss what other solutions are possible and try to solve the given sample problems in different ways.
- 3) Examine the solved examples and compare them with your own solution.

At all stages of the process, peer groups could benefit from many applications/tools offered by Google (Youtube, E-mail, Drive, Sheets, Slides, Sites, Calendar, Keep, Groups) as well as live lessons, collaborative work, announcements, question/answer, different homework activities.

Activity examples prepared in accordance with the purpose of the research were presented to peer groups in order, one activity each week, over a five-week period. In this process, the peer groups collaborated on the activity sample document given to them weekly and carried out extra studies

according to their own wishes for the targeted outcomes on the basis of the activity by using different cloud technologies. The studies carried out by the peer groups on a weekly basis were continuously controlled by the researcher through the created Classroom classes, documents, hangouts groups and weekly feedback forms.

Taking the opinions of the participants about the CBPT process

Upon completion of the peer teaching process, an interview form was used to obtain the opinions of students regarding the peer teaching process, and 10 students were interviewed online (in the form of written interviews using Hangouts) under the basis of volunteerism, whereas 21 students were interviewed in writing.

Data Analysis

The content analysis was performed on the data obtained from the research. The purpose of content analysis was to identify concepts and relationships that could explain the data (Yıldırım and Şimşek, 2006).

In the first stage of the analysis, the data obtained were transferred to the Nvivo program, and then coded. While coding, the opinions of three experts (faculty members) were consulted. In the second stage, similar data were categorized according to categories and themes by taking expert opinion. The categories and themes were reviewed by two experts (faculty members) and necessary revisions were made. In the third stage, the data were organized according to codes, categories, and themes, and the findings were presented in tables. In the last stage, the findings were interpreted and reported.

As qualitative research differs from quantitative research in its design, approach, and data collection process, different criteria are used to ensure validity and reliability (Büyüköztürk et al., 2012). Guba and Lincoln (1982) used the concepts of credibility and transferability for internal and external validity, and consistency and confirmability for internal and external reliability.

Detailed explanations of the preparation, implementation, and analysis processes as well as the other components were provided in order to facilitate the transferability of the research. Additionally, direct quotations were incorporated into the text. Further, Daymon and Holloway (2011) proposed that the findings of the study must be associated with the literature through theory-based generalizations in order to ensure external validity in qualitative research. In this study, the codes obtained from the participants' responses regarding what kind of contributions were provided by the process in both interview forms were categorized according to teacher competencies (Ministry of National Education [MoNE], 2017) by taking expert opinion.

Expert opinions were consulted during the preparation, implementation, analysis, and other stages of data collection tools in order to ensure consistency in the research. A set of data collection tools and a method of analyzing the data were specified for confirmability, and the findings from this study were interpreted in conjunction with findings from other studies in order to ensure validity. Furthermore, raw data obtained from the study were kept in reserve for reanalysis when necessary and confirmation was attempted.

A consensus among the coders was sought in order to increase the reliability of the study (Miles & Huberman, 1994). Two experts were asked to evaluate the codes, themes, categories, and quotations obtained from the analysis of the data, and they were required to determine the compatibility of the codes, themes, and categories, as well as the distribution of quotations based on those codes. As a result, the inter-coder consensus was determined to be 0.78. This value was acceptable according to Miles and Huberman (1994).

Findings

Below were the findings and interpretations obtained from the qualitative data related to the problem stated as "*What are the opinions of pre-service teachers regarding programming teaching with the cloud-based peer tutoring method?*"

Findings and Interpretations related to Opinions on Contributions of the Process

Table 3 presented the findings and interpretations obtained from analyzing the responses of the participants to the question, "What kind of contribution do you think the process you have experienced (the studies you have completed) has made/will make to you?" at the end of the process.

Table 3. Distribution of opinions on the contributions of the process

Theme	Category	Code (Node)	n	f
Professional Knowledge	Content Knowledge	Regular study and review	7	8
		My algorithm logic has improved	2	2
		I have completed what I lacked.	2	2
		Reinforcement of topics	2	2
		Making what I learned permanent	1	1
		I have achieved practicality	1	1
Professional Skill	Creating Learning Environments	Technology integration	4	4
		Peer tutoring	3	4
	Managing the Tutoring and Learning Process	Instructional process	3	3
		Measurement and Evaluation	Evaluation process	1
Attitudes and Values	Personal and Professional Development	Tutoring experience	7	7
		Learning to learn	4	4
		Sense of responsibility & curiosity	3	3
		Self-confidence & self-assessment	2	2
		Learning Speed and Effectiveness	1	1
		Course interest and motivation	1	1
		Gaining a different perspective	1	1
		Associating with daily life	1	1
		Self-Improvement	1	1
		Communication and Collaboration	Communication skill	5
No contribution	Extraordinary		1	1
	Due to peers		1	1

Based on Table 3, participants stated the process contributed the most to the Attitudes and Values (f=26) theme, Personal and Professional Development (f=21) and Communication and Cooperation (f=5) categories. For the theme of Professional Knowledge (f=15), participants indicated that it contributed to the category of Field Knowledge (f=15). Participants also reported that it contributed to categories related to the theme of Professional Skills (f=11), as well as the categories of Creating Learning Environments (f=8) and Managing the Tutoring and Learning Process (f=3). Further, two participants did not believe that the process contributed (f=2).

