



## Investigation of Pre-Service Teachers' Opinions on Advantages and Disadvantages of Online Formative Assessment: An Example of Online Multiple-Choice Exam

Fatma Gizem KARAOĞLAN-YILMAZ 

Bartın University, Faculty of Sciences, Computer Technology and Information Systems,

[gkaraoglanymaz@gmail.com](mailto:gkaraoglanymaz@gmail.com)

ORCID: <https://orcid.org/0000-0003-4963-8083>

Ahmet Berk ÜSTÜN 

Bartın University, Faculty of Sciences, Computer Technology and Information Systems,

[ustun.ab@gmail.com](mailto:ustun.ab@gmail.com)

ORCID: <https://orcid.org/0000-0002-1640-4291>

Ramazan YILMAZ 

Bartın University, Faculty of Sciences, Computer Technology and Information Systems,

[ramazanyilmaz067@gmail.com](mailto:ramazanyilmaz067@gmail.com)

ORCID: <https://orcid.org/0000-0002-2041-1750>

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### ABSTRACT

The interest in using online formative assessment activities has gradually increased in both traditional teaching and distance education processes. Research emphasizes the importance of using online formative assessment in learning processes. Due to this fact, it is essential to uncover pre-service teachers' thoughts about online formative assessment activities in a critical manner. Because they will decide whether to employ these activities in the educational field in a few years. Therefore, the aim of this study is to explore pre-service teachers' opinions about the advantages and disadvantages of online formative assessment. The research was conducted on 35 pre-service teachers enrolled in Computer I course during an academic term. They participated in online formative assessment activities every week within the scope of the research. An online formative assessment system based on multiple-choice exams and providing immediate feedback was developed. Data were collected through using a semi-structured interview method and content analysis was conducted to analyze the data. The advantages and disadvantages of using online formative assessment activities that provide immediate feedback in the form of a multiple-choice exam were revealed according to pre-service teachers' opinions as a result of this study. Various practical and constructive suggestions were offered for the design, development and implementation of online formative assessment in accordance with the results obtained from the research.

## Introduction

The advancements of information and communication technologies have brought about digital transformation in the field of education as in all areas of our lives. The limitations of space and time in the teaching and learning processes have been overcome with the digital transformation in the field of education. Learners can access the information sources they need from the inside and outside of the classroom via the internet. Massive Online Open Courses (MOOCs), video sharing platforms, social networking communities are commonly preferred online learning resources today. Although these online learning resources, specifically MOOCs, are informal learning platforms, several institutions including universities have begun to utilize these platforms as a formal learning platform if meeting their accreditation requirements (Annabi & Wilkins, 2016; Tsai et al., 2018). Many universities offer accredited degree courses for a variety of undergraduate programs through MOOCs. Learners can even find opportunities to complete undergraduate and graduate degree programs through MOOCs. MOOCs have also become learners' preferred learning environments of all ages for certificate programs (Wong et al., 2019). Besides, although online education is an optional instructional delivery system for those who live far from campus, prefer to study at your their pace or work full-time, it might be an inevitable way of delivering educational instruction when traditional learning cannot be applicable due to any undesired conditions affecting human beings such as wars or pandemics like coronavirus. According to these developments, online learning can be considered as a lifelong learning program encompassing learners of all ages. In fact, research reveals that online education can be as beneficial and effective as traditional education if the online learning environment is well-designed (Sezer, Karaoglan Yilmaz, & Yilmaz, 2017).

One of the most important components of the learning process is assessment. Assessment is an essential component of the learning process for the evidence and accreditation of learning (Lubinescu, Ratcliff, & Gaffney, 2001). Assessments that ask probing questions also help students to deepen their understanding (Ustun & Tracey, 2019). Summative assessment encompasses decisions that are mostly related to certification of achievement and performance, giving a final grade, making a pass-fail decision (Harlen & James, 1997). However, formative evaluation is being recognized as being at the forefront of the online learning process (Yilmaz, 2017). Since learners are responsible for their own learning process in online learning. Because of this fact, they need to possess skills such as self-regulated learning, self-directed learning, and intrinsic motivation to be successful in the online learning process (Lynch & Dembo, 2004; Saks & Leijen, 2014). Learners who do not have these skills may need external support (Karaoglan Yilmaz, Olpak, & Yilmaz, 2018). However, it might not be possible to provide external support to each learner when it is considered that masses are taught in online learning. Formative assessment becomes important at this point (Gikandi, Morrow, & Davis, 2011).

