# The Effect of Distance Education Students' Virtual Classroom Participation Status on Their Course Achievement

Erdi Okan Yılmaz[*]
*Distance Education Vocational School, Uşak University, Uşak, Türkiye*
*ORCID: 0000-0002-7423-725X*

This study examines the effects of distance education students' virtual classroom participation on their course achievement. The sample of this study, designed in the survey model, consists of 953 higher education students in a university in Turkey. Within the scope of the study, the students' virtual classroom participation status was examined. The students' only watched synchronous or asynchronous, both synchronous and asynchronous, and no course-watching statuses were compared with the Turkish Language Course achievement scores. In addition, it was investigated whether the common effect of students' gender and virtual course-watching status affected course achievement. The average achievement scores of the students who watched course videos synchronously and asynchronously were significantly higher than those who watched only synchronously or asynchronously and did not watch at all. It was found that the achievement averages of the students who never attended/watched their virtual classrooms were significantly lower than all the other groups. In addition, it was concluded that the status of those watching virtual lessons, and the gender of these students created a significant difference in their course achievement. Still, the common effect of the status of these students watching virtual lessons and gender on their course achievement was not significant. The research findings were discussed and reported in light of the literature.

## Introduction

Technological developments and digital transformation have brought about significant changes in the field of education. These developments enable educational institutions to create more advanced, modern and cost-effective learning environments instead of traditional education, training and management approaches (Truong & Diep, 2023). In particular, the widespread of the internet and advances in information technologies have made distance education applications more accessible and effective. Integrating online learning platforms and educational technologies has revolutionised traditional teaching methodologies, allowing for innovative approaches catering to diverse learning needs. In the context of higher education, the application of internet technologies has facilitated the development of new pedagogical strategies that enhance teaching effectiveness and student engagement (Wang, 2023; Lam, 2018). Distance education eliminates geographical barriers and offers students time and space for independent learning opportunities. In this context, virtual course materials and learning management systems (LMS) used in distance education play an important role in

students' educational processes. Virtual course materials and learning management systems (LMS) enable students to engage with educational content at their own pace and convenience, which is crucial for fostering independent learning opportunities (McVey, 2017).

Distance education has undergone a significant transformation since its inception, evolving from simple correspondence courses to a sophisticated system that integrates synchronous and asynchronous learning modalities through advanced digital technologies. The historical roots of distance education can be traced back to the 18th century, where initial attempts at educating individuals remotely were primarily conducted through postal correspondence. This foundational model laid the groundwork for developing more structured forms of distance learning, which technological advancements and pedagogical theories have shaped over the years (Katane & Katans, 2015). Today's modern distance education applications offer a structure that enables learner-learner, learner-content and learner-teacher interactions thanks to web-based applications (Borup, 2016).

With the development of technology, the communication methods used in the interaction between students and courses are also evolving. Traditionally, asynchronous interaction has been the method for involving students in distance education courses. However, with technological advancements, synchronous communication has become increasingly important for participation in virtual classrooms (Watts, 2016).

There are generally two communication models in distance education. The first model is asynchronous education, and the second is synchronous education. In synchronous education, mutual communication can co-occur even if the teacher and student are in different places (Yılmaz et al., 2020). Distance education processes can be carried out only synchronously or asynchronously, or they can be structured so that synchronous and asynchronous teaching processes can be carried out together.

Synchronous distance education activities are a process in which students and teachers simultaneously interact in real time through communication technologies. In this process, applications and platforms that allow instructors and students to interact can be used (Erkut, 2020). This mode of communication fosters a dynamic and interactive environment, which is essential for effective learning, particularly in the context of distance education. The integration of synchronous tools, such as video conferencing platforms, has gained traction, especially following the COVID-19 pandemic, necessitating a shift towards online learning environments (Aoki, 2023; Themelis, 2014). Video conferencing platforms (Zoom, Microsoft Teams, Google Meet, Skype, and alike.), web-based live broadcast tools (YouTube Live, Facebook Live, and so on.), voice interview tools (Clubhouse, X chat room, and others.), instant messaging applications (Slack, WhatsApp, etc.), screen sharing tools (TeamViewer, Discord, and alike.) and learning management systems (Moodle + BigBlueButton, Blackboard, Adobe Connect, Canvas, and so on) are widely used synchronous interaction tools in synchronous distance education processes. These tools allow real-time video/image/audio transfers, instant surveys, question and answer, and collaborative work opportunities can be found.

