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University students' online cooperative learning attitudes and its relationship with course achievement

Züleyha Yıldırım Yakar [a] *

[a] Kahramanmaraş Sütçü İmam University, Türkiye

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Highlights

- The study supports that the cooperative learning model can also be applied effectively in distance education.
- Group research technique of cooperative learning model was used through Google Drive applications.
- The practice did not create a significant change in the attitudes of the students.
- Students' opinions on practice are positive.
- There is no significant relationship between course success and attitude towards practice.

Article Info: Research Article

Keywords: *Online cooperative learning, Students' attitude, Course achievement*

Abstract

This study attempts to examine the effect of online cooperative teaching on students' attitudes towards online cooperative learning (OCLAS) and the relationship between OCLAS and course achievement. Besides, students' views on online collaborative practice were taken. The study was conducted with the 3rd year pre-service teachers who were studying at the primary school mathematics teaching program of a state university in Türkiye and who received the "algebra teaching" course during the spring term of the 2020-2021 academic year. Having the nested mixed method design, quantitative data were collected through use of a one-group pretest-posttest quasi-experimental design and correlational design. The findings revealed no statistically significant difference across the students' attitudes towards online cooperative learning after the implementation. In addition, the interviews conducted with students who had different attitude levels indicated that all of the students took certain advantages of the implementation and that they found the Google tools (docs, slides, forms, spreadsheet) used in group work convenient and useful for collaboration. The findings also suggested no significant relationship between the students' achievement in the Algebra Teaching Achievement Test and their attitudes towards online cooperative learning.

1. Introduction

Distance education has developed through the form of teaching by letter, then continued with broadcast radio and television, open education, teleconferencing and finally the most recent generation of distance education based upon internet (Moore & Kearsley, 2005). Today, with the use of the internet, distance education is more effective and useful, it has become more effective and it can appeal to wider audiences as well as providing opportunities similar to face-to-face education (Kologlu, et al., 2016). The use of the internet in distance education to access learning resources, interact with content, instructors and other learners, and to receive aid throughout the learning process is intercorrelated with the concept of online learning (Ally, 2004). Learning communities that come together by utilizing internet opportunities are regarded as online learning communities or virtual learning communities (Palloff & Pratt, 1999). According to Anderson (2011), online learning refers to a type of teaching and learning status in which the student is

* Corresponding author. Department of Elementary Mathematics Education, Kahramanmaraş Sütçü İmam University, Türkiye.
e-mail address: zyildirimyakar@gmail.com

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away from the instructor, using technology to interact with the instructor and other students and to access learning materials. Online learning and teaching holds a wide variety of tools, resources, pedagogical approaches, roles and organizational arrangements as well as a combination of different forms of interaction, monitoring and support (Bullen & Janes 2007).

Online learning can eliminate many of the limitations of distance education thanks to the features it contains (Garrison, et al., 2000). However, students' access to the necessary hardware, software, internet and other applications and the adequacy of their technological skills (Narozny, 2010) along with the quality of the applied instructional designs are also significant to consider in achieving this (Anderson, et al., 2001). Given that even if students participate in online courses, this does not mean that students benefit from teaching as they should (Greener, 2020), alternative teaching approaches that provide students' active participation should be used in planning (Ma, 2020; Marshall & Kostka, 2020). Aghajani and Adloo (2018) highlighted that integrating teaching approaches that have ensured successful in traditional education environments with online learning may prove useful and enhance learning outcomes. Johnson and Johnson (2004) implied that the best way to carry out a technology-aided teaching is to integrate it with cooperative learning. The analysis of the related literature demonstrates that cooperative learning stands out as one of the teaching approaches that can disqualify the instructional difficulties of distance education in view of its theoretical foundations (Chao, et al., 2010; Kupczynski, et al., 2012; Nam, 2014; Gradel & Edson, 2011; Aghajani & Adloo, 2014). Cooperative learning (Bin, 2014), which emerged in the 1970s and made inroads in the 1980s, has been one of the most extensively surveyed teaching approaches in the field of education (Slavin, 1994). Having been studied at different learning levels and educational environments, cooperative learning is effective on plentiful variables, including attitudes and social relations, except for students' achievement (Johnson & Johnson, 1991; Stevens & Slavin, 1995).

The term cooperative learning generally describes instructional techniques in which students are divided into small groups and each member of the group contributes to the group project (Marr, 1997). However, cooperative learning approach is more than throwing students together and expecting learning to happen (Herreid, 1998). There are five elements to successfully implement cooperative learning: (1) Groups must be given a clear task and group goal that demands several individuals work together (positive interdependence). Students should understand that they will either succeed by cooperating or fail because the task is too complex and time consuming to do alone. (2) Not only must the group be responsible for achieving the goal, but each person must be held responsible for his/her own contributions (individual accountability). Group members must be aware that they cannot "hitchhike" on the work of others. (3) Students should exchange resources with care for each other, encourage and help each other through acting in a trusting way (Interaction). (4) Students must be taught how to work in groups. Decision making, trust-building, communication and conflict-management skills must be known as significant as academic skills (Interpersonal skills). (5) Students must constantly evaluate how well their group is functioning and if something is wrong, they must fix them (group processing) (Johnson, et al., 2013). When these principles are well structured in the learning process, cooperative learning provides an increase in students' academic achievement, participation, accountability and motivation. Besides, these basic elements that differ cooperative groups from other instructional groups must be understood in order to understand how to use cooperative learning not only in traditional face-to-face environments but also in instructional technologies (Johnson & Johnson, 2004).