Online formative assessment is an assessment approach in which each learner can test themselves using online tools and environments, where feedback is provided to them about the learning process, in which it is aimed for them to make self-assessment based on this feedback and consequently, they make decisions about their own learning process to improve this process. The main advantages of online formative assessment are to allow

learners to take the exam without the restriction of place and time, to repeat it as needed, to obtain ongoing and immediate feedback as soon as completing it, to get an opportunity for self-regulation and self-directed learning and to receive continuous external support (Gikandi et al., 2011). Ongoing feedback helps learners identify their strengths and weaknesses and determine gaps in their understanding of topics they have learned.

The related literature shows that a wide variety of learning activities is used to carry out online formative assessment (Baleni, 2015; Crossouard, 2008; Olson & McDonald, 2004). Peer assessment, computer-assisted cooperative learning, online discussions, online project-based learning are some examples of activities used to make online formative assessment. Besides, one of the widely preferred strategies to do online formative assessment is an online multiple-choice exam based on self-assessment. However, when the literature is examined, it is determined that there is a need to conduct studies investigating the effects of doing online multiple-choice exams based on self-assessment on learning-teaching processes. The aim of this study is to examine the pre-service teachers' opinions about online formative assessment based on multiple-choice exams.

### **Method**

The information about the research model, study group, data collection tools and data analysis is provided in this section.

### **Research Model**

The preservice teachers' opinions towards online formative assessment were tried to be determined within the scope of the research. In accordance with this purpose, their opinions about the advantages, disadvantages and limitations of online formative assessment were revealed. In this sense, the research strategy was the case study that is one of the qualitative research designs. Both quantitative and qualitative research methods were employed in this research. Quantitative data were obtained using a questionnaire developed by the researchers and qualitative data were obtained using a semi-structured interview form developed by the researchers.

### **Study Group**

The participants of the study were 35 students studying the Faculty of Education at a state university in Turkey. The age ranges of students vary between 17 and 23. Preservice teachers studied at the department of elementary mathematics education, 17 students of them are male (48.6%) and 18 students of them are female (51.4%). When looking at the technological devices they had, it was ascertained that all of them had smartphones with the internet connection, 91% of them had laptops and 57% of them had tablet computers. It was observed that students mostly preferred to use their smartphones to connect the internet.

### **Data Collection Tools and Analysis**

The data were collected through a questionnaire and an interview form consisting of semi-structured questions. Both data collection instruments were developed by the researchers. A series of questions were asked to the preservice teachers in the questionnaire in order to obtain information about their age, department, technological tools, internet accessibility and so on. The semi-structured questions in the interview form were also asked to them in order to determine the advantages and disadvantages of online formative assessment. After the questionnaire and interview form was judged by experts in the field of instructional technology, both instruments were reshaped according to their feedback and used in the research.

### **Online Formative Assessment and Procedure**

Moodle was used as a learning management system in the research. The assessment tool Moodle provided was utilized to develop the online formative assessment activities. Students participated in the online formative assessment activity implemented in Moodle to assess themselves after studying each topic every week within the scope of the course. Each online formative assessment activity was available to students at the end of each week. Online formative assessment activities were prepared in a way that allowed the students to take the assessment activity whenever and wherever they want. The questions included in the online formative assessment were prepared as a multiple-choice exam with five choices for each question. A multiple-choice exam consisting of approximately 10 questions was applied to students every week. While preparing a multiple-choice exam, an immediate feedback system that provided the reason why the selected choice of answer is correct or wrong for each question was designed. Feedback was also given to students at the end of the exam. Thus, it was aimed that the student could make self-assessment according to feedback. Students were able to take an exam as many times as they wanted. The research continued every week through an academic semester in the same manner.

### **Data Analysis**

The content analysis technique was used to analyze the data obtained from the student opinion form consisted of semi-structured questions. After the collected data was coded by a coder in the qualitative data analysis process, the data was re-coded by a second coder to ensure the reliability of the study. The number of codes that both coders agreed on divided by the total number of codes to calculate the reliability of the coding. The coding reliability percentage was found as 91%. For the remaining 9% difference, the coders came together and reached a consensus. When the pre-service teachers' written explanations were examined, this difference of coders was because of the fact that some of the answers given by a pre-service teacher were gathered under several sub-themes.

## Findings

### Technological Tools Pre-Service Teachers Prefer to Participate in Online Formative Assessment

Pre-service teachers were asked which tool they would prefer to participate in online formative assessment. Technological tools that they preferred to participate in online formative assessment are shown in Table 1.