Synchronous learning enables immediate interaction and instant feedback between students and instructors (Padaguri & Pasha, 2021). In contrast, asynchronous learning is advantageous in terms of offering increased flexibility regarding time and location of accessing learning materials (Persada et al., 2022). While synchronous distance education processes help students get instant answers to their questions in real-time, all kinds of messages to be

transmitted in audio/visual or written format can be answered simultaneously; collaboration can be achieved through online whiteboard applications and synchronous education activities can be recorded and students can repeat them asynchronously (Pullen & Snow, 2007). The learning process becomes more dynamic and interactive thanks to live lessons, discussions, and group work. Students can meet their classmates, work together, and establish social connections through synchronous lessons (Le & Tran, 2023). Synchronous lessons provide opportunities for students to interact, express frustrations, and develop a sense of belongingness (Alger & Eyckmans, 2022). These interactions help mitigate feelings of isolation, particularly for students living alone off-campus (Phaire, 2022). In addition, synchronous distance education is carried out within a specific course program (during class hours). Thanks to this situation, it provides flexibility in learning and time management (Doğan & Arslan, 2023), allowing students to utilize free time effectively and prepare for classes more efficiently (Bunayah, 2022).

In addition to the advantages of synchronous distance education activities, there are also some disadvantages. Technical issues and difficulties in content comprehension are major drawbacks of synchronous learning (Yorkovsky & Levenberg, 2022). In addition, students spending long periods in front of the screen can negatively affect learner performance (Göçer, 2020). Web-based synchronous distance education faces several challenges that can negatively impact learner performance. Technical issues like connection problems and audio-video difficulties hinder interaction and engagement (Tonga & Sahin, 2023; Buadu et al., 2024). The use of video cameras in online learning is a complex issue, influenced by various factors including social presence, motivation, and individual differences (Sederevičiūtė-Pačiauskienė et al., 2022; Trust & Goodman, 2023). While camera use can enhance cooperation, self-discipline, and social presence, students may choose not to use cameras due to multitasking, privacy concerns, or technical limitations (Sederevičiūtė-Pačiauskienė et al., 2022). With the COVID-19 pandemic, the most critical problems in synchronous distance education processes have emerged as technical problems and internet problems (Dinh & Nguyen, 2020; Van & Thi, 2021). In addition, although distance education provides students with flexible learning opportunities, synchronous distance education applications also lack flexibility. Fixed semester programs offered to students can make it difficult for students with busy lives to participate in synchronous virtual classes. Since the instructor controls the class flow in synchronous virtual classes, students may be prevented from learning at their own pace (Schullo, Siekmann, & Szydlo, 2003). In synchronous courses, shy students may feel uncomfortable participating in the real-time environment (turning on the camera, communicating with the microphone, writing messages, sharing the screen, etc.).

Asynchronous distance education activities allow students to learn at their own pace and time (Kamaludin et al., 2023). This form of learning positively affects the learning of students with different learning styles, especially since it allows for a deeper understanding of concepts (Midkiff & Dasilva, 2000). It will enable students to access course materials and virtual classroom video recordings whenever and wherever they want. Asynchronous distance education offers program flexibility, especially for students with busy schedules or time zone differences, allowing them to access course materials more easily (Gaspay, Legorreta, & Dardan, 2009). Using web technologies increases the effectiveness of asynchronous distance education activities (Frank, 2008). Students can stop, rewind, and replay course video recordings in asynchronous virtual classroom activities. This provides advantages, especially in internalising the subject and repeating the parts that need to be understood (Saluky & Bahiyah, 2023).

Asynchronous distance education activities have some disadvantages as well as advantages. The lack of a planned synchronous virtual lesson, lack of social interaction, and the student's inability to interact with their peers/instructor can cause some students to feel isolated and lonely (Rush, 2015). Asynchronous distance education requires students to be self-disciplined and have time management skills. Students who do not have these characteristics may be negatively affected by the distance education process (McFerrin, 1999). This situation can be challenging for students who want immediate feedback from their instructors or classmates or want to collaborate simultaneously. Studies investigating the effects of asynchronous or synchronous distance education processes on student success show different results (Oguguo, Ocheni, & Adebayo, 2021).

