



| Research Article / Araştırma Makalesi |

Experiences of a Mathematics Teacher Implementing Micro Learning During Emergency Distance Teaching

Acil Uzaktan Öğretim Süresince Mikro Öğrenme Uygulayan Bir Matematik Öğretmeninin Deneyimleri

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Keywords

1. E-learning
2. Micro learning
3. Mathematics teaching
4. Teacher experience
5. Information and communication technology (ICT)

Anahtar Kelimeler

1. E-öğrenme
2. Mikro öğrenme
3. Matematik öğretimi
4. Öğretmen deneyimi
5. Bilgi ve iletişim teknolojileri

Received/Başvuru Tarihi
17.09.2022

Accepted / Kabul Tarihi
03.02.2023

Abstract

Purpose: The aim of this study is to contribute to a better understanding of the effects of digital sources on the works and professional development of mathematics teachers. In line with this aim, the microlearning experiences of an experienced secondary-school-mathematics teacher who is pursuing a Ph.D. in a university, in an e-learning environment is the focus of this study.

Design/Methodology/Approach: The study design is a narrative analysis. The researcher's diaries and interview recordings were analyzed in this context. The researcher diaries were written by one of the researchers, a PhD student mathematics teacher who took an active role in the practice. In addition, the semi-structured interview recordings with the same teacher are included in the research as data and documents, and they were analyzed in detail. The diaries of the teacher, the researcher, which are kept during the microlearning period and the interviews were analyzed using the content analysis method. Categories and codes were created as a result of the analysis.

Findings: As a result of the analysis, it was identified that the teacher especially focused on the teachers' concerns before teaching using microlearning and how these concerns change in time, the process of preparing digital lessons, student observations during the implementation, and changes within herself in diaries and interviews.

Highlights: The study has revealed important results in terms of supporting e-learning. It may be recommended to integrate micro learning and micro content into mathematics and other courses. By eliminating the limitations of the research, comprehensive research of qualitative, quantitative, or mixed type can be conducted with more participants.

Öz

Çalışmanın amacı: Bu çalışmada dijital kaynakların matematik öğretmenlerinin çalışmaları ve mesleki gelişimleri üzerindeki etkisinin daha iyi anlaşılmasına katkıda bulunmayı amaçlıyoruz. Bu amaçla, ortaokul düzeyinde deneyimli bir matematik öğretmenin e- öğrenme ortamında gerçekleştirdiği mikro öğrenme deneyimine odaklanılmıştır.

Materyal ve Yöntem: Çalışma tasarımı bir anlatı analizidir. Araştırmacı günlükleri ve görüşme kayıtları bu bağlamda analiz edilmiştir. Araştırmacı günlükleri, uygulamada aktif rol almış, araştırmacılarından biri olan doktora öğrencisi matematik öğretmeni tarafından yazılmıştır. Detaylı olarak analiz edilmiştir. Öğretmenin, araştırmacı olarak mikro öğrenme sürecinde tuttuğu günlükler ve görüşmeler içerik analizi yöntemi kullanılarak analiz edilmiştir.

Bulgular: Analiz sonucunda, öğretmenin özellikle mikro öğrenmeyi kullanarak öğretmeden önce öğretmenlerin kaygılarına ve bu kaygıların zaman içinde nasıl değiştiğine, dijital derslerin hazırlanma sürecine, uygulama sırasında öğrenci gözlemlerine ve kendi içindeki değişimlere odaklandığı tespit edilmiştir

Önemli Vurgular: Yapılan çalışma e-öğrenmenin desteklenmesi açısından önemli sonuçlar ortaya koymuştur. Bu bağlamda öğretmenler açısından mikro öğrenme ve mikro içeriğin matematik ve diğer derslere entegre edilmesi önerilebilir. Araştırmanın sınırlılıkları ortadan kaldırılarak, daha fazla katılımcı ile nitel, nicel veya karma türde kapsamlı araştırmalar yapılabilir.

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INTRODUCTION

The limits of time and location changed due to the rapid development of web technologies and mobile devices. Smartphones, tablets, and computers are being used in all areas of life with or without the internet with the developing information technologies, and they provide various conveniences. As digitalization increases in education systems around the world, many countries are updating their legislation and action plans to speed up the process (Fransson et al., 2018). This makes the issue of how to effectively integrate digital technology into teaching and learning practices (Viberg et al., 2020). Digital technologies are being actively used in education (e.g. smart boards, Web 2.0 devices, digital content, educational applications, etc.), teachers can access richer course content and prepare course content (Trouche et al., 2020). Students can also access information from wherever they want thanks to the technology.