With the development of modern technology, cooperative learning activities can be actively applied in online learning environments (Fu, et al., 2009; Nam, 2014). Therefore, various technological tools such as discussion groups, Google wave, web 2.0 technologies, e-mail groups, Google Drive and specially developed collaborative virtual learning platforms are used (Baran & Keleş, 2011). These tools facilitate information exchange between student-student and student-instructor and support collaboration as a way to increase learning (Witney & Smallbone, 2011). Online collaboration activities that can be performed with these technological tools provide students with active participation opportunities for the acquisition of

knowledge, skills and attitudes (Dewiyanti, et al., 2007). Despite all these advantages, online cooperative learning also possesses some limitations. For instance, the lack of face-to-face communication in online learning communities and the fact that some group members do not behave as expected makes it harder to share their knowledge in virtual environments (Hsu, et al., 2007). In addition, individuals may perceive comments and criticisms in virtual environments as personal attacks (Rourke & Kanuka, 2007). Unlike face-to-face collaboration, students are expected to spend more time and effort in activities that require self-management, as well as helping their groupmates in order to achieve their goals in virtual environments (ChanLin, 2012). For these reasons, the harmony and relationships between cooperative learning groups in online learning environments are more fragile than that of face-to-face learning environments (Hsu, et al., 2007). Keeping this in mind, it is of great importance for teachers to make an in-depth explanation about how this teaching method will be implemented and support students to adopt positive attitudes (Niemi & Nevgi, 2014). Altun and Korkmaz (2012) concluded that determining students' attitudes towards online cooperative learning before teaching and taking timely measures for related problems will undoubtedly contribute to the successful completion of cooperative activities.

Under the strength of the above information, the current study is conducted on online cooperative learning attitude, which is emphasized as a determining factor in the efficiency of online cooperative learning (Korkmaz, 2012). The relevant literature covers studies examining students' attitudes towards online collaborative learning (Nam & Zellner, 2011; Chatterjee & Correia, 2020; Nam,2014; Erten, 2015; Molinillo, et al., 2018; Ku, et al., 2013; Alanazy, 2011; Altun & Korkmaz, 2012; Er & Aksu Ataç, 2014; Duckworth, 2010; Neo, et al., 2009; Jung, et al., 2002). In one of these studies, Molinillo et al. (2018) sought for the variables that affected students' cooperative learning attitudes within the context of social media. In another study, Chatterjee and Correia (2020) examined the relationship between students' attitudes towards online collaborative learning and their sense of community. Nam and Zellner (2011) compared the effects of "positive interdependence" and "group processing", the basic principles of cooperative learning, on students' online cooperative learning attitudes. Altun and Korkmaz (2012) and Korkmaz (2013) analyzed students' online learning attitude levels, which is also the subject of the current study. Among the related studies, there is no such a study specifically published on examining the change in students' online cooperative learning attitudes through using the experimental research method and the relationship between students' course achievement and online learning attitudes in online learning course design. Based upon previous studies, answers to the following questions were sought in order to contribute to filling this gap in the related literature:

(1) Is there a significant difference between the online cooperative learning pre-attitudes and post-attitudes of the students learning at an online cooperative learning environment?

(2) Is there a relationship between the online cooperative learning attitudes of students learning at an online cooperative learning environment and their course success?

(3) What are the views of students learning at an online cooperative learning environment regarding online cooperative learning?

This study, which aims at identifying whether online cooperative teaching lead to a change in students' attitudes towards the method, whether the course success is affected by the students' attitudes and what the students' views are about the method, is expected to form the basis for further studies.

2. Methodology

2.1. Research Design

This study employed a mixed method research design. In the mixed method, both quantitative and qualitative data are collected, analyzed and the results are integrated to seek answers to research questions (Creswell, 2003). The nested (embedded) design, one of the mixed method designs, was used in the current

study. Quantitative and qualitative data can be gathered simultaneously or sequentially in the Nested design, but one of the data types plays a supplemental role within the overall design (Creswell, 2003). In accordance with the design, the quantitative data at the center of the current study were collected with a one group pretest-posttest quasi-experimental design and correlational design. A semi-structured interview method was used to collect qualitative data embedded in the quantitative data.

2.2. Data Collecting Tools

2.2.1 Online Cooperative Learning Attitude Scale

The study deployed the Online Cooperative Learning Attitude Scale (OCLAS), developed by Korkmaz (2012), to measure pre-service teachers' online cooperative learning attitudes. The tool consists of 17 items and 2 factors. The factor called "positive attitude" includes 11 items and the other called "negative attitude" contains 6 items. Being a 5-point Likert-type, the choices for the items were organized as graded between "(1) Never" and "(5) Always". The KMO value of the scale was calculated as 0.937, and the Bartlett test value as 4161.7. The internal consistency coefficient was determined as α=0.89 for the "positive attitude" factor, α=0.82 for the "negative attitude" factor, and α=0.904 for the overall scale. In the current study, the internal consistency coefficient of the scale was found to be 0.95 for the positive attitude factor, 0.85 for the negative attitude factor, and 0.86 for the whole scale. This tool was administered via Google Form as a pre-test before the implementation and as a post-test after the implementation.