Pullen and Snow (2007) and Göçer (2020) stated that the distance education process in which synchronous and asynchronous learning processes are carried out together is the most effective method for student learning. Özgül and Ocak (2023) examined the effects of students' synchronous or asynchronous participation in the distance education process on their academic success and motivation. As a result of the 8-week research, they found that students who participated asynchronously had higher academic success than students who participated synchronously. Similarly, Demirtaş and Türk (2022) examined the effects of students' participation in the synchronous or asynchronous distance education process in a microeconomics course on their academic success. As a result of the study, they concluded that students who participated asynchronously had higher academic success than students who participated synchronously. Nieuwoudt (2020), in his research examining the effects of synchronous or asynchronous course participation in online learning on student success, concluded that students' participation in virtual courses synchronously and watching virtual course video recordings asynchronously later did not make a difference in students' success. Hung, Wu, and Chen (2024) examined the effects of synchronous and asynchronous participation in online learning on students' learning outcomes. As a result of the research, they stated that students who carried out the online learning process synchronously and asynchronously showed higher learning outcomes and satisfaction. Schoenfeld-Tacher and Dorman (2021), in their study on veterinary students, examined whether the face-to-face synchronous or online asynchronous courses in distance education made a difference in learning outcomes and student perceptions. As a result of the research, they stated that synchronous or asynchronous did not affect the student's academic performance. Oguguo et al. (2021), in their study, they concluded that participation in synchronous distance education processes improved academic success more than participation in asynchronous distance education activities.

In general, studies on the effects of participation in asynchronous or synchronous distance education processes on student success show different results. Students' participation in synchronous or asynchronous distance education activities is generally evaluated, and no evaluation is made regarding the achievement status of students who do not participate in any learning activities.

Distance education in Türkiye is carried out within the framework of the procedures and principles prepared by the Council of Higher Education (YÖK, 2023). According to these procedures and principles, the relevant unit boards that carry out the education will determine whether students are required to attend virtual courses given through distance education.

When we look at the practices worldwide, the requirement to attend virtual courses synchronously varies from university to university. For example, while there is a requirement

to participate in synchronous classes in the Ohio State University distance nursing program (Scheiderer, 2022), with its decision, the Uşak University Senate in Türkiye does not require attendance in courses continued through distance education. These courses, called campus-based online courses, are taken online by university students (Üstün, 2020). Therefore, students are not required to attend classes synchronously or asynchronously. At this point, it has become necessary to evaluate the achievement of students who study via distance education and do not attend any classes synchronously or asynchronously but only take exams. Especially after the COVID-19 pandemic, the rapid increase in distance education applications carried out globally has made it necessary to carefully structure web-based teaching and learning processes. Recently, numerous studies have explored the effectiveness of distance education and the adaptation processes of students to this learning model. These studies examine how distance education students access course materials and the effects of their interactions with these materials on their course success. In particular, the impact of virtual course viewing habits on students' academic performance has become an important research topic. The contributions of synchronous and asynchronous learning methods to students' course success are one of the focal points of these studies.

This study examined the effects of distance education students' participation and gender in virtual courses on their achievement. In this context, the students' 14-week virtual course participation and viewing status were examined, and the effects of students' only synchronous, only asynchronous, both synchronous and asynchronous, and no virtual course attendance and gender on their Turkish Language Course achievement scores were reported. At this point, the problem status of the research is based on examining the effect of distance education students' virtual course attendance status on Turkish Language Course achievement scores. The following questions were asked in the research:

(1) Do students' course achievements show a significant difference according to their virtual classroom participation status?
(2) Do students' course achievements show a significant difference according to their gender?
(3) Do students' course achievements show a significant difference depending on the common/joint effect of their virtual classroom participation status and gender?

The findings of this research will significantly contribute to the literature on the effects of virtual course attendance habits or gender on student achievement in distance education. The research provides valuable information that educators and policymakers can consider when determining the methods and strategies used in distance education. This research is significant as it provides empirical evidence on the impact of virtual course attendance and gender on student achievement in distance education. Understanding how different participation patterns—synchronous, asynchronous, both, or none—affect students' success in the Turkish Language Course offers valuable insights for educators and policymakers. Examining the interaction between attendance status and gender contributes to a deeper understanding of equity and inclusivity in virtual learning environments. The findings of this study can guide the development of more effective instructional strategies, enhance student engagement, and support evidence-based decision-making in distance education policies, ultimately improving learning outcomes.

## Method

### Research Design

The survey model was used in this research, which has the characteristics of quantitative and descriptive research (McMillan & Schumacher, 1984). The reason for choosing the survey model is to reveal the existing situation. Survey studies are studies that describe the current situation on the subject under investigation (Büyüköztürk, 2018).

### Working Group

The study's sample consists of 953 first-year students who are continuing their education at Uşak University (in Türkiye) in the 2023-2024 academic year, taking the Turkish Language course via distance education with the same instructor. Purposive sampling was used as the sampling method. The purpose of using purposive sampling is to ensure homogeneity and to be suitable for the purpose of the research. The variables were tried to be controlled by selecting students who took the same course from the same faculty member in the same academic year at the same university. Of the students, 434 (45.54%) are male, and 519 (54.46%) are female.

