A validity and reliability study of the Online Cooperative Learning Attitude Scale (OCLAS)

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ABSTRACT

Determination of students' attitudes towards online cooperative learning is an important issue, which has not been studied adequately. In the literature, there are few scales to measure the attitude towards online cooperative learning for which validity and reliability have been proven. The main purpose of this study is to develop an attitude scale in order to specify students' attitudes towards online cooperative learning. The sample group is composed of 599 students for the first application and 242 students for the second. In order to detect the validity of the scale, exploratory and confirmatory factor analyses, item factor total correlations, corrected correlations and item discriminations were conducted. In order to assess the reliability of the scale, the level of internal consistency and the stability levels were calculated. OCLAS is a five-point Likert-type scale and includes 17 items that can be gathered under 2 factors. The analyses provided evidence that the Online Cooperative Learning Attitude Scale (OCLAS) is a valid and reliable scale that can be used in order to determine students' attitudes towards cooperative learning in online environments.

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1. Introduction

The cooperative learning method, which is considered to be one of the most contemporary education methods, is one of the most original examples of teamwork (Slavin, 1995). Cooperative learning might be defined as small group activities through which students strive for both themselves and their friends to reach the highest levels (Veenman, Benthum, Bootsma, Dieren, & Kemp, 2002). When the literature is reviewed, it is possible to find much research suggesting that cooperative learning contributes to students' academic successes, social developments, thinking skills, self-confidence, learning, metacognition levels, problem solving skills, teamwork abilities, positive attitudes towards learning and courses and internal motivations (Hew & Cheung, 2008; Johnson, Johnson, & Smith, 2007; Jones & Issroff, 2005; Kumaran, 2009; Law, 2011; Nam & Zellner, 2011; Sharan, 2010; Veenman et al., 2002; Wang, Lin, & Sun, 2007; Yersilyurt, 2009; Yesilyurt, 2010; Zhi & Liu, 2007). It is also stated that cooperative learning is an education method that is widely preferred and accepted to be efficient at all levels of education (Johnson et al., 2007).

There are some requirements for every education method to be successful. The success of cooperative learning depends on whether all of the members participating in the group activity contribute to the cooperation. There are some crucial points in order to realize an effective cooperative learning environment. Nam and Zellner (2011), Veenman et al. (2002) and Yesilyurt (2010) stated that these were positive interdependence, individual responsibility and ensuring equal individual contribution.

As stated above, it is possible to mention many advantages of online cooperative learning. Nevertheless, it is also stated that students are generally reluctant to participate actively in group activities and this is threatening the success of the cooperative learning process (Korkmaz & Yesil, 2011; Nam & Zellner, 2011). Sometimes a few willing students fulfil nearly all the responsibilities of the group while the others evade their responsibilities. In such cases, it becomes quite difficult to evaluate the individual contributions made to the group product. In this case, the difficulties of evaluating every group member individually may become one of the most important problems facing cooperative learning activities in class (Nam & Zellner, 2011; Wang, 2010). In research conducted by Korkmaz and Yesil (2011), it was stated that this situation was the main factor that lay behind the reluctance and negative motivation for group activities. It can be said that this situation may negatively affect the three conditions that were stated above as having key roles for the success of cooperative learning.

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This problem might be solved by ensuring the equal contribution of all members of the group. Internet-based information technologies suggest many instruments in order to facilitate student activities and improve cooperative activities within a constructivist perspective in parallel with contemporary education approaches (Biasutti, 2011). In addition according to Biasutti and EL-Deghaidy (2012), online learning is a sector of education that is flourishing since it has several advantages for institutions and universities, such as the cut down of educational costs. Within this framework, online technologies such as discussion groups, Google documents, Web 2.0 technologies, social networking tools and mail groups might be used (Wang, 2010). It can be argued that the most important contribution of these kinds of technologies to cooperative learning activities is that they present the opportunity to gauge how much, when and how each member fulfils his/her responsibility while the group project is carried out. The cooperative environments created using these instruments can present a virtual social environment with an active learning perspective that will ensure that students understand and improve themselves better through social interaction (Amhag & Jakobsson, 2009; Biasutti, 2011; Biasutti & EL-Deghaidy, 2012). Besides, there is much research in the literature that suggests that these kinds of online virtual cooperative environments particularly improve students' satisfaction levels, positive perceptions and attitudes (Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007; Johnson, Hornik, & Salas, 2008; So & Brush, 2008).

