Experiences of Pre-Service Mathematics Teachers on the Use of Mentimeter in Distance Learning

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Abstract
This study addressed the use of Mentimeter, one of the Web 2.0 tools, by junior-level pre-service mathematics teachers, who study at the department of primary mathematics teaching, to maintain the students' interest in the lesson and to encourage them to participate more easily. Drawing on a case study design, this study further aimed to investigate the advantages and disadvantages of using Mentimeter on students in courses. To collect data accordingly, the students participating were asked to write two reflection papers on the use of Mentimeter in the first and last course. This study was carried out on a voluntary basis with the participation of 30 pre-service teachers. This study concluded that the positive opinions of the pre-service teachers positively on the use of Mentimeter included that it increased the motivation towards the course, allowed the students to answer the questions without any hesitation as they were kept anonymous on the screen while answering, and acquired different perspectives as they could read the opinions of their peers; on the other hand, some of the negative opinions emphasized the time-consuming nature of the application, causing delays in the lesson.
Keywords: Mentimeter, Web 2.0 Tools, Pre-Service Mathematics Teachers

Introduction

It is plausible that generations who grew up in an age surrounded by technological equipment study in classrooms that are intertwined with technology, given their skills of using technology. Due to the omnipresence of technology in human life, there has been an evolution from traditional teaching to technological-based teaching in education, which has led to the integration of technology into teaching on various platforms. As one of them, e-learning (distance learning) creates teaching environments where various teaching methods are used regardless of time and place. The effectiveness of education in distance learning depends on how meaningfully students interact regardless of time and place (Anderson & Rourke, 2005; Shin & Eom, 2020). In order to effectively conduct real-time interactive lessons, it is necessary to ensure that students participate and reflect on the ways to cooperate with each other. Yet, in distance learning, students are positioned as listeners rather than learners. To overcome this and to enhance the communication and interaction between the teacher and the students, tools are needed to help design activities in a digital setting (Sirajudin & Hasan, 2018). That said, web 2.0 tools, where information is shared, revised and transferred in e-learning environments, have emerged as an application that allows interactive teaching (Gökbulut, 2020).

One of the modern teaching tools of the 21st century for designing interactive e-learning environments, which are defined as involving teaching activities in an electronic environment and transfer of knowledge and skills through electronic technologies (Gülbahar, 2012), are web 2.0 tools (Genç, 2010; Gökbulut, 2020). Web 2.0 tools were first used in today's modern sense by O'Reilly in October 2004 at the MediaLive international conference and were described as the second generation of web-based applications and services (O'Reilly, 2007). Web 2.0 tools are interactive online platforms that offer active participation, communication, sharing of information and ideas (McLoughlin & Lee, 2007) and that provide advantages such as easy access to information, information and idea sharing, cooperative content creation and sharing, evaluation, maintaining interest to its users at every level (Ajjan & Hartshorne, 2008).

One of these Web 2.0 tools that interest students in e-learning environments and motivate them to learn through participation in the lesson is Mentimeter. Mentimeter is a web 2.0 tool that has more than 30 million users and allows you to design interactive and entertaining warm-up presentations for courses in a quick and fun way before, during and after the course, and to prepare exercises such as surveys, tests, quizzes, word clouds (Gökbulut, 2020; Mayhew, 2019). Mentimeter provides a platform that requires students to use their own devices to interact with each other in real time. Indeed, if Mentimeter is to be used in classroom setting to enhance interaction during the course, then, not only a projector or a SMART board but also a smart phone, a tablet or a computer with Internet access for use among students are required. For distance learning, students only require a smart device with Internet access to access the application (Mayhew, 2019; Moorhouse & Kohnke, 2020; Skoyles & Bloxsidge, 2017). Further, the system creates a six-digit code and a square code in order for students to access the activities on Mentimeter. Students can access the activities on Mentimeter by entering the six-digit code or by showing the square code created by Mentimeter through the square code application. As Mentimeter constantly updates the number of the students answering the questions, the teacher can decide when to pause or to continue the course. Mentimeter has a free version and does not require any installation, which means that it is easy to use (Jurgen, 2018). Mentimeter also offers teachers a wide range of activities. In fact, they can design multiple-choice, open-ended (140 characters maximum per answer) questions, prepare presentations with questions in the form of questions and answers, or create Likert-type scales, exams, voting-based activities (to choose a winner), assessments with 100 points (distributing 100 points over the possible alternatives) and so forth (Mayhew, 2019; Rudolph, Harris & Zhiwei, 2018).