In the content knowledge category, the contributions provided by the process were coded as Regular Study and Repetition (f=8), I improved my algorithm logic (f=2), I completed what I lacked (f=2), I reinforced topics (f=2), I made what I learned permanent (f=1), and I achieved practicality (f=1). This resulted in the following feedback being provided by the participants: "...my algorithm logic improved" (OGR2), "...I was able to associate the new practices in the given activity with what I had already learned" (OGR4), and "...I learned topics I was not familiar with" (OGR14).

In the category of Creating Learning Environments, the contributions provided by the process were listed as Technology Integration (f=4) and Peer Tutoring (f=4), in the category of Managing the Tutoring and Learning Process as Tutoring Process (f=3), and in the category of Assessment and Evaluation as Assessment Process (f=1). Some of the feedbacks given by the participants about this was as follows: "...it enabled me to prepare studies on Google products such as Google documents, Hangouts, Google slides, etc. effectively" (OGR19), and "...Tutoring, transferring what I know has also been an experience for me, so I think it will contribute a lot to my profession in the future" (OGR1).

In the category of creating professional skills / learning environments, it could be argued that the participants were familiar with the use of the peer tutoring method, and they were willing to use the method in their future professional lives. Furthermore, it was possible to argue that the integration of technology in education contributed to the organization of more effective teaching environments by incorporating technological tools and environments.

The contributions provided by the process in the Personal and Professional Development category were expressed as tutoring experience (f=7), learning to learn (f=4), sense of responsibility and curiosity (f=3), self-confidence and self-evaluation (f=2), learning speed and effectiveness (f=1), interest and motivation in the course (f=1), gaining a different perspective (f=1), associating with daily life (f=1), self-development (f=1), communication skills in communication and cooperation category (f=5). According to the participants, these were some of the topics discussed: "...I realized that I was capable of completing the studies on my own if I so desired" (OGR9), "...I believed that it would contribute to the process of learning, remembering, adapting to daily life, etc." (OGR26).

In the category of attitudes and values/communication and collaboration, it could be argued that the participants' communication skills improved. Furthermore, it contributed positively to their professional and personal development. It appeared that the views of the participants in the process were in agreement with those concerning gaining tutoring experience, sense of responsibility and curiosity, self-confidence, self-evaluation, interest in the lesson and developing different perspectives. Furthermore, it was possible to say that the ability to gain tutoring experience, to learn to learn, to learn quickly, and to associate what they learned with everyday life was enhanced. Moreover, these findings were consistent with studies indicating that peer tutoring enabled university students to take responsibility for their own learning from an affective perspective (Yurttas, 2015).

In the category of No Contribution, participants who considered that the process had no impact on them expressed their opinions as Extraordinary (f=1) and Due to Peers (f=1). One feedback received from the participants regarding these was "... although I think it is useful, I did not find it particularly beneficial since my peer friend had broken his arm" (OGR28).

From the viewpoints of the participants, it could be concluded that the lack of interest and reluctance of the peers negatively affected the CBPT process. Furthermore, there may be extraordinary reasons (health problems) that could negatively affect the process.

Findings and Comments regarding the Opinions on the Most Favorable Practices, Situations or Studies in the Process

The findings obtained from the analysis of the participants' answers to the question "What are the practices, situations, or activities that you liked the most during the process?" at the end of the process were summarized in Table 4.

Table 4. Distribution of opinions about the most favorable practices, situations, or activities during the process

Theme	Category	Code (Node)	n	f
Tutoring & Learning Process	Tutoring & Learning Process	Feeling of tutoring	4	4
		Activity Sample & Instructions	2	2
		Exploring different examples	2	2
		Increased self-confidence	2	2
		Facilitating	1	1
		Peer-presented materials	1	1
		Providing a rich learning atmosphere	1	1
Communication and Interaction	Communication with Peer	Improving friendship bonds	2	2
		Feeling no abstention	1	1
		Differences of opinion	1	1
		Receiving help	1	1
	Communication with Instructor	Different ways of solution	1	1
		Time freedom	2	2
		Sincerity	1	1
Technology Integration	Technology	Using Google Tools	9	10
	Integration	Experience in distance education	3	3

Based on the analysis of Table 4, it became apparent that the participants' favorite practices, situations, or activities in the process were those relating to Learning and Tutoring Process (f=13), Communication and Interaction (f=9), and Technology Integration (f=13).

Participants' opinions in the theme/category of Learning and Tutoring Process were specified as Feeling of learning (f=4), Activity sample and instructions (f=2), Exploring different examples (f=2), Increased self-confidence (f=2), Facilitating (f=1), Peer-presented materials (f=1), and Providing a rich working atmosphere (f=1). Participants provided feedback on these including "... It was nice to be able to teach someone something new" (OGR3), "... It was exciting to solve questions that we have never studied or encountered before" (OGR14).

Among the aspects of CBPT that participants enjoyed as part of their learning and tutoring process were the feeling of tutoring, the development of self-confidence, studying regularly as a result of activity examples and instructions, and the practice of different examples presented by peers.