In light of the explanations given above, it is possible to argue that one of the required conditions for the success of face-to-face or online cooperative learning environments is students' attitudes towards working in groups and cooperative learning. In this regard, it can be said that it is important to detect students' attitudes towards online cooperative learning. However, it is stated that attitudes towards online cooperative learning is a topic that has not been studied adequately (Johnson et al., 2007). Conducting this kind of research is obviously only possible by measuring attitudes towards cooperative learning. It is possible to encounter some scales developed in order to measure students' reactions (perception, attitude…) regarding face-to-face or online cooperative learning in the literature (Gottschall & García-Bayotms, 2008; Huang, Huang, & Yu, 2011; McLeish, 2009; Ramsay & Richards, 1997; Tseng, Wang, Ku, & Sun, 2010; Veenman, Kenter, & Post, 2000). However, there is not any standard scale which has been developed in order to measure students' reactions regarding online cooperative learning and of which validity and reliability studies have been conducted. Within the scope of research carried out by Nam and Zellner (2011), a 14-item survey was conducted in order to present students' online cooperative learning experiences but this research was limited to the survey's structural validity analyses. In this regard, in the literature, there is not any scale which has been particularly developed to measure attitudes towards online cooperative learning and for which validity and reliability have been proven. The aim of this research is to fill this gap in the literature and develop an attitude scale in order to specify students' attitudes towards online cooperative learning. A cooperative learning attitude can be defined as an inward feeling expressed by outward behaviour on this strategy which involves students in established, sustained learning groups or teams. Online cooperative learning application (OCLA) can be defined as an environment that is a learning-teaching process in an online area. It is thought that this scale will make important contributions to the literature since it will be the first scale in this sense.

2. Method

2.1. Sample

The study group of this research was composed of 599 students who were in the third and fourth grades (mean of age = 21.3, age range = 20–24) of computer education and instructional technology education departments of education faculties graduate degrees from eleven different universities in Turkey for the first implementation, and 242 students who were in the second grade (mean of age = 19.7 range of age = 19–22) of the same departments from eight different universities in Turkey for the second implementation. While exploratory factor analysis and other validity and reliability analyses were conducted on the data collected with the first implementation, confirmatory factor analysis was conducted on the data collected with the second implementation. All of the students have sufficient experience of online cooperative learning applications. Although these students are at different universities, according to the legal legislation in the teacher training process in Turkey, they have to receive courses with the same content in a similar way. Cooperative learning tasks applied to these students are very similar to each other. Students are required to present group projects as a requirement of the programming language I and II courses they take in 3rd and 4th grades. These group activities can be performed both as face-to-face in-campus applications and by using online project manager applications out-campus. Likewise in Instructional Material Design and Instructional Design courses that they are required to take in the same grades there are similar group activities. These activities are implemented both as face-to-face in-campus applications and by using online applications. In online applications of such courses Google document and open learning systems of universities can be benefited. In Distance Education course offered during 5th semester it is possible to gain basic skills involving distance education, blended learning and web-aided learning and also implement distance education applications. All these activities together gain students online cooperative learning experience starting from the 3rd semester. The distribution of the study group according to universities, grades and genders are summarized in Table 1.