The relevant literature further indicates that Mentimeter as a web 2.0 tool offers many advantages. As Mentimeter presents no personal information of the students on the application screen, shy, introverted, and withdrawn students in the classroom can participate in the lesson as well (Latham & Hill, 2014; Musliha & Purnawarman, 2020; Shaffer & Collura, 2009). Indeed, Vallely and Gibson (2018) argues that the anonymity of the answers given on Mentimeter allows students to feel that they can contribute to a non-judgmental environment. Thus, anonymity is a function that maintains the students' interest, encourages debate and underlies high-quality learning (Crump & Sparks, 2018; Sari, 2021; Heaslip, Donovan, & Cullen, 2014). Furthermore, anonymous answers may allow the instructor to ascertain the understanding of the students more freely (Rudolph et al., 2019).

Mentimeter promotes active learning in an entertaining way by increasing the interaction between learner-content, learner- instructor and learner-learner (Little, 2016; Mohin, Kunzwa & School, 2020;). Moreover, the advantages of this tool include timesaving in preparing slides, increased real-time feedback, easier identification of possible misconceptions among students, and increased support in the design of additional activities. On the other hand, Vallely and Gibson (2018) identifies the following disadvantages of Mentimeter:

- Because Mentimeter responses are anonymous, it is not possible to identify which students have contributed.
- Students can contribute only if they have a Wi-Fi-connected device.
- Once students have submitted their answers, they are unable to retrieve or edit their responses; this

has left some students feeling frustrated and, occasionally, embarrassed over errors that have been made.
- If staff may use the tool too often with the same group, risking SRS over saturation and consequent student disenchantment.

Due to the epidemic affecting all over the world, distance education has been introduced for all grade levels from primary school to undergraduate level; thus, attempts have been made to ensure that students are positioned not only as listeners but also as active participants in the lesson (Anderson, 2020; Chang & Satako, 2020; UNESCO, 2020, UNICEF, 2020).

It is particularly essential for pre-service teachers who pursue their education in teacher training programs through distance learning teacher candidates to be in an interactive setting to allow for maximum communication (Cheng & Wang, 2019; Gökbulut, 2020). Many applications or web tools are used to create such setting. In this regard, this study aims to assess the opinions of pre-service teachers on the use of a web 2.0 tool, namely Mentimeter, based on their experiences in the distance learning process. In the relevant literature, there has been no study on the analysis of Mentimeter as a web 2.0 tool regarding its use among pre-service mathematics teachers. Also, in this age of technology, teachers who are required to carry out technology-supported education in schools or guide such education must be technologically competent. Considering that teachers acquire such competency through teacher training programs, it is obvious that practices on a web 2.0 tool are crucial for pre-service teachers to improve themselves. Another aspect that underlines the significance of this study is that the opinions of pre-service teachers participating in this study regarding the use of this tool are expected to contribute to a guiding perspective for other teachers to use Mentimeter in their courses. Accordingly, the problem of this study is determined as follows: "What do pre-service primary school mathematics teachers think on the use of Mentimeter before and after the course on mathematical connections in mathematics teaching?"

Method

Research Model

As this study seeks to reflect the opinions of pre-service primary school mathematics teachers about using Mentimeter in mathematics teaching in a detailed and holistic way, it draws on phenomenology design, one of the qualitative research methods (Yıldırım & Şimşek, 2011).

Study Group

The participants are 38 junior-level pre-service mathematics teachers who study in the department of primary mathematics teaching at a faculty of education in Turkey. The reason why the participants were junior-level students is that the use of Mentimeter is introduced in the course on mathematical connections, which is a junior-level course. For this reason, criterion sampling method, one of the sampling methods for qualitative research, was used in the selection of the participants. All of the participants were selected from the pre-service teachers who previously attended the course on mathematical connection in mathematics teaching; consequently, this study was carried out with 38 volunteer pre-service teachers selected from a total of 43 volunteer pre-service teachers. Thus, the participants were selected on a voluntary basis.

