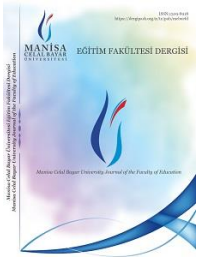
Manisa Celal Bayar University Journal of The Faculty of Education
ISSN: 1309-8918

2024, Vol. 12, No:1



Evaluating the Usability of a Virtual Classroom Application from the Educator Perspective

Alper ŞİMŞEK[1], Şeval BİLGİ BATAR[2], Mustafa Serdar SAYPINAR[3] , Feyzanur ÇAKMAK[4]

Abstract

The purpose of this research is to reveal the usability of virtual classroom application, which is used for synchronous lessons, in terms of effectiveness, efficiency, and satisfaction. A user-based approach was applied in order to collect quantitative data in this mixed method research. The effectiveness and efficiency of the system were revealed on the basis of 13 authentic tasks considering the status of the instructors performing the tasks, the number of critical mistakes they made during the tasks, and the time they spent on completing the tasks. The satisfaction of instructors with the virtual classroom application was determined through the SUS-satisfaction scale, observations during user tests, and interviews. A total of 12 instructors were in the data collection process. According to the findings, the completion rate of two of the seven tasks was over 90%. However, the successful completion rate of the total of six tasks was limited to 20%. It was also determined that the number of errors in the remaining 11 tasks exceeded the ideal number of operations and the completion periods were considerably longer. Overall results of the study revealed that the educator satisfaction levels for the Adobe Connect virtual classroom application were quite low.

Keywords
Usability
User-based approach
Virtual classroom
User satisfaction

Received 10.10.2023 **Accepted** 26.03.2024 | **Research Article** |

Suggested APA Citation:

Şimşek, A., Bilgi Batar, Ş., Saypınar, M. S. & Çakmak, F. (2024). Evaluating the usability of a virtual classroom application from the educator perspective. *Manisa Celal Bayar University Journal of the Faculty of Education, 12*(1), 46-65, https://www.doi.org/10.52826/mcbuefd.1373470

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INTRODUCTION

Online learning, which has different names and definitions in the literature, is basically explained as a form of learning that is carried out synchronously or asynchronously through the internet, by planning the individual's own learning, without time or place restrictions (Babuçoğlu, 2006; Demir, 2013). Online learning is widely preferred for reasons of providing flexible education, being independent of time and place, having low cost (Ilgaz, 2018; Turan & Canal, 2011), and offering theoretically unlimited information and synchronous education opportunities (Bulun, Gülnar & Güran, 2004; Horzum, 2019). Online learning is a web environment where all kinds of interactions are provided (teacher-student, student-student, student-content), all educational activities are carried out, messaging, live lessons and exam applications are presented, and participation can be achieved synchronously or asynchronously (Çalışkan, 2019). One of the most important elements of learning in online education platforms is the interface, where student-teacher, student-content, and student-student interactions are provided. Systems with highly usable interfaces are expressed as one of the basic parameters that affect educational outcomes in the e-learning process (Dreheeb, Basir & Fabil, 2016). Similarly, systems with interfaces that match the user's expectations are accepted as an important predictor of satisfaction in e-learning (Freeze, Alshare, Lane, & Wen, 2010). It is of great importance that the interface be readily usable by everyone. Therefore, the interface should allow users to navigate the Learning Management System (LMS) easily. In addition, systems with high interaction and usability interface are preferred more by users (Kaysi & Aydemir, 2017).

Various studies are carried out on the usability of the systems in order to find out to what extent online learning environments can respond to teacher-student needs and expectations (Erdoğdu, Kokoç, Pinal, Bilgi, & Murat, 2015). Nielsen and Nielsen (2000) defined usability as a quality indicator that measures how easily interfaces can be used and methods developed to increase ease of use during design. In another definition, usability is expressed as the effectiveness, efficiency and satisfaction level of a product determined to achieve the intended goals by users (ISO, 1998). Effectiveness means that users can perform the skills in the desired tasks; efficiency is the effort, time, cost and number of errors spent to perform the tasks, and satisfaction expresses the feelings and ideas created during the use of the system (Çoban, 2016). Studies on the usability of online learning systems contribute significantly to the learning activities carried out on these platforms (Koohang, 2004; Meiselwitz & Sadera, 2008). The design of highly usable interfaces in this direction increases the satisfaction of instructors and students in teaching activities conducted through online teaching systems (Shneiderman, 1998; Şengel & Özdemir, 2012).

There are many widely used online learning environments such as Moodle, Blackboard, Webct, Angel, Adobe Connect, etc. (Çoban, 2016). One of these applications is Adobe's virtual classroom application Connect. More than 2.5 million people and almost 15,000 customers worldwide use the Adobe Connect virtual meeting application. Adobe Connect is a flexible and comprehensive online learning platform where users can connect with any web browser (İzmirli & Akyüz, 2017). It has many features such as sharing and presenting documents, sharing computer screen, web pages, and whiteboards, video, and audio sharing, recording events, and sending public and private messages through chat part (Birogul, Özkaraca, Isik & Karacı, 2010). All these features are integrated in the virtual classroom application that allows synchronous education (Dikbaş Torun, 2013). The presence and usability of the features needed in the virtual classroom application firmly affect both student and teacher satisfaction in the teaching process (Çalışkan, 2019).

Various approaches are used to evaluate the usability of the interfaces. In-process usability tests are used to shed light on and contribute to the design process of the interfaces and end-of-process tests are used to evaluate the final version of the interface. Either test type can be preferred in the development process of interfaces but using both in-process and end-of-process tests together prevents many usability problems that may arise (Çağıltay, 2018). Apart from checking and evaluating interfaces with existing design guides, tests with usability experts and user-based usability tests, which include testing users with real tasks in practice, are considered the most common testing approaches. However, the user-based approach offers more effective results in terms of reaching more objective data

on the system and the usability of the interfaces (Çağıltay, 2018). The user-based approach allows to evaluate all physical (cursor movements, gestures and facial expressions, verbal feedback) movements of the users and, if provided with appropriate technology, eye movements and brain activities as a data source while using the system or interface in the real environment. The usability of various online systems has been studied on the basis of these approaches. In the studies carried out, the usability of the interfaces in many web pages (Dalcı, Alçam, Saatçioğlu & Erdal, 2008; Özçelik, Kurşun & Çağıltay, 2006; Ateş & Karacan, 2010; Turan & Canal, 2011; Yeniad, Güzin Nazman, Tüzün & Akbal, 2011) and educational environments (Bayram & Yeni, 2011; Meiselwitz & Sadera, 2008) was examined.