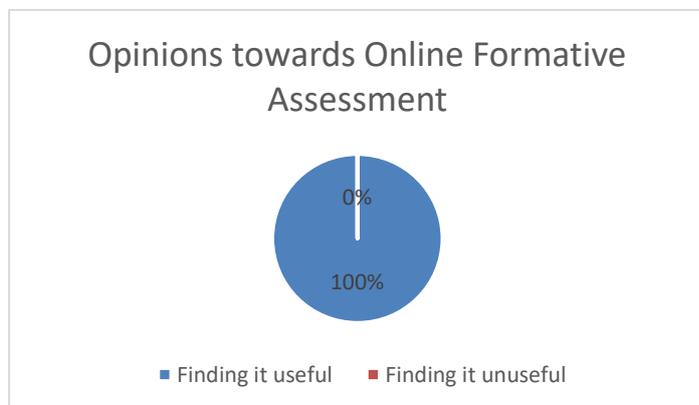
*Table 1.* Technological tools pre-service teachers prefer to participate in online formative assessment

| Technological Tool | Preference Status (%) |
|--------------------|-----------------------|
| Smart Phone        | 92%                   |
| Laptop             | 8%                    |
| Tablet             | 0%                    |

Pre-service teachers mostly preferred to use their smartphones to take the online formative assessment. Some of them preferred to use their laptop in participating in the online formative assessment. There are no students who used their tablets.

### Pre-service Teachers' Opinions towards and Intention to Use for Online Formative Assessment

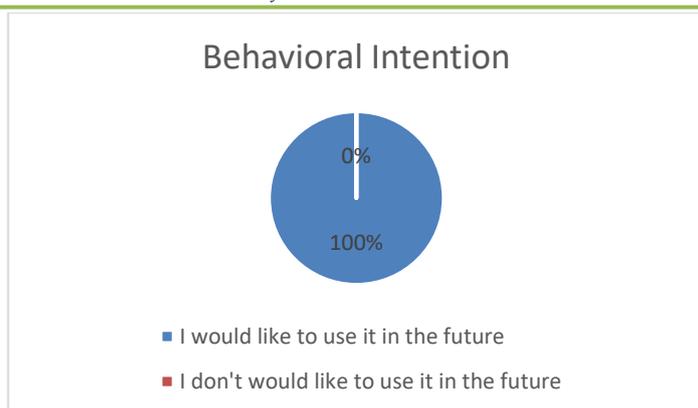
The pre-service teachers were asked if they found the online formative assessment activities beneficial. Their thoughts about finding online formative assessment beneficial are shown in Figure 1.



*Figure 1.* Pre-service teachers' opinions towards finding online formative assessment useful

When Figure 1 is examined, all of the pre-service teachers who participated in the study found online formative assessment useful.

The pre-service teachers were asked if they would like to utilize online formative assessment activities in the future. The behavioral intention of pre-service teachers to utilize online formative assessment in the future is shown in Figure 2.



*Figure 2.* Pre-service teachers' opinions on finding online formative assessment useful

When Figure 2 is examined, all of the pre-service teachers who participated in the study were willing to use the online formative assessment in their future courses and their behavioral intentions were positive.

### **Pre-service Teachers' Opinions about Advantages of Online Formative Assessment**

What the advantages of online formative evaluation pre-service teachers gained were asked. Pre-service teachers' opinions about the advantages of online formative assessment they gained are shown in Table 2.

*Table 2.* Pre-service teachers' opinions about the advantages of online formative assessment

| Sub-Themes   | Frequency (f) |
|--|---------------|
| Allowing me to check whether I have succeeded or not                                       | 35            |
| Giving an opportunity for me to take the exam at any desired place and time                | 34            |
| Providing an opportunity for me to take the exam as much as I want                         | 32            |
| Promoting learning   | 31            |
| Providing immediate feedback about my correct and wrong answers at the end of the exam     | 29            |
| Enabling me to make self-assessment  | 28            |
| Reinforcing what I have learned  | 27            |
| Allowing me to understand/learn the topic better   | 26            |
| Facilitating learning  | 26            |
| Helping me become more successful at the course  | 25            |
| Being a practical activity   | 23            |
| Making the learning process more efficient   | 22            |
| Being less stressful and more comfortable than the traditional in-class (paper-based) exam | 21            |
| Increasing my motivation   | 19            |
| Making me active in the learning process   | 19            |
| Providing feedback that helps me learn by myself   | 17            |
| Being enjoyable  | 15            |
| Encouraging me to study in a regular manner  | 14            |
| Asking questions related to the course topics  | 12            |

Some pre-service teachers' opinions are given below.

PsT1: "It not only helps us understand the course topics better but also gives us the opportunity to test ourselves after studying the topics. Therefore, we can realize how much we have learned. We understand our deficits better."

PsT2: "Because of having the exam in a more comfortable environment, I can do it easier. As a result of the exam, I can be aware of my learning needs. I get stressed less."