### Data Collection Tools

The study used system logs (records), students' demographic data and Turkish Language course achievement grades as data collection tools. System logs were obtained from the Uşak University Learning Management System. Moodle LMS v4.0.3+ was used as the LMS infrastructure. BigBlueButton v2.5.0 was used as the virtual classroom software. Students' achievement scores were obtained from the Turkish Language course exam results. The Turkish Language course was selected because it was a common course that all students in the research sample studied. The same instructor gave virtual courses for all students in the research sample. Students' achievement scores were obtained from the exam scores conducted after the distance education process.

Moodle is an open-source, free, web-based LMS widely used worldwide. Course areas can be created on the system, and synchronous and asynchronous course activities and materials can be shared within the course areas. All user movements are also recorded on Moodle. BigBlueButton (BBB) is an open-source virtual classroom software installed on Moodle LMS. Virtual classroom software includes activity modules such as presentation sharing, instant messaging board, whiteboard application, and instant survey application. This software allows synchronous live lesson execution and provides real-time recording. Recorded videos can be watched asynchronously later via BBB.

### Achievement Test

This study developed an achievement test consisting of multiple-choice questions to measure students' achievements in the Turkish Language course after the experimental process. The course instructor prepared the achievement test to cover 14-week Turkish Language topics and achievements. The scope of the test content includes understanding the written Turkish language and its features, spelling rules and use of punctuation marks, written and oral expression features, paragraph types and reading skills. Two separate Turkish Language field experts examined the questions. The field experts examined whether the questions were compatible with the learning objectives, whether the evaluation criteria were appropriate, whether they met the achievements, and whether they were understandable in

terms of language. Field experts reviewed the question texts, and the achievement test was finalised by making updates and corrections. Within the scope of the reliability study of the achievement test, a pilot application of the 25-question draft test was carried out on 30 students. In the pilot application, 30 students who are studying at the university, randomly selected from different faculties and who have taken Turkish Language courses, participated. As a result of the pilot application, the difficulty index of the test was calculated as 0.49, the discrimination average was 0.56, and the KR-20 reliability coefficient was 0.71. The achievement test was administered under supervision in a face-to-face classroom environment at the end of the distance education process.

*Implementation Process*

Students took the Turkish Language course via distance education for 14 weeks in the 2023-2024 academic year. The Turkish Language course was taught synchronously in real-time in a virtual classroom by a single instructor in accordance with the course program, and students attended the synchronous course if they wanted. Only course presentation, live video camera footage and audio were shared by the instructor in synchronous virtual courses. No learning materials were shared within the learning management system other than asynchronous past course video recordings. Synchronous virtual lessons were recorded as videos by the learning management system. Students who requested watched the recorded video recordings asynchronously. Regarding the use of the distance education system, system user guides were sent online to all students before the application, and they were also trained. Technical support service was also provided. During the process, students were free to watch the course synchronously or asynchronously. The virtual classroom participation statuses of the students are as follows in Table 1.

Table 1. Participation Status of Students in Virtual Classroom

| Participation Status | Explanation |
|---|---|
| Synchronous (simultaneous) monitoring only | Students in this group attended the virtual classroom in real time with their instructors on the day and time announced in their course schedules for 14 weeks. These students attended all synchronous classes. They only participated synchronously and did not watch the course videos asynchronously later. |
| Asynchronous monitoring only | Students in this situation only watched the recorded virtual course videos asynchronously later. These students watched all 14 weeks of asynchronous course videos. They did not participate in the synchronous virtual course in real-time. |
| Synchronous and asynchronous monitoring | In this case, students participated in the virtual classroom in real-time with the instructor on the day and time announced in their course schedules. These students attended all 14 weeks of synchronous virtual classes and then watched asynchronous course videos. |
| Never participated | Students in this situation did not participate in any virtual courses, synchronously or asynchronously, but only took the exam. (Other than asynchronous video recordings, no course materials were shared on the LMS.) |

*Analysis of Data*

First, the percentage and frequency table related to the data is presented. Assumptions were tested before data analysis. Normality and extreme value analyses of the data set were also performed. In comparing student score averages, the suitability of the data for parametric analysis was first checked. One-way variance analysis ANOVA, two-way ANOVA and t-tests were used. The effect sizes ($\eta^2$) values obtained from parametric tests were also presented. In

data analysis, $p<.05$ was accepted as the significance value and the SPSS v29 program was used in the data analysis process.