2.2.2 Algebra Teaching Achievement Test

In accordance with the content of the algebra teaching course, an achievement test consisting of 20 multiple-choice questions was prepared in order to measure the students' knowledge of algebra. This test was applied to the students at the end of the implementation. 3 questions in the test were taken from the Algebra Pedagogical Content Knowledge Test developed by Güler (2014) to measure pre-service teachers' knowledge of algebra teaching. The other 17 questions were developed by the researcher. The relevant literature was taken into account in the preparation of the questions, and attention was paid to include the components of content knowledge (7 questions), knowledge of student understanding (4 questions), curricular knowledge (4 questions) and knowledge of instructional strategies (5 questions) defined by Grosmann (1990) for pedagogical content knowledge. The test questions presented to the expert views were determined to be appropriate for the purpose of the test and the components of pedagogical content knowledge. The test was administered to 60 pre-service teachers who received the algebra teaching course for the pre-implementation. Since the mean difficulty value of the test items was 0.52 and the discrimination indices were between 0.21 and 0.69, the test was thought to meet the necessary criteria for implementation.

2.2.3 Semi-Structured Interview Form

The present study employed a semi-structured interview form developed by the researcher to determine the students' views regarding online collaborative practices. The preparation of the questions was supported by the relevant literature and two experts' views. The form got its final version in line with the feedback from the expert views, and 5 sample questions are as follows:

(1) What were the problems you experienced in the Algebra teaching course based upon the online cooperative teaching method?

(2) What tasks did you think you did best while learning algebra teaching online cooperatively?

(3) What were the studies that you considered yourself as incomplete while learning algebra teaching online cooperatively?

(4) What were the contributions of learning algebra through online collaborative practices?

(5) Did you find the Google tools you used while learning algebra online cooperatively appropriate and sufficient? What do you think about these tools?

An interview invitation was sent to 10 students to get their views on the online collaborative implementation. These students were randomly selected among those whose attitudes varied across the data obtained from the online cooperative attitude scale, which was implemented as a pre-test and post-test. 8 out of 10 pre-service teachers came to terms for interviews. Table 1 depicts information regarding the online cooperation pre-attitude-post-attitude score levels of the students who were in this interview group and who were coded as S1, S2,……,S8.

Table 1.

Online Cooperative Learning Attitude Levels of Interviewed Students

Student's Code	Pre-attitude level	Post-attitude level	Student's Code	Pre-attitude level	Post-attitude level
S1	Very low(25)	Very low(25)	S5	Low(46)	Medium (64)
S2	Low(39)	Low(42)	S6	Medium (64)	High(78)
S3	Low(48)	Low(42)	S7	Medium (64)	High (81)
S4	Medium (67)	Very low(27)	S8	High (72)	High (73)

The pre-service teachers were interviewed one-on-one via Zoom. The interviews lasted approximately 20 minutes (min: 16 minutes, max: 30 minutes), and they were recorded.

2.3. Study Group

This study was conducted with the 3rd grade pre-service teachers studying at the primary school mathematics teaching program of a state university in Türkiye and taking the "teaching algebra" course. These pre-service teachers were normally registered for face-to-face education. Due to the coronavirus epidemic, they took their courses online through distance education for 3 semesters, including the spring semester of the 2020-2021 academic year when the study was conducted. The content of the courses available in the current period and their appropriateness for the study were taken into account while determining the participants. Although 56 students were enrolled in the "teaching algebra" course, 8 of whom stated that they could not attend the live lessons regularly and fulfill their group responsibilities due to special reasons, and that wanted to individually prepare weekly research tasks that would be effective in the end-of-term grade. Since participation in live classes is not compulsory in distance education, these requests were welcomed and cooperative activities were carried out with the remaining 44 students. In this vein, the study was carried out thoroughly online during the course period with 44 pre-service teachers receiving the "teaching algebra" course.

2.4. Data Analysis

Quantitative and qualitative data analysis approaches were used in the current study. The quantitative data obtained from the online cooperative learning attitude scale (OCLAS) and the algebra teaching achievement test (ATAT) were analyzed through use of SPSS 20 package program. OCLAS was administered as a pre-test and post-test, and ATAT as a post-test. Kolmogorov-Smirnov normality test was used to determine whether the data demonstrated normal distribution. Since the data were normally distributed, parametric tests were used during data analysis.

Paired samples t-test was used to identify whether there was a significant difference between students' pre-test and post-test scores regarding their online cooperative learning attitudes. A significance level of 0.05 was taken into account in the interpretation of the elicited data. The value ranges used to determine students' attitude levels are as follows; 1.00-1.80 very low, 1.81-2.60 low, 2.61-3.40 medium, 3.41-4.20 high, and 4.21-5.00 very high. The Pearson correlation coefficient was calculated for the relationship between the OCLAS post-test and ATAT post-test scores. The descriptive analysis technique was used during qualitative data analysis. The interview recordings were converted into text in computer environment. The obtained data were organized and interpreted under the themes. The data were supported with direct quotations in order to present the pre-service teachers' views obviously and precisely.