In the theme of Communication and Interaction, whereas the participants' views in the category of Communication with Peers were expressed as Improving friendship bonds (f=2), Feeling no abstention (f=1), Differences of opinion (f=1), Receiving help (f=1) and Different ways of solution (f=1), in the category of Communication with the Instructor, the opinions were expressed as Time freedom (f=2) and Sincerity (f=1). Some of the feedback given by the participants regarding these were "...Feeling no abstention made me feel comfortable in the process" (OGR20), "...I was able to communicate with my instructor without time constraints..." (OGR6).

Among the situations that participants enjoyed in the process were the development of friendship relationships, the ability to converse freely with their peers, the differences in opinion, and the ability to receive support in a comfortable manner. Additionally, peers enjoyed this process due to the fact that they could communicate with the instructor within a flexible timeframe.

Within the Technology Integration theme/category, the most common opinions were Using Google Tools (f=10) and Experience in Distance Education (f=3). Among the feedback that the participants provided regarding these were the following: "...My favorite part of the course was learning how to use Google applications, becoming aware that applications such as Classroom exist, as well as discovering the ability to instruct students and assign homework from our sitting positions." (OGR12), "...I enjoyed interacting with my peers during the process through question-and-answer exchanges, screen shares, and Hangout conversations. I greatly appreciated these." (OGR16).

Another aspect of the process that participants enjoyed was learning about Google tools for cloud computing and experiencing distance education through these tools.

Findings and Comments on the Opinions regarding the Difficulties Experienced in the Process

Table 5 presented the findings from an analysis of the answers of the participants to the question: "What practices, situations, or activities did you find most difficult during the process?"

Table 5. Distribution of opinions on difficulties experienced in the process

Category	Code	n	f
Peer-Driven	Communication	6	6
	Roles	3	4
	Time conflict	3	3
	Indifference	1	1
Personal	Some applications (examples)	6	6
	Missing Subjects (Readiness)	3	4
	Using Google tools	4	4
	Course attendance	2	2
Technical Skills & Disruptions	Internet connection	6	6
	Hardware problems	1	1
Learning and Tutoring Process	Tutoring skill	1	1

Based on the analysis of Table 5, it appeared that the participants' opinions regarding the difficulties encountered in the process were categorized as Peer-driven (p=11), Personal (p=12), Learning-tutoring process (p=1), and Technical skills and disruptions (p=7).

Based on participants' opinions, the peer-oriented difficulties they encountered were Communication (f=6), Roles (f=4), Time synchronization (f=3), and Indifference (f=1). Some of the feedback provided by the participants were as follows; "... it was difficult for me to communicate with my peer" (OGR8), "... due to time conflicts, I had difficulty communicating with my peer" (OGR10).

Participant opinions regarding the difficulties they personally encountered were described as Some applications (examples) (f=6), Missing subjects (Readiness) (f=4), Using Google tools (f=4), and Course Attendance (f=2). Participants provided the following feedback on these; "I found it most challenging to sometimes have to deal with very different questions from my peer friend :) I wondered how I could answer or do something when I did not have adequate knowledge of that subject" (OGR6), "...I did not be able to complete the applications due to my lack of attendance in some courses..." (OGR5).

According to the participants' views, technical difficulties were related to Internet connections (f=6) and hardware problems (f=1), while learning and tutoring difficulties were related to tutoring skills (f=1). Participants provided the following feedback regarding these issues: "I only had internet problems" (OGR22), "... from time to time, the audio hardware on the computer of my peer caused problems in our Hangouts calls" (OGR22).

Participants personally experienced difficulties relating to lack of subject matter for the relevant course, inability to effectively use cloud tools, and difficulty attending courses. As the participants stated in the differences they experienced in the process, due to the fact that they were new to cloud computing tools, they encountered difficulties in using them.

It can be argued that the difficulties that the participants were possible to encounter in the CBPT method due to cloud computing were internet connection, technical problems, incompetence in using cloud tools, and the indifference and reluctance of peers, communication, and readiness problems in terms of peer tutoring.

Findings and Comments on Opinions and Suggestions for Making the Process More Effective

The findings obtained from the analysis of the participants' answers to the question "What are your opinions and suggestions for making the CBPT process more effective?" at the end of the process were presented in Table 6.

Table 6. Distribution of opinions and suggestions for making the process more effective

Category	Code	n	f
Peer groups	Peer matching	8	8
	Gender congruence	2	3
	Conducting with peers concerned with the course	3	3
	Peer roles	2	2
	Group size	1	1
Tutoring process	Follow-up of the process	4	4
	Duration may be extended	2	3
	A free studying atmosphere	2	2
	Study time should be scheduled	1	1
	Can be more enjoyable	1	1
	Reward and punishment	1	1
	Communication of the tutoring group	1	1
Content	Activity examples and instructions	2	2
	Supplementary sources and materials	1	1
	Different content can be prepared	1	1
Other	Class size	1	1
	Technical infrastructure support	1	1

When Table 6 was analyzed, it was noted that the opinions and suggestions of the participants about making the process more effective were in the categories of Peer groups (f=17), Tutoring process (f=13), Content (f=4) and Other (f=2).

