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Résumé de l'article

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# Examining Pre-Service Teachers' Perceptions About Virtual Classrooms in Online Learning

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## Abstract

Using a descriptive research design, this study explored pre-service teachers' perceptions of synchronous virtual classrooms and Web camera use in online learning. The study sample consisted of 256 pre-service teachers from the education faculty of a university in Turkey, and data was collected using a survey. The results showed that most pre-service teachers did not want to open their own Web cameras, due to reasons such as unsuitable physical environment, unsuitable appearance, and distractions on the screen. In addition, they stated that instructors' gestures, facial expressions, and verbal-visual emphases were essential, and they wanted instructors to be visible on screen. They also suggested that student-centered practices and question-answer activities should be carried out to increase the effectiveness of virtual classrooms. In addition, sessions should not be scheduled in the early hours of the day, and should be of short duration.

*Keywords:* synchronous learning, virtual classroom, online learning, pre-service teacher, web camera

# Introduction

Online learning (OL) resources differ according to the purposes they are used for and the technological opportunities available. In addition to asynchronous resources such as video lecture recordings, written content, and discussion forums, synchronous resources such as audio-video conferences and virtual classrooms (VCs) that allow instant interaction and information exchange are also used (Simonson & Schlosser, 2009). Students and teachers meet online for each learning session at a pre-determined time for instruction with synchronous resources (Fidalgo et al., 2020).

VCs are an important part of the array of synchronous resources. Theory regarding synchronous learning has focused on concepts related to interaction and distance. Teacher-student, student-student, and student-content interaction are among the factors and stakeholders of distance education emphasized by Moore (1989), and have an important role in positive learning outcomes in OL environments (Zimmerman, 2012). Moore (1993) discussed these three interaction types within his theory of transactional distance that focused on the perceived psychological and emotional distance between instructor and learner rather than physical distance. VCs have the potential to decrease levels of these non-physical distances while enhancing interaction.

VCs have been used very often throughout the world, especially during periods of emergency remote teaching. VCs are interactive OL environments where participants can attend meetings live (Falloon, 2012). VC applications allow for discussion and collaborative activities and have also improved self-disciplined students' learning outcomes (Ng & Peggy, 2020). Moreover, compared to traditional classrooms, students tended to prefer VCs that minimize barriers such as travel difficulties and costs (Morice et al., 2020). University administrators and instructors have also seen these applications as a tool to reach more students through online education (Zydney et al., 2019). VCs have the potential to bring aspects of face-to-face classroom environments to the digital learning environment. Therefore, student behavior and classroom management are critical issues for teachers in VCs, as in face-to-face education (Rufai et al., 2015). Lisciandrello (2020) suggested that the problems occurring in classroom management may be reduced when students are motivated to follow the teacher's directions closely and are engaged in cooperative tasks. Increasing motivation and cooperation in a virtual lesson has also facilitated classroom management in OL (Dyer et al., 2015). Moreover, thanks to their interactive features, VCs have provided conveniences in terms of student participation and communication (Gotsiridze, 2014).

This study investigated pre-service teachers' (PTs) opinions about VCs in detail. Specifically, it aimed to reveal the underlying reasons for their participation in VCs and their Web camera use. To make VCs more effective, teachers should learn new methods and techniques about digital applications that will motivate students (Kosturska, 2019). However, analyzing students' behavioral tendencies in virtual sessions is an important aspect of OL. There is a need for further research on what students think about the components used in VCs, what factors affect their use, and recommendations for their practical application.

With the increase of OL and virtual courses, particularly in the post-pandemic period (Lockee, 2021), such studies have become more critical. The results of the current research were intended to contribute to closing the gap between VCs and face-to-face classes and reducing the limitations in OL. It may also encourage reflection on the interrelation of critical educational variables such as student satisfaction,

motivation, and performance. In addition, these results may help practitioners to increase the effectiveness of VCs and design of virtual learning environments in the future.

The purpose of this study was to examine pre-service teachers' perceptions on synchronous VCs and Web camera use in online learning. In light of this, our four research questions (RQs) were as follows:

RQ1: What are PTs' opinions about the effectiveness of various VC combinations made up of elements such as presentation, camera, and whiteboard?

RQ2: What factors direct PTs to attend VCs or not attend?

RQ3: What are PTs' opinions about Web camera use by instructors and PTs during VC sessions?

RQ4: What are PTs' suggestions for making VCs more effective?