PsT3: Mobile exam activities are economic because there is no transportation problem, there is no fear of being late for the exam, there is no limitation of time and place, it provides an educational opportunity for students with physical disabilities.

### **Pre-service Teachers' Opinions about the Disadvantages / Limitations of Online Formative Assessment**

What the advantages/limitations of online formative evaluation pre-service teachers experienced were asked. Pre-service teachers' opinions about the advantages of online formative assessment they experienced are shown in Table 3.

*Table 3.* Pre-service teachers' opinions about the disadvantages/limitations of online formative assessment

| <b>Sub-Themes</b>  | <b>Frequency (f)</b> |
|--|----------------------|
| Experiencing internet connection problems during the exam  | 22                   |
| Easily cheating in the exam  | 19                   |
| Feeling anxious during the exam  | 12                   |
| Getting not enough time to finish the exam sometimes   | 11                   |
| Obtaining low scores as a result of the exam may lead to demoralization or may decrease motivation | 10                   |
| Having smartphones with insufficient features  | 4                    |

ÖA1: We are sometimes demoralized when we receive low scores. There is a decrease in our motivation toward the course."

ÖA2: "The disadvantage is that the person feels anxious so being unable to answer questions."

ÖA3: "I don't think there is any disadvantage."

### **Discussion and Conclusion**

Pre-service teachers' opinions about online formative assessment activities were investigated in this study. A multiple-choice online formative assessment system providing immediate feedback was developed and the positive and negative opinions of pre-service teachers who used this system through a semester within the scope of the course were revealed. As a result of the study, all pre-service teachers stated that they found the online formative assessment beneficial. All of them also indicated that they would like to utilize online formative assessment in their future courses. In other words, it was concluded that their behavioral intentions towards online formative assessment were positive. This aligns with a study conducted by Santamaría Lancho et al. (2018) who found that students were satisfied and encouraged with automated formative assessment. They also revealed that

students' writing skills and levels of conceptual understanding were improved by means of the feedback given after the automated assessments.

According to pre-service teachers' opinions about online formative assessment, there were many advantages of carrying out online formative assessment activities such as allowing students to receive feedback to improve their performance. Productive formative assessment activities increasing students' motivation depend on providing opportunities for students in obtaining feedback instead of points (Shepard, Penuel & Pellegrino, 2018). Duckor (2014) indicated that carefully designed formative assessment can be influential on student outcomes in a positive way. However, it was observed that a small number of pre-service teachers encountered some problems during the online formative assessment activities. When the advantages of online formative assessment are considered, employing online formative assessment in traditional and distance education can be a beneficial part of the effective teaching and learning process despite its disadvantages.

Gibbs and Simpson (2005) pointed out that making formative assessment and providing individualized feedback are effective factors in order to enhance students' performance, promote their motivation and maintain their engagement. According to pre-service teachers' opinions and suggestions about developing online formative assessment activities, availing the following design elements to develop effective online formative assessment activities is essential in the instructional design process. Therefore, while developing and implementing multiple-choice online formative assessment activities, the following design points should be considered;

- Feedback should be prepared for the choices of each question in a multiple-choice exam. Explanations should explicitly be provided to the student why his answer is correct or wrong.
- The student should be able to see summary reports on the total score he achieved, the topics he learned well, and the topics he needs to study more at the end of the exam.
- All the questions are displayed in random order. In other words, if a student takes the exam again, questions will appear in a random order.
- The exam duration is essential to attract the student's attention to the exam. However, the length of time for the per question should not be too short.
- It should be noted that online formative assessment is considered a part of the learning process. Therefore, students should be allowed to take an exam as many times as they want.
- Students indicated that their anxiety surface during online formative assessment. Online formative assessment should be used in students' early ages (primary school, middle school, etc.) in order to cope with this exam anxiety,
- Students should be able to take the exam at any time and place.
- Multimedia elements such as video, sound recording, graphic or table should be included in questions in order to make the questions more attractive.

- The vast majority of students participated in online formative assessment activities using their smartphones. Considering this fact that it is important that the format of online formative assessment should be compatible with mobile devices.

In conclusion, online formative assessment can be employed to shift teaching and learning approaches from teacher-centered learning to student-centered learning by giving chance to students to identify their learning needs and focus on learning processes and their own progress. The design of online formative assessment activities developed as a multiple-choice exam can be effective to positively influence students' learning experience when specific and immediate feedback is provided and multiple-choice exams are easily accessible and iterative. The principles of universal design for learning can also be followed to develop effective online formative assessment activities. Therefore, using online formative assessment can positively influence students' learning experience.

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