There are different studies examining the teaching activities in the distance education process, which includes the Adobe Connect virtual classroom application. It is noteworthy that these studies on the evaluation of the environment and process are mostly carried out with qualitative approaches and focus on general evaluation of the distance education process. For example, Caliskan et al. (2020) determined the views of 15 instructors who conducted their lessons through distance education technologies due to the pandemic, regarding the use of Adobe Connect during the distance education process through semi-structured interviews, and made suggestions for the improvement of the system. The results revealed that the instructors who used the Adobe Connect virtual classroom application for the first time did not have sufficient knowledge, and they had difficulties in using the application, communicating and interacting with the students. In another study, Duman (2020) evaluated the distance education process in which Adobe Connect virtual classroom application was used, through the opinions of 28 teacher candidates studying in different departments of the education faculty. The research revealed that the high level of satisfaction due to the compatibility of the Adobe Connect virtual classroom application with mobile phones decreased due to the limitations in the interaction. Şahin and Nihan (2019) studied with five different instructors who had been teaching distance education in higher education for about seven years and concluded that student participation in synchronous history lessons using Adobe Connect virtual classroom application and student satisfaction decreased over time, which, as they emphasized, was due to the problems arising from the internet as well as the inadequacy of the application's interactive features.

Erdoğdu et al. (2015) conducted a study with pre-service teachers to determine the usability of the Adobe Connect virtual classroom application in the dimensions of effectiveness, efficiency and satisfaction. In their research, the effectiveness and efficiency dimensions of the virtual classroom application were examined through the authentic tasks prepared for the application, while the satisfaction dimension was analyzed with the satisfaction scale available in the literature. They concluded that the Adobe Connect virtual classroom application was at a medium level in terms of effectiveness, weak in terms of efficiency, and that the level of participant satisfaction was low.

In literature on user satisfaction in e-learning, the effect of interfaces on user satisfaction is mostly explained through user feedback. So, the effectiveness and efficiency components of the interface are presented in the light of qualitative data. The number of user-based researches carried out by including authentic tasks related to the interface is quite limited. Also, research on the usability of the Adobe Connect virtual classroom application in terms of educators is limited in the literature. Therefore, there is a need to understand the usability of the Adobe Connect virtual classroom application in the context of the instructor, where the lessons are conducted in the emergency distance education process, so as to contribute to the usability of the application, the satisfaction of the instructors, and the quality of the concurrent lessons. Therefore, the results of a user-based study with instructors on the usability of the Adobe Connect virtual classroom application are believed to provide implications for designers, practitioners and users.

This study set out to evaluate the usability of the Adobe Connect virtual classroom application, which is used for synchronous lessons in distance education, in the context of effectiveness, efficiency and satisfaction and to offer solutions to the identified usability problems. The answers to the following research problems were sought:

1. What are the levels of instructors to successfully complete the usability tasks for the virtual classroom implementation?

2. What is the duration of the tasks completed by the instructors in the virtual classroom application and the number of mistakes they make in this process?
3. What are opinions of the instructors as for satisfaction with the virtual classroom application?

METHOD

Research Design

This study used mixed-design research method to evaluate the usability of Adobe Connect virtual classroom application. Qualitative and quantitative data collection tools are used together in the mixed-design research method to obtain a richer data set about the situation to be examined (Creswell, 2012). Study was conducted using a sequential explanatory design, which is a type of mixed research design that combines quantitative and qualitative data. The design primarily relies on quantitative data, while qualitative data are used to interpret, associate, and discuss the quantitative data (Baki & Gökçek, 2012). The quantitative data obtained by this method were tried to be presented to the reader in the discussion section in the context of cause-effect relationship. In the study, user-based approach, which is one of the usability approaches, was applied in order to collect quantitative data. The user-based approach aims to test real users while using the interface through authentic tasks in the application environment and to evaluate the usability of the interface by analyzing the collected data. The user-based approach is a frequently used method to achieve the most realistic and consistent results regarding the usability of the interface. In the user-based approach, an evaluation is made on the basis of users' ability to perform the task, the number of critical mistakes they make during the task, and the time they spend on completing the task (Çağıltay, 2018).

The verbal and reactive states of the participants were recorded with a camera during the user tests carried out in the research. A usability satisfaction scale was applied to the participants following the application to determine the satisfaction levels for the usability of the system. In addition, interviews were conducted with users after the usability test sessions. The qualitative data collected during the research process were used to explain the quantitative data collected in the user-based tests

Working Group

Participants were recruited from those who used the Adobe Connect virtual classroom application for at least two semesters during the emergency distance education process. Two (one female, one male) instructors (T1 and T2) were included in the pilot study and 12 (seven female, seven male) instructors (P1-P12) were included in the main study. Participants from various fields with different titles, experiences, and gender were included in order to increase the validity and reliability of the data to be obtained on the usability of the virtual classroom application. The demographic data of the participants included in the pilot and main studies are presented in Table 1.

Table 1. Demographic Data of the Participants

Participant	Application	Gender	Programme	Age	Title	Experience (year)	E.D.A.I.U.T	Total Lesson Hours
T1	Pilot	Female	Special Education	46	Asst. Prof	>20	2-4 hours	>20
T2	Pilot	Male	Mathematics Education	37	Lecturer	8-12	> 4 hours	2-6
P1	Main	Male	Special Education	50	Lecturer	>20	0-1 hour	2-6
P2	Main	Female	Physical Education	40	Assoc. Prof	8-12	2-4 hours	2-6
P3	Main	Male	Physical Education	36	Asst. Prof	8-12	2-4 hours	>20
P4	Main	Female	Science Education	36	Asst. Prof	8-12	1-2 hours	8-12
P5	Main	Female	Special Education	42	Asst. Prof	8-12	1-2 hours	14-20

P6	Main	Male	Social Sciences	58	Lecturer	>20	1-2 hours	14-20
P7	Main	Male	Turkish	48	Lecturer	>20	2-4 hours	14-20
P8	Main	Male	Chemistry Education	42	Assoc. Prof	8-12	2-4 hours	8-12
P9	Main	Female	Science Education	39	Assoc. Prof	13-19	2-4 hours	14-20
P10	Main	Male	Mathematics Education	42	Assoc. Prof	13-19	> 4 hours	8-12
P11	Main	Female	Mathematics Education	45	Assoc. Prof	>20	1-2 hour	14-20
P12	Main	Female	Music Education	49	Assoc. Prof	>20	> 4 hours	14-20

*Note. * E.D.A.I.U.T= Extracurricular daily average Internet Usage Time*

Nielsen (1994) stated that the required number of people should be at least five in usability tests in order to reveal the basic problems about a system. He also emphasized that well-designed tests could determine about 75% of usability problems. On the other hand, he stated that 15 participants were sufficient to detect all possible problems. Therefore, 14 participants, were included in this study, which was conducted to determine the usability problems of the Adobe Connect virtual classroom application.