## Findings

### Descriptive Findings Regarding Students' Virtual Classroom Participation Status

The findings regarding the status of watching virtual lessons obtained from the distance education system of 953 students constituting the sample of the research are shown in the Venn cluster diagram in Figure 1.
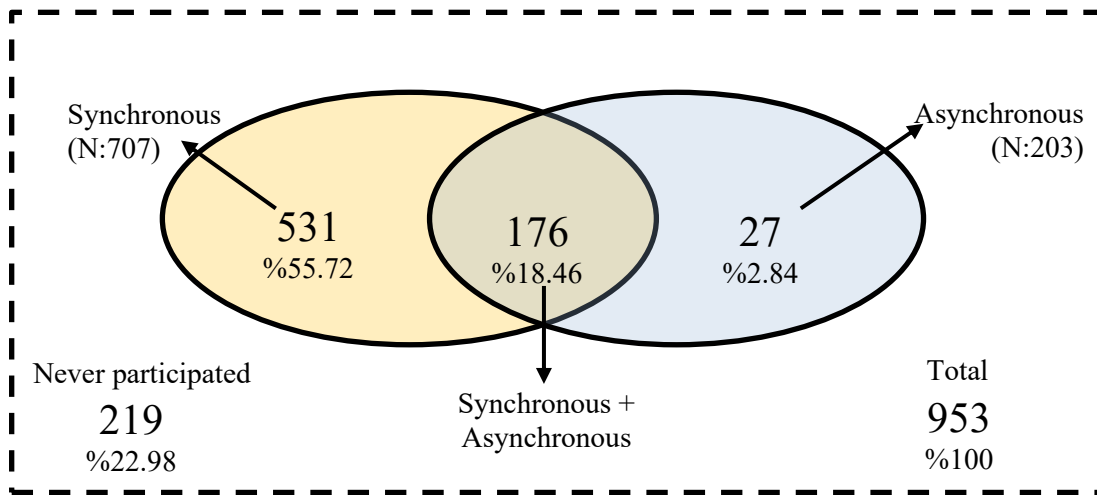


Figure 1. Numerical distribution of students' virtual classroom participation status

According to the cluster distribution in Figure 1, 531 students watched virtual course videos only synchronously. These 531 students followed their virtual courses "only synchronously". The total number of students who watched synchronously is 707. 27 students watched course videos "only asynchronously". These students did not participate in the course synchronously at all; they only watched the course video recordings asynchronously. The total number of students who watched asynchronously was 203. 176 students attended virtual courses both synchronously and asynchronously. These students both attended virtual courses synchronously and watched past course video recordings asynchronously after the course. 219 students did not watch any virtual courses either synchronously or asynchronously.

### Findings Regarding Students' Course Achievements According to Their Virtual Classroom Participation Status

Descriptive statistics regarding the distribution of students' Turkish Language course achievement point averages according to their virtual course-watching status are presented in Table 2.

Table 2. Course Achievement Point Averages

| Participation Status | N | $\bar{X}$ |
|---|---|---|
| Synchronous only | 531 | 62.34 |
| Asynchronous only | 27 | 60.18 |
| Synchronous and asynchronous | 176 | 65.90 |
| Never participated | 219 | 55.68 |
| Total | 953 | Avg. 61.02 |

According to Table 2, it was seen that the highest-grade point average was obtained by the student group who watched both synchronously and asynchronously out of 100 points (X̄: 65.90). However, it was found that the grade point average of the students who watched only synchronously was X̄: 62.34 and the grade point average of the students who watched only asynchronously was X̄: 60.18. The grade point average of the students who did not watch any videos was X̄: 55.68. It can be stated that the grade point average of the students who did not watch any videos was lower than the other groups. One-way ANOVA was used to examine whether the student's grade point averages significantly differed according to their virtual course-watching status. Before the analysis, the data set was tested for suitability for parametric analysis (normal distribution, homogeneity of variances, multiple connectivity, etc.). The mean, standard deviation, max-min, skewness and kurtosis values of the data set are given in Table 3.

Table 3. Descriptive Data of the Data Set

| Participation Status | N | SD | Skewness | Kurtosis | Min | Max |
|---|---|---|---|---|---|---|
| Synchronous only | 531 | 62.34 | 12.86 | -.486 | .708 | 10.00 |
| Asynchronous only | 27 | 60.18 | 13.55 | .283 | .567 | 30.00 |
| Synchronous and asynchronous | 176 | 65.90 | 14.56 | -.442 | 1.010 | 10.00 |
| Never participated | 219 | 55.68 | 14.20 | -.618 | .378 | 10.00 |

In the normality assessments made before the parametric analysis, firstly, the homogeneity of the variances was examined, and it was seen that the Leneve Test results were not significant ($p=0.221>.01$). It was seen that the kurtosis and skewness values in the obtained data were in the range of -2 / +2. According to George and Mallery (2016), the range of -2 / +2 was defined as an acceptable range. According to the data in Table 4, the assumptions for ANOVA from parametric tests were met.