It is desired that the content for teaching purposes developed is long-lasting, practical, reusable, can be combined with other teaching materials and is easy to access (Ceylan, 2008; Tekdal, 2004). The concept of learning objects that can carry these features has emerged. There are many definitions of learning objects. Cisco (2001) defines learning objects as small, reusable pieces of information independent of the environment. Polsani (2003) on the other hand, learning objects; It defines it as units of learning content that can be reused in different learning contexts, that can be found independently and on their own. Thanks to learning objects, students can easily access information whenever and wherever they want, thanks to learning objects.

As in other teaching areas, the use of digital technologies, and especially mobile technologies, in mathematics teaching and learning areas is attracting increasing attention among researchers and practitioners (Borba et al., 2017). For this reason, researchers began to consider designs that could integrate technology into mathematics learning environments, taking into account the opportunities provided by digital technology (Trouche et al., 2020). One of the learning environments focusing on digital technology is microlearning. Micro learning, a new learning style, is an innovative approach that will accelerate digitalization in mathematics teaching, attract students to mathematics, and combine technology and mathematics education.

Micro Learning

Micro learning is a learning approach that aims to use students' time effectively to conduct personalized learning activities through online educational resources (Lin et al., 2020). Micro learning presents the users with personalized learning activities in small pieces and it is one of the best approaches for students in the 21st century (Jomah et al., 2016). Considering that people's attention span is getting shorter, micro learning becomes more important since it emphasizes short learning periods (Leong et al., 2020). This learning approach not only includes today's students in mobile-based micro learning but also provides a promising learning method for life-long (adult) students (Buchem & Henrike, 2010).

Micro learning arising from micro-content is a concept that expresses the way of transferring small digital information contents in the form of concise, condensed small groups, so to speak "factoids" (Mitchell, 2020). In microlearning, which facilitates the learning process by dividing the concepts into small parts or factoids, and also called as micro-content, small learning units are given to students gradually and in a way that suits them (Mohammed et al., 2018). Even though there are many definitions of microlearning, Hug's definition of micro learning based on seven dimensions is the most widely accepted (Hug, 2006). These seven dimensions are as follows: (a) *time*, spending relatively short time, providing low effort, etc. (b) *content*, well-delineated short units, and relatively simple problems, (c) *curriculum*, sections of modules or parts of curriculum content, brief tutorials (d) *form*, pieces, factoids, lab assignments, etc. variety of formats; (e) *process* discrete, interconnected or real, situational or integrated activities, iterative method, attention management, awareness, etc. (f) *mediality*, classroom-based learning or distance learning based on different multimedia content; (g) *learning type*, repetitive, reflexive, pragmatic, constructivist, concept-based, connectionist, etc.

The seven dimensions put forward by Hug creates the framework of micro learning. The next step is to create micro-content by considering these dimensions. While designing micro content (Leene, 2006), some issues should be taken into consideration. These issues are as follows: *Form*, the micro-content should be designed so that the units are short, easy to detect at a glance (e.g. without scrolling down for further information), and light enough to be quickly deployed across different media (e.g. simple construction, low resolution). *Focus*, the goal is that the topics should be clear and easily articulated in a few short and concise sentences. *Autonomy* means that each piece of micro-content is independent so that students do not have to search for additional information. *The structure* is a condensation of simple, yet essential information (title, subject, author, date, tags, etc.). *Simple access* is that micro-content is designed to be hosted as a single resource on the internet, but is also easily accessible from any other location.

Even though micro learning has different concepts and versions (Hug, 2005), according to Buchem and Hamelmann (2010), the common feature of micro learning is that it includes micro-content, a single identifiable idea, and a short learning time (no longer than 15 minutes). Micro learning is becoming more popular thanks to the features such as being learner-centric, cost-effective, interactive, and making learning effective (Jomah et al., 2016). Lin et al., (2020) defined the micro-content creation steps as follows:

- (1) While preparing micro-content check whether the content is suitable for microlearning.

- (2) If the content is not suitable for micro learning, divide the contents into small and independent micro-contents that are meaningful in itself.
- (3) Add explanations for each micro-content.
- (4) After the preprocessing, the content becomes available and can be used as a micro learning resource.

Micro learning has benefits such as increasing student participation (Nikou, 2019), making the concepts to be better kept in mind (Giurgiu, 2017), including simple and narrow subjects (Jomah et al., 2016), providing opportunities for repetition (Hug, 2005). In addition, Jomah et al., (2016) stated that micro learning is an attractive option because it handles the subjects in accordance with the individual needs of the students. Besides, another important benefit of microlearning is that it increases students' motivation (Nikou & Economides, 2018). In addition to these important benefits, micro learning has some limitations (Jomah et al., 2016). According to Jomah et al. (2016), these limitations are that it is not suitable to be used in situations where complex skills, processes or behaviors need to be acquired, and it is insufficient to provide explanatory feedback to students.