Data Collection Tools

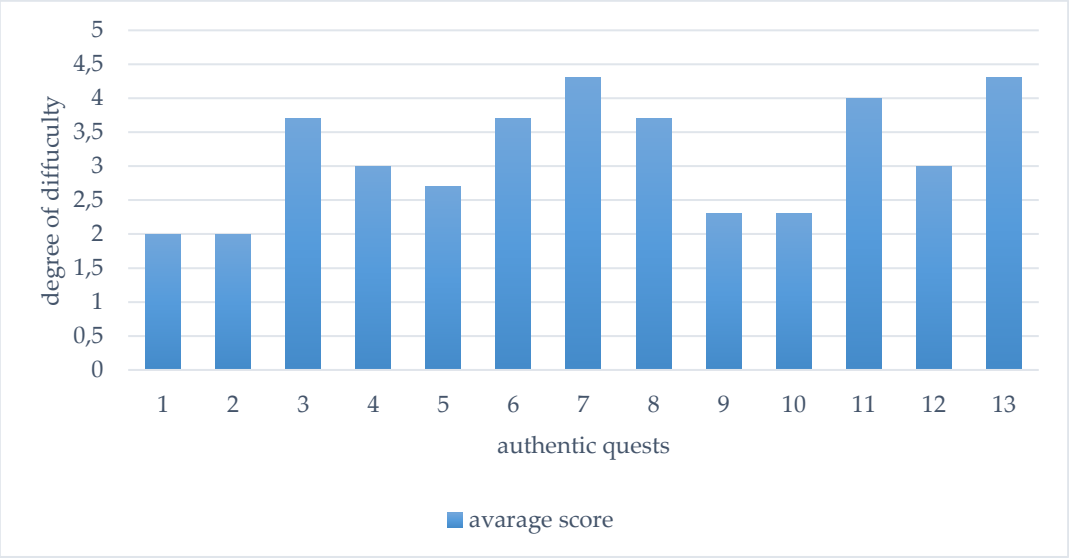
Questionnaire

The questionnaire developed by the researchers consisted of two parts. The first part included demographic questions such as participants' age, gender, title, department, professional experience, average daily internet usage time, distance lesson hours, use of different virtual classroom applications, and computer usage levels. The second part included semi-structured questions to get the participants' evaluations of the use of the Adobe Connect virtual classroom application during distance education process. The questionnaire form prepared by the researchers was first presented to two Turkish field experts for Turkish language validity and meaning integrity. The content validity of the questionnaire was examined by three academicians who had served at the level of technical support and coordinator in the field of distance education for the last 10 years.

Authentic Tasks

During the research process, 13 authentic tasks were planned to be used in usability test measurements. The tasks determined by the researchers were intended to test the administrative and pedagogical use cases of the online virtual classroom application in line with a lesson scenario. Three field experts, who took part in distance education for technical support and implementation, knew and used the system, were consulted in the process of determining authentic tasks. The authentic tasks were examined together with the relevant field experts and their difficulty levels were scored as “1=Very easy” “5=Very difficult”. The averages of the scores taken from the field experts for the difficulty levels of the determined authentic tasks are presented in Table 2.

Table 2. Average Scores for Difficulty Levels of Authentic Tasks



The authentic tasks determined in line with the scores given by the field experts vary in difficulty. The tasks 1, 2, 4, 5, 9, 10 and 12 are lower than the average difficulty level, and the tasks 3, 6, 7, 8, 11 and 13 are higher than the average difficulty level.

The form was examined by two different field experts from Turkish Education in terms of language validity and semantic integrity. The application process was designed as a pilot and main study. Two instructors were included in the pilot study in which data about the application environment, the computer and recording systems used as well as the authentic tasks were collected. The data collected were analyzed and evaluated and the main study was planned. Authentic tasks prepared for the usability of the system are presented in Table 3.

Table 3. Authentic Tasks

Task Number	Task Description
T1	Write a note to students on the virtual classroom screen stating that you will start 15 minutes late.
T2	Activate your microphone and camera.
T3	Prevent students from starting private chats among themselves in the connect session.
T4	Open the document you will use in the presentation of the lesson on the screen share. Highlight any statement in the document you are sharing by underlining it.
T5	Give server authorization to any student.
T6	Change the Adobe Connect interface layout from sharing to discussion, and then back to sharing.
T7	Make the necessary settings so that the system warns you that you need to save the session.
T8	Ask an open-ended question to the students using the survey application. Finish the survey and share the results with the students.
T9	Let students see your screen-by-screen sharing.
T10	Remove one of the students from the session.
T11	Open the whiteboard application and draw a shape, show the shape with an arrow and write its name aside.
T12	Share a file that students can download instantly in the synchronous lesson environment.
T13	Remove the chat panel from the screen so that students cannot see it, and then make it visible again.

The opinions of the participants regarding environment in which the application was made and tasks prepare are presented in Table 4.

Table 4. Authentic Tasks and Application Environment

Application Process	Frequency
Suitable Application Environment	12
Clear Tasks	10
Some incomprehensible tasks	1

The data in Table 4 revealed that research environment was suitable and tasks were understood clearly by almost all of the participants.

Satisfaction Scale

The System Usability Scale (SUS) (Brooke, 1996) is a widely used scale to evaluate the perceived usability of interactive systems and has been widely accepted due to its simplicity and practicality (Demirkol and Şeneler, 2018). The SUS scale consists of 10 items in five-point Likert type (1=strongly disagree, 5=strongly agree). Odd numbered items (1, 3, 5, 7 and 9) have positive expressions, while even numbered items (2, 4, 6, 8 and 10) have negative meanings. The total score to be obtained is multiplied by 2.5 to obtain the general value of the scale. Converting SUS scores to a scale that can vary between 0 and 100 facilitates usability measurements, and high scores from the application are accepted as an indicator of high satisfaction with the system (Brooke, 2013). A SUS score between 65 and 70 is accepted as a moderate level of satisfaction with the usability of the system (Bailey, 2006).

Interviews

Interviews were held with the participants immediately after the application process of the research. The purpose of the interview with the participants is to explain the satisfaction by identifying the application environment, authentic tasks, practical views and user experiences. The data obtained through the interview was used to make sense of the results that emerged with the satisfaction scale applied to the participants. The interviews were recorded with a voice recorder upon the permission of the participants and then converted into text forms for content analysis. In this context, firstly codes were created and then themes that would cover certain code groups were determined. The themes and codes presented in the table were presented to the reader, supported by direct quotations of the views of the participants.