The views of the participants in the category of Peer groups were coded as Peer matching (f=8), conducting with peers concerned with the course (f=3), Gender congruence (f=3), Peer roles (f=2) and Group size (f=1). Participants provided the following feedback regarding these: "...I think it is efficient enough, but same-gender participants in the same group would positively affect the activities in the process while making peer matches" (OGR19), "... It is important that the roles of tutor and student change weekly, so that the tutor understands what the student expects from them and plans the week accordingly" (OGR24).

In the Teaching Process category, participants provided opinions as Follow-up of the process (f=4), Duration may be extended (f=2), A free studying atmosphere (f=2), Communication of the tutoring group (f=1), Can be more enjoyable (f=1), Scheduling the study time (f=1) and Reward and punishment (f=1). Participants provided the following feedback regarding this category: "I believe it would be better if the instructor of the course followed the process more closely." (OGR14), "This activity does not appeal to students because it is difficult; however, it is effective, but they are unaware of it. I believe that this activity should be made more enjoyable, as even university students are attracted to games" (OGR23).

Providing guidance and following up on group activities in the peer tutoring process enhanced the effectiveness of the process (Demirel, 2007). In this context, it was in accordance with the opinions of the participants to make the process as effective as possible. Participants also suggested that *the five-week implementation period be extended over the course of the semester*. The reason for this finding may be that the students felt that the process was effective, but that extending it over a longer period of time would result in more benefit to them. Participants' reluctance to participate in the process could be interpreted as a reflection of their desire to provide an authentic learning environment; however, they continued the process because they believed it was part of the course evaluation.

In contrast to the opinion of determining a common study schedule, CBPT offered a flexible learning environment in terms of both time and space. Several factors contributed to this view, including the difficulties peers faced during the process and the conflicting demands of time. To conclude, in this category, it was considered useful to include game activities in the process in line with the objectives of the course in tandem with peer opinions in order to make the process more enjoyable for its effectiveness.

Participants' opinions in the Content category were stated as Activity examples and instructions (f=2), Supplementary sources and materials (f=2), while their opinions in the Other category were stated as Class size (f=1) and Technical infrastructure support (f=1). Participants provided feedback on these issues, including: "...the availability of supplementary sources and a greater level of guidance can be provided" (OGR26), "...if the necessary infrastructure is created, if both sides have access to the internet and computers" (OGR16).

Discussion, Conclusion and Recommendations

In general, it could be concluded that the CBPT method increased students' knowledge of the content and enhanced learning and practice processes. Similarly, Chu et al. (2017), Lin ve Yang (2013), Tsuei (2017), Tsuei (2012), Watcharapunyawong (2018) and Zulkifli et al. (2018) found that online peer tutoring increased students' involvement in the learning process and their academic performance.

In the peer tutoring process, students who played the role of tutors lacked professional competencies (Yurtaş, 2015). By enhancing this method with cloud computing, multiple contributions were made in the areas of professional knowledge, professional skills, attitudes, and values competencies, as well as in ensuring pre-service teachers have the competencies required for their profession (MoNE, 2017). Gabarre and Gabarre (2012) and Goldschmid and Goldschmid (1976) emphasize that in the peer teaching process, especially peers in the tutor role should have the skills to use teaching strategies. In light of the findings obtained from the study, it may be concluded that the

process contributed to students developing instructional strategies and preparing and using assessment and evaluation activities in the role of tutors.

Peer tutoring enhanced the learning process (Al-Hebaishi, 2017; Griffin and Griffin, 1997; Loke and Chow, 2007; Schunk, 2011; Türkmenoğlu and Baştuğ, 2017). As a result of the CBPT process, students were able to communicate effectively with their peers and the instructor in charge of the course, study a variety of examples and activities, gain new ideas, improve their self-confidence and technological proficiency, and make the learning and teaching process more enjoyable.

According to the study conducted by Ünver and Akbayrak (2013), peer tutoring not only provided cognitive gains but also contributed to the development of psychomotor and affective skills, and that the positive atmosphere created during the tutoring process allowed students to take on their own learning responsibilities and self-control. According to the findings of the study, the CBPT process led the participants to experience positive emotions in the sense of socially studying with peers, studying in a cloud-based environment, and playing the role of tutor for peers. In addition, it could be argued that the sense of responsibility and self-confidence they felt as tutors encouraged them to study and transformed the learning process into one that was enjoyable. These findings were in line with the studies in the literature (Rutherford et al., 2017; Tran et al., 2023).

According to the participants, peer-related difficulties they experienced in the process included the inability to communicate with their peers, the inability to set a common schedule for studying together, and the reluctance of one peer. While peers could conduct their studies in a cloud-based learning environment without setting a common schedule, the reason why participants mentioned this as a challenge could be interpreted as the need for simultaneous or face-to-face collaboration. Being in the role of a tutor was also mentioned by participants as a challenge. According to the expressions of the participants, being in the role of a tutor imposed a greater burden than being in the role of a learner. This might be due to the fact that students in the tutor role provided appropriate feedback to their peers in the learner role, provided access to appropriate sources, and guided their own learning (Goldschmid and Goldschmid, 1976). During the peer tutoring process, students who served as tutors were required to use teaching strategies. The training of students in tutoring roles was essential for achieving this goal (Ali and Anwer, 2015; Türkmenoğlu and Baştuğ, 2017). A second explanation may be that the programming course in which the research was conducted was difficult to teach (Arabacıoğlu, Bülbül and Filiz, 2007; İmal and Eser, 2009; McCauley et al., 2015; Özmen and Altun, 2014).