2.2. Development process of the scale

During the development process of the scale an initial literature review was performed (Gottschall & García-Bayotms, 2008; Huang et al., 2011; McLeish, 2009; Nam & Zellner, 2011; Ramsay & Richards, 1997; Tseng et al., 2010; Veenman et al., 2000). In this regard, the scales prepared in order to measure interests, attitudes and thoughts towards cooperative learning in face-to-face environments were examined. The appropriate items of these scales were adapted. For example, the "CL groups improve social skills" (Ramsay & Richards, 1997) item was adapted as "OCLA improves my social skills". The "I like helping others learn" (Ramsay & Richards, 1997) item was adapted as "I enjoy helping others in OCLA". The "When I work together I achieve more than when I work alone" (McLeish, 2009) item was adapted as "I think that I have had/will have more successful results since I work with a group in OCLA". Besides this, the research that examined the general characteristics, features, expected benefits and limitations of cooperative learning in the literature (Biasutti, 2011; Veenman et al., 2002; Yesilyurt, 2010) was analyzed and the conclusions obtained were added to the item pool appropriately. In addition, 22 students who had online cooperative learning experiences were asked to write freely about their thoughts on cooperative learning in online environments and these texts were analyzed and added to the item pool appropriately. These students used an online project management website as the

Table 1
The distribution of the study group according to universities, grades and genders.

Universities	I. Implementation					II. Implementation		
	3rd class		4th class		Total	2nd class		Total
	Female	Male	Female	Male		Female	Male	
A. Kocatepe Un	18	12	14	17	**61**	19	18	**37**
Ahi Evran Un	21	16	11	23	**71**	17	19	**36**
Amasya Un	18	12	14	5	**49**	18	7	**25**
Anadolu Un	12	19	10	13	**54**	0	0	**0**
Atatürk Un	9	11	8	8	**36**	0	0	**0**
Bahçeşehir Un	9	16	8	12	**45**	0	0	**0**
Gazi Un	26	21	7	12	**66**	9	16	**25**
Kırıkkale Un	21	20	13	13	**67**	34	29	**63**
M. Akif Ersoy Un	19	24	13	9	**65**	14	19	**33**
METU	14	12	4	18	**48**	5	4	**9**
Uludağ Un	13	7	7	10	**37**	6	8	**14**
Total	**180**	**170**	**109**	**140**	**599**	**122**	**120**	**242**

cooperative environment. They are at the same university, not campus students and have the same experience with cooperative learning. They are master degree students and this master program is carried out online. The mean age of these students is 27.7 and 13 of these students are female and 9 male. In addition, 8 students in this group have been working as online content development expert in private companies. The item pool created in this way was examined, both in terms of the coinciding items and content validity by three faculty members, two of whom were education technologists and one of whom was a psychological counselling and guidance expert. Then, a Turkish language expert was consulted and the obscure expressions or expression errors in the items were corrected.

A 30-item pool was formed with the student views, information gathered from the literature and the contributions of area experts. Eighteen of the items in this pool consisted of positive statements and 12 consisted of negative statements. A range of 5-point choices were placed for the items in order to specify the students' attitude levels expressed in the items. These choices were organized and graded as "(1) never", "(2) seldom", "(3) sometimes", "(4) generally" and "(5) always".

The scale draft was examined by the 22 students whose opinions had been taken before and the scale draft was finalized after investigating how the students perceived each item, whether they had difficulties in understanding, and reexamining the items that were not understood or misunderstood. The finalized scale was transmitted to the electronic environment and published online. One faculty member of the computer and educational technologies teaching department from each education faculty within the study group was asked for help, and with the supervision of these faculty members, the scale was applied to the third and fourth grade students in the first implementation. After the exploratory factor analysis was completed, the scale was applied to the second grade students as well. The data collected electronically were uploaded to SPSS 15.00 and AMOS 16 programs in order to statistically conduct the validity and reliability analyses of the scale. The values regarding negative statements were reverse coded while being uploaded to the programs.

2.3. Data analysis

As part of the statistical analyses, KMO and Bartlett test analyses were carried out on the data collected with the scale. The fact that the KMO value was over .90 is interpreted as the data set being perfectly appropriate for factor analysis (Russell, 2002). In addition, it is seen that the null hypothesis was rejected with a significance level of .05 according to the Bartlett test values, which are known to be the unit matrix of the correlation which it tests (Büyüköztürk, 2002; Eroglu, 2008).