Observation Notes

Observation was used at two different points during the research process; one during the process of performing the authentic tasks on the computer by the participants, and the other during the process of re-examining the videos of the recorded performances. Observations made in both environments were discussed together with other data sets in explaining the effectiveness, efficiency and system satisfaction of the users regarding the tasks.

Pilot Study

The research was carried out in two stages as pilot and main study. A female instructor from the Special Education Teaching Department and a male instructor from the Elementary Mathematics Teaching Department were included in the pilot study. Participants were completed a demographic information form and an online questionnaire form with open-ended questions before the application. In the post-application interviews with both participants, their views on the application environment, the computer used and the tasks were taken. It was decided to make the following arrangements in order to make the actual application more efficient and effective in line with the implementation and post-implementation critical interviews with both participants in the pilot study:

1. The application environment with a laptop computer and a second monitor for the pilot study was found suitable by both participants. The purpose of using two monitors was to record the user's reactive states, navigation and clicks of the tasks in the virtual classroom interface by screen recording during the tasks. However, the two-monitor solution and its positioning (bottom-up) created a

problem for one of the participants in terms of screen navigation. The other participant stated that the screen response speed of the wireless mouse was slow. Therefore, it was decided to perform the main application on a standard desktop computer (with single monitor, wired keyboard and mouse) with dual cameras.

2. In the first task in the authentic task form, the phrase "start the meeting" was omitted.
3. The observations of the applications of two different participants in the pilot study revealed that the virtual classroom interface was opened at different times depending on the internet speed. Since this situation, which is not caused by the participants, may have negative impacts regarding the duration of the tasks, the start of the recording time was rearranged.
4. The application in task three was not used by the participants who emphasized that students were automatically assigned to the courses and they did not feel the need to use it. For this reason, it was decided to change this task to produce output on behalf of classroom management. Task three was changed to "Prevent students from starting private chats among themselves in the connect session".
5. The post-application interviews revealed that the instruction given regarding task four was not fully understood. Therefore, the task statement "share the document on the screen" was changed to " open the document on the screen share".
6. The word “participant” was changed to “student” in all tasks.
7. Since it was understood that the instruction given for task 12 was not fully understood and was skipped by the participants, the statement "Share a file so that the participants can download it" was rearranged as " Share a file that students can download instantly in the synchronous lesson environment".

After the interviews with two participants included in the pilot study, 3 tasks in the authentic task list were rearranged. The main study was carried out with 12 participants in the same setup, after the arrangements made for the application environment, application process and data collection tools.

Adobe Connect Virtual Classroom Application

In the Adobe Connect virtual classroom application, instructors can make adjustments for the control and layout of the interface as well as technical arrangements such as microphone and camera settings. There are also applications in the interface for providing teacher-student, content-student and student-student communication and interaction. For instance, the instructor can share documents and screen, conduct instant file sharing, multiple choice and open-ended surveys, question and answer sessions, and use chat and whiteboard applications during a synchronous lesson. In addition, the instructor has the authority to include the students in the class visually and audibly and to assign the students the role of presenters. Students can chat with each other in the background depending on the permission defined by the instructor in the system preferences. As a result, Adobe Connect online virtual classroom application offers many features to instructors to conduct lessons based on communication and interaction with their students and to provide classroom management when necessary. Instructors are also offered the opportunity to arrange the interface in the application as they wish in line with their own teaching plans. Figure one shows the educational interface of the Adobe Connect virtual classroom application, where instructors and students came together for online synchronous lessons.

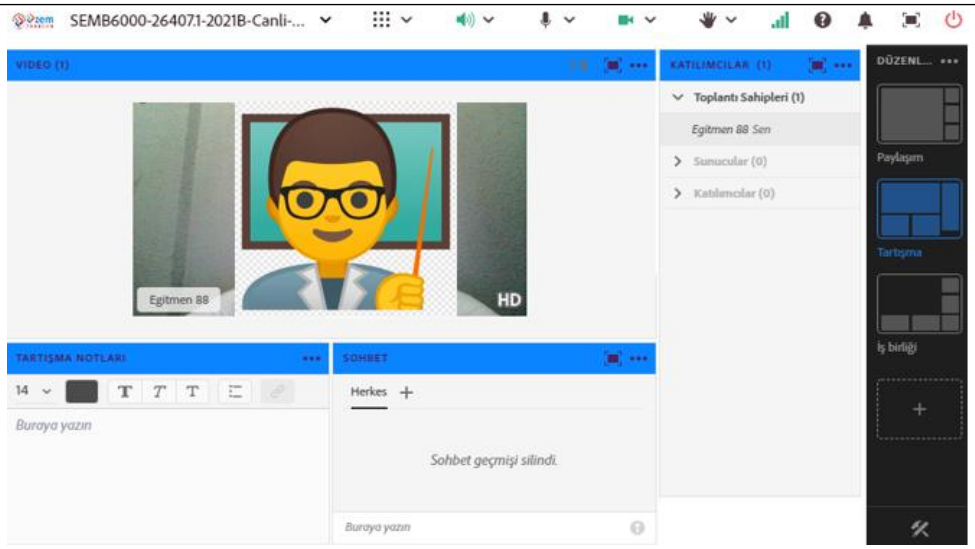


Figure 1. Discussion Oriented Interface of Adobe Connect Virtual Classroom Application

Ethical Authorizations of the Research

Name of the ethical review board: Trabzon University Social and Human Sciences Ethics Committee

Date of ethical assessment decision: 14/02/2022

Ethical assessment certificate number number: E-81614018-000-2200007441

FINDINGS

The usability of the Adobe Connect virtual classroom application was investigated in terms of effectiveness, efficiency and satisfaction from the perspective of educators. In this section, findings related to these sub-problems are presented.

Effectiveness

12 participants included in the study were required to complete 13 authentic tasks determined in the Adobe Connect virtual classroom application. The success of the participants regarding these tasks is presented in Table 5.