One-way ANOVA was used to analyse whether the students' achievement score averages differed according to their status of watching virtual course videos. The findings obtained from the analysis are presented in Table 4.

Table 4. One-Way ANOVA on Students' Achievement Scores According to Video-Watching Status

| Achievement | Sum of squares | df | Mean of squares | F | p | Significant difference |
|---|---|---|---|---|---|---|
| Between groups | 11244.946 | 3 | 3748.315 | 20.493 | <.05 | |
| Within groups | 173581.812 | 949 | 182.910 | | | Yes |
| Total | 184826.758 | 952 | | | | |

To test whether there is a significant difference between the achievement scores of the students according to the four virtual classroom participation statuses, a statistical difference was found as a result of the ANOVA [$F(3, 949) = 20.493$; $p<.05$]. The effect size (eta-squared) was found to be $\eta^2 = 0.06$. This eta-squared value indicates a "medium" level effect. This result shows that students' participation in virtual courses has a statistically significant effect on their success scores and that this effect cannot be ignored. However, the fact that the effect size does not fall into the "large" category suggests that virtual course participation alone is not the strongest factor determining success and that other variables may also affect success. Post-Hoc test was used to decide between which groups the significant difference was (Table 5). Since the group sizes were not equal, LSD post-hoc test was preferred (Akbulut, 2010; Mert, 2016).

Table 5. Differences Between Groups

| | Groups | N | $\bar{X}$ | SD | F | p | Significant difference | |
|---|---|---|---|---|---|---|---|---|
| Ach. | Synchronous only (1) | 531 | 62.34 | 12.86 | | | | |
| | Asynchronous only (2) | 27 | 60.18 | 13.55 | | | 1-3, | 2-3, |
| | Synchronous and asynchronous (3) | 176 | 65.90 | 14.56 | 20.493 | <.05 | 3-4, | 1-4, |
| | | | | | | | 2-4 | |
| | Never participated (4) | 219 | 55.68 | 14.20 | | | | |

The mean differences between the groups are presented in Table 6, the result of the post-hoc analyses conducted to determine which situations of the students' video watching affected their achievement scores.

Table 6. ANOVA Test Findings Comparing Students' Achievements According to Virtual Classroom Participation Status

| Groups | Participation Status | Mean Difference | Std. Error | p |
|---|---|---|---|---|
| Synchronous only | Asynchronous only | 2.15945 | 2.66813 | .419 |
| | Synchronous and asynchronous | -3.56446* | 1.17632 | .003 |
| | Never participated | 6.65970* | 1.08613 | .001 |
| Asynchronous only | Synchronous only | -2.15945 | 2.66813 | .419 |
| | Synchronous and asynchronous | -5.72391* | 2.79530 | .041 |
| | Never participated | 4.50025 | 2.75856 | .103 |
| Synchronous and asynchronous | Synchronous only | 3.56446* | 1.17632 | .003 |
| | Asynchronous only | 5.72391* | 2.79530 | .041 |
| | Never participated | 10.22416* | 1.36911 | .001 |
| Never participated | Synchronous only | -6.65970* | 1.08613 | .001 |
| | Asynchronous only | -4.50025 | 2.75856 | .103 |
| | Synchronous and asynchronous | -10.22416* | 1.36911 | .001 |

*$p<.05$*

As a result of complementary post-hoc tests, it was determined that the achievement score averages of students who watched the course videos synchronously and asynchronously were significantly higher than those who watched only synchronously or asynchronously and did not watch at all. In other words, students' achievement was positively affected by following the virtual courses simultaneously and then watching these video recordings again asynchronously. Although the score averages of students who watched only synchronously were higher than those who watched only asynchronously, this difference was not statistically significant. In other words, whether students watched the course videos synchronously or asynchronously did not significantly affect achievement scores. When the situations of students who never attended/watched their virtual courses were examined, it was found that the achievement score averages of these students were lower than all other groups and especially significantly lower than the achievement scores of students who watched only synchronously and those who watched both synchronously and asynchronously.

*Findings Regarding Students' Course Achievements According to Gender*

A t-test was used to examine whether students' course achievement showed a significant difference according to their gender. The t-test results of students' achievement in Turkish Language courses according to gender are presented in Table 7.