## Literature Review

Previous research has addressed various aspects of VCs, including (a) student opinions of their advantages and limitations (Faloon, 2012); (b) perceived stress among students taking courses in VCs (AlAteeq et al., 2020); (c) comparison of anxiety levels of these students with those in face-to-face classrooms (Moïse-Richard, 2021); and (d) comparison with video podcasts (Aghababaeian et al., 2019).

Web cameras and video conferencing applications have been widely used to increase interaction in OL. Thanks to Web cameras, communication in synchronous online lessons have been enriched by including the images of students and teachers (Codreanu & Celik, 2013). While this has helped simulate face-to-face classroom environments, it has also offered positive pedagogical effects (e.g., motivation, participation) associated with interactive learning (Jauregi et al., 2012).

However, a limited number of studies have investigated the trends of Web camera use in online courses. For instance, Kozar (2015) found that students turned on the camera for a few weeks at the beginning of the semester for social and emotional reasons, and then turned it off in the following weeks. Students noted privacy concerns and tediousness as their reasons for turning off the Web camera. Gherhes et al. (2021) also investigated the reasons why students turn their cameras on and off during online courses; the main reasons for students turning off their cameras were factors such as anxiety, shyness, and home privacy.

Rajab and Soheib (2021) showed that many students who study online in higher education are against using cameras for reasons such as privacy and anxiety. Moreover, other reasons for their opposition included poor Internet connections and concern for background visuals in their study environment (Castelli & Sarvary, 2021). Several other studies have focused on the effects of camera use on communication in VCs. According to O'Dowd (2006), cameras provided for the transmission of non-verbal messages and strengthened interaction. Aaltonen et al. (2009) stated that gestures and facial expressions were beneficial during online synchronous communication. Similarly, Giesbers et al. (2013) found that the use of video conferencing in lectures encouraged social interaction and feedback. They indicated that a video conferencing system had a positive effect on participation, motivation, and success.

Telles (2010) pointed out the important effects of cameras on communication and pedagogical elements. Other studies focused on the use of Web cameras in online language teaching (Hampel & Stickler, 2012; Jauregi et al., 2012) and their effects on interactive learning (Codreanu & Celik, 2013). However, despite the studies mentioned above, there is still a need to investigate students' opinions in detail and to make pedagogical inferences accordingly. It is important to reveal the impacts of VC technology, which has become an indispensable part of distance education, on the learning environment. Such inquiries will inform the innovative and more efficient pedagogical use of these technologies. In these aspects, this study differed from previous research.

# Methodology

## Design and Sample

We adopted a descriptive research design in this study, as it is the most appropriate method to describe an existing phenomenon or situation without analyzing the relationships between variables (Fraenkel & Wallen, 1993). A total of 256 (145 females, 111 males) PTs from the education faculty of a university located in the Black Sea Region in Turkey voluntarily participated in this study. Their ages ranged from 18 to 42 years ($M$ = 20.03, $SD$ = 1.02). Participants majored in mathematics ($n$ = 50), teaching social sciences ($n$ = 45), teaching Turkish ($n$ = 43), primary education ($n$ = 42), psychological counselling and guidance ($n$ = 32), fine arts ($n$ = 23), and teaching science ($n$ = 21).