Table 5. The Success Rate of the Participants in The Tasks

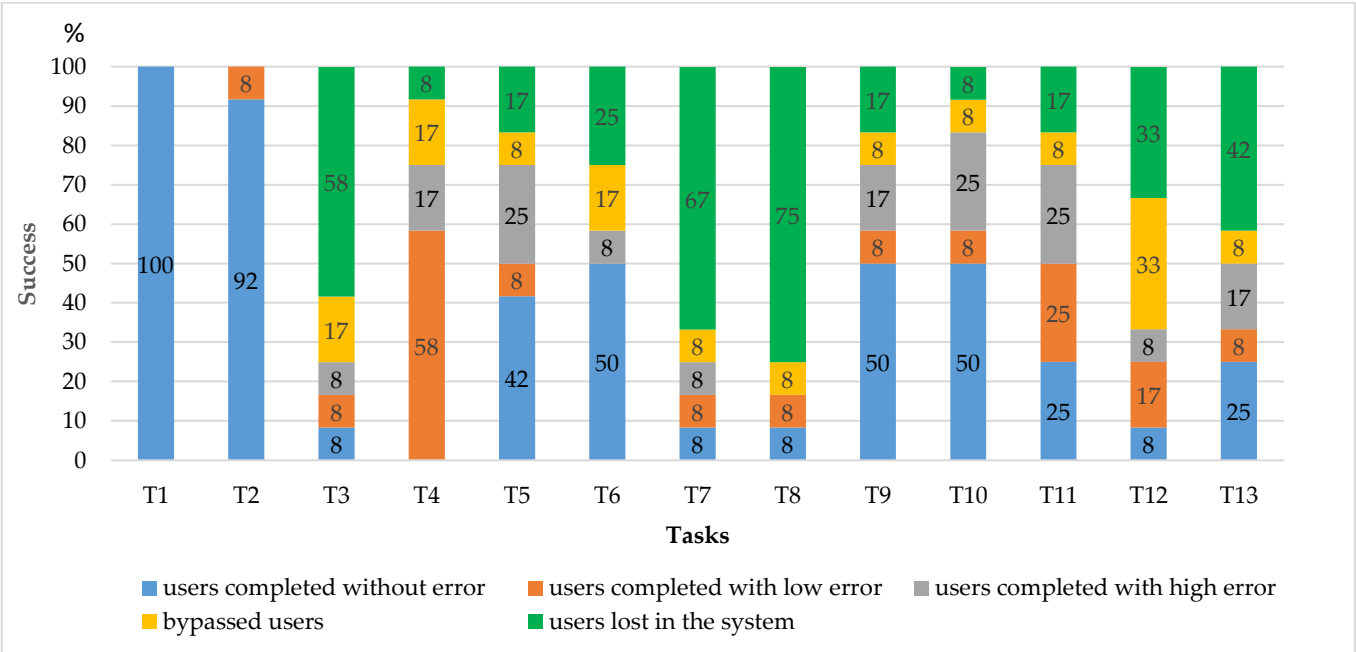


Table 5 reveals that the error-free completion rate of all 13 authentic tasks was 30% on average. However, only task 1 was completed with 100% success by the participants. The success rate of task two was 92%. The error-free completion rates of other missions decreased to 50% and below. On the other hand, the rate of tasks completed by making fewer mistakes than the ideal number of transactions decreased to 11% on average. The rate of tasks completed by making more mistakes than the ideal number of transactions was 12% on average. The participants in this group were able to complete the relevant task even though they had not experienced it before.

Another striking point is when the participants skipped the task after reading it or failed despite trying. After reading about 12% of the tasks, the participants stated that they did not know or did not use them before and moved on to the other task. Similarly, about 33% of the participants failed to complete the given tasks. Figure five reveals that the rate of those who completed the given tasks without any errors or with an error lower than the ideal number of operations was approximately 40%. Out of a total of seven tasks (1, 2, 4, 5, 9, 10, and 12), which were evaluated as easy in terms of their degree of difficulty, only the completion rate of tasks 1 and 2 could exceed 90%. On the other hand, the successful completion of six tasks (3, 6, 7, 8, 11 and 13), which were described as difficult, was limited to approximately 20%.

Efficiency

In order to determine the efficiency, which is another dimension of system usability, in the research, the status of completing the given tasks was revealed as the time they spent on the task and the mistakes they made during this time. Thus, the ideal number of procedures and ways required for the successful completion of the tasks directed to the participants were analyzed and defined. It was observed that some of the tasks involved activities such as creating text content and writing, but the participants were not provided with a standard text, which caused a significant time difference between them. In general, the success score could not be calculated for the participants due to the low level of success of the participants, skipped tasks, the length of time determined for the completion of the task, and the mistakes made more than the ideal number of operations. The number of errors and durations obtained are presented in Table 6 and was interpreted in accordance with the qualitative approach.

Table 6. Completion Periods of Tasks and Number of Errors

	Participant Periods (Seconds)															
Tasks	P1	P2	P 3	P 4	P 5	P 6	P 7	P 8	P 9	P 10	P 11	P 12	Average Time	SD	Total Mistake Number	Average Mistake Number
1	55	10	20	22	31	31	30	40	181	21	18	14	39	46	0	0
2	14	6	13	2	4	14	11	11	7	7	4	8	8	4	1	0
3	p	30	22	8	18	43	p	38	70	39	174	63	51	47	68	7
4	p	60	50	p	46	42	101	70	199	29	44	96	74	50	110	11
5	p	33	38	33	13	32	21	7	7	14	5	14	20	12	24	2
6	p	36	53	4	p	11	10	8	9	17	46	138	33	41	40	4
7	7	53	38	12	p	12	23	36	44	29	27	122	37	32	63	6
8	13	60	159	p	26	22	20	80	70	68	74	128	66	46	166	15
9	p	3	20	16	25	40	13	11	8	8	50	8	18	15	30	3
10	p	10	48	19	10	31	29	21	14	4	19	14	20	12	14	1
11	p	112	178	4	38	76	71	32	44	46	63	80	68	47	97	9

12	p	91	p	50	p	p	44	22	71	12	40	80	51	28	63	8
13	p	23	13	75	12	60	128	23	24	148	17	27	50	48	74	7

Skipped Completed successfully Tried but failed

Table 6 shows the participants' average time and standard deviations for each task. The findings show that the time spent by the participants to perform the tasks was quite different from each other. All participants completed the first task without any errors in an average of 39 seconds. This task took a long time because it included informing the students that the lesson would start late and accordingly it required the participants to write the text content. Since the content of the message to be written was not given to the participants, some participants kept this briefing short but some long. The ability to use the keyboard in this task was also one of the variables that affected the process. When evaluated on participant basis, it was determined that participant two (P2) completed this task in 10 seconds and P9 in 181 seconds. When the screen recordings of the relevant participants were examined, it was seen that P9 wrote a very long message to the students. As in the first task, the second task, which included activating the camera and sound, was completed without any errors by all of the participants. However, P4 forgot to turn up the volume after the camera. This task was the one that was completed in the shortest time among all tasks. The operations in this task were the basic operations for synchronous lessons held in the virtual classroom environment, and the objects of the related operations were fixed in the interface. The total number of errors and failures of the participants increased, especially in tasks 3, 6, 7, 8, 12 and 13. The statements in the records in particular confirm that the above-mentioned tasks were not used by the majority of the participants in their previous lessons. Although they had no previous experiences, the participants made an effort on the system to perform these tasks, thus, increasing their processing times as can be seen in Table 6. However, some participants were able to complete the task with high error numbers in the same process. For example, in task 3, where the ideal number of operations was five, P9 completed the task in 70 seconds, despite making 17 mistakes. Similarly, in task four, where the ideal number of operations was seven, P9 completed the task in 199 seconds despite 32 errors. On the contrary, in task six, which consists of two steps, participant 12 could not complete the task despite 28 errors and 138 seconds of effort. For example, in task eight, which consists of nine steps, the same is true for P11. Table 6 reveals that some of the tasks could be completed by making more mistakes than the ideal number of operations but some of them could not be completed despite high error numbers. The tasks with no errors or fewer than the number of operations required to complete the task are the tasks 1, 2, 5, 9 and 10, which were lower than the average difficulty level. Both in the video recordings taken during the application and in the interviews with the participants after the application, these tasks were informed to be frequently performed by the participants in virtual classroom applications. The tasks with higher number of errors and higher processing times had not been experienced by the participants before.