Table 7. T-Test Results of Students' Achievements According to Gender

| Gender | N | X̄ | SS | sd | t | p |
|---|---|---|---|---|---|---|
| Female | 519 | 64.24 | 12.73 | 951 | 7.048 | .001 |
| Male | 434 | 58.01 | 14.54 | | | |

*p<.05*

Students' achievements show a significant difference according to gender, t(951)=7.048, p<.01. It was found that the course success score average of female students (X̄=64.24) was significantly higher than that of male students (X̄=58.01). This finding was interpreted as a significant relationship between the students' success and their gender. The effect size $\eta^2$ value was .05. According to this value, it can be stated that approximately 5% of the variance observed in the student success scores is due to gender, indicating a small to medium effect size. Cohen's *d* value was calculated as .46. Accordingly, it was found that the difference between the Turkish Language course success scores of female and male students was a .46 standard deviation.

Students' course achievements showed significant differences depending on the common effect of their virtual course viewing status and gender. For unrelated measurements between groups, a two-factor ANOVA was used to test whether students' course achievements showed significant differences. Descriptive statistics of students' achievement test scores are presented in Table 8.

Table 8. Descriptive Statistics of Achievement Scores by Virtual Classroom Participation Status and Gender

| Participation Status | | *Female* | | *Male* | | | *Total* | | |
|---|---|---|---|---|---|---|---|---|---|
| N | | X̄ | SS | N | X̄ | SS | N | X̄ | SS |
| Synchronous only | 291 | 64.77 | 11.90 | 240 | 59.39 | 13.38 | 531 | 62.34 | 12.86 |
| Asynchronous only | 14 | 58.57 | 12.15 | 13 | 61.92 | 15.21 | 27 | 60.18 | 13.55 |
| Synchronous and asynchronous | 117 | 68.67 | 13.10 | 59 | 60.42 | 15.81 | 176 | 65.90 | 14.56 |
| Never participated | 97 | 58.14 | 12.33 | 122 | 53.72 | 15.30 | 219 | 55.68 | 14.20 |
| Total | 519 | 64.24 | 12.73 | 434 | 58.01 | 14.54 | 953 | 61.41 | 13.93 |

It was observed that the achievement score averages (X̄=68.67) of female students who watched both synchronous and asynchronous videos were higher than the other students, and the achievement score averages (X̄=53.72) of male students who did not watch any videos were lower than the others.

*Findings Regarding the Common Effect of Students' Virtual Classroom Participation Status and Gender on Course Achievement*

The two-factor ANOVA results for the comparison of the achievement score averages of the students according to their gender are presented in Table 9.

Table 9. Two-Way ANOVA Results of Achievement Scores According to Virtual Classroom Participation Status and Gender

| Source of Variance | Sum of Squares | sd | Mean of Squares | F | p |
|---|---|---|---|---|---|
| Par. Status | 8153.256 | 3 | 2717.752 | 15.474 | .001 |
| Gender | 1080.015 | 1 | 1080.015 | 6.149 | .013 |
| Par. Status x Gender | 887.650 | 3 | 295.883 | 1.685 | .169 |
| Error | 165974.347 | 945 | 175.634 | | |
| Total | 3778925.000 | 953 | | | |

*p<.05*

According to Table 9, it was found that the students' virtual classroom participation status created a significant difference in their course success $F(3, 945)=15.474$, $p<.05$ and also that the students gender made a significant difference in their course success $F(1, 945)=6.149$, $p<.05$. It was found that the common effect of the virtual classroom participation status and gender on the students' Turkish Language course success was not significant $F(1, 945)=1.685$, $p>.05$. In other words, it was found that the student's course achievement did not differ significantly according to the common effect of gender and tracking status.

## Results and Discussion

This study examined the impact of distance education students' virtual classroom participation status and gender on their academic achievement in the Turkish Language course. The findings indicate that different forms of virtual classroom participation influence students' academic performance in varying ways. Students who watched the course videos synchronously (live) and asynchronously (recorded) had significantly higher success scores than those who only watched synchronously, watched asynchronously, or did not watch at all. Synchronous participation allows students to actively interact with their instructors and classmates while allowing them to ask questions instantly and resolve their misunderstandings immediately. Asynchronous participation allows students to re-watch, take notes, and learn at their own pace. According to this result, carrying out asynchronous distance education processes, which students can manage both synchronously and at their own pace, together with a blended approach, will be a more effective method for student learning. The results of this part of the study are also consistent with the cognitive load theory. According to the cognitive load theory, repetitions are stated to be more effective on long-term memory (Baddeley & Hitch, 1974). From the student's perspective, revisiting the learning material at intervals positively affects their learning.