In cloud computing, internet connectivity was a major problem (Islam et al., 2017; Pocatilu et al., 2010). The process may be adversely affected by problems encountered with the internet connection and a slow connection speed. Moreover, hardware and software problems resulting from the electronic tools that the participants would be using in the process may also negatively impact the process (Tran et al., 2023). The possibility of conducting face-to-face studies was considered to reduce such problems to a certain extent, depending on the structure of the research.

The peer-oriented responses provided by participants for improving the process were that while forming peer groups and determining roles, students' academic achievements and their interest in the course should be taken into account as well as their own desires. This finding was supported by the previous studies in the literature (Goldschmid and Goldschmid, 1976; Sencar Tokgöz, 2007; Yurttaş, 2015). Nevertheless, no information was found in the literature regarding the possibility of maximizing the efficiency of the process by including same-gender participants in the participants' peer groups. Similarly, since there were less than six people in the group, the participants' suggestion of three-peer groups comprised of two tutors and one learner may also be considered as an option. In contrast, it did not coincide with the belief that two-peer groups were the most effective form of peer tutoring (Yurttaş, 2015).

The opinions of participants in the content and other categories suggest that the level of questions regarding the activity example and instructions can be reduced, and that the content can be enriched by increasing the number of resources and materials available to peer groups. Furthermore, providing infrastructure and technical support, especially for cloud computing, will enhance the efficiency of the process (Masud and Huang, 2012). A further suggestion made by participants in this context was that the method might be more effective if used in smaller classes, taking into account the

size of the classes. This is believed to enhance the effectiveness of the process since it will allow the teacher to more effectively control it.

The CBPT process, therefore, contributes positively to the teaching of programming courses. Furthermore, it facilitates the development of professional knowledge, skills, attitudes, and values in pre-service teachers. As a result, the learning and teaching process is transformed into one that is enjoyable for the participants by promoting communication and cooperation and integrating technology into the learning and teaching process. The technical competency of participants, the internet connection, technical difficulties, and peers' interests and desires can all negatively impact the process.

It is recommended that students be given readiness tests on both the course content and the use of cloud computing tools and completion trainings should be provided prior to implementing the CBPT process. There is a possibility that technical problems and an insufficient Internet connection could adversely affect the process. Providing students with infrastructure and technical assistance in the area of informatics would enhance the efficiency of the process. In light of the fact that peer tutoring can enable peers to create learning environments and develop teaching, assessment, and evaluation strategies, such practices can be included in teacher training programs.

In the study, the peer teaching process was carried out in a cloud-based online environment and the participants were allowed to study face-to-face in addition to the activities in the online environment. In future studies, the peer teaching process can be carried out only in online environments by limiting face-to-face interactions and the results can be compared.

References

- Akay, G. (2011). *Akran öğretimi yönteminin sekizinci sınıf öğrencilerinin dönüşüm geometrisi konusundaki matematik başarılarına etkisi*. Yayınlanmamış Yüksek Lisans Tezi. Ortadoğu Teknik Üniversitesi Sosyal Bilimler Enstitüsü, Ankara.
- Akıllı, M. (2007). *Öz değerlendirme ve akran değerlendirmesi yöntemlerinin öğretmen eğitimine etkisi*. Yayınlanmamış Yüksek Lisans Tezi. Atatürk Üniversitesi Fen Bilimleri Enstitüsü, Erzurum.
- Akpınar, B. (2015). *Eğitimde Program Geliştirme*. Ankara: Data Yayınları.
- Al-Hebaishi, S. M. (2017). The Effect of Peer Instruction Method on Pre-Service Teachers' Conceptual Comprehension of Methodology Course. *Journal of Education and Learning*, 6(3), 70–82. doi:10.5539/jel.v6n3p70
- Ali, N. & Anwer, M. (2015). Impact of Peer Tutoring on Learning of Students Private Sector Investment Opportunities View project Peer Tutoring View project. *Journal for Studies in Management and Planning*, 1(2), 61–66.
- Arabacıoğlu, T., Bülbül, H. İ. ve Filiz, A. (2007). *Bilgisayar programlama öğretiminde yeni bir yaklaşım*. akademik bilişim'07 - IX. Akademik Bilişim Konferansında sunulan bildiri, 193–197. Dumlupınar Üniversitesi, Kütahya. Erişim adresi: https://ab.org.tr/ab07/kitap/arabacioglu_bulbul_AB07.pdf
- Batı, K. (2015). *Bulut bilişim ve etkileri*. Yayınlanmamış Yüksek Lisans Tezi. Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü, İzmir.
- Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö., Karadeniz, Ş. ve Demirel, F. (2012). *Bilimsel araştırma yöntemleri*. (13.basım). Ankara: Pegem A Yayıncılık.
- Can, Ü. K. (2009). *Müzik öğretmenliği gitar öğrencileri için geliştirilen akran öğretimi programının etkililiğinin sinanması*. Yayınlanmamış Doktora Tezi. Marmara Üniversitesi Eğitim Bilimleri Enstitüsü, İstanbul.
- Chu, H. C., Chen, J. M. & Tsai, C. L. (2017). Effects of an online formative peer-tutoring approach on students' learning behaviors, performance and cognitive load in mathematics. *Interactive Learning Environments*, 25(2), 203–219. doi:10.1080/10494820.2016.1276085
- Corrigan, J. A. (2012). The implementation of e-tutoring in secondary schools: A diffusion study. *Computers and Education*, 59(3), 925–936. <https://doi.org/10.1016/j.compedu.2012.03.013>
- Daymon, C. & Holloway, I. (2005). *Qualitative research methods in public relations and marketing communications* (Second edition). London and New York: Routledge.
- Demirci, N. ve Şekercioğlu, A. G. (Çirkinoğlu). (2009). Akran öğretimi yönteminin üniversite öğrencilerinin elektrostatik konusundaki başarılarına etkisi ve yönetime yönelik tutumları. *E-Journal of New World Sciences Academy*, 4(1), 240–256.
- Demirel, Ö. (2007). *Eğitimde program geliştirme*. (10. Basım). Ankara: Pegem A Yayıncılık.