Data Collection Tools and Process

The data were collected from the pre-service teachers through "a reflection paper on the use of Mentimeter in mathematics teaching" written before and after the course on mathematical connections. Along with a reflection paper, the answers given by the pre-service teachers in each course to the word form of Mentimeter, open-ended and long-answer and multiple-choice question forms also provided rich data for this study. These forms are forms available on Mentimeter and ready to use during the course in an interactive way. The forms were filled out based on the answers of the pre-service teachers to the questions regarding the subjects of the course on mathematical connections in mathematics teaching, which are asked for the purpose of obtaining their opinions and ensuring active participation in the course. To ensure an effective use of Mentimeter, a pilot study was performed prior to this study with

junior-level pre-service mathematics teachers who study in the department of primary mathematics teaching at a university different than the university studied under this research in Turkey and who have previously attended the course on mathematical connections. The pilot study helped determining the questions to be asked to the pre-service teachers. In the course content, the questions intended to create an interactive setting were first asked to the pre-service teachers. Then, all of the pre-service teachers were asked to answer the questions. The answers were recorded randomly and anonymously on Mentimeter and then projected onto the screen for everyone to see. Afterwards, a discussion setting was created using the answers given and the question itself by seeking active participation. The data collection process continued for one semester within the scope of the course on mathematical connections in mathematics teaching. This process was carried out for three course hours each week for a period of 14 weeks, but online due to the epidemic. The questions and content for each course were designed prior to the course. Table 1 shows the sample course content and questions.

Table 1 Sample Course Content and Questions

Week	Course Content	Questions
3 Week	Connection between the Concepts	• Between which two mathematical concepts can you make a connection? • What is the aspect/s that helps you identify such connection?
8 Week	Relation with other disciplines	• How do you relate mathematics to different disciplines? • Give an example of such relation.
11 Week	Association with different forms of representation	• In which ways can you model fractions?

Below are examples of applications of Mentimeter performed during this research. Figure 1 presents a visual with examples of the answers of the pre-service teachers to the open-ended questions of "Between which two mathematical concepts can you make a connection? What is the aspect/s that helps you identify such connection?"

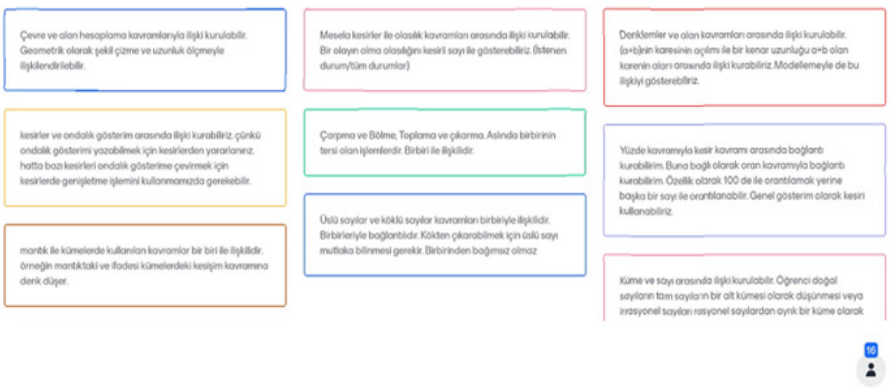

Figure 1 Examples of Open-Ended Questions Forms

Figure 1 Translate from Turkish to English: In accordance with the visual side-by-side order

- Relationships can be made with the concepts of perimeter and area calculation. Geometrically, it can be associated with drawing shapes and measuring lengths.
- For example, a relationship can be established between fractions and probability concepts. We can show the probability of an event as a fractional number. (Desired state/all situations).

- Relationships can be established between equations and field concepts. We can relate the expansion of the square of (a+b) to the areas of a square with a side length (a+b). We can show this relationship with modeling.
- We can relate fractions to decimal notation because we use fractions to write decimal notation. You may even need to use fraction expansion to convert some fractions to decimal notation.
- Multiplication and division, addition and subtraction. In fact, they are the opposite of each other. They are related to each other.
- I can make a connection between the concept of a percentage and the concept of a fraction. Accordingly, I can relate to the concept of ratio. As a feature, it can be proportional to another number instead of being proportioned with a percentage. We can use fraction as general notation.
- The concepts used in sets and logic are related to each other. For example, the expression "and" in logic corresponds to the concept of "intersection" in sets.
- The concepts of exponents and radicals are interrelated. In order to be able to root, the exponent must be known, it cannot be independent of each other.
- A relationship can be established between the set and the number. The student can think of natural numbers as a subset of integers or irrational numbers as a discrete set from rational numbers.