2.5. Research Procedures

The "teaching algebra" course is a theoretical course with three-credit hours. This course aims to provide undergraduate students with knowledge about algebra, to make in-depth examinations of the teaching of algebra subjects in the secondary school mathematics curriculum and to understand student knowledge about these subjects. The planning of this course was made in accordance with the "group investigation" technique of the cooperative learning method in an online environment. Students are active planners and evaluators throughout the learning activities in the "group investigation" technique, which is one of the many different application techniques developed in line with the principles of cooperative learning.

Students plan how they will do their research on the subject they will learn in small groups and share tasks among themselves. After completing their research, they present their research reports in the classroom. The studies of the groups are evaluated by the teacher and the students in the classroom (Sharan & Sharan, 1990). Thanks to the group investigation technique, the students' ability to conduct research like a researcher is improved (Oh, et al., 2004), helping them to gain new information about the content of the algebra teaching course. In this course, students would do their collaborative work via Google Drive applications, share course materials in Google Classroom, and weekly live lessons would be held through the Zoom program. Online cooperative learning attitude scale was administered as a pre-test to all students enrolled in the course via Google Form. In the first week of the semester, pre-service teachers were informed about the purpose and content of the course as well as online cooperative learning practices based on the "group investigation" technique. Besides, the Google Drive and Google Classroom application, which are preferred for online collaborative applications, were introduced at a basic level. The reason for choosing Google Drive is that people can access all applications and documents wherever they have internet access, and that anyone with permission can work collaboratively by making edits on the same file (Miller, 2008).

The Google Classroom application was preferred since it is a learning platform (Hamutoğlu, 2018) that enables to give assignments, feedback, access to all learning resources from a single environment and provides uninterrupted communication. All of the students used the Google Classroom application in a course they had previously taken. However, few of them stated that they used Google Drive's application tools such as documents, presentations, spreadsheets, forms, and similar applications for purposes other than collaborative tasks. In addition, they clarified that they could easily make collaborative applications through Google Drive by watching the videos on YouTube and working on them. Until the coming class week, students were requested to form collaborative investigation groups of 4 among themselves and to work collaboratively by opening a joint file on Google Document related to the topic of "arithmetic-algebra relationship". The purpose of this one-week preliminary study was to identify the difficulties that may occur in the process and to take measures in this regard. Considering that the students were mature enough to make their own decisions, it was deemed appropriate to form the groups themselves. In addition, each group was asked to share the Google document, which they created to work on weekly and named with the group numbers, with the instructor of the course. In this way, the instructor could examine the contributions of each group member from the moment the group members created the document, and that they could see the comments made among students. Therewithal, they could provide recommendations to the groups on the document. In other respects, the decision was taken on giving extra scores in their weekly evaluations to the groups that participate in the live lessons with all their members. Hence, the students attended the classes regularly except excuses.

After the collaborative investigation groups were formed, the topics were planned on a weekly basis (Table 2) and shared in the Google class as a spreadsheet. As is seen in Table 2, the students were ensured to study different aspects of the related algebra concept each week. Among these topics, "Pattern Teaching" and "Equality Teaching" lasted for one week and other topics 2 weeks. All groups were insured to make their presentations as much as possible, especially in 2-week topics. The practices of the students were carried out starting from the 3rd week of the term.

Table 2.

Weekly Assigned Topics for Groups

Week	Topic	Topic Concept	Topic in Curriculum	Teaching Plan	Usage in Technology	Misconception	Relation with life and other lessons
3	Pattern Teaching	G1-G7	G2-G8	G3-G9	G4-G10	G5-G11	G6-G12
4-5	Algebraic Expression Teaching	G2-G8	G3-G9	G4-G10	G5-G11	G6-G12	G1-G7
6	Equality Teaching	G3-G9	G4-G10	G5-G11	G6-G12	G1-G7	G2-G8
7-9	Equation Teaching	G4-G10	G5-G11	G6-G12	G1-G7	G2-G8	G3-G9
10-11	Linear Equation Teaching	G5-G11	G6-G12	G1-G7	G2-G8	G3-G9	G4-G10
12-13	Identity Teaching	G6-G12	G1-G7	G2-G8	G3-G9	G4-G10	G5-G11
14-15	Inequality Teaching	G1-G7	G2-G8	G3-G9	G4-G10	G5-G11	G6-G12

The instructor attached a self-evaluation form to the document the students were working on every week with a view to increasing the group members' awareness towards their responsibilities. Along with the weekly presentations that the groups prepared as an investigation report and shared on Google Drive with the instructor, the weekly group evaluation form prepared through Google Form was uploaded to Google Classroom and the whole class was provided for examining the group work. The self-evaluation form includes 4 items: (1) I shared the resources I found in the subject investigation with my groupmates. (2) I fulfilled my responsibilities towards my groupmates. (3) I took into account the directions and suggestions of my groupmates. (4) I discussed my ideas in interaction with my groupmates.