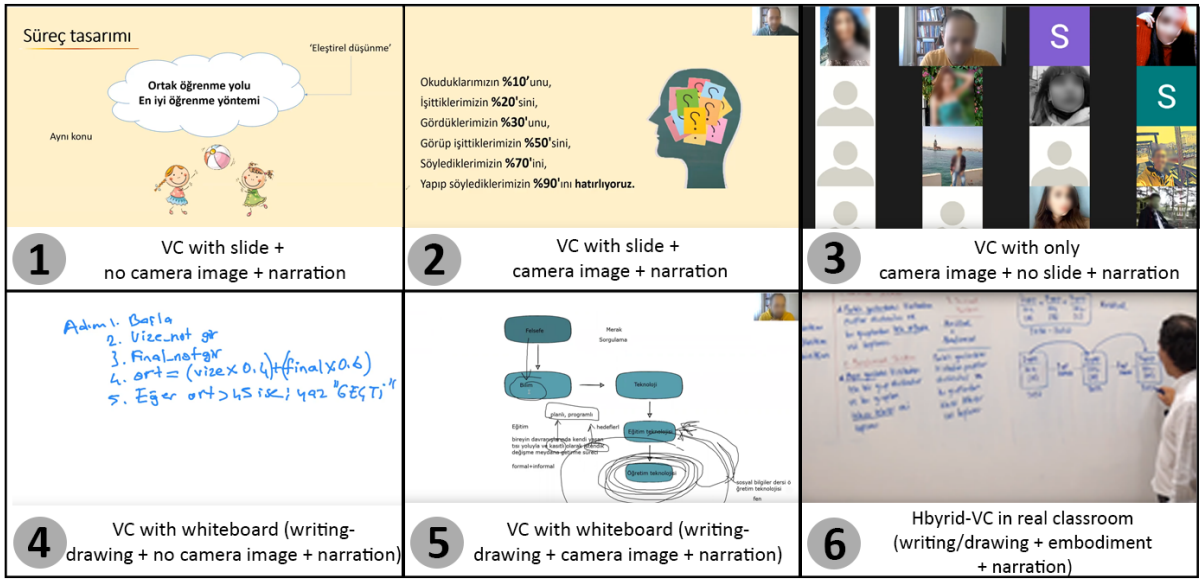
## Procedure and Data Collection

This study was performed during the fall term of the 2020–2021 academic year. Because of the COVID-19 pandemic, the participants took their courses in an OL environment, through a learning management system (LMS) both synchronously and asynchronously. PTs connected to the VCs via the Zoom application. Data in this study were collected using a survey created in Microsoft Forms; the link to the survey was shared with PTs on the LMS and was active for three weeks.

The survey consisted of three sections. The first had several questions to gather demographic information such as PTs gender and area of study. The second section used a seven-point Likert scale to evaluate the effectiveness of the given VC combinations (see Figure 1). The scale ranges from 1 (*less effective*) to 7 (*more effective*). PTs rated six common VC combinations made up of the following synchronous elements: whiteboard, instructor's image, and content presentation. Figure 1 shows the screenshots of these combinations.

**Figure 1**

*Screenshots of VCs: Combinations of Synchronous Elements*




The third section of the survey presented nine open-ended questions and a closed-ended question to gather data on PTs' perceptions of VCs (see Appendix).

We examined the relevant literature to create the survey questions. Two academics reviewed the survey to ensure its validity and reliability. The survey questionnaire was finalized according to both the experts' opinions and feedback from a pilot implementation. The experts' opinions indicated that the questions were appropriate in terms of content, understandability, and usability. The pilot implementation was conducted with eight PTs to ensure the questions were clear and complete.

## Data Analysis

The data obtained from the survey were reported with descriptive statistics such as frequency (*f*), mean (*M*), and standard deviation (*SD*) to determine the effectiveness of different combinations of VCs. The responses to the open-ended questions in the third part of the survey were analyzed using both descriptive analysis and content analysis. In the descriptive analysis, data are interpreted according to previously determined themes (Yildirim & Simsek, 2011). In the present study, both the research questions and the survey questions formed a framework for the descriptive analysis. Content analysis was used for a more in-depth analysis of the data summarized in the descriptive analysis.

The content analysis was carried out in two stages. First, codes and themes were identified by the researchers. PTs' perceptions were organized by converting them to pieces of code. Then, similar codes were combined into themes. In this second stage, the qualitative datasets obtained through the initial coding and sorting were analyzed by two experts who were not part of the main research team. Miles and Huberman's (1994) formula was used to compare codings and check the consensus; this value was found to be 92%. The frequencies (*f*) of the codes related to the repeated opinions in the study were presented in a tabular form. In addition, PTs' direct quotations were also included. To keep the identity of each participant confidential during the data editing, identifiers (e.g., PT-1, PT-2) were created for each individual.