Teachers are the people who will transfer teaching with digital technologies which are the necessities of our age, such as micro learning, to the classroom environment. Pre-service and post-service training is provided to increase the productivity of teachers (Harris & Sass, 2011). Various frameworks, models, and literacy have been developed in various educations to support teachers to use new and emerging technologies in their classrooms (Falloon, 2020). In this article, we aim to contribute to a better understanding of the impact of digital resources on the work and professional development of mathematics teachers. For this purpose, the article focused on the micro learning experience of a mathematics teacher who is experienced in secondary-school-mathematics, and who is pursuing a Ph.D. degree in Turkey, in an e-learning environment. As in many other countries, Turkey had to do "emergency distance education" due to the Covid-19 outbreak in mid-March 2020 (Özudogru, 2021). This study will reveal the micro learning experiences of a mathematics teacher in the emergency distance education process. This study provides an understanding of the use and design of digital resources in the teaching of mathematics teachers. In this context, the aim of the study is to convey the experiences and opinions of the mathematics teacher who teaches using micro learning in the e-learning environment. In this context, the research question of the study was determined as follows:

"What are the experiences and views of the teacher who taught mathematics through micro learning for the first time?"

METHOD

Research Model

The narrative analysis (as a method) approach has been adopted in order to deal with the process in depth and multidimensionally in the study. In this context narrative research method was used. Narrative research, one or more It is the type of study that allows the presentation and research of experiences or individual experiences (Cohen et al., 2018). In order to achieve the aims stated in the narrative research, the interview and document analysis techniques frequently used in research has been used. Salmon (2008) argues that narratives connect experiences and thoughts and organize random and scattered discourses. In addition, the narrator makes sense of experiences and phenomena and makes associations (Riessman, 2008). The subject of narrative analysis in this research is the assessment of mathematics teacher's experiences, who teach using micro learning in an e-learning environment. In this context, researcher diaries and interview records were analyzed in document forms based on concepts and opinions to provide in-depth information and describe the situation in the current study. The researcher's diaries were prepared by the mathematics teacher who conducted the research and took an active role in the application, who is also studying for a Ph.D. In addition, semi-structured interview records with the same researcher were also included in the research as information and documents and were examined in detail. Figure 1 presents the schematized research process.



Figure 1. Research process

Research Participants

Two researchers who were involved in the planning and implementation stages of the research, worked collectively. The first researcher is an expert working as a faculty member, Ph.D., in the field of mathematics education. This researcher, who is the first author, was actively involved in the planning of the research, literature review, preparation of data collection tools, analysis, and reporting of data. At the same time, the first researcher conducted a semi-structured interview with the second researcher. The second researcher is a mathematics teacher who is pursuing her Ph.D. in the field of mathematics education and also works in a public secondary school affiliated with the Ministry of National Education [MoNE]. She has received various in-service trainings on digital transformation and Web 2.0 tools in distance education. In this context, the second researcher had an active role in conducting the research and preparing micro-content as the implementing teacher. In addition, as the implementing teacher, she wrote the research diaries and participated in the semi-structured interview, and explained the implementation process in detail. Within the scope of the research, 10 sixth-grade students studying in a public secondary school in a province of the Eastern Anatolia region of Turkey were also included as participants in the application.

Data Collection Process

In the research, the first phase of the data collection process is the literature review on the subject and the preparation of an implementation plan for the research. In the second phase, necessary information and explanations were provided to the students' parents about the research process. In this context, before the research, the parents signed voluntary participation forms, and necessary permissions were obtained from the parents. The current research was initiated on February 22, 2021, and was terminated on March 12, 2021, after a three-week teaching period. In the third phase, students were given information about the microlearning process and Web 2.0 tools, and visual examples of the micro-contents used were presented. The research was designed in a three-week period to teach the ratio subject in mathematics and its achievements in MoNE, (2018) Secondary School 6th Grade Mathematics Curriculum based on microlearning. The teacher used Prezi, Padlet, Khan Academy TR, Google Forms, Mindmeister, and Canva Web 2.0 tools to prepare micro-content. The second teacher had an active role in preparing the micro-content as the implementing teacher. In addition, the implementing teacher wrote the research diaries, participated in the semi-structured interview, and explained the implementation process in detail. Thus, diary and interview records are included as data collection tools in the research.

Researcher Diaries: The second researcher prepared them regarding the implementation process in the three-week research process. The researcher diaries kept by the researcher-teacher for 15 days were included in the data analysis. During the research process, the implementing teacher included in the diaries in detail the observations obtained from the students, with her own views and experiences, especially regarding the realization of microlearning. While writing a diary, the researcher can direct various questions to herself with both critical and reflective thinking (Ger, 2009). In this context, during preparing and writing diaries, the teacher asked herself: Are the micro-contents I have created useful? Do students adopt the microlearning method and benefit from it? Are there any actions that I am missing or doing wrong in the process? Is there a difference between the teaching process I planned and the teaching process I carried out? These questions have dynamically strengthened the research process and enriched microlearning in terms of its benefits to students.