In light of the values obtained, exploratory and confirmatory factor analyses were conducted on the data, the scale's allocation to factors was specified through principal component analysis and the factor loads were examined using the Varimax rotation method. The items with factor loads lower than .30 and the items that do not have at least .100 difference between their loads on two factors, or in other words, the items with loads separated into two factors, should be removed (Büyüköztürk, 2002). As a matter of fact, the fact that the factor loads of the items in the scale are over .30 and at least 40% of the general variance is explained is found to be sufficient for the behavioural sciences (Büyüköztürk, 2002; Eroglu, 2008; Kline, 1994; Scherer, Wiebe, Luther, & Adams, 1988).

The scale form obtained with the exploratory factor analysis was applied to a new study group other than the study group with which the first implementation was conducted and a confirmatory factor analysis was conducted on the collected data. The maximum likelihood method was used in the confirmatory factor analysis. In the structural equation model, it is generally recommended to report more than one adaptive value (Thompson, 2000). For this reason, five adaptive values were reported in this research. In the scale model obtained as the result of the confirmatory factor analysis, having the observed values between the ranges of $\chi^2/d < 3$; $0 < RMSEA < .05$; $0 \leq S\text{-RMR} \leq .05$; $.97 \leq NNFI \leq 1$; $.97 \leq CFI \leq 1$; $.95 \leq GFI \leq 1$; $.95 \leq AGFI \leq 1$ and $.95 \leq IFI \leq 1$ indicates a perfect fit, while having them between the ranges of $\chi^2/d < 5$; $.06 \leq RMSEA < .08$; $.06 \leq S\text{-RMR} \leq .08$; $.90 \leq NNFI \leq .96$; $.90 \leq CFI \leq .96$; $.90 \leq GFI \leq .96$; $.90 \leq AGFI \leq .96$ and $.90 \leq IFI \leq .96$ indicates an acceptable fit (Kline, 2005; Şimşek, 2007, pp. 18–71).

Item discrimination of the items that were left in the scale after factor analysis was tested with the sample t test, their item-total correlations were tested with Pearson's r test and the scale's validity was specified. Finding the correlations between the scores obtained from each item and the scores obtained from the factor of the item was used as a criterion for understanding each item on the scale's level of serving the general purpose of the factor (Balci, 2009). Another value that can be observed in terms of testing an item's level of serving the general purpose is corrected correlations. The fact that the corrected correlation coefficients are over .20 means that an item can serve the purpose of the factor at a significant level (Tavşancıl, 2010). These coefficients are validity coefficients of each item and indicate the item's consistency with the whole scale, in other words, the item's level of serving the scale's general purpose (Carmines & Zeller, 1982). Discrimination is accepted as one of the most important proofs used in determining the validity of a scale (Büyüköztürk, 2002). Another way

of testing a scale's discrimination is to observe the differentiation between the lowest 27% of groups and the highest 27% of groups after sorting raw scores obtained from an item from the highest to the lowest.

In order to determine the scale's reliability, stability tests were conducted with internal consistency coefficients. The Cronbach alpha reliability coefficient, the correlation value between two congruent halves, the Sperman–Brown formula and Guttmann split-half reliability formula were used in order to determine the internal consistency level. A reliability coefficient that is higher than .70 is accepted as an indication of the scale's reliability (Büyüköztürk, 2002; Gorsuch, 1983). The stability level of the scale was calculated by determining the correlation between the results of two implementations; the second one was carried out five weeks after the first one. As is known, a reliable measurement instrument is required to make stable measurements (Balci, 2009). In addition, reliability is related to the stability, consistency and sensitivity of the scale. For this reason, these values stated as stability coefficients are evaluated as proof for the reliability of the scale (Hovardaoğlu, 2000). It increases as the reliability coefficient indicating the consistency level approaches 1.00 and decreases as it approaches .00 (Gorsuch, 1983). As known, the values between .00 and .30 generally indicate a low correlation, the values between .30 and .70 indicate a medium correlation and the values between .70 and 1.00 indicate a high correlation for correlation coefficients (Büyüköztürk, 2002).