Group members responded as yes/no/partially to these items in order to demonstrate their contribution to group work. The group evaluation form prepared for the evaluation of group work by both the instructor and other students includes an item the " If you evaluate Group X's work in terms of 'conformity of the content to the topic"/"source reliability"/"a good command of subject"/"slide format"/"presentation effectiveness", how much would you give out of 5?". The students' performance in the cooperative learning process and the score they got from the quality of the group reports they prepared (60%) as well as the scores they got from the Algebra Teaching Achievement Test (40%) were effective in the end-of-term grades of the course. The achievement test was administered as a final exam through the distance education application used by the university. The online cooperative learning attitude scale was applied to the students via Google form as a post-test at the end of the implementation. Beyond recall, semi-structured interviews were held with 9 students in sessions planned on the Zoom platform in order to identify their views regarding the online collaborative practices.

3. Findings

3.1. Findings Regarding the First Sub-Problem

The first sub-problem of the study was "Is there a significant difference between the online cooperative learning pre-attitude-post-attitudes of the students learning at the online cooperative learning environment?". Although the sample of the study consisted of 44 students, 36 students' online cooperative learning attitude scale (OCLAS) pre-test and post-test scores were analyzed. Table 3 displays the descriptive statistics related to these students' OCLAS pre and post-tests.

Table 3.

OCLAS Pretest Posttest Descriptive Statistics

	N	Min	Max	$\bar{X}$	Sd	Skewness	Kurtosis
Pre-test	36	1.47	5	3.34	0.79	-.444	.197
Post-test	36	1.47	5	3.50	0.86	-.508	-.070

As is seen in Table 3, the minimum score obtained by the students in both pre-test and post-test regarding online cooperation attitudes was found as 1.47, and the maximum score as 5. The mean of the pre-test scores was 3.34 and the standard deviation was 0.79. The mean of the posttest scores was 3.50 and the standard deviation was 0.86. The skewness and kurtosis values were checked to identify whether the pre-test and post-test scores demonstrated a normal distribution. The fact that these values are between -2 and +2 indicates that the data have a normal distribution (Tabachnick & Fidell, 2007). Accordingly, the pre-test scores (skewness=-,444, kurtosis=,197) and post-test scores (skewness=-,508, kurtosis=-,070) showed normal distribution; therefore, dependent group t-test, one of the parametric tests, were used during data analysis.

Table 4.

Paired Samples t Test for OCLAS Pre and Post-Test

Test	*N*	$\bar{X}$	*df*	*t*	*p*
Pre-test	36	3.34	35	-1.276	.210
Post-test	36	3.5			

Table 4 suggests that the difference between the students' OCLAS post-test mean (X=3.50) and pre-test mean (X=3.34) was 0.16, meaning that there was no statistically significant difference (t(35) =-1,276, p>.05). In this regard, online cooperative teaching implementation did not have a significant effect on the students' online cooperative learning attitudes.

3.2. Findings Regarding the Second Sub-Problem

The second sub-problem of the study was "Is there a relationship between the online cooperative learning attitudes of students studying in an online cooperative learning environment and their course achievement?". The descriptive statistics related to the scores of 43 students whose data were obtained from the algebra teaching achievement test (ATAT) and the online cooperative learning attitude scale (OCLAS) post-test are presented in Table 5.

Table 5.

Descriptive Statistics for OCLAS Post-Test and ATAT

	N	Min	Max	$\bar{X}$	Sd.	Skewness	Kurtosis
OCLAS	43	1.47	5	3.32	0.86	-0.365	-0.391
ATAT	43	1.47	5	3.39	0.70	-0.323	0.963

As observed in Table 5, the minimum score obtained from the OCLAS post-test and ATAT was determined as 1.47, and the maximum score as 5. The mean score of COLAS post-test was 3.32 and the standard deviation was 0.86. The mean of the scores obtained from the ATAT was 3.39 and the standard deviation was 0.70. Since the scores obtained from the OCLAS post-test (skewness=-0,365, kurtosis=-0,391) and ATAT (skewness=-0,323, kurtosis=+0,963) were normally demonstrated, the correlation between test scores was analyzed through use of the Pearson correlation analysis, one of the parametric tests. According

to the result, no significant relationship was noted across students' online cooperative learning attitudes and their achievement in online cooperative learning ($p>.05$).

3.3. Findings Regarding the Third Sub-Problem

The third sub-problem of the study was "What are the views of students learning at an online cooperative learning environment regarding online cooperative learning application (CLA)?". The data obtained from eight pre-service teachers' views regarding online cooperative learning after the implementation were analyzed through descriptive analysis. In this vein, themes were organized and presented in line with the interview questions such as "the problems experienced in CLA", "best tasks in CLA", "incomplete studies in CLA", "contributions of CLA", "adequacy of google tools in CLA".