Semi-structured Interview: The semi-structured interview between the first researcher and the implementing teacher lasted approximately forty minutes. In this context, data were obtained and recorded with a semi-structured interview form consisting of five questions. In the process of creating and finalizing the semi-structured interview form, expert opinions were sought and relevant literature was reviewed. The questions in the semi-structured interview form are as follows:

- (1) Why did you want to teach using microlearning?
- (2) Can you summarize your process to create digital content?
- (3) Can you talk about your teaching process?
- (4) How was the implementation?
- (5) Do you have anything to add regarding the implementation?

Images from the micro-content preparation and researcher diary kept by the implementing teacher during the research process are given below.

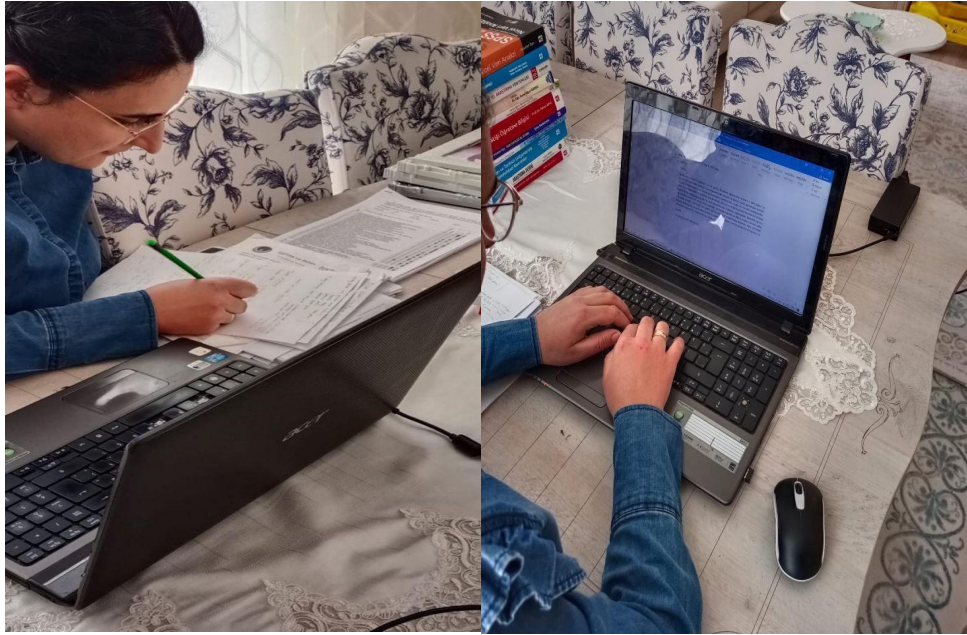


Figure 2. Research diary writing process

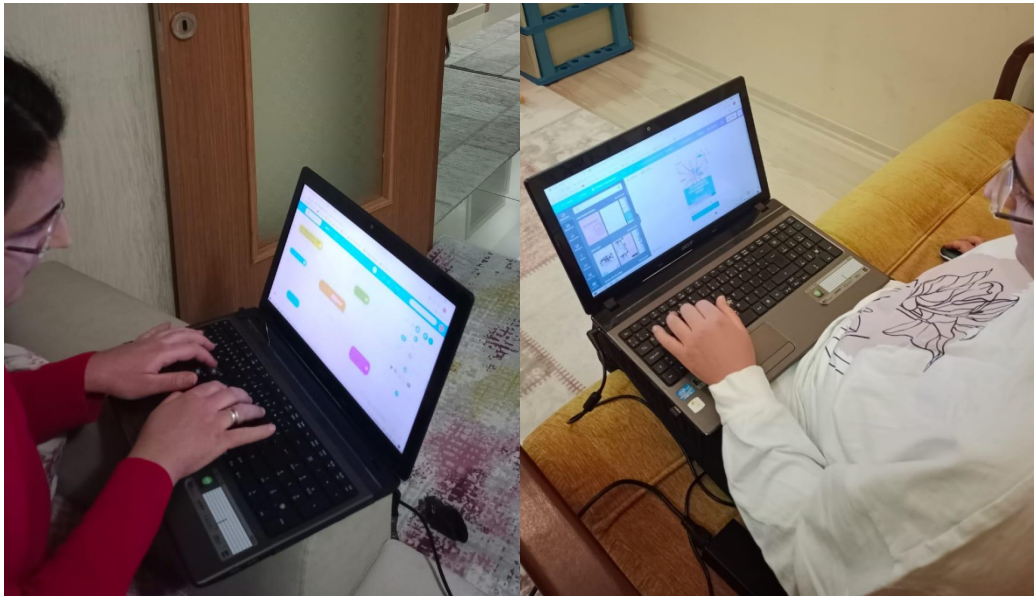


Figure 3. Micro-content preparing process

Data Analysis

The diaries and semi-structured interview records, which are the data in the research, were analyzed by the content analysis method. The data obtained in the content analysis are presented by combining similar concepts, categories, codes, and themes, and in a way that readers can understand (Creswell, 2014; Yıldırım & Şimsek, 2016). Content analysis of the researcher diaries and semi-structured interview records was carried out by considering the following stages:

- (1) Coding by carefully reading every detail in the diaries,
- (2) Gathering the generated codes within the framework of certain categories,
- (3) Examining the similarities and differences of codes and categories,
- (4) Finalizing the categories,
- (5) Presenting categories and codes by interpreting them.