Although students who only attended live lectures achieved higher achievement scores than those who only watched recorded videos, this difference was not statistically significant. In other words, whether students followed the lectures live or watched the recordings later did not significantly affect their academic achievement. This finding challenges the widespread assumption that live (synchronous) interaction inherently leads to better learning outcomes. Asynchronous content can be as beneficial as synchronous participation when designed effectively.

Research on interaction in distance education has yielded mixed results on the effectiveness of synchronous and asynchronous methods (Lin & Gao, 2020). While some studies suggest that synchronous live interactions contribute more to the learning process (Yin & Shi, 2022; Nieuwenhuyse, 2021), others highlight the potential for flexibility and increased student autonomy offered by asynchronous approaches (Wright & Osler, 2020).

Göçer (2020) and Pullen & Snow (2007) stated that synchronous and asynchronous learning processes are the most effective methods when combined. This conclusion aligns with the research findings. In their studies, Özgül & Ocak (2023) and Demirtaş & Türk (2022) discovered that asynchronous participation leads to higher academic success than synchronous participation. In this study, students who participated solely synchronously achieved higher success than those who engaged only asynchronously, though the difference was insignificant. Therefore, it can be inferred that the results of this study differ from those of Özgül and Ocak (2023) and Demirtaş and Türk (2022) but agree with the findings of the study conducted by Oguguo et al. (2021). Nieuwoudt (2020) and Schoenfeld-Tacher and

Dorman (2021) indicated that only neither synchronous nor asynchronous participation significantly influenced academic success. Similarly, this study found no significant difference in success scores between synchronous and asynchronous participation, which is consistent with the findings reported in those studies.

The success scores of the students who did not participate in the distance education process but only took the exam and did not participate in any virtual class synchronously or asynchronously were lower than those in the other groups. The success of the students who did not participate in any way was significantly lower than those who participated synchronously and those who watched both the live and recorded sessions. The researcher expected this finding. It is expected that the students who did not participate in any distance learning activities would have lower academic success.

Additionally, female students enrolled in distance education had significantly higher achievement in the Turkish Language course than male students. However, the combined effect of participation status in the distance education process and gender on students' academic success was not statistically significant. In other words, when considering gender and course viewing status together, there was no meaningful difference in students' achievement levels. These findings regarding gender suggest that female students may have an advantage in terms of factors such as language skills, study disciplines, or their ability to adapt to learning strategies in a distance education environment. When the literature on how gender differences emerge in specific academic fields is examined, some studies suggest that female students tend to be more successful in language and social sciences (Hyde & Linn, 2006), while other studies suggest that individual motivation, time management skills, and learning strategies better explain achievement differences between genders (Richardson, 2013; Zimmerman, 2002).

Especially in distance education environments, high individual learning responsibility may provide an advantage to students with developed self-regulation skills (Zimmerman, 2002). In this context, female students' higher academic success may be related to their ability to manage their learning processes more disciplined. However, the fact that the combined effect of gender and course tracking method was not significant suggests that other variables in the learning process - such as the student's previous academic background, ease of access to learning materials, instructional design, and individual motivation levels - may be more decisive in success. Studies examining the relationship between success and gender in distance education have yielded different results. Contrary to the findings of this study, Armah, Akayuure and Armah (2021) stated that male students taking Mathematics courses through distance education were significantly more successful than females. While Kirali and Alci (2016) stated that there is no difference in the perceptions of male and female students about distance education, Figaldo et. al. (2024) stated that male students find distance education processes more useful and successful than female students. There are different research results regarding the success and perceptions of female and male students in distance education processes. These findings indicate that gender may influence distance education experiences and outcomes in intricate ways. Nevertheless, the inconsistencies across studies suggest that factors such as cultural context, academic level, and individual traits likely interact with gender to shape distance education success. More research is required to clarify these relationships and inform targeted support strategies for male and female distance education students. In addition, the fact that the effect size of students' participation in virtual courses on their success does not fall into the "large" category indicates that virtual course participation alone is not the strongest factor determining success and that other variables may

also affect success. In this regard, it is recommended that researchers conduct similar studies with additional variables.

It is recommended that institutions and policymakers implementing distance education provide students with asynchronous content along with synchronous courses. Students who attend synchronous courses should be encouraged to review topics by watching asynchronous course video recordings. It is recommended that policymakers and educational institutions update legislation that requires asynchronous viewing of course video recordings following synchronous training. Distance education students' course viewing status and habits should be monitored regularly, and technical support and guidance services should be provided to improve asynchronous participation. Students should be informed about the advantages of synchronous and asynchronous course viewing methods and encouraged to develop more effective learning strategies.

**Declarations**

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