3. Results

3.1. Findings regarding the validity of the scale

Within the scope of the validity of the Online Cooperative Learning Attitude Scale (OCLAS), the structural validity, item-total correlations, corrected correlations and item discrimination were examined and the findings are presented below:

3.1.1. Structural validity
3.1.1.1. Findings regarding the exploratory factor analysis. In order to test the structural validity of the OCLAS, firstly Kaiser–Meyer–Oklin (KMO) and Bartlett tests were applied to the data and their results were found to be KMO = .937 and $\chi^2 = 15916.32$; df = 1176 ($p = .000$) for the Bartlett test. In terms of these values, it was seen that factor analysis could be conducted on the 30-item scale.

In the first place, principal component analysis was conducted in order to determine whether the scale was one-dimensional. Then the Varimax rotation method was used according to the principal components. In line with this, after 10 items with less than .30 item load and 3 items the loads of which were distributed to different factors, in total 13 items were removed from the scale, the factor analysis was applied to the remaining items again. The obtained item pool was again examined by two education technologists in order to prevent the disruption of content validity due to the removed items. These two education technologists independently analyzed the new item pool in the sense of the measurement adequacy of students' attitudes towards online cooperative learning and evaluated whether the scale had content validity or not. The evaluations of both of these education technologists show that this item pool has content validity. After the area experts stated that the content validity was not affected by the removal of these 13 items, other analyses were conducted.

After these processes, it was seen that the remaining 17 items in the scale were distributed under two factors. It was found that the KMO value of the final 17-item scale was .936 and the Bartlett values were $\chi^2 = 4161.700$; df = 136; $p < .001$. It was seen that the unrotated factor loads of the remaining 17 items were between .436 and .653 while the rotated factor loads after the Varimax rotation method was applied were between .640 and .773. In addition, it was specified that the items and factors in the scope of the scale explained 51.50% of the total variance. In the next step, the contents of the items in the factors were examined and factor names were given. Under the factor named "Positive Attitude" which is gathered all the positive items, there were 11 items and under the factor named "Negative Attitude" which is gathered all the negative items, 6 items were placed. The Kaiser (1960) rule is the most often used procedures to determine the number of components. According to Kaiser (1960) each observed variable contributes one unit of variance to the total variance. If the eigenvalue is greater than 1, then each principal component explains at least as much variance as 1 observed variable. According to the Kaiser Criterion examined eigenvalues, the scale is confirmed by the above-mentioned two-factor structure.

After these processes, the findings regarding the item loads per factors, the eigenvalues and variance explaining the percentages of the factors for the remaining 17 items are presented in Table 2.

As seen in Table 2, the "Positive Attitude" factor of the scale includes 11 items and the factor loads vary between .640 and .727. The eigenvalue of this factor within the general scale is 5.3340 and its contribution to the general variance is 31. 410%. The "Negative Attitude" factor includes 6 items. The factor loads of the items vary between .659 and .773. The eigenvalue of the factor within the general scale is 3.415 and its contribution to the general variance is 20.086%.

3.1.1.2. Findings regarding confirmatory factor analysis. Confirmatory factor analysis was applied to the data collected from 242 students other than the sample from which the data was used for exploratory factor analysis for confirming factor structures of the scale, which was found to be comprised of 2 factors as the result of exploratory factor analysis collected.

As the result of the confirmatory factor analysis conducted using the maximum likelihood method without any limitations, the worth of fit values was found to be $\chi^2_{(df = 118, N = 242)} = 202.808$, $p < .001$, RMSEA = .055, S-RMR = .045, GFI = .91, AGFI = .91, CFI = .99, NNFI = .98 and IFI = .99. According to these values, it can be said that GFI and AGFI observable fit values indicate an acceptable fit and the other observable fit values indicate a perfect fit. In other words, this obtained model indicates that the factors are confirmed by the data. The factorial model and values regarding factor–item relation of the scale are presented in Fig. 1.

3.1.2. Item factor total and corrected correlations
In this section, the correlations between the scores obtained from each item and the scores obtained from the factors with the item total correlation and corrected item correlation method were calculated and each item's level of serving the general purpose was tested. The item–factor correlation values and corrected correlation values for each item are presented in Table 3.