Figure 2 presents a visual with a word cloud on the answers given by the pre-service teachers to the question of "What mathematical concepts can you associate with ratio and proportion?" on Mentimeter.

Figure 2 Examples of Word Cloud Forms

Figure 2: Translate from Turkish to English

- Denklem: equation, Alan: area, Benzerlik: similarity, Ortalama: average, Hacim: volume, Üçgenler: triangles, Sadeleştirme: simplification, Ölçme: measurement, Çarpma bölme: multiplication division, Ondalık sayıları: Decimal numbers, Pay payda ilişkisi: numerator and denominator relationship, Çapraz çarpım: cross product, Eğim: slope, Pi sayısı: pi, Yüzde: percentage, Üçgende benzerlik: similarity in triangle, Koordinat düzlemi: coordinate plane, Daire grafiği çizme açı: angle to plot a pie diagram, Kesirler: fractions, Öklit: Euclid, Olasılık: probability, Yüzdeler: percentages, Bölme: division, Doğru orantı: direct proportion, Karışım problemleri: mixture problems, Eşlik benzerlik: congruence similarity, Rasyonel sayılar: Rational numbers, Cebirsel ifadeler: algebraic expressions, Denklemler: equations, Çıkarma: subtraction, Toplama: addition, İstatistik veri: statistical data, Genişletme: expansion, Çevre: circumference, Tam sayılar: Whole numbers

Figure 3 includes a graph of the answers given by the pre-service teachers to the multiple choice question of "The problem given is an example of what kind of relation?" on Mentimeter.

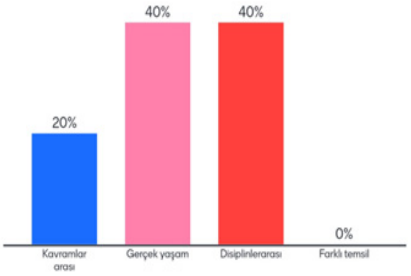

Figure 3 Examples of Multiple-Choice Forms

Figure 3: Translate from Turkish to English

- Kavramlar arası: cross-concept, Gerçek yaşam: real life, Disiplinlerarası: interdisciplinary, Farklı temsil: different representation

During the data collection, to prepare the pre-service teachers ready for the research process, the researcher stated that this process is not an exam and that the use of this application is only intended to explore what they think on the research subject and to ensure their active participation in the course.

Data Analysis

The content analysis technique was used to analyze the collected data. The analysis of the data obtained from the reflection papers that the pre-service teachers wrote before and after the course on mathematical connections was performed in three steps. In the first step, the answers were reviewed by two researchers. Then, the data were coded separately by the researchers. The researchers found that there is an agreement of 85% between the resulting codes. For the codes not agreed upon, the data and codes were reviewed again; then, the codes were revised considering the consensus reached between the researchers. In the last step, the codes expressing the same concept were collected under the same themes by the coders in the coding process.

Validity and Reliability of the Study

To enhance the internal validity of the research, the relevant literature was considered in preparing the questions to be asked to the pre-service teachers during the course on mathematical connections in mathematics teaching. The agreement of the codes with the themes emerged from the data was reviewed to ensure integrity. In the data collection process, the pre-service teachers were informed that this application would not affect their grades on the course to eliminate any worry they may have. To increase the external validity, the research process was described in detail. To further enhance the internal reliability, the findings were presented without any comment or interpretation.

Findings

Reflections of Pre-Service Mathematics Teachers on Mentimeter before the Course

The reflection papers written by these 38 pre-service teachers indicated that none of them had any knowledge of Mentimeter and knew how to use it.

Reflections of Pre-Service Mathematics Teachers on Mentimeter after the Study

Based on the analysis of the reflection papers written by the pre-service teachers, 5 themes were identified: functionality of Mentimeter, cognitive, affective themes as well as negative opinions and suggestions. These themes are discussed respectively.