In the findings related to the tasks, especially the tasks 4 and 8 draw attention in the context of error and completion times. Task four included sharing documents on the screen and highlighting any sentence by underlining. The participants completed this task in an average of 74 seconds with a total of 110 errors. Although one participant failed in this task, the other participants had difficulty in highlighting any part of the document and made mistakes repeatedly. Similarly, in the task of creating an open-ended questionnaire and sharing the results with the students, the participants had long processing times and high error numbers. The participants spent an average of 66 seconds and made a total of 188 errors. High processing times and error numbers were generally concentrated in the context of educational tasks that support the active participation of the student in the virtual classroom environment and administrative processes that help customize the system interface and controls.

Satisfaction

The System Satisfaction Scale (SUS) consisting of 10 items was applied to the participants immediately after completing the tasks. The scores and satisfaction levels of the participants from the SUS scale are presented in Table 7.

Table 7. Participants' Satisfaction Levels

Participants	SUS score	Satisfaction
P1	62.5	
P 2	27.5	
P 3	62.5	
P 4	45	
P 5	57.5	
P 6	52.5	
P 7	60	
P 8	60	
P 9	50	
P 10	80	
P 11	45	
P 12	65	
	Average: 55.6	

*Note. *SUS score between 65 and 70 means a moderate level*

According to Table 7, the average SUS scores of the participants' was 55.6, which shows that the satisfaction levels of the instructors towards the Adobe Connect virtual classroom application were quite low. Bailey (2006) states that a SUS score between 65 and 70 means a moderate level of satisfaction. The findings obtained from the satisfaction scale reveal that only one of the 12 participants (P10) had a high level of satisfaction with the virtual classroom application, one participant (P12) had a medium level of satisfaction, and the remaining 10 participants (P1, P2, P3, P4, P5, P6, P7, P8, P9, P11) had quite low levels of satisfaction. The average satisfaction level of the entire group in the research was determined as approximately 56%. In summary, these results show that instructor-level user satisfaction with the Adobe Connect virtual classroom application was quite low. The interviews conducted to explain the reason for this low satisfaction highlighted that the past experiences of the participants with the Adobe Connect virtual classroom application were low within the framework of the authentic tasks observed in the study.

After the interviews with the instructors in the research, it was determined that they used the Adobe Connect virtual classroom application with its limited features. The most common use of the system was the presentation of the subject to the students through screen sharing. The instructors were not familiar with or aware of the tasks that were skipped, completed with high errors and time, or failed. Examples of the participants' views regarding these identified situations are as follows:

P1: *"The reason I skip a lot of things is because I don't use them or they're complicated, not because they're hard."*

P5: *"I realized that I didn't know some of the tasks because I hadn't used them before."*

P7: *"I share documents and we usually talk about it. I try to involve the students in the chat in the form of questions and answers."*

P10: *"The reason for skipping some tasks is not because the expressions are not clear, but because I don't know how to do them."*

The views of the instructors evaluated in the categories of interaction, interface and technical infrastructure regarding the system are coded and presented in Table 9.

Table 9. The Views of Lecturers on the Usability of the System

Themes / Codes	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	Total
Interaction													
Poor synchronous communication	●	●	●	●	●			●	●	●		●	9
Different apps are better	●				●				●	●	●	●	6
Non-interactive classroom environment	●	●		●	●					●	●		6
System Interface													
Confusing menus		●	●			●			●	●			5
Poorly visible objects		●	●			●		●		●	●		6
Busy and uneven interface			●					●	●				3
Incomprehensible interface tittles		●				●							2
System Structure													
Not suitable for all courses											●	●	2
Insufficient Supported File Type		●	●						●				3
Version-based problems										●			1
Poor video and audio support		●	●										2
Total	3	7	6	2	3	3		3	5	6	4	3	45

Table 9 reveals that the instructors had negative opinions about the interaction dimension of the Adobe Connect virtual classroom application. The participants stated that the synchronous communication possibilities of the virtual classroom application were limited; they had difficulties in creating an interactive classroom environment, and that there were better applications available for this purpose. Examples of instructors' views regarding these identified situations are as follows:

P2*: "I never let students turn on the camera in undergraduate classes, I never did. Students want to activate it, but it makes a problem. But, there is no problem in graduate classes as they are 2-3 people, I can activate their camera immediately."*

P5: *"I can see 20 people in front of me at the same time in Zoom, but I could not perform this in Adobe Connect. In particular, I used Zoom in some lessons. I started Adobe Connect because it was necessary to record, I shared the screen from there but opened the zoom and actively used the zoom."*

P8*: "Even if a person connects via video in Adobe Connect, falls and interruptions begin. But other applications do not have such problems. I don't do screen sharing too much as there are problems with it, I share the document directly."*

P11: *"As a solution, I now do my lessons in the Zoom application. Everyone's camera is on in Zoom. In Connect, I record the Zoom screen."*

Similarly, the participants emphasized that the menus in the virtual classroom interface were complicated, some of the titles did not reflect the content, the objects to provide access to the system-related menus and preferences were vague, and that the interface was very busy. Examples of participants' views are as follows;

P2*: "How many different actions did I try to block access! I can do it, but not everyone can remember what to do. For example, I did not know how to record the lesson, I forgot to record the lesson 2-3 times and when the lesson was over, I realized that I hadn't recorded it."*

P3: *"I start the lesson and press the record button. The system does not tell me what time I started the lesson, the recording time, and the total number of hours I studied when I finished. You can see it very easily in the Teams app."*

P9: *"There are too many objects. I think it would be more useful if the objects in the dimension of these tasks were reduced. There are so many that you have to search for."*