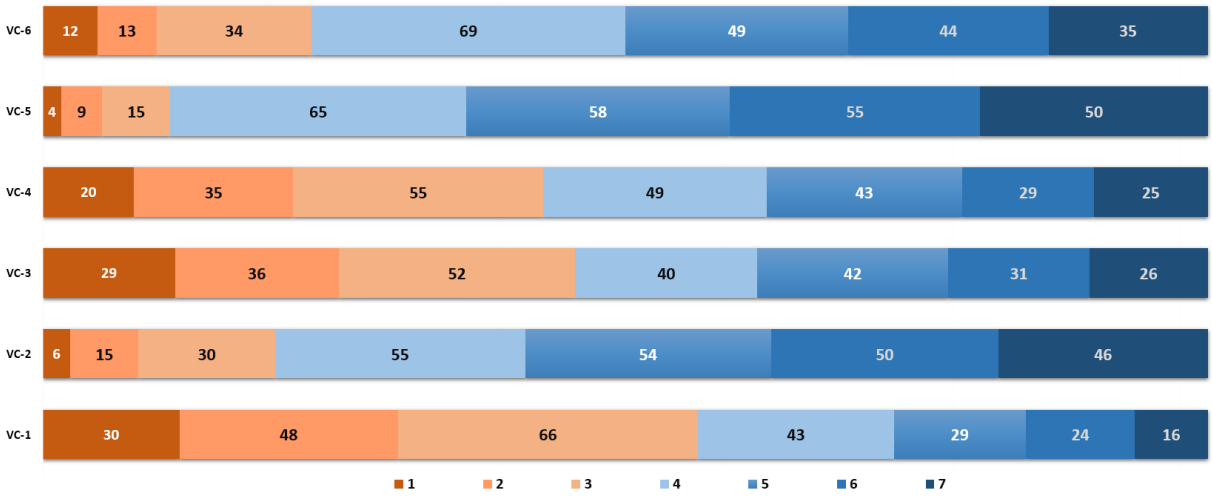
# Findings

## PTs' Opinions About the Effectiveness of Various VC Combinations

To address the first research question, PTs compared the effectiveness of six VC combinations made up of the elements of whiteboard, instructor's image, and content presentation. Figure 2 shows the frequency distribution of these comparisons of VCs.

**Figure 2**

*Comparison of Various VC Combinations of Elements*




As seen in Figure 2, PTs evaluated VC-5 ($M = 5.07$, $SD = 1.14$), VC-2 ($M = 4.84$, $SD = 1.20$), and VC-6 ($M = 4.57$, $SD = 1.24$) as more effective. They perceived the VC-1 ($M = 3.50$, $SD = 1.43$) as less effective. In particular, the elements such as whiteboard use for writing or drawing and the presence of the instructor's image were found more effective than the presentation of PowerPoint slides without an instructor's image or any other interaction on screen. VCs with the instructor's image, drawing/writing on the screen or a whiteboard, or visuals were perceived as more effective by PTs.

## Factors That Direct PTs to Attend VCs or Not

In exploring the second research question, we identified two sub-themes, namely the reasons for attending VCs and the reasons for not attending VCs. Tables 1 and 2 show the specific codes for PTs' opinions and their frequency distributions.

**Table 1**

*Reasons for Attending VCs and Frequency of Response*

| Code | *f* |
|---|---|
| To better learn and reinforce the subject matter | 54 |
| To ask the instructor about subjects of interest or needing clarification | 52 |
| To create an interactive classroom environment | 32 |
| To improve exam mark, grade, and to pass the class | 30 |
| To get immediate feedback | 25 |
| Compulsory attendance and roll call | 22 |
| To get information and tips about the exam | 22 |
| Instructor's qualifications | 14 |
| Attractiveness of the course and the pleasure it offers | 13 |
| A more effective learning environment than asynchronous content | 12 |
| To stay current and not fall behind in the course | 11 |
| To be informed about the announcements and anything new | 9 |
| Sense of responsibility | 6 |
| VC not recorded | 3 |
| Opportunity to make up for deficiencies | 2 |
| Complements the asynchronous educational content | 2 |
| Possibility of attending from anywhere | 2 |
| Professional development and its contribution to learning | 1 |

As seen in Table 1, most PTs stated that they attended VCs mainly it helped them better reinforce the subject matter ($f$ = 54), and instantly ask the instructor about subjects that were interesting or they didn't understand ($f$ = 52). For example, PT-203 noted that "usually, when there is a point that I don't understand or I am confused about, I try to ask a question to learn the answer. In general, I try to attend the class whenever I find time." According to PT-91:

> I have a chance to pause and listen to the content with asynchronous video when I do not understand, but I do not have a chance to ask questions when I get stuck. There cannot be a better opportunity to ask questions about things I could not comprehend.

Some PTs emphasized that they attended VCs with anxiety about exams and grades, as attendance was compulsory. PT-45 expressed this concern, stating "frankly, I attend the VCs to get high marks in the exam and pass the course… In the course, the instructor can sometimes give information about the exam." PT-40 stated reasons for attending the VCs as "the fear of absenteeism, being responsible for the subjects in exams and homework, and passing the course." Some PTs also emphasized reasons such as the instructor's qualifications, the attractiveness of the course, ineffective asynchronous course content, and their sense of responsibility.