In this context, the categories and codes compiled from the data obtained are given under the findings. In addition, direct quotations from researcher diaries and semi-structured interview records are provided.

Validity and Reliability of the Research

In the research, data collection and the application process were carried out simultaneously. The data sources of the research consisted of the researcher herself and the students that she implemented the research on. Data collection tools are semi-structured interview records including the observations and the researcher diary. It was constantly checked whether the data obtained from the different tools specified confirmed each other. In addition, the reported findings and explanations of the data were supported by direct quotations from the diary and interview records. Thus, to ensure validity and reliability and to increase the credibility of the findings, it is important to use different data sources and data collection tools, to make a detailed literature review, and to benefit from expert opinions.

FINDINGS

The diaries kept by the researcher-teacher during the micro learning period, and semi-structured interview records, were analyzed by the content analysis method. Codes and categories were created as a result of the analysis. The categories created in the study were grouped under four categories as follows: decision-making, preparation, concerns and expectations, and the process. The codes under the decision-making category are as follows: in-service training, effort, and curiosity. The codes under the preparation category are as follows: digital content preparation, and psychological background. The codes under concerns and expectations are as follows: success, background, and teaching process. The codes under the process category are as follows: content preparation, satisfaction, and student performance. Figure 4 presents the codes and categories obtained as a result of the analysis.



Figure 4. Categories and codes obtained as a result of the analysis

Decision-making

In this category, the decision-making process of the researcher-teacher about teaching using microlearning is discussed. Three codes were created under the decision-making category. These codes are as follows: in-service training, effort, and curiosity. The codes were analyzed one by one.

In-service training

The teacher highlighted in the diaries that the in-service trainings contributed to the preparation of digital content. She stated that following the trainings very carefully helped her a lot in this phase and that her curiosity in microlearning arose thanks to the trainings she received. A part of the interview conducted with the teacher is given below.

Researcher: Why did you want to teach using microlearning?

Teacher: Due to the COVID-19 pandemic, we received intensive in-service training provided by the Ministry of National Education in the periods when we transitioned to distance education. I discovered microlearning in the e-learning training I took during my winter break. It was based on digital content. I was interested in the subject, and I thought it could be used in mathematics. I started preparing digital content by gathering information from the internet. When I understood that it can be done, I decided that I could teach using this method.

As seen in the dialogue above, the teacher stated that she discovered microlearning thanks to the e-learning trainings she received. It is seen that the training she received had an effect on her ability to teach using microlearning.

Effort

This code presents the teacher's effort to create digital content after the knowledge acquired for micro learning. The teacher realized that she had difficulties in creating digital content at first, but then she was able to create more comprehensive content in a short time. When she reviewed the digital content she had prepared first in this process, she stated that she did not like the first drafts, but that she had to go through these stages to create good digital content. In one part of the diary, the researcher wrote, "To be frank, the Prezi presentation challenged me. It was a somewhat complex and demanding digital tool in its nature, but I was confident that I could overcome it.", "I did not experience the difficulties I encountered in videos and presentations with Canva." As can be seen from the diary sections, the teacher showed effort while preparing the digital content. A part of the interview conducted with the teacher is given below.

Researcher: Can you summarize your process to create digital content?

Teacher: After the training, I started creating digital content. I have to admit that it was difficult. However, I grasped the gist of micro learning once I was satisfied with the digital content I prepared recently.

As seen in the dialogue above, the teacher mentioned that the idea of teaching using micro learning started to grow on her after preparing digital content. It can be said that these experiences in the decision-making process are effective.

Curiosity

In the interviews, the teacher stated that she became curious after the trainings received and her own efforts. She stated that she thought "I wonder if mathematics can be taught using microlearning?" She stated that this question led to other questions so that she developed a sense of curiosity towards micro learning. In the interviews and in her diaries, the teacher mentioned that she started thinking "How will micro learning affect the success of the students, how will it affect their performance, what will be the opinions of the students about this method..." She stated that she was curious about these subjects.

Preparations

This category presents the psychological states of the researcher-teacher and students before and during microlearning. The preparations category consists of 2 codes: digital contents and psychological preparations. Codes were analyzed one by one.