P11: *"It may need editing in terms of the interface. For example, I understand that I need to search for the chat part there, but there are a lot of things above. There are two small icons next to the record button, I only see them as icons but it is not clear what they are."*

Another striking point in the table is the views of the participants on the technical structure of the virtual classroom application. The absence of mathematical equations and expressions in the whiteboard application and the problem of synchronization in sound and image create limitations in lessons such as mathematics and music which are conducted synchronously. In addition, the file types allowed for sharing during the lesson were also quite inadequate. Some instructors, on the other hand, emphasized that they experienced problems after the updates, depending on the version of Windows used in the interface. The views of the participants are as follows:

P3: *"I'd like to see a slide from one side and see myself on the other. Because when I do not see myself, when I do not see the chat part or the people in front of me, it creates a negative feeling in me. It's like I'm telling you in vain but when I see myself, at least I feel like I'm doing a repetition in front of the mirror."*

P9: *"Students can't upload something, that is Word, they have to convert it to pdf and upload it."*

P10: *"It does not support Windows 7 based operation after update. It has to be Windows 10, I guess it's processing over the web, not on Java. Of course, it may be faster, but it has prevented me from using a pen, so I'm using my tablet computer."*

P11: *"The thing that challenged me was the absence of equations in Connect, I use them a lot."*

P12: *"We are having big problems with synchronization in cases related to our field. It's not possible, we can't solve it."*

In summary, the views of the instructors on the Adobe Connect virtual classroom application draw attention to the limitations of the system's interaction, interface and infrastructure. There are problems in multi-communication in the interaction dimension of the system, the poor visibility of existing objects and menus in the interface dimension, and the problems encountered in the course type, file type, version and platform in the infrastructure dimension negatively affect the usability and satisfaction.

DISCUSSION AND CONCLUSION

This study examined the usability of Adobe Connect virtual classroom application, which is one of the synchronous applications in distance education in the dimensions of effectiveness, efficiency and satisfaction. The instructors were included as participants and the data were collected through authentic tasks, satisfaction scale and interviews.

In the study, first of all, the effectiveness dimension of the usability of the Adobe Connect virtual classroom application was analyzed. During the implementation process, the rate of successful completion of 13 authentic tasks by the instructors was limited to almost 30%. According to Sauro (2011), the average task completion rate was 78% in the analysis of almost 1200 usability tasks. He states that this rate can be accepted as the limit value for success in usability studies. In this study, successful completion of one and two task out of seven easy tasks above 78% revealed that the system has very poor usability in terms of effectiveness. In the administrative operations for classroom management, the instructors could not complete the processes of authorizing the server to the students, customizing the modules in the interface, blocking or allowing unauthorized chat access among the students, and removing any participants, which may be due to the fact that the instructors neither knew how to conduct these tasks nor felt the need to learn. Individual factors such as technological literacy, usefulness, and ease of use of e-learning systems directly affect their usability (Almaiah, Al-Khasawneh & Althunibat, 2020). Cigdem and Topcu (2015) in their study on acceptance of LMS technologies, concluded that there is a positive relationship between instructors' technical competences for LMS technologies and their perceptions of the system's ease of use. In the related study, it was observed that the perceived ease of use in the context of LMS decreased dramatically when the instructors did not have sufficient experience about LMS. On the other hand, this failure can be explained by the poor visibility of the system and the inadequacy of actions and objects to minimize the user's memory load. As a matter of fact, the

interviews with the participants support the second inference, which can be evaluated as the weak usability of the interface and menus in the context of customizing administrative operations. These features of the system can be evaluated in terms of quality. In the related literature, it is pointed out that the quality problems of the systems used in the e-learning process affect both user satisfaction and usage negatively (Almarashdeh, 2016; Bossman & Agyei, 2022; Dreheeb et al., 2016; Nguyen, 2021). It was also concluded that the instructors usually failed in the educational tasks, in which the success rate was lower than 50% (Figure five). It was observed that many errors occur and processing times are prolonged in tasks involving teacher-student, student-content and student-student interaction, such as survey, document and note sharing, and use of whiteboards. In the interviews with the instructors, it was determined that these educational features provided by the system had not been used before. Kohnke, Zou and Zhang (2023) conducted a study on Zoom, a video-based virtual classroom application used during the Covid-19 pandemic. They found that the application included various features such as questionnaires, emojis, chats, breakout rooms, and interactive whiteboards to facilitate communication, interaction, and collaboration. However, it has been emphasized that the usage preferences of these features are closely related to the instructors' technological literacy skills, as well as their pedagogical beliefs about the course conduct. In fact, the literature suggests that providing pedagogical content support at certain intervals (Çiğdem & Topçu, 2015; Xue, Wang & Yang, 2022) can enhance the performance of instructors in the e-learning process. The lack of technological and pedagogical training for instructors during the Covid-19 pandemic, which has led to a rapid transition to e-learning, may have exposed this issue. The limited use of the system by instructors, which only included activating their own cameras, sharing presentations, and engaging in question-answer activities, supports this view. The limited use of the virtual classroom application by the instructors in this way can be considered as their not being able to provide multiple communication and interaction with the students. However, student motivation in distance education systems is affected by the interaction between cognitive, technological and social environmental factors (Cheng, 2020). Therefore, the literature emphasizes the effective use of small group division among students in video-based virtual classroom applications, written chats, and the use of interactive whiteboard applications to provide interaction in synchronous e-learning applications (Kohnke et al., 2023). It is thought that the most important problem stated in the interviews with the instructors is the synchronization encountered when more than one person is included in the system via video and audio. Until Covid-19, the majority of learning activities were conducted asynchronously. With Covid-19, it is understood that video-based virtual classroom applications are preferred to support students' social presence and sense of community development as in face-to-face teaching environments (Hogan & Devi, 2019). However, it has been stated that opening the cameras of both the instructor and all students simultaneously during this synchronous process may lead to interaction and communication issues due to poor internet connectivity and audio and video delays (Belt & Lowenthal, 2023). This limitation in the dimension of supporting multiple communications in the system is similar to the findings of Dikbaş Torun (2013) who evaluated synchronous interaction in a course conducted with Adobe Connect application. Therefore, the fact that the instructors could complete authentic tasks with low success shows the weak usability of the system in terms of effectiveness, which may be a result of the instructors' synchronous conduct of the lessons with a teacher-centered approach. However, according to social constructivist theory, instructors should structure e-learning environments to enhance interaction, communication, and collaboration (Camilleri & Camilleri, 2022). As a result, it was concluded that the interaction elements offered by the Adobe Connect virtual classroom application in the educational dimension were not preferred by the instructors and they conducted their lessons on a presentation basis. However, the desired teaching outcomes and student satisfaction can be ensured if educators use strategies and methods suitable for online learning environments, unlike traditional approaches in which they are experienced (Hussein, Daoud, Alrabaiah & Badawi, 2020).