**Table 2**

*Reasons for Not Attending VCs and Frequency of Response*

| Code | *f* |
|---|---|
| Instructor's lecture ineffective and boring | 83 |
| VCs scheduled in the early hours of the day | 82 |
| Technical problems | 44 |
| Lengthy course duration | 16 |
| Poor interaction and socialization | 9 |
| Having access to asynchronous recording | 7 |
| Boring course content | 7 |
| Disliking the course | 5 |
| Work responsibilities and illness | 5 |
| Efficient asynchronous content | 2 |
| Late starting the course | 2 |
| Personal study environment | 2 |
| Laziness | 2 |
| Waste of time | 1 |
| Learning better alone | 1 |
| Fear of turning on the Web camera | 1 |

As seen in Table 2, the main reasons PTs did not attend VCs were instructors' ineffective and boring lectures and scheduling early in the day. As PT-16 explained, "the teacher's inability to explain the subject, being in the early hours of the morning and the dull tone of her voice makes me sleepy." PT-203 expressed that "I generally attend the VCs, but when it is early in the morning, especially during this pandemic period, I have to listen to the lesson without having breakfast, and I cannot get enough sleep." These findings suggest that the instructor's lecturing style and the lesson's start time had the greatest impact on students' reluctance to attend the VC. Factors such as technical problems (e.g., sound, image, Internet), VCs long duration, and poor interaction were among the other reasons emphasized. In support of this finding, PT-52 reported that:

> VCs in which the instructors are not in contact with the students are not effective. Some instructors' VCs take too long. Also, there are the same contents on LMS, they overspeak on a subject. It gets too boring and uninteresting.

For example, PT-100 drew attention to the ineffectiveness of the VC in which the teachers read and run the presentations, the students do not talk at all, and there are no opportunities for questions and answers. These findings also show that the factors originating from the instructor were critical in developing negative attitudes towards the course.

## PTs' Opinions About Web Camera use by Instructors and PTs During VC Sessions

Related to our third research question, Table 3 depicts PTs' responses about whether the students' and teachers' cameras should be turned on or not.

**Table 3**

*PTs' Responses: Should Students' and Teachers' Web Cameras Be Turned On or Not*

| Student | | Instructor | |
|---|---|---|---|
| **Code** | *f* | Code | *f* |
| Should not be compulsory | 119 | Better if his/her camera is on | 102 |
| Should not turn on the camera | 48 | Should turn the camera on | 68 |
| Should turn camera on at his/her will | 42 | Not important | 7 |
| Better if the camera is on | 40 | Should turn it on at his/her will | 4 |
| Should turn on the camera | 24 | Should turn on the camera during activities | 3 |
| Should turn on the camera when possible | 20 | | |
| Should turn on the camera during activities | 10 | | |
| Only the respondent should turn it on | 8 | | |
| Not important | 7 | | |

As shown in Table 3, most PTs emphasized that it should not be compulsory for students to turn on their cameras during VCs. There were 48 different opinions regarding the perspective that cameras should not be turned on at all. Some of the students who stated that it should not be compulsory emphasized that they should turn it on at their own will, while others stressed that students' cameras should be turned on at the time of an activity, when possible, or when they are allowed to speak. 24 PTs stated that their cameras should be turned on. A total of 170 different opinions were reported about instructors' camera, mainly indicating that "it is better if the camera is on" (*f* = 102) and "the camera should be turned on" (*f* = 68). PTs' opinions mostly emphasized that instructors should turn on their cameras during VCs. PTs noted that turning on the camera should not be compulsory for students. For example:

> Considering this period and the lessons with and without cameras on, I think teachers should turn on their cameras. While I was reluctant to attend the course in which opening the camera was obligatory, I willingly attended the course of our instructor who asked us to open it as long as we were available. (PT-105)

Although most PTs generally felt that it should not be compulsory to turn on the cameras during VCs, some PTs expressed their views on the effectiveness of turning on the cameras. Moreover, we identified two sub-themes, namely the reasons for the necessity of turning on the camera in VCs and the reasons for not turning on their cameras in VCs. The codes related to these sub-themes and the frequency distributions of PTs' opinions are presented in Tables 4 and 5.