- Eryılmaz, H. (2004). *Akran öğretiminin lise öğrencilerinin fizik başarısına ve fizik dersine olan tutumlarına etkisi*. Yayınlanmamış Doktora Tezi. Orta Doğu Teknik Üniversitesi Fen Bilimleri Enstitüsü, Ankara.
- Evans, M. J. & Moore, J. S. (2013). Peer tutoring with the aid of the Internet. *British Journal of Educational Technology*, 44(1), 144–155. <https://doi.org/10.1111/j.1467-8535.2011.01280.x>
- Fuchs, L. S., Fuchs, D. & Kazdan, S. (1999). Effects of Peer-Assisted Learning Strategies on High School Students with Serious Reading Problems. *Learning Strategies*, 20(5), 309–318. doi:10.4324/9781315188652
- Gabarre, C. and Gabarre, S. (2012). Criteria for successfully recruiting online peer-tutors in foreign languages. *Asia Pacific Journal of Education*, 32(2), 197–223. doi:10.1080/02188791.2012.684954
- Gaikwad, P., Hamane, S., Kulkarni, S., Deore, R. & Chavan, B. (2014). Cloud Based Code Studio. *International Journal Of Scientific Progress And Research (IJSPR)*, 3(1), 1–4.
- Goldschmid, B. and Goldschmid, M. L. (1976). Peer teaching in higher education : A Review. *Higher Education*, 5(1), 9–33.
- Gölpek Sarı, F. (2013). *Çevrimiçi işbirliği uygulamaları google dokümanlar örneği*. Yayınlanmamış Yüksek Lisans Tezi. Marmara Üniversitesi Eğitim Bilimleri Enstitüsü, İstanbul.
- Griffin, B. W. & Griffin, M. M. (1997). The effects of reciprocal peer tutoring on graduate students' achievement, Test Anxiety, and Academic Self-Efficacy. *The Journal of Experimental Education*, 65(3), 197–209. doi:10.1080/00220973.1997.9943454
- Guba, E. G. & Lincoln, Y. S. (1982). Epistemological and methodological bases of naturalistic inquiry. *Educational Communication & Technology*, 30(4), 233–252. <https://doi.org/10.1007/BF02765185>
- Gülçek, N. (2015). *Öğretmen adaylarının ideal gazlar konusundaki fen başarısına akran öğretiminin etkisi*. Yayınlanmamış Yüksek Lisans Tezi. İnönü Üniversitesi Eğitim Bilimleri Enstitüsü, Malatya.
- Horzum, M. B., Kıyıcı, M., ve Akgün, Ö. E. (2015). Bulut bilişim tabanlı öğrenme-öğretme yaklaşımı. G. Ekici (Editör), *Etkinlik örnekleriyle güncel öğrenme-öğretme yaklaşımları - II*. Ankara: Pegem A Yayıncılık, ss.2-49.
- Ijeh, S. (2023). Effect of peer tutoring teaching strategy and attitude on student's achievement in geometry. *DELSU Journal of Educational Research and Development*, 17(2), 67–72. <https://www.researchgate.net/publication/370731953>
- Islam, M. A., Abul Kasem, F. Bin & Zaman Khan, S.-U. (2017). Cloud computing in education : Potentials and challenges for Bangladesh. *International Journal of Computer Science, Engineering and Applications*, 7(5), 11–21. doi:10. 5121/ijcsea.2017.7502
- İmal, N. ve Eser, M. (2009, Ekim). *Programlama dili öğrenmedeki zorluklar ve çözüm yaklaşımları*. Elektrik Elektronik Bilgisayar Biyomedikal Mühendislikleri Eğitimi IV. Ulusal Sempozyumunda sunulan bildiri, Osmangazi Üniversitesi, Eskişehir. Erişim adresi: http://www.emo.org.tr/ekler/8bd988bd20804a2_ek.pdf
- Kocakulah, A. ve Savaş, E. (2013). Akran öğretimi destekli bilimsel süreç becerileri laboratuvar yaklaşımının öğretmen adaylarının bazı bilimsel süreç becerilerine etkisi. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi*, 7(2), 46–77. doi:10.12973/nefmed202
- Koç, A. (2020). *Bulut tabanlı akran öğretiminin öğretmen adaylarının akademik başarı, iletişim becerileri ve derse ilişkin tutumlarına etkisi*. Yayınlanmamış Doktora Tezi. İnönü Üniversitesi Eğitim Bilimleri Enstitüsü, Malatya.
- Lin, W. C. & Yang, S. C. (2013). Exploring the roles of Google.doc and peer e-tutors in English writing. *English Teaching*, 12(1), 79–90.
- Loke, A. J. T. Y. & Chow, F. L. W. (2007). Learning partnership—the experience of peer tutoring among nursing students: A qualitative study. *International Journal of Nursing Studies*, 44(2), 237–244. <https://doi.org/10.1016/j.ijnurstu.2005.11.028>
- Masud, M. A. H. & Huang, X. (2012). A novel approach for adopting cloud-based e-learning system. *2012 IEEE/ACIS 11th International Conference on Computer and Information Science*, 37–42. <https://doi.org/10.1109/ICIS.2012.10>
- McCauley, R., Grissom, S., Fitzgerald, S. and Murphy, L. (2015). Teaching and learning recursive programming: a review of the research literature. *Computer Science Education*, 25(1), 37–66. <https://doi.org/10.1080/08993408.2015.1033205>
- MEB (2017). *Öğretmenlik mesleği genel yeterlikleri*. Ankara: Öğretmen Yetiştirme ve Geliştirme Genel Müdürlüğü.
- Mirzeoğlu, A. D. ve Özcan, G. (2015). Akran öğretimiyle işlenen okul deneyimi dersi hakkında öğrenci görüşleri ve kazanımları. *Sport Sciences (NWSASPS)*, 10(4), 16–33.