3.3.1 The Problems Experienced in CLA

The findings reveal that students experienced various problems during the online cooperative learning process such as access to the internet and technical inadequacy (S3, S5, S7), disagreement in task sharing (S5), indifference of groupmates (S1, S2, S4, S5), lack of communication within the group (S4), fear of presentation (S8), the intense group work (S3), and not being inclined to group work (S1, S3, S4). Only one student (S6) expressed that s/he did not encounter a situation that compelled him/her during the implementation process. here are some students' statements regarding the encountered problems:

S1: "It was a problem as I am more inclined to individual work. I was more active during the lesson when there was no group work. Now, I was active only during the presentation. I think the work was very good, everybody participated. What I observed was beneficial to those other than me…"

S3: "…You always wanted comments, you were saying that you should evaluate each other's ideas. Frankly, I had a difficulty with that. Most of the time, I was looking at google documents via my phone, yet I could not see the comments on the phone. I could only see the texts they shared…"

S8:"…at first, I had trouble in speaking in terms of presentation. There was a fear of whether I would make a mistake or whether I could answer the question immediately or think about it. Then I got over this fear…"

3.3.2 Best done tasks in CLA

Students explained the best-done tasks during the implementation as preparing a presentation (S1, S2, S8, S5), giving feedback on the shares of groupmates (S5, S7, S8), sharing resources with groupmates (S6, S7), and leading the task to start (S2, S4), fulfilling all responsibilities (S6), doing deep investigation (S5, S8) and group spokesperson (S3). The direct statements of some of the students regarding the subject are as follows:

S2: "Maybe the point where I was most successful was the organizing part. For instance, I was starting the presentation. Or I was saying let's do this, let's do that, we were proceeding that way. I was preparing the presentations most of the time …"

S6: "I didn't do anything to put my group mates in trouble. I did my homework on time, I attended my classes… I paid great attention these tasks. Apart from that, I shared the resources I found with my friends. I said I read it, you can read this part, and you can take advantage of it…"

S5: "…while preparing the presentation, I was constantly warning my friends about duration, and the order of the content. While I was reading the document, the same sentences were repeated in the paragraphs. I was deleting it from the presentation. Long texts were added to the document, and one would not have the patience to read it. I divided them, removed extra places and made additions. Namely, I paid great attention while preparing the presentation slides…"

3.3.3 Incomplete studies in CLA

The students stated the following as the studies they found themselves lacking during the implementation; providing a variety of resources (S3, S4, S5), detailed research (S2, S3, S4), communication (S1, S2, S4, S5), directing the group (S1, S2), giving feedback on the shares of groupmates (S2, S3, S4), reviewing group reports in the google classroom (S4). Three students (S6,S7,S8) stated that there were no incomplete tasks in practice. In this regard, some statements of the students coded S2, S3 and S4 are as such:

S2: "We had little communication with each other, everyone was struggling to complete their homework. There was no comment about whether it was right or wrong. If my friends had also examined my task and helped me, I could have commented on their task, criticized it, and corrected it together. My friends were too busy so we couldn't do them…"

S3: "…I did not have a source book. One of my groupmates just had one. Mostly we got the knowledge from this source book. I was mostly getting knowledge from the internet and articles. I could have done this more extensively, but we were having too many assignments…"

S4: "…I was only studying on which topic I was going to prepare that week. I was just learning about my own topic. Due to distance education and the intensity of my other courses, I did not review the group studies you uploaded to google classroom. Still, I could see the shortcomings. Otherwise, I could find more various documents, I could access information…"

3.3.4 The Contributions of the CLA

Students were of the view that online cooperative teaching enabled them to socialize (S1, S2, S3, S4, S6), facilitate their learning (S5, S6, S8), increase their courage to speak and present when they face the community (S1, S6, S7, S8), improve their research skills (S4, S5, S6, S7), increase their participation in the course (S5, S6), gain the ability to do group work (S1), increase their motivation (S5,S7), and gain a sense of responsibility (S2, S8). The following excerpts suggests some students' views regarding the contributions of CLA;

S1: "…I can say that making presentations increased my self-confidence. It also increased my active participation in other courses as well. I do not prefer group work, but I think it is socially positive, I was able to make new friends here…"

S5: "…I did not attend the other classes on time, I was watching the videos later. However, in the algebra class, I used to say that I had a class every Wednesday, I would make a presentation, I would listen to my friends and I would score accordingly. This was very motivating factor for me. I was so bored in other lessons that I could not get any efficiency since our teacher just read the slides. Your method was quite instructive.

S8: "…If we hadn't made these presentations, if you had just read them, maybe it would have hung in the air. We are here at the learning center and we are striving for something. This not only developed the sense

of responsibility more but it also beneficial in terms of learning. I had to examine other friends of mine as they had other ideas and ways of expression, which developed my mindset."