**Table 4**

*Reasons for the Necessity of Turning on Cameras*

| Code | *f* |
|---|---|
| Increase interaction and communication | 39 |
| Create more effective learning environment | 21 |
| Use gestures and facial expressions | 17 |
| Ensure concentration on the course | 13 |
| Ensure attentive listening | 9 |
| Make eye contact | 8 |
| Increase seriousness | 7 |
| Increase participation in the course | 5 |
| Create a warm atmosphere | 3 |
| Monitor students in the course | 3 |
| Maintain order and discipline | 3 |
| Ensure the course is not being boring and monotonous | 3 |
| Adapt to the course | 2 |
| Increase the liveliness of the course | 2 |
| Create motivating environment | 1 |

As seen in Table 4, PTs emphasized turning on the cameras mainly to (a) increase interaction and communication, (b) create a more effective learning environment, (c) use gestures and facial expressions, and (d) ensure concentration on the course. PT-66 stated that "it will be better if cameras are on. It creates a more interactive and friendly atmosphere and helps students direct their attention to the course." Similarly, PT-142 noted that:

> In the VC, it is better if the cameras are turned on because it gives at least a sense of classroom environment close to the real one though not creating an environment just like in the classroom. Teachers and students interact better. The instructor can observe whether the students understand the subject from their facial expressions.

In addition, some PTs also suggested that turning on the cameras helped them listen to the instructor and establish eye contact, and increased their seriousness and participation in the course. Codes and frequencies for the sub-theme of reasons for not turning on their cameras in VCs are given in Table 5.

**Table 5**

*Reasons for Not Turning on Their Cameras in VC*

| Code | *f* |
|---|---|
| Inappropriate physical environment | 182 |
| Inappropriate personal appearance | 61 |
| Distracting and tiring | 54 |
| Others do not turn on the camera | 22 |
| Privacy issues and invasion of private space | 16 |
| Feeling stress or tension | 14 |
| Shyness | 14 |
| Early class hours | 12 |
| Slow Internet | 9 |
| No reason | 9 |
| Not necessary | 8 |
| Privacy or security concerns | 8 |
| Not compulsory | 7 |
| Poor-quality camera | 6 |
| Not willing to be seen by others | 3 |
| Having no camera | 3 |
| Inability to express oneself comfortably | 3 |
| Desire to watch the lesson in a more comfortable position | 3 |
| Loneliness | 3 |

In Table 5, the code inappropriate physical environment stood out. PT-31 illustrated the perceptions behind this code, stating that:

> I think it should not be compulsory to turn on the camera. Because we cannot always attend classes in a suitable environment at home. I agree that the instructor's camera opening increases participation in the course. For students, I think, this situation causes more stress.

PT-103 explained the reason for this situation in this way: "I don't have a room of my own, there are always people going in and out, so I don't open a live camera." The other remarkable codes in this group include (a) inappropriateness of personal appearance, (b) distracting and tiring, (c) others do not turn on cameras, (d) privacy issues and invasion of private space, (e) feeling stress and tension, (f) shyness, and (g) early class hours. As an example of student comments regarding these codes, PT-211 noted that "I don't want to show my current appearance and my home state to everyone. I feel more comfortable with the camera off. Otherwise, I get excited and stressed."

Based on the PTs' opinions, it can be inferred that they tended not to turn on their cameras, especially during VCs in the early morning hours. For instance, according to PT-98 "when morning class comes, I get out of bed and directly go to the VC in my pajamas and with no make-up. My clothes are not suitable to show myself." Some PTs had privacy and security concerns during VCs; PT-33 stated that "frankly, I do not trust the system in terms of privacy, there may be unwanted images and screenshots can be taken and shared." Some students suggested guidelines for turning on the camera. For example, PT-44

emphasized that only those speaking or presenting for an extended period of time should turn on the camera.

## PTs' Suggestions for Making VCs More Effective

Regarding the fourth research question, PTs offered several suggestions for making VCs more effective. Table 6 shows the codes related to PTs' suggestions and their frequency distributions.