Digital Content

The teacher talked about the preparations she carried out for the application in her diaries. In the diaries, for the first week, the teacher wrote the following: "Web 2.0 tools to be used on the second day of the first week of the research were introduced to the students via smart boards. The interfaces of all Web.2 tools, their purpose of use, all visuals, the way and methods to be followed for design development were explained in general terms. A virtual classroom was created in the Microsoft Teams application and each student was assigned a class code. In line with the gradualism included in the general design of the research, the achievements have been added to the virtual classroom in a certain order, as various digital contents. It was emphasized that the students could access the content and learn anytime, anywhere, without limits. The added content was explained to the students through the WhatsApp group." Similarly, she talked about the preparation stages of the digital content she prepared for the implementation process in the diaries. In another part of the diaries, she wrote: "I created an animated poster with Canva for the first achievement in the curriculum. The definitions and basic information in the first achievement were added to the worksheets, making it more interesting with the addition of animation." As can be seen in this statement, the teacher made the necessary preparations to make the digital content more effective and interesting.

Psychological Preparations

The researcher-teacher tried to adapt herself and the students to this process before and during the application. In a part of the diaries, she wrote "Students were asked to not to prejudge and try adapting to the process. The excitement and curiosity of the students were obvious. They were also worried if it was going to be difficult. They had never been involved in any scientific research before and considered themselves as novices. Students constantly asked questions such as, Will the research be difficult or will we be challenged? It was obvious that they were faced with an experience they had never heard of or experienced before. The idea of research, digital tools, and virtual classrooms was very interesting to them. I tried to resolve their concerns by giving them detailed information about the process. It was also a very exciting and new development for me as well. At the same time, I would have had the experience and opportunity to fully use the Web.2 tools that I would introduce to them. For me, this was the start of increasing my technological and pedagogical content knowledge and keeping up with the digital transformation in education." In this statement, the teacher talked about the psychological state of the students and herself in the application process. As it is seen, the teacher is as excited and curious as the students. A part of the interview conducted with the teacher is given below.

Researcher: Can you talk about your teaching process?

Teacher: ...The effect of even a week in practice on me and the curiosity it aroused in students was incredible. Both the students and I were so excited and curious that I think this had a very positive effect on the implementation process because we take our work very seriously. By informing students at every stage of the process, I prepared them for microlearning.

As seen in the dialogue above, the teacher attributed the excitement in the students and herself to the fact that they took the implementation seriously. She stated that this situation is positive for the study. She mentioned that she provided information at every stage of the application to prepare the students for the microlearning process.

Concerns and Expectations

This category presents the researcher-teacher's concerns and expectations regarding the microlearning process. The concerns and expectations category was grouped under three codes as achievement, background, and teaching process. Codes were analyzed one by one.

Success

In the interviews conducted with the researcher-teacher and in the diaries she wrote, she talked about the expectations about the success of the lesson. In a part of the diaries, the teacher wrote "Students became aware of microlearning and began to like the process and understand that small information, short content that would not distract their attention, actually facilitated their learning. This reduced my anxiety about their success." As can be seen in this section, the teacher had a concern about the success of teaching using microlearning. In a part of the diaries, the researcher-teacher wrote, "I was curiously waiting for the positive cognitive and affective characteristics that I observed informally in students to be realized in real life." As can be seen from this section, the teacher had cognitive and affective expectations for teaching using microlearning. Since it was a different experience for both the teacher and the students, in the first days, the teacher was uneasy since there was a risk of students not understanding the lesson delivered using this method. However, as it can be understood from the chapter in the diary, she observed that the students internalized this method and stated that it facilitated their learning. The concern of the method not being successful that the teacher experienced at the beginning of the implementation was resolved by her observations. Thus, the failure concern was replaced by the expectation of success.

Background

The teacher was concerned about using the Internet and digital tools from the beginning of the implementation. She wrote her concerns about students accessing digital tools in her diary. The teacher wrote the following in her diary: "I asked whether there are technical problems to the students, whether they have Internet access and the necessary digital tools. The research started since there were no issues.", and "On the first day of the third week, I first asked the students how the two-week process was for them. I examined whether they encountered technical problems and whether they had problems accessing digital content". The teacher monitored the students' status of accessing the content from the beginning to the end of the implementation and completed the process without any problems. However, she had concerns about students having problems throughout the process.

Teaching Process

The teacher was concerned about the preparation and the teaching as well. The teacher was concerned about the students being able to adapt, adopting this teaching method, lessons being interesting, and the students not getting bored during the three-week process. The teacher wrote in her diary the following: "On the first day of the second week, I first asked the students what the first week meant to them, and whether they liked the implementation. I can say that I received positive feedback in general.", and on the first day of the third week, I first asked the students how the two-week process was for them. A part of the interview conducted with the teacher is given below.

Researcher: How was the implementation process?