Findings on the Functionality Theme

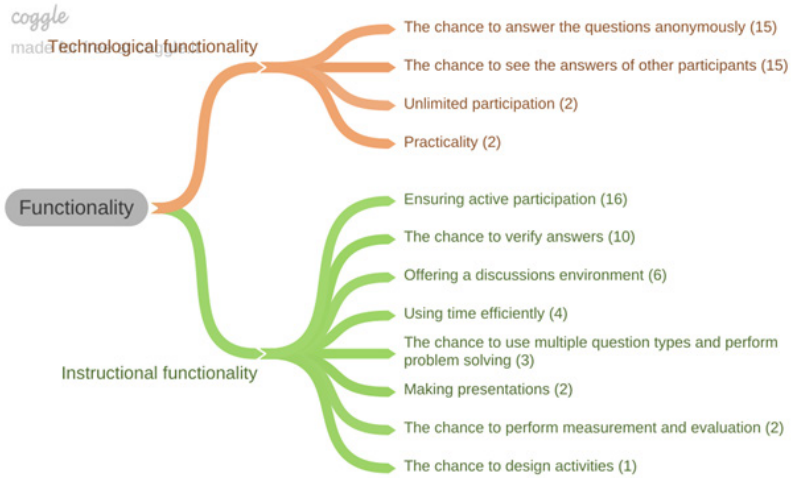

Figure 4 Findings on the Functionality Theme

Figure 4 shows that the functionality theme was examined under two sub-categories: the technological and instructional functionality. The answers that considered Mentimeter only as a technological tool were included in the sub-category of "technological functionality" whilst the answers that focused on its function in teaching were included in the sub-category of instructional functionality. Anonymous answers and an overview of all answers given on the screen are the most common features expressed under

the sub-category of technological functionality. In the sub-category of instructional functionality, the most prominent features of Mentimeter are active participation and discussion environment it offers. The pre-service teachers who expressed that Mentimeter offers a discussion environment under the sub-category of instructional functionality provided the students with the opportunity to give feedback on the answers, which emphasized this functionality.

P3: ...Because not everyone can take the floor and express their opinions, but in this way, perhaps thanks to the anonymity, they can clearly articulate what they think. Afterwards, all opinions are shared with everyone; this allows us to have insights into what other pre-service teachers think.

P11: The questions you ask us through Mentimeter enable us to realize my own opinions and to understand the opinions of my peers. As sometimes we can realize things that we did not previously reflect on, and I think that we can have new ideas in this way. Further, the anonymity of this application ensures a higher participation in the lesson. Moreover, it is nice that the questions you ask us through Mentimeter enable us to realize my own opinions and to understand the opinions of my peers...

P18: Thanks to the application used by our lecturer in the lesson, we shared our thoughts and descriptions we created with other people in the class both through the square code and the shared link. I think this application is useful in that it allows everyone to see each other's comments. It is also a time-saving application. I would also like to say that it is quite useful for creating a discussion environment in classes.

Findings on the Cognitive Theme

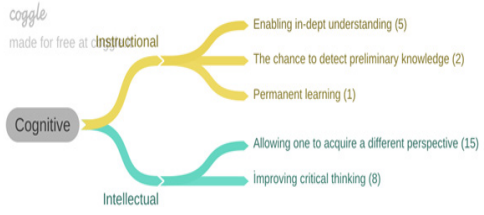

Figure 5 Findings on the Cognitive Theme

The pre-service teachers stated that the use of Mentimeter makes teaching efficient and boosts mental skills too. These categories are grouped under the cognitive theme as shown in Figure 5. In-depth learning under the instructional functionality category is described as involving learning about the possible misconceptions of the subject discussed by the pre-service teachers, their relations with different disciplines, and detailed information on these misconceptions. The reflection papers also emphasized the opportunity of in-depth learning offered by Mentimeter from an instructional perspective.

The intellectual category included two codes: giving a different perspective and improving critical thinking. Gaining a different perspective, the pre-service teachers stated that they approached the subject from different points of view as they were able to read each other's answers and that they learned new information. Also under this code, it is notable that an inter-conceptual relationship can be established and that it is possible synthesize the process with different learning areas.

P13: ...I think that the inquiring questions asked during the lesson made me have a more critical perspective towards the subject...