**Table 6**

*PTs' Suggestions for making VCs More Effective*

| Code | *f* |
|---|---|
| Use student-centered activities | 68 |
| Provide question-and-answer activities | 52 |
| No early-hour classes | 33 |
| Short session duration | 17 |
| Instructors should take students' opinions | 14 |
| Use engaging visuals | 8 |
| Use applications that increase interaction | 7 |
| Use of whiteboard | 6 |
| Chat on different extracurricular topics | 6 |
| Create a sense of a real classroom | 5 |
| Cameras should be on | 5 |
| Talk about current issues | 4 |
| Provide tips, use of highlighting elements | 3 |
| Give extra points to those who attend VCs | 3 |
| Provide evaluation activities at the end of sessions | 3 |
| Increase instructor qualifications | 2 |
| Ask pre-reminding-organizer questions | 1 |
| Relaxing music | 1 |
| Use gestures and facial expressions | 1 |

As seen in Table 6, most PTs stressed that student-centered activities should be carried out in VCs rather than just instructors' lecturing with presentations. They stated that the interaction should be increased by asking questions of students. "Student-teacher interaction should be ensured and students should be made more active by conducting question-answer activities" (PT-8). PT-30 suggested that "instructors can make the course enjoyable and more interesting with different methods and techniques instead of constantly reading from the presentation."

Some PTs stated that VCs in the early hours of the day should be brief. As PT-62 explained,

> While we have difficulty in focusing in the early hours even in face-to-face education, we have more problems in VCs early in the morning. I think it will be more efficient if the sessions are shortened and start a little later.

Clearly, both the start time and duration of the VC session were seen as related to its effectiveness, as well as the instructor's lecturing style, planning the learning-teaching environment, and focusing on student-centered activities.

Regarding the duration of VCs, participants responded to the following questions: How long do you think the VCs should last for a single session? After which minute do you start to get distracted? Based on our findings, the mean value for the VC duration was calculated as 27.5 minutes ($N$ = 256, $Min$ = 10, $Max$ = 60, $SD$ = 7.85). PTs were also asked: Considering the asynchronous content, at which time intervals do you think the VCs should be held? In all, 176 PTs reported that they should be held once a week, 33 PTs suggested once every two to three weeks, another 8 PTs said once a month, 31 PTs stated only before the exam, and 8 PTs felt VCs should never be held.

## Discussion

This study indicated that PTs perceived virtual classrooms in which the instructor was visible via Web camera and supported by several highlighting elements (e.g., underlying important points, accentuation of voice, gestures, and facial expressions of instructor) to be more effective. VCs in which the instructor was not visible and the subject matter was presented only through narration were rated as less effective. The results showed that PTs did not want the cameras to be compulsory in VCs. Their primary reasons were that their physical environment and personal appearance were not suitable, the sessions were scheduled early in the morning, and cameras were a distracting factor. Similarly, Castelli and Sarvary (2021) showed that the most frequent reasons why students did not turn on their cameras were personal and environmental concerns. Costa (2020) also suggested that if students were ashamed of their home environment and did not have a private study room, the best policy would be not to ask them to turn on their cameras.

The results of this study showed that teachers, in particular, should turn on their cameras because gestures, facial expressions, emphases, and visual hints increase interaction. On the other hand, the act of students turning on their cameras can increase interaction depending on whether the class is crowded or the students could get the floor for speaking. However, when students are required to turn on the cameras, they may feel pressure and their desire to learn may be lowered. In the case of crowded classrooms, turning on the cameras in VCs may distract the students by watching each other from the camera images on the screen. These factors should not be overlooked when turning on the cameras in VCs and making communicative decisions. In particular, the COVID-19 pandemic and subsequent changes in teaching and learning have negatively affected students psychologically. When interpreting the findings in this study and similar studies, students' levels of anxiety and depression should be taken in account as these have increased since the COVID-19 outbreak (Huckins et al., 2020). An obligation to turn on their cameras may also worsen students' psychological state. Therefore, positive factors that will trigger camera use can be recommended by instructors before VC instruction begins.

On the other hand, as previously revealed by many studies, for VCs to reach the efficacy of face-to-face education, student-student and student-teacher interaction are critical factors (Gloria & Uttal, 2020). For instance, Kalman et al. (2020) pointed out that students who were previously engaged in collaborative work that increased interaction felt as if they were in a physical classroom when completing activities with the camera on. During VCs, collaborative learning can be used as well as methods such as project-based learning (Cortazar et al., 2021) and peer collaboration (Rapanta et al., 2020). Moreover, in order to increase the interaction, the suggestions of PTs in the use of virtual classrooms should be taken into consideration such as student-centered practices as well as question-

and-answer activities. In this direction, Caton et al. (2020) emphasized the increase in students' questioning behavior had a positive effect on student participation in general.

In addition to these student-centered activities in the VCs, instructional materials such as videos can be used before the virtual classroom to support these student-centered activities. For instance, in their study with higher education students, Brockfeld et al. (2018) concluded that students found the videos at least as effective as VCs; they stated that supporting VCs with videos could increase their effectiveness. Islam et al. (2020) suggested that pre-recorded videos offered a more flexible learning opportunity. However, they also drew attention to the need for students to be motivated to watch such videos and the provision of time for students to watch them.