As seen in Table 3, the item test correlation coefficients vary between .645 and .748 for the first factor and vary between .503 and .699 for the second factor. Each item is in a significant and positive relationship with the general factor ($p < .000$). Besides, as seen in Table 3, the

Table 2
Factor analysis results of the scale as per factors.

Items				Common factor variances	F1	F2
Positive attitude	I1	I enjoy solving problems regarding the group project using Online Cooperative Learning Application (OCLA) with my group members.		.480	.657	
	I2	Being interactive with the other group members using OCLA increases my motivation for learning.		.487	.640	
	I3	I enjoy experiencing cooperative learning using OCLA with my group members.		.558	.707	
	I4	Online group activity increases our creativity.		.560	.716	
	I5	I believe that the group can work on a document effectively with the online cooperative learning application.		.436	.654	
	I6	OCLA improves my social skills.		.470	.676	
	I7	I enjoy helping others in OCLA.		.452	.641	
	I8	OCLA is very entertaining for me.		.540	.727	
	I9	OCLA helps me feel better psychologically.		.519	.700	
	I10	More ideas come up as a result of OCLA.		.486	.656	
	I11	I think that I have had / will have more successful results since I work with a group in OCLA.		.544	.659	
Negative attitude	I12	Trying to teach something to my group members in OCLA makes me tired.		.526		.723
	I13	OCLA does not make any sense to me.		.653		.773
	I14	I cannot develop my own ideas in OCLA.		.521		.684
	I15	I don't like that people are depending on me in OCLA.		.483		.672
	I16	I don't think that my interaction with my group members in OCLA will make any contribution to me.		.469		.661
	I17	OCLA is not suitable for me.		.570		.659
Eigenvalue					5.340	3.415
Explained variance					31.410	20.086

corrected correlations between each item and the factor that it belongs to vary between .597 and .679 for the first factor and between .538 and .687 for the second factor. In this regard, it can be said that each item serves both the general purpose of the factor that it belongs to and the general purpose of the scale.

3.1.3. Item discrimination

The discrimination power of the items in the scale was calculated. For this reason, firstly, the raw scores obtained from each item ranged from highest to lowest and then, the lowest and highest groups which formed the lowest 27% and the highest 27% and both of these which included 161 people were determined. The t test values of the independent groups were calculated with the total scores in the group. The findings regarding the t test values and significance levels of the discrimination powers are presented in Table 4.
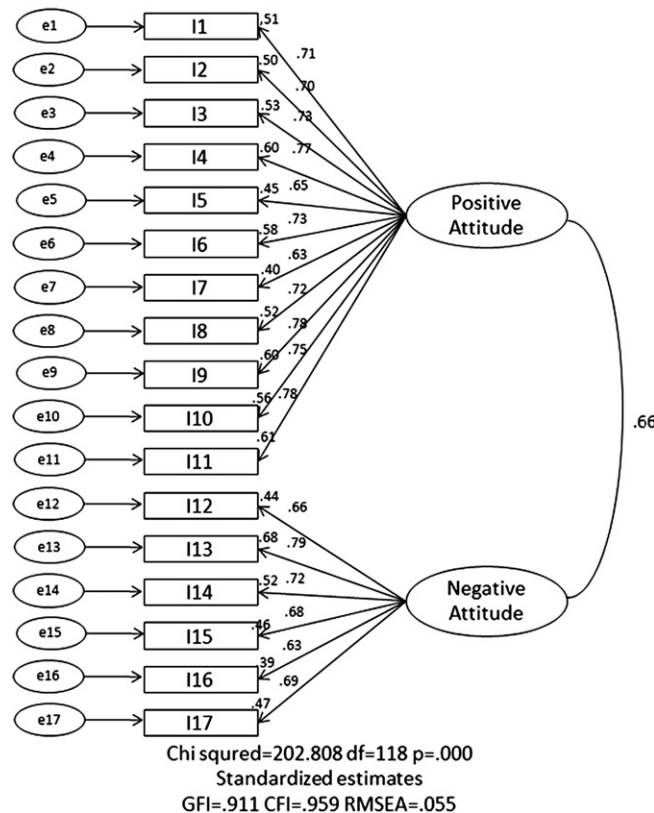

Chi squred=202.808 df=118 p=.000
Standardized estimates
GFI=.911 CFI=.959 RMSEA=.055

Fig. 1. Confirmatory factor analysis diagram of the scale.