- Mirzeoğlu, A. D., Munusturlar, S. ve Çelen, A. (2014). Akran Öğretimi Modelinin Akademik Öğrenme Zamanına ve Voleybol Becerilerinin Öğrenimine Etkisi. *Hacettepe Journal of Sport Sciences*, 25(4), 184-202.
- O'Donovan, J. & Maruthappu, M. (2015). Distant peer-tutoring of clinical skills, using tablets with instructional videos and Skype: A pilot study in the UK and Malaysia. *Medical Teacher*, 37(5), 463-469. <https://doi.org/10.3109/0142159X.2014.956063>
- Özmen, B. ve Altun, A. (2014). Üniversite öğrencilerinin programlama deneyimleri: güçlükler ve engeller. *Turkish Online Journal of Qualitative Inquiry*, 5(3), 9-27.
- Pocatilu, P., Alecu, F. and Vetrici, M. (2010). Using cloud computing for e-learning systems. *WSEAS Transactions on Computers*, 9(1), 42-51.
- Rutherford, S. M., Limorenko, G., & Amici-Dargan, S. L. (2017). 'Shadow module leaders'-student experiences as peer-teachers and facilitators of peer-assisted learning. *Ireland International Conference on Education*. <https://orca.cardiff.ac.uk/id/eprint/101345>
- Sansone, N., Ligorio, M. B. & Buglass, S. L. (2018). Peer e-tutoring: Effects on students' participation and interaction style in online courses. *Innovations in Education and Teaching International*, 55(1), 13-22. <https://doi.org/10.1080/14703297.2016.1190296>
- Saju, R., & Mathew, P. A. (2022). *Shifting trends from traditional teaching to student partnerships : A Study on Peer Tutoring at UTAS-Ibra*. 7(1), 35-50.
- Sarıtaş, M. T. ve Üner, N. (2013). Eğitimdeki yenilikçi teknolojiler: Bulut Teknolojisi. *Eğitim ve Öğretim Araştırmaları Dergisi*, 2(3), 192-201.
- Savaş, E. (2011). *Akran öğretimi destekli bilimsel süreç becerileri laboratuvar yaklaşımının öğretmen adaylarının bilimsel süreç becerilerine etkisi*. Yayınlanmamış Yüksek Lisans Tezi. Balıkesir Üniversitesi Fen Bilimleri Enstitüsü, Balıkesir.
- Selvi, O. (2011). *Bulut bilişim ve eğitim alanında örnek bir uygulama*. Yayınlanmamış Yüksek Lisans Tezi. Süleyman Demirel Üniversitesi Fen Bilimleri Enstitüsü, Isparta.
- Sencar Tokgöz, S. (2007). *Akran öğretiminin altıncı sınıf öğrencilerinin fen bilgisi dersi başarılarına ve fen dersine olan tutumlarına etkisi*. Yayınlanmamış Doktora Tezi. Ortadoğu Teknik Üniversitesi Fen Bilimleri Enstitüsü, Ankara.
- Schunk, D. H. (2011). Yapılandırmacı teori (çev. M. Y. Demir). *İçinde Eğitimsel Bir Bakışla Öğrenme Teorileri*. (çev. Ed. M. Şahin.). Ankara: Nobel Yayıncılık. ss. 234-277. (Eserin orijinali 2009'da yayımlandı).
- Şahinel, M. (2005). Etkin öğrenme. Ö. Demirel (Editör). *Eğitimde Yeni Yönelimler*. Ankara: Pegem A Yayıncılık, ss.145-161.
- Şekercioğlu, A. G. (2011). *Akran öğretimi yönteminin öğretmen adaylarının elektrostatik konusundaki kavramsal anlamalarına ve tutumlarına etkisi*. Yayınlanmamış Doktora Tezi. Balıkesir Üniversitesi Fen Bilimleri Enstitüsü, Balıkesir.
- Thomas, D. & Brown, J. S. (2016). Kolektif öğrenme. (çev. İ. Çelik). *İçinde Yeni nesil öğrenme kültürü: Sürekli değişen bir dünya için hayal gücü geliştirmek*. (çev. Ed. H. Uysal). Ankara: Pegem A Yayıncılık. ss.31-35. (Eserin orijinali 2011'de yayımlandı).
- Topping, K. J., Dehkinet, R., Blanch, S., Corcelles, M. & Duran, D. (2013). Paradoxical effects of feedback in international online reciprocal peer tutoring. *Computers & Education*, 61(1), 225-231. <https://doi.org/10.1016/j.compedu.2012.10.002>
- Tran, K. N. P., Weng, C., Tran-Nguyen, P. L., Astatke, M., & Tran, N. P. D. (2023). What are tutors' perceptions of an online tutoring project—Digital Learning Companion—During the COVID-19 pandemic? A case study in Taiwan. *Universal Access in the Information Society*, 0123456789. <https://doi.org/10.1007/s10209-023-00976-1>
- Tsuei, M. (2012). Using synchronous peer tutoring system to promote elementary students' learning in mathematics. *Computers & Education*, 58(4), 1171-1182. <https://doi.org/10.1016/j.compedu.2011.11.025>
- Tsuei, M. (2017). Learning behaviours of low-achieving children's mathematics learning in using of helping tools in a synchronous peer-tutoring system. *Interactive Learning Environments*, 25(2), 147-161. <https://doi.org/10.1080/10494820.2016.1276078>
- Türkmenoğlu, M. ve Baştuğ, M. (2017). İlkokulda akran öğretimi aracılığıyla okuma güçlüğü'nün giderilmesi. *Eğitimde Nitel Araştırmalar Dergisi - ENAD*, 5(3), 36-66. <https://doi.org/10.14689/issn.2148-2624.1.5c3s2m>
- Ünver, V. ve Akbayrak, N. (2013). Hemşirelik eğitiminde akran eğitim modeli. *Dokuz Eylül Üniversitesi Hemşirelik Yüksekokulu Dergisi.*, 6(4), 214-217.