Finally, it should be noted that the concept of equal opportunity plays a key role in studies of online learning and VCs. Although the basic philosophy of distance education is to provide equality of opportunity, there must also be equal access to the technological infrastructure necessary for online learning environments to achieve this goal. In developing countries, there are gaps in access to technology and infrastructure facilities among different socio-economic classes (Venkatesh & Sykes 2013). Similarly, on a global scale, it can be said that this problem also exists between countries (Hill & Lawton, 2018). In addition, Internet connection problems make it difficult for some students to access online education (Todd, 2020). While some international organizations have provided tablets and computers, they have also opened their learning platforms and provided free digital educational resources (United Nations Educational, Scientific and Cultural Organization, 2020).

### Limitations

This study had several limitations. First, respondents were participants in VCs with crowded classes at the higher education level. The perceived importance of the various elements in VCs with small class sizes and at different academic levels may vary. Keeping the cameras on in VCs for classes that are not crowded is an important factor that increases interaction. Second, the current study was not designed as an experiment, so did not allow for cause-and-effect inferences. Future studies could explore different communication elements in VC environments compared experimentally. Indeed, current research findings can pave the way for specific issues to be discussed in future experimental and causal-comparative studies. Third, since it was carried out in the emergency remote education process, the findings of this study may have differed from other distance education studies. Moreover, the sample for this research came from a university in Turkey. Hence, the results about turning on and not turning on the camera during VCs may vary in different countries. Geographic, religious, and cultural elements (e.g., Islamic religion) may have affected the results. Accordingly, similar research should be replicated with different samples in various regional contexts.

## Conclusion and Recommendations

This study revealed the opinions of PTs about the effectiveness of various VC combinations, reasons for attending or not attending VCs, use of Web cameras, and suggestions for making VCs more effective. First, the results of this study showed that the elements such as whiteboard use for writing or drawing and the presence of the instructor's image were more effective than the presentation of PowerPoint slides without an instructor's image or any other interaction on screen. Second, PTs emphasized their reasons for participating in VCs, such as reinforcing the subject of the lesson,

asking questions of the instructor, and increasing interaction. Many PTs stated that they did not want to attend the VCs because of the instructor's professional inadequacy and the earliness of the lesson hour. Third, we also asked questions about the use of the Web camera itself, an important element of VCs. Most PTs stated that instructors' Web cameras should be turned on during the Zoom session. As well, most PTs said that they did not want their Web cameras on for reasons such as unsuitable physical environment, unsuitable appearance, and distractions on the screen. It should be noted that these views were related to crowded online classes. It is clear that turning on the cameras in online classrooms with a small number of students increases interaction. Last, PTs offered several suggestions on how to make VCs more effective. They recommended student-centered activities (e.g., gamification, question-and-answer technique, online cooperative learning tools), effective instructional design, and short virtual sessions.

Based on our findings, in future studies, it would be interesting to perform this study on larger samples, in different fields and grade levels in higher education. We recommend that instructors should turn on their cameras in VCs, while the students who want to speak can turn on their cameras as they wish. Moreover, considering that the students attend the session from home or a dormitory, synchronous sessions should not be in the early hours of the day, and their durations should be short. We suggest that instructors use the interactive features of the applications (e.g., break-out room, emojis, polling, and video backgrounds) available in VCs.

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# Appendix

## Questions in the Third Part of the Survey

1. What are the factors direct you attending VCs (via Zoom)? Please explain.
2. What are the factors direct you not attending VCs (via Zoom)? Please explain.
3. What do you think about whether students should turn on their cameras or not in VCs? Please explain.
4. What do you think about the instructors turning on the camera or not in VC? Please explain.
5. What are your opinions about the effectiveness of turning on student and teacher cameras during VCs in distance education? Please explain.
6. What are the reasons for not turning on your camera in VCs? Please explain.
7. What are your suggestions for making VCs more effective? Please explain.
8. How long do you think the VCs should last for a single session? After which minute do you start to get distracted?
9. Considering the asynchronous content, at which time intervals do you think the VCs should be held?
   ( ) Once a week
   ( ) Once every two to three weeks
   ( ) Once a month
   ( ) Just before the exam
10. Which way do you mostly use to communicate with your instructor during the VCs? Please explain.