P20: ...This application also improves our ability to think and respond instantly. This also positively affects us as we also must quickly respond to the questions that our students ask...

P15: ...First, we proposed our own definitions, and then we realized our own mistakes after we read the correct definitions. It was very nice to have such awareness...

Findings on the Affective Theme

Figure 6 Findings on the Affective Theme

The aspects regarding the emotional states of the pre-service teachers while using Mentimeter in their reflection paper were included in the affective theme. Figure 6 demonstrates that there are four main categories in this theme. Under the category of feeling comfortable, two codes are defined as the comfort caused by the happiness the pre-service teachers felt when using the application and the comfort caused by the anonymity (remaining hidden). It is remarkable that positive emotions are predominant under this theme.

P14: I am quite happy to be able to improve myself while using Mentimeter, to find myself in an environment where I can express myself comfortably during the course, and not to be judged by and felt bad because of what we say.

P5: It was nice to answer the questions using a square code; I used it for the first time. Moreover, anonymous answers motivated us further to answer the questions and made us feel freer...

P15: The subject covered was very good, but it was more fun when we used Mentimeter... I believe it is very motivating. I also think that Mentimeter is very fun and useful. To be honest, our names were kept anonymous our, which made us more motivated to answer the questions...

Findings on Negative Opinions and Suggestions on Mentimeter

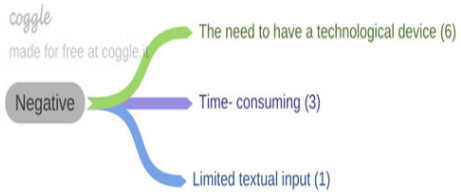

Figure 7 Findings on the Negative Opinions Theme

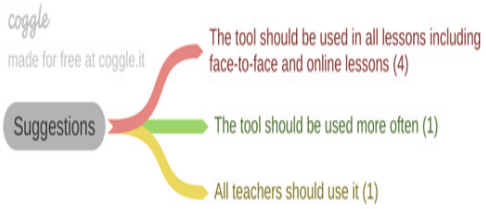

Figure 8 Findings on the Suggestions Theme

Although the pre-service teachers expressed the usefulness of Mentimeter in their reflection papers, negative opinions (Figure 7) on and suggestions (Figure 8) for Mentimeter were also identified in these papers. These opinions and suggestions are presented under two separate themes. The most notable negative opinion on Mentimeter was that "it is not possible to use Mentimeter without a technological device." In this regard, the pre-service teachers stated that not every student in classrooms with no or poor technological equipment can benefit from this tool. However, it is also remarkable that the pre-service teachers who believed so did not come up with any suggestion.

To get more efficiency from Mentimeter, it is suggested that this tool should be used in all lessons including both face-to-face and online lessons, and that it should be more commonly used and all teachers should use it.

P6: It might be better if we did more often what we did today using Mentimeter in the course to express our opinions. Although it may be sometimes time-consuming, we can speak up without any hesitation...

P28: ...As a pre-service teacher, I think that this application is very good, especially in online education, and that it will improve class participation if other lecturers also use this application.

P31: ...In my opinion, its only shortcoming is the need to have a technological device; economically disadvantageous students don't have the opportunity to use it.

Discussion, Conclusion and Suggestions

This study on the reflections of the pre-service teachers on the use of Mentimeter yielded that none of the pre-service teachers were knowledgeable about Mentimeter or its use before this study. This may be result from the lack of technological knowledge and experience among the pre-service teachers due to the insufficient use of technological equipment before the epidemic (Karadağ & Yücel, 2020; Karahan, Bozan & Akçay, 2020). Based on the analysis of the reflection papers written by the pre-service teachers, 5 themes were identified: functionality of Mentimeter, cognitive, affective themes as well as

negative opinions and suggestions. Technological and instructional functionality are also notable under the functionality theme. In this regard, the most common functionality codes are anonymity and active participation. Further, codes such as ability to read the answers of other participants, unlimited audience size, practicality, ability to verify the answers, ability to use multiple types of questions and ability to perform solutions. Valleyl and Gibson (2018) yielded opinions on functionality similar to the opinions expressed by the pre-service teachers in this study. Valleyl and Gibson (2018) particularly emphasized that anonymous answers on Mentimeter make the students feel themselves secure. Similarly, the research conducted on Mentimeter show that name confidentiality (anonymity) is considered as the key positive feature (Mayhew, 2019; Musliha & Purnawarhan, 2020; Rudolp et al., 2019; Sari, 2021; Valleyl & Gibson, 2018;).