Teacher: I was stressed about the implementation, actually. I was worried about the students liking this method, and being able to follow the digital content, and the method being interesting for them, but my concerns were unfounded. I was surprised by the fact that the students adapted to the process quickly, and their visible interest, and increased my expectations towards the end of the process.

As it can be seen from the dialog, the teacher had concerns about the teaching process. However, she stated that her concerns were unfounded and the students liked the teaching process, and that they were interested in the subject-matter.

Process

This category presents the status of the teacher and the students in the microlearning process. The content preparation, satisfaction, and student performance codes were grouped under this category. The codes were analyzed one by one.

Content preparation

The researcher-teacher stated the difference in preparing the digital content towards the end of the implementation process. The teacher wrote in her diary the following: "We were about to complete the research. All the achievements regarding the ratio topic in mathematics were uploaded in the digital classroom. I prepared a Prezi presentation about the topic. It was a 3.5-minute presentation that explained the topic of ratio in general, with all the achievements and with different examples, in my own voice. I wanted to give them general information, exercise and I wanted them to be able to review the topic. I informed the students about the contents in the WhatsApp group. I asked my students to prepare a one-sentence slogan to see the conceptual learning of my students.", and "On the last day of the research, I wanted to provide a general assessment of the whole topic of ratio. For this, I prepared a mini quiz using Google Forms, students stated that they liked it very much. I stated that they had to solve it in 3 minutes in total. I added a mini quiz and a general assessment quiz, a fun lecture video, and the end-of-the-topic logo to the Padlet digital board." As can be seen, in the last days of the research, the teacher preferred to prepare more compelling digital content for the subject. The digital contents she created differ from those at the beginning of the process. Towards the end of the implementation, she focused on reviews, quizzes and more general content.

Satisfaction

Towards the end of the implementation, the teacher stated in the diaries and in the interview that the implementation process went very well both for the students and for herself. In a part of the diary she wrote the following: "Today was the last day of the

research. It was difficult at some points, but overall I was happy that we had a nice and different learning experience. We mutually stated that the research was satisfactory.” A part of the interview conducted with the teacher is given below.

Researcher: Do you have anything to add regarding the implementation?

Teacher: ... The students and myself were happy by the end of the research. We had a different experience and we were happy about it. This experience was incredible. The students stated that they liked this method very much, and I was happy because they were happy.

As can be seen in the dialogue above, the teachers and students happily completed the teaching process at the end of the research. It was a different experience for both parties and they were happy that they completed this process together without any problems. Thus, at the end of the implementation process, both parties were satisfied with the completion of the research.

Student performance

The researcher-teacher stated that the microlearning process increased students' interest and attention towards digital learning. The teacher wrote the following in her diary: “I told the students that they could create their own digital content if they wanted to. My students designed their own mind maps using the MindMeister Web 2.0 tool. I was very happy that they showed interest, took the time to create their own digital content and provided this positive feedback. Also, some of my students made their own lecture videos. After checking these, I added them to the virtual class. I was also happy to receive such good feedback.” It was a positive outcome for the study that students created their own digital content at the end of the microlearning process. It can be said that the e-learning process increases students' interest in digital learning.

DISCUSSION AND CONCLUSION

Based on the findings obtained within the scope of the research, it was seen that the first factor in the decision of the researcher-teacher, who teaches using micro learning in the mathematics lesson, to use microlearning is based on the in-service training she received. At the same time, it was seen that the trainings received improved the sense of curiosity in the teacher and was effective in trying to create digital content. The researcher-teacher stated that she gained information about e-learning during the in-service training she received and that she found micro learning interesting. This shows that the training given to the teachers has an important connection with the methods and strategies they apply in the classroom. It can be said that the trainings received is a source of inspiration for professional development activities or at least they can spark some ideas. Harris and Sass (2011) stated in their study that in-service vocational training has significant effects on only secondary and high school mathematics, and that teachers' experiences increase their productivity (Harris & Sass, 2011). In the study, the researcher-teacher is a mathematics teacher and thanks to the in-service training she received, she gained information about e-learning and found micro learning interesting. In other words, one of the important factors in deciding to teach mathematics using micro learning was due to the in-service training she received. Some similar studies revealed that the teacher's practices in the classroom are positively affected by the increased knowledge of in-service training (Garet et al., 2008; Garet et al., 2010). These results are consistent with the research findings.