Table 3
Item-factor scores correlation analysis.

Items factor total correlation (N = 599)				Items corrected correlation (N = 599)			
F1 (positive attitude)		F2 (negative attitude)		F1 (positive attitude)		F2 (negative attitude)	
Items	r	Items	r	Items	r	Items	r
I1	.690**	I12	.503**	I1	.617	I12	.541
I2	.696**	I13	.663**	I2	.619	I13	.687
I3	.744**	I14	.605**	I3	.679	I14	.590
I4	.748**	I15	.567**	I4	.679	I15	.556
I5	.645**	I16	.556**	I5	.567	I16	.538
I6	.683**	I17	.699**	I6	.600	I17	.620
I7	.676**			I7	.597		
I8	.726**			I8	.648		
I9	.721**			I9	.645		
I10	.698**			I10	.624		
I11	.732**			I11	.664		

$^{**}p < .001$.

In Table 4, it can be seen that the independent sample t test values regarding the 17 items, the factors and the total score in the scale vary between 12.265 and 19.597. The t value for the general scale was found to be 44.067. The level of each difference determined is significant ($p < .001$). In this regard, it can be said that both the general scale and each item of the scale have high item discrimination power.

3.2. Findings regarding the reliability of the scale

In order to calculate the reliability of the scale, internal consistency and stability analyses were conducted on the data. The processes that were performed and the results are given below:

3.2.1. Internal consistency level
The scale's factor and whole reliability analyses were conducted using Cronbach's alpha reliability coefficient, the correlation value between two congruent halves, the Sperman–Brown formula and Guttmann split-half reliability formula. The reliability analysis values for each factor and for the general scale are summarized in Table 5:

As seen in Table 5, the scale's (that had 2 factors and 17 items) two congruent half correlations were found to be .655; the Sperman–Brown reliability coefficient was found to be .792; the Guttmann split-half value was found to be .786 and Cronbach's Alpha reliability coefficient was found to be .904. On the other hand, it is seen that factors' congruent half correlations were .789 and .700; Sperman–Brown values were .882 and .823; Guttmann split-half values were .878 and .823 and Cronbach's Alpha values were .899 and .822. In this regard, it can be said that both factors and the general scale can make consistent measurements.

3.2.2. Stability level
The stability level of the scale was calculated using the test–retest method. The 17-item final form of the scale was re-applied to 37 students, to whom the scale had been applied, after five weeks. These 37 students were voluntary senior students at the same institution and department of computer education and instructional technology. There are many barriers to reach many more students for retesting. However, these 37 students at Uludag University could be reached easily. In any case, it can be said that 37 participants are enough for parametric analyses. The correlations between the obtained scores after each application were examined, both in terms of the general scale and each item in the scale. Therefore, both the general scales and each item's ability to make stable measurements were tested and the findings are summarized in Table 6.

In Table 6, it is seen that each item's correlation coefficients obtained with the test–retest method vary between .428 and .765 and each correlation is significant and positive. In addition, it is seen that the factors' correlation coefficients obtained with the test–retest method vary between .892 and .856; the correlation of the total score is .965 and each correlation is significant and positive ($p < .001$). In this regard, it can be said that the scale can make stable measurements.

Table 4
Item discrimination powers.

F1 (positive attitude)		F2 (negative attitude)	
Items	t	Items	t
I1	15.168	I12	12.265
I2	16.619	I13	18.850
I3	17.961	I14	18.944
I4	19.597	I15	15.209
I5	14.835	I16	15.006
I6	15.465	I17	20.680
I7	15.315	**F1**	**30.282**
I8	15.566	**F2**	**28.447**
I9	15.214	**Total**	**44.067**
I10	16.026	**df: 320; p < .001**	
I11	18.291	**N = 599**	

Table 5
Reliability analysis results considering the whole of the scale and its factors.