Regarding the functionality theme on Mentimeter, the reflection papers showed that active participation was ensured during lecturer-student and student-student interaction and that student anxiety was reduced in the process, moving away from traditional education. It further encouraged students to respond and allowed for efficient use of time, which were considered among its advantages. In this process, it was ascertained that Mentimeter also offers the opportunity to make a formative assessment. The findings of this study are congruent with the findings of other studies in the literature (Gökbulut, 2020; Little, 2016; Mohin et al., 2020; Mayhew, 2019; Musliha & Purnawarhan, 2020; Musliha & Purnawarhan, 2020; Rudolph et al., 2018; Sari, 2021; Shin & Eom, 2020; Valleyl & Gibson, 2018; Valleyl & Gibson, 2018;).

The use of digital media and the adoption of a learning style incorporated with technology support the development of decision-making, visual and spatial abilities in individuals (Yang & Wu, 2012). That said, the pre-service teachers in this study stated that the use of Mentimeter made teaching efficient and boosted their mental skills. So much so that gaining a different perspective, the pre-service teachers stated that they approached the subject from different points of view as they were able to read each other's answers through Mentimeter and that they learned new information. Wong (2016) and Funnell (2017) argued that Mentimeter is used to create an environment of opportunity for discussion of different answers and debate. Currently, Mentimeter and different web 2.0 tools serve to create an active student profile that does not consume the information provided in the classroom, but generates new information (Elmas & Geban, 2012). In this process, students are expected to enjoy using the mentioned digital programs while their educational needs are met (Prensky, 2001). For this reason, the affective functionality of web 2.0 tools can be a subject of inquiry. This study concluded that the pre-service teachers had positive emotions while using Mentimeter. Indeed, the comfort caused by the happiness the pre-service teachers felt when using the application and the comfort caused by the anonymity are strongly present. Gökbulut (2020) also revealed that even introvert, shy students in the classroom felt more comfortable and had enhanced participation in the lesson because no personal information was provided on the system screen.

This study found out not only positive opinions on the use of Mentimeter but also negative opinions, which can be considered as disadvantages. The first of them is the need to have a technological device to use this application. Valleyl & Gibson (2018) ascertained those students can only contribute to the process if they have a Wifi-connected device, and this can be deemed as a disadvantage of Mentimeter. Although Mentimeter is overall considered to be an advantageous tool for the future thanks to its fast and easy-to-use interface, this study showed that some pre-service teachers believed that the installation and use of the tool are time-consuming, and the limited textual input is a disadvantage as well.

The reflection papers included some suggestions from the pre-service teachers. In particular, those who favored the use of Mentimeter stated that this tool should be used in all lessons including both face to face and online lessons, and that it should be more commonly used, and teachers need to learn how to use it. Burnett and Collins (2007), and Walker and Pearce (2014) emphasized that students are interested in this new teaching tool and eager to use it. The results of these studies imply that teachers can maintain the interest of students and contribute to a

more effective lecture by using new and different web 2.0 tools during both face-to-face and online courses. Similarly, Little (2016) studied Mentimeter and determined that Mentimeter increased student interest and engagement in the lesson, even in crowded amphitheaters.

Overall, these studies indicate that Mentimeter plays a crucial role in encouraging student participation and changing classroom dynamics, contributing to a more interactive and fun lecture. For this reason, the use of Mentimeter is recommended in the lessons to enhance and assess the understanding of students. Yet, the use of Mentimeter entails high-quality connection and technological tools. Before using Mentimeter, it is recommended to provide the necessary technological infrastructure, explain the use of Mentimeter to students in detail, and effectively prepare teachers for the activities created on Mentimeter. In this way, perhaps the maximum efficiency can be obtained from this tool. Lastly, this study was conducted with pre-service mathematics teachers. Similar studies on the use of Mentimeter may be performed with mathematics teachers, and teacher awareness on web 2.0 tools can be increased through in-service training courses.

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