- Van Rosmalen, P., Sloep, P. B., Brouns, F., Kester, L., Berlanga, A., Bitter, M. and Koper, R. (2008). A model for online learner support based on selecting appropriate peer tutors. *Journal of Computer Assisted Learning*, 24(6), 483–493. <https://doi.org/10.1111/j.1365-2729.2008.00283.x>
- Watcharapunyawong, S. (2018). The effects of online peer tutoring on first-year undergraduate students' english grammar achievement. *Indonesian Journal of Informatics Education*, 2(2), 69–76. <https://doi.org/10.20961/ijie.v%vi%i.24382>
- Yaşar, A. (2016). *Akran öğretim yönteminin ortaöğretim öğrencilerinin elektrik ve manyetizma konularındaki kavramsal anlama*. Yayınlanmamış Yüksek Lisans Tezi. Balıkesir Üniversitesi Fen Bilimleri Enstitüsü, Balıkesir.
- Yavuz, O. C. (2014). *Web tabanlı akran ve öz değerlendirme sistemi ile zenginleştirilmiş akran öğretiminin 7. sınıf rasyonel sayılar konusunda öğrencilerin başarı ve tutumlarının üzerine etkisi*. Yayınlanmamış Doktora Tezi. Dumlupınar Üniversitesi Eğitim Bilimleri Enstitüsü, Kütahya.
- Yiğit, F., ve Durukan, E. (2023). Effect of peer-assisted and learning together techniques on 6th grade students' reading comprehension achievement and attitudes towards reading. *International Journal of Education and Literacy Studies*, 11(1), 31–43. <https://doi.org/10.7575/aiac.ijels.v.11n.1p.31>
- Yıldırım, A. ve Şimşek, H. (2006). *Sosyal bilimlerde nitel araştırma yöntemleri* (6. basım). Ankara: Seçkin Yayıncılık.
- Yurttaş, G. D. (2015). Akran öğretimine dayalı öğrenme-öğretme yaklaşımı. G. Ekici (Editör), *Etkinlik Örnekleriyle Güncel Öğrenme-Öğretme Yaklaşımları-III*. Ankara: Pegem A Yayıncılık, ss.1-27.
- Zulkifli, N. N., Halim, N. D. A. & Yahaya, N. (2018). The impact of online reciprocal peer tutoring on students' academic performance. *Journal of Engineering Science and Technology*, 13(Special Issue on ICITE 2018), 10–17.

This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