Factor	Number of items	Two congruent halves correlation	Sperman–Brown	Guttmann split-half	Cronbach's alpha
Positive attitude	11	.789	.882	.878	.899
Negative attitude	6	.700	.823	.823	.822
Total	17	.655	.792	.786	.904

Table 6
Test–retest results of the items of the scale.

Items	r	Items	r
I1	.554**	I10	.719**
I2	.547**	I11	.618**
I3	.543**	I12	.765**
I4	.725**	I13	.588**
I5	.439**	I14	.693**
I6	.428*	I15	.727**
I7	.698**	I16	.613**
I8	.489*	I17	.516**
I9	.500**	**F1**	.892**
F2	.856**	**Total**	.965**
N = 37			

$^*p < .05$, $^{**}p < .001$.

4. Discussion

In this research, a scale was developed in order to determine students' attitudes towards cooperative learning in online environments. OCLAS is a five-point Likert-type scale and includes 17 items that can be gathered under two factors. According to Nam and Zellner (2011) effective cooperative learning has several important components: 1) positive interdependence, 2) individual accountability, and 3) group processing for equal individual contribution. Nonetheless in relevant literature as factor structures of the scales designed to measure students' attitudes towards cooperative learning are analyzed it is realized that rather than general components stated hereinabove there are factors directed to positive and negative perception or attitude. For instance in factors used by Veenman et al. (2002) in "student teacher perceptions of cooperative learning scale" the items are such: "willingness to use CL", "benefits of CL for pupils", "positive attitudes towards CL" and "positive attitudes towards workgroup management". As Group Work Attitude Scale developed by Gottschall and García-Bayotms (2008) is examined it surfaces that it has a dual-factor structure as "negative aspect of group work" and "positive aspect of group work". It has also been determined that the scale developed by McLeish (2009) to measure cooperative learning attitudes of students has single-factor structure and all items are positive. Accordingly it has been deemed appropriate to name two factors in OCLAS-taking the items summed in factors into account as well as "positive attitude" and "negative attitude".

Item total correlations and corrected correlations were calculated and it was found that each item and each factor in the scale significantly served the purpose of measuring the feature that was expected to be measured with the general scale. In addition, the item discrimination powers were investigated by examining the t values regarding the difference between the highest 27% and the lowest 27% groups and it was determined that both the general scale and each item in the scale had high discrimination power, in other words each item was discriminatory at the expected level. The scale's internal consistency coefficients were calculated and it was found that the scale could make reliable measurements. In order to specify the scale's level of time invariance, the test–retest method was applied using the data collected from the applications conducted in a five-week interval and it was found that each item and each factor in the scale could make stable measurements in terms of time invariance.

Determination of students' attitude towards online cooperative learning has critical importance in the sense of the success of learning-teaching activities in online cooperative learning environments (Nam & Zellner, 2011). According to Korkmaz (2012) regardless of all learning environments, the actualization of learning depends on a good number of factors one of them which can be stated as the attitude towards learning which indicates the willingness to learn. Given the learning-instruction processes and their effectiveness, it is important to know about the affective characteristics of students such as their interest and attitude towards information technologies and academic subjects (Petty & Cacioppo, 1996). According to Liaw, Chen, and Huang (2008) understanding learners' attitudes towards web-based collaboration learning is a crucial issue in enhancing learning effects. In this frame, before online cooperative learning applications, the process of instructional design can be directed in light of findings obtained with this scale. Furthermore, this assessment instrument can be used in prediction studies about different variables which may have an effect on the attitude of students towards online cooperative learning. In addition to this, this assessment instrument can be used as a pre-test and post-test in experimental studies which are designed in order to determine the ways of developing students' attitudes towards online cooperative learning.

As a result, it can be said that the OCLAS is a valid and reliable scale that can be used in the determination of students' attitude towards online cooperative learning. However, validity and reliability studies of the assessment instrument are restricted only to 841 students of Computer and Instructional Technologies Teacher Education. It can be suggested that validity and reliability studies should be repeated in order for the scale to be used in different stages of education.

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