The teacher did not mention the point of creating micro content (dividing the subject into small parts) for mathematics in diaries. This may be an indication that she did not have any difficulties in separating the mathematics subject she chose into micro-contents. However, she expressed some of the difficulties she experienced when she converted micro content into digital content. Despite this, the researcher-teacher prepared digital content using many Web 2.0 tools while teaching micro learning. It was seen that the teacher's efforts to prepare digital content were successful and that she created digital content alone with the help of the internet. It is known that teaching environments using digital content provide more effective and efficient learning (Friesen et al., 2001). Similarly, (MoNE), (2018) Mathematics Curriculum (Primary and Secondary Schools 1, 2, 3, 4, 5, 6, 7 and 8th Grades) expressed that ICT competence, one of the eight key competences determined in the Turkish Qualifications Framework (TQF), is important. In this context, the study is important for the ICT competence of both teachers and students. In addition, many international organizations (European Union Parliament, 2006; Organization for Economic Co-operation and Development [OECD], 2019) have emphasized the importance of ICT competence and teachers are the most important examples in enabling the individuals to gain digital competence (Cuban & Jandric, 2015; Redecker, 2017). In this context, it is thought that the study is a guiding experience and resource for mathematics teachers who want to prepare lessons for micro learning, and enables the transformation.

It can be said that the researcher-teacher's design of digital content in the course and the designs increased her capacity for digitalization. The teacher did not give up on the Web 2.0 design tools that she had difficulties with, and created digital contents, and it seems that she got used to these digital contents towards the end of the process. So much so that in the last week of the micro-teaching application, she guided students by thinking that they could also create digital content. Thus, students were also involved in the digital content preparation process. Students created their own digital content and the teacher uploaded them to the virtual classroom. This may be an indication that the type of resources that the teacher uses in the lessons affect the student as well. Different researchers also emphasized that the materials used by teachers have effects on students, such as active participation in the process, facilitating learning how to access information and problem-solving skills, and increasing interest for the lesson (Dağhan et al., 2017; Kablan et al., 2013). Web 2.0 tools, which are especially important for 21st century learners, were used in the research. Learning using mobile devices was supported by the digital content prepared. As the highlight of the research,

it was highlighted that efficient learning would take place by integrating and combining the information obtained from different sources, and that the learners should be encouraged to be innovative and productive individuals (Jan, 2017; Tonta, 2009). Similarly, it is emphasized that access to information is important and mobile devices facilitate access to information (Siemens, 2005). The importance of learning integrated into daily life using internet technology is an undeniable fact (Hwang et al., 2008). Similarly, in the research, it was determined that learning realized independently of time and place in the digital environment with different Web 2.0 tools, revealed positive results for students.

It was seen that the researcher-teacher was concerned about the micro learning process, at the beginning but the concerns were solved as the implementation process was going on. The teacher was also concerned since it was her first time using those tools. The increase in the teacher's expectations towards the end of the implementation indicated that she would not be so concerned in the next micro learning experience. In this sense, it can be said that it is normal for teachers who want to teach using micro learning to be concerned at the beginning of the process, but these concerns will decrease as the process progresses.

Researcher-teacher and the students were very satisfied with the micro learning experience at the end of the process. In addition, the teacher stated that the students adapt easily to the process and that micro learning enables students to learn easier using simple content and factoids without being distracted. Thus, she stated that she believes micro learning contributes to the increasing success of the students. This is in line with the nature of microlearning, because micro learning includes simple narrowed topics and facilitates learning (Jomah et al, 2016). In addition, micro learning increases student satisfaction and motivation (Nikou & Economdies, 2018). With the research, it has been seen that micro learning can be used in mathematics lessons in accordance with its nature.

RECOMMENDATIONS

Several suggestions based on the findings and results obtained in the research will be made for the teachers and those who will conduct research in the future. In this context, it can be suggested that micro learning and micro-contents can be integrated into mathematics and other courses. Micro-contents prepared using Web 2.0 tools were used in the research, but the contents can be enriched using different internet-based applications. Correlational studies can be conducted to reveal the role between teachers' ICT skills and microlearning. Thanks to this study, teachers in mathematics or different branches can design their lessons based on micro learning for post-Covid-19. By eliminating the limitations of the research stated below, comprehensive research of qualitative, quantitative or mixed type can be conducted with more participants. Considering the limitation of using only researcher diaries in the current study, it is suggested that students or other professionals in teaching could also keep a diary.

Limitations of the research

The current research has its limitations. First, we chose to study one teacher in this study. This is a conscious choice as we wanted to delve deeper into teacher experience, especially in teaching using micro learning. It was thought that studying more teachers would make it difficult to show the subjects that were difficult to detect. Working with a single teacher creates a generalizability problem. This context and the chosen mathematics teacher are not typical. Since the teacher received in-service training according to the education system in Turkey, pursuing a P.h.D., and has professional experience for a certain period of time, the results obtained should be discussed in a specific context.

Despite these limitations, it is thought that the study will help teachers who want to teach mathematics using micro learning in terms of being inspiring and providing resources.

Acknowledgements

No financial or moral support or financing has been received from any person, institution or foundation.

Conflicts of Interest

The authors have no conflicts of interest to declare relevant to the content of this article.

Ethical Procedures

All procedures performed in the present study was in accordance with the ethical standards of the Ethics Review Committee (ERC) of the Kilis 7 Aralık University.

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