3.3.5 Views on Google Tools used in CLA

The findings also demonstrated that all of the students found the use of google tools (docs, slides, forms, sheets, etc.) appropriate and sufficient for online collaborative applications. Only one student (S3) had worked with these tools before, but this was not for the purpose of cooperation, whereas all the other students learned how to use google tools with this application for the first time. Here are some excerpts related to students' views on collaborative use of google tools:

S2: "…I liked it very much in terms of group work because it had a structure that showed exactly how responsibility was organized. It was very good because it was clear who wrote what, when it was entered, and even deleted items were obvious…"

S6: "… I never knew the Google document, the slide. I learned it for the first time in this course. I think they are better than Word document and PowerPoint. We were texting at the same time, or commenting or editing. I think it was perfect and ideal…"

S7: "Yes, it was definitely appropriate and sufficient. I learned all about this in this lesson for the first time. It enabled us healthy communication with our group friends. In fact, we had to do group homework in another lesson, and we preferred to use it. Because our feedback to each other was healthier. So, it was great for us to learn the slides and google docs …"

4. Discussion

According to Bailey and Card (2009), it is important for online instructors to prefer pedagogical approaches that focus on helping students collaborate with each other in the online course. Because in this way, it is possible to develop students' personal understanding of course content, connect students to learning resources and encourage student initiative. Considering these issues highlighted in the literature and the results of studies investigating the importance of collaborative learning activities in the online environment (Chatterjee & Correia, 2020; Chen, et al., 2006; Nam, 2014), it is expected, conducting online cooperative learning with innovative technologies, Google applications, has a positive effect on students. In this direction, this study aims to examine whether students' attitudes varied across online cooperative learning through online cooperative teaching application with the support of Google tools. The results depicted that students' online cooperative learning pre-attitudes were at a medium level with an average of 3.34, and their post-attitudes were at a high level with an average of 3.50. In the studies conducted by Alanazy (2011), Nam and Zellner (2011) and Korkmaz (2013), the results about the online cooperative learning attitude levels of university students are in line with that of the high post-attitude scores of the students in the current study. No statistically significant difference was identified despite an increase in students' attitudes towards online cooperative learning after the application compared to before.

The relevant literature covers studies (Erten, 2015, Yilmaz & Karaoglan-Yilmaz, 2020; Cankaya & Yunkul, 2018) that analyze students' online cooperative learning attitudes through making online cooperative applications just as in this study. Of these, only Erten (2015) examined the difference in students' pre- and post-attitudes towards online collaboration. In his study conducted with university students studying at Computer and Instructional Technologies Education, Erten (2015) used a virtual classroom environment and a web page to apply collaborative online to the experimental group. The results revealed no significant difference between students' online cooperative learning pre-attitude scores (X=3.06) and post-attitude scores (X=3.07). In the study conducted by Yilmaz and Karaoglan-Yilmaz (2020), the Moodle mobile

learning management system (MLMS) was used to create a computer-aided collaborative learning environment for university students.The study employed a posttest-control group experimental design; as a result, experimental group students' attitudes towards online cooperative learning were determined to be high, and that a significant positive difference was found compared to the control group. Cankaya and Yunkul (2018) used Edmodo to provide a collaborative learning environment for university students in a course taught in the Computer Education and Instructional Technologies Department. They administered online cooperative learning attitude scale to the students at the end of the lesson, and thus the students' attitudes were noted to be quite positive. The present study is similar to Erten's (2015) study in terms of no significant difference across students' attitudes before and after the experiment. Moreover, this study is in parallel to those of Yilmaz and Karaooglan-Yilmaz (2020) and Cankaya and Yunkul (2018) in terms of increasing students' attitudes from medium to higher level, despite not at a significant level. This present study and previous studies concluded that the results about the online cooperation attitude levels varied due to the differences in many variables such as the departments, their class levels and individual learning preferences, the technological applications used to ensure collaboration in the online environment and the students' previous experience of online collaboration. This study searched students' views after the application in order to explain why there was no significant increase in the students' final attitude scores due to the application.

Considering the quantitative findings of the current study and those of qualitative about the students' views, it is most likely that the students' approaches towards practice are quite positive. This may be due to the fact that even students with low attitude scores think that they are not inclined to cooperate in terms of learning style, but that the method actually contributes to their other friends. All of the students confirmed that they took certain advantages of the implementation. Similar to the view advocated in the literature, that cooperative learning techniques provide higher achievement, positive attitude towards the course and development of self-confidence (Stockdale & Williams, 2004) the interviewed students highlighted the advantages of doing group work in the online environment as more socialization, facilitating learning, providing self-confidence, and gaining research skills. Similarly, in a study conducted by Turaçoğlu (2011) on group work, pre-service teachers stated that they gained the ability to conduct scientific studies, show respect to their friends and communicate.

Based upon the students' views, cooperative learning, known as contributing to students in many different areas in the face-to-face environment (Arreguin-Anderson & Esquierdo, 2011; Gambari, et al., 2015), may be also effective in the online environment. Likewise, all of the students certified that google tools (docs, slides, forms, sheets, etc.) used during the application were quite convenient for online collaborative work and that learning these tools would make great contributions to their further educational activities. In a study (Hamutoğlu, 2018) supporting these views of students, an increase seemed in the cloud computing technology acceptance scores of students learning cooperatively with cloud computing technologies. Also, the relevant studies indicate that cloud computing technologies such as Google tools are welcomed by learners thanks to their flexible structure that facilitates sharing and interaction (Stevenson & Hedberg, 2013) in online collaborative learning environments (Chu & Kennedy, 2011; Lin, et al., 2014). In conclusion, the findings of the present study confirm the view that cloud computing technologies such as Google Docs have the potential to develop teaching methods based on constructivism and cooperative learning (Denton, 2012).