The processing times of the instructors and the number of errors they made during the authentic tasks were analyzed to explain the efficiency dimension for the usability of the application. It was determined that the number of errors in 11 tasks, except for the 2 tasks given in the process of performing the authentic tasks, exceeded the ideal number of operations and their completion times were considerably longer. Therefore, the success scores of the

instructors for the authentic tasks could not be calculated. The results showed that the usability of Adobe Connect virtual classroom application in terms of productivity was quite low in terms of instructors, which may be due to the fact that the instructors had limited competencies for virtual classroom implementation and most of the tasks had never been experienced before. As a matter of fact, the literature shows that the technical skills of instructors on hardware and software that can be used for e-learning, as well as the knowledge they have about the educational opportunities offered by these technologies, are an important factor in the effectiveness of e-learning (Almas, Machumu & Zhu, 2021; Gülbahar & Kalelioğlu, 2015; Parkes, Reading & Stein, 2013). The standard deviation between the processing times in some tasks was in a very wide range, which may be due to the fact that some instructors continued the search processes in the system in order to complete the given task. It was also observed that the instructors had a lot of difficulty in tasks that required sequential processing steps, they scanned the interface randomly, and they got lost in the system by making wrong clicks. These findings are in line with the findings of Yeniad et al., (2011) in which they evaluated the usability with eye tracking approach. High processing times and error numbers encountered during authentic tasks can be interpreted as low availability of the system in terms of efficiency.

The educational satisfaction levels for the Adobe Connect virtual classroom application were quite low in this study, which is in parallel with the results achieved in terms of effectiveness and efficiency. The results of the satisfaction scale applied to the instructors showed that all but one had low satisfaction. This result reached in this study is similar to many studies (Gumussoy, Pekpazar, Esengun, Bayraktaroglu & Ince, 2021; Kortum & Peres, 2014) showing that there is a linear relationship between user satisfaction with the system and the ability to perform tasks in the system effectively and efficiently. The suspicious behavior of the instructors towards the clicks they made during the authentic tasks in which they had difficulty and failed, and their efforts to verify the clicks and operations they made during the tasks to the observer can be interpreted as an indicator of their low satisfaction level. The findings obtained in the research clearly reveal that the instructors find the Adobe Connect virtual classroom application insufficient in terms of interaction, interface and system infrastructure.

The results of the study affirm that synchronous lessons conducted with the Adobe Connect virtual classroom application did not amply allow multiple communications in the form of student-teacher and student-student. The problems faced by the instructors in activating a second student's camera other than their own camera or during the screen sharing process negatively affected communication and interaction. As stated in the literature, turning off student cameras for various reasons highlights that teachers become isolated in front of the screen over time and their satisfaction is negatively affected (Belt & Lowenthal, 2023). Studies in the literature show that satisfaction with online learning environments is one of the most important components affecting learning outcomes (Erdoğdu et al., 2015; Kim & Park, 2021). The quality and level of teacher-student, student-student and student-content interaction is accepted as one of the key factors affecting satisfaction as well as the usefulness of the interface (Kim, 2011; Nguyen, 2020; Magableh & Alia, 2021). The weak level of interaction in online learning environments can negatively affect the emotional state of students and lead them to disconnect from the teaching process (Magableh & Alia, 2021). The tendency of the participant instructors to use different virtual classroom applications such as Zoom, Google Meet and Microsoft Teams in synchronous lessons can also be interpreted as an effort to increase the interaction on the basis of teacher-student and student-student. The Adobe Connect application was analysed for usability, accessed by teachers and students on the university's own servers. However, the other video-based virtual classroom applications mentioned above use the servers of global companies that do not have any hardware limitations. Therefore, instructor dissatisfaction, particularly with regards to the inability to access student cameras, may be due to technical inadequacies in the institution's servers and internet infrastructure (Camillleri & Camillleri, 2022). The participants' search for the interaction environment in online synchronous lessons like the face-to-face classroom environment can be considered as a reflection of their educational preferences and pedagogical beliefs. The resistance of instructors who are exposed to a rapid transition from face-to-face classroom environment to e-learning may be another factor affecting this situation (Xue et al., 2022). In addition, the findings showed that the system interface

had limitations in terms of visibility, similarity to the real world, compatibility with different platforms and versions, and intuitive invention. In fact, Pala, Arslan and Özdinç (2017) evaluated the usability of the EBA education information network with authentic tasks and eye tracking and concluded that the incompatibility of the objects in the interface with each other, unhighlighted important points, lack of remarkable visuals and unspecified shortcuts reduced the usability of the system. In this context, both studies support each other in terms of the visibility of the interface.

SUGGESTIONS

In line with this study, the following suggestions for increasing the usability of Adobe Connect virtual classroom application are presented:

- Screen sharing and including a participant in the conversation with their camera during synchronous communication cause the system to pause and the synchronization to be adversely affected. Therefore, bandwidth should be increased to support multiple communication in Adobe connect virtual classroom application.
- The necessary tools and interaction elements should be presented as different colored visual icons in the appropriate areas of the interface so as to carry out the interaction-oriented synchronous lessons more effectively.
- The operations regarding the visibility of the attendee list, chat, file sharing, etc. sections in the interface should be removed from the submenus and turned into on/off buttons on the interface.
- Meeting status information including meeting recording time and starting time should be presented to the host and participants next to the "record" icon on the interface during synchronous lessons.
- Some consistency should be ensured in the interfaces in versions developed for different platforms such as Apple and Windows. The platform-oriented situation adversely affects the communication between the supporting team and the user, making it difficult to understand the problem and reducing the satisfaction with the technical support provided.
- The excessive number of modules and features presented to the user in the interface negatively affects the visibility. Therefore, the standard host interface facing should be simplified.
- The objects and titles used to access the menus should be presented with a resolution that will increase the satisfaction of all users (with vision loss, etc.).

In this research on the usability of the Adobe Connect virtual classroom application from a tutorial perspective, data were collected through analysis of authentic tasks, satisfaction scale, interviews and observations based on a user-based approach. Eye tracking methods can be used in future studies to determine the variables that affect the performance of users during authentic tasks, to interpret errors and long processing times. Determining the areas that users focus on in the interface through eye tracking approaches, and their focusing times can provide more descriptive information about the usability of the application. In addition, forming a control group of field experts in order to establish a reference point for processing times and error numbers related to authentic tasks may contribute to a more objective evaluation of participant performances in future studies.

Acknowlegments: We would like to thank the faculty members who agreed to participate in this study and the ethics committee of our university for their support.

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