Students with a low level of attitude towards online cooperative learning enounced the difficulties they experienced during the application, especially due to the indifference of their groupmates and their tendency to individual study. In the study of Er and Aksu Ataç (2014), it was determined that some students did not want to work in a group due to different learning styles, and they believed that their learning, motivation and fluency of learning procedure would be damaged when they worked in a group. The findings of the current study once again showed that supporting students to receive education in accordance with their own learning styles is the best approach (Dunn et al., 1990). Although many studies say that working in

collaborative teams provides better learning compared to individual work (Hornby, 2009), some students may choose to work individually as it is easier and more comfortable (Dunn et al., 1989). In this study, in which cooperative teaching was applied, if a separate planning had been included for students who are prone to individual learning, the process could have been carried out more efficiently. It was of great significance for the students to fulfill their responsibilities towards their groupmates and to carry out a process based on communication and interaction in the smooth implementation of the implementation. Despite the constant emphasis on this, the interviews with the students outlined the presence of the students who had problems due to the indifference of the group members, in-group disagreement and poor communication.

The results also suggested the existence of technical problems during the implementation process. The results of previous studies indicate that technical problems caused by the internet and the device used (Olson & McCracken, 2014; Woltering et al., 2009; Akarasriworn, 2011) and personal problems (Asunka, 2009; Capdeferro & Romero, 2012) affected students' satisfaction levels with the online implementation and that they were a hindering factor in its successful execution. The current study concluded that the attitudes of the students who encountered these problems towards online collaborative practice decreased or remained the same compared to the pre-application. Among the interviewed students, those with low attitude levels found themselves lacking in many subjects such as acquiring various resources, deep investigation, communication, directing the group, examining and commenting on the studies of groupmates and communication, while a student with a medium level attitude found himself/herself lacking in communication and resource diversity. Students with higher attitudes, on the other, expressed that they were sufficient in every subject. Considering the best tasks students completed during the online application, students with low attitude levels fulfilled the subjects such as leading the group study on the Google document, preparing a presentation, group spokesmanship, while those with medium or high attitude levels succeeded in preparing presentations, giving feedback on the shares of their groupmates, sharing resources, fulfilling all responsibilities in a timely manner and making deep investigation.

These results indicate that students with a higher attitude towards online collaboration affirmed that they performed higher when performing their tasks in online collaborative practice. In this regard, the proper implementation of online collaboration is both a cause and a consequence of students' high desire and attitude towards online collaborative learning. The analysis of the changes in students' attitudes towards the method after the online cooperative application along with the reasons will facilitate taking the necessary precautions in the planning and execution of further instructional design. Another purpose of the study was to determine the relationship between students' achievement and their attitudes after their practical experience. Accordingly, no significant relationship was noted between the students' achievement in the Algebra teaching knowledge test and their attitudes towards online cooperative learning, which illustrates that some other individual differences may also be effective on students' achievement besides their attitudes towards the method they experienced. Along similar lines, Ghaith and Bouzeineddine (2003) revealed no relationship between students' perceptions of cooperative learning experiences and their achievement. Ghaith and Bouzeineddine (2003) also identified that low achievers enjoyed their cooperative learning experience more than their higher-achieving counterparts. This may arise from the fact that low-achieving learners are more comfortable in a supportive and motivating learning environment as opposed to being put in a more competitive whole class situation. These findings corroborate those of Gonzales and Torres (2016) who examined the relationship between students' reading comprehension scores and their attitudes towards cooperative learning. Thus, a positive attitude towards cooperative learning was found to have little or no effect on achievement. In the study conducted by Reda (2015), a strong negative relationship was determined between the attitude towards cooperative learning and academic achievement. That high-achieving learners did not gain any benefit from the low achievers was effective on the emergence of this result. It may be wise to mention that the students' academic achievement and their attitudes towards online cooperative learning do not directly affect each other.

5. Conclusion, Implication and Limitation

The findings revealed that the change in attitudes towards the method after the online cooperative practice was positive in general, yet some students' attitudes changed negatively due to the problems they experienced. The reason why the students in some groups experienced more problems may be that they created the groups themselves. Therefore, the determination of the strengths and weaknesses of the students before the application in terms of cooperation and the creation of more balanced and heterogeneous groups may reduce the problems that may be experienced. The instructors' consideration of the students' views on the method in the current study will guide them when planning online cooperative learning.

Also, no significant relationship was identified between achievement and attitude towards online collaboration; moreover, the underlying reasons were not revealed. Further research is recommended to study the reasons rather than just examining and generalizing the relationship between these variables. Since the number of studies on this subject is scarce, more studies will reveal whether the result is generalizable or not. Considering the gap in the relevant literature, the findings of this study are expected to contribute significantly to further studies on attitudes towards online cooperative learning.

This study has several limitations. Due to Covid-19 pandemic, exam was held in online platform. Yakar (2021) stated that online testing is problematic on reliability. In the literature, it is recommended to create heterogeneous groups in terms of gender, academic achievement, etc., in order to realize cooperative learning more effectively (Johnson, et al., 2013). It is thought that failure to provide this in the study may have an undesirable effect on the results.

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