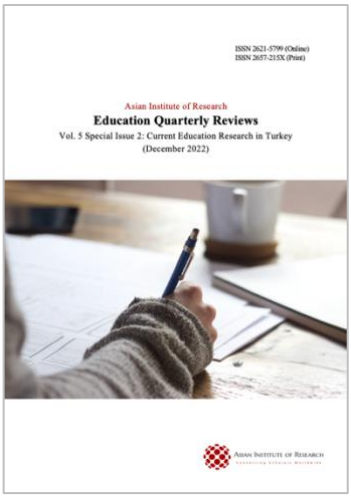

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Using WhatsApp in Math Classes in High Schools: Teachers' and Students' Opinions*

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Abstract
Digital technology is prevalent in every aspect of life. WhatsApp is very popular because it is free and user-friendly, offers instant messaging, makes communication faster, and it can also be used on smartphones easily. This study aims to reveal teachers' and students' opinions about using WhatsApp in Math classes. This study is qualitative, and in order to collect data, semi-structured interview form was used. The study was conducted with the participation of 6 Math teachers and 40 students in a state high school. Convenience sampling was done in this study. For the analysis of the data, descriptive analysis technique was conducted. Furthermore, direct quotations from the participants' responses were used. The findings of the study are as follows: Teachers and students use WhatsApp in Math classes mostly to communicate with each other, share information (information, assignments, files, and documents), make announcements, or solve math problems. Participants mentioned both advantages and disadvantages of the application. Among the advantages they mentioned are getting instant feedback, no restrictions on time and space, and sharing multimedia messages. On the other hand, the participants emphasized some disadvantages, such as systemic problems (internet outage, problems with uploading and opening documents); difficulty in communicating with large groups, understanding solutions to math problems, checking assignments; the application occupying too much space on the phone; and becoming addicted to using phones too much. Participants also suggested some upgrades for the application such as being more user-friendly for math classes and having a feature of solving math problems online.

Keywords: Math Classes, WhatsApp, Social Media, Mobile Learning

1. Introduction

1.1 Introduce the Problem

Technology is becoming more appealing for individuals, and keeping up with the digital age for students' increasing and varying educational needs has become inevitable because this process enables students to contact more people, more frequently by using more means (Murray, 2008). Today, technology has become

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an inseparable part of education, and it has influenced teachers' and students' roles. It has led teachers to adopt approaches that inspire and motivate students, make learning easier, and encourage more participation (Onyema & Deborah, 2019). Moreover, social media, which has developed rapidly in parallel with technology, has become an indispensable part of life. In line with the widespread use of the internet, social media offers people convenience in terms of communication and posts in various fields (Sarsar et al., 2015). Social Media tools appeared as an incredible technology that facilitates students' learning (Rasheed et al., 2020). Social media is actively used in every aspect of life for various purposes particularly in education in recent years, and the WhatsApp application is one of them.

1.2 Explore Importance of the Problem

Social media can be defined as web-based services which enable individuals to create half-open or open profiles, communicate with other users, and view others' connections and visits within the system (Boyd & Ellison, 2007). Social media is a powerful tool that makes it possible for people to connect with any person or large groups of people around the world simultaneously, and also to share information (Baishya & Maheshwari, 2020). Besides, the fact that social media has a high level of virtual interaction comfort makes its use more appealing (Sulisworo & Permprayoon, 2018). Today, social media is intensively used by students for sharing information, entertainment, and various activities. According to Chen, social media and social networking sites help students to create a useful learning environment where they can join online discussions (Rasheed et al., 2020). Social networking sites mainly focus on creating online groups that have common interests and activities (Raut & Patil, 2016). Mostafa (2015) defines social media within the context of Web 2.0 as the use of Web-based tools such as YouTube, Facebook, Twitter, and WhatsApp that connect people and enable them to share information, videos, photos, etc. (Mulenga & Marbàn, 2020). These tools and social media are commonly used by students in education. Thus, individuals communicate with their peers on online platforms more; they are more motivated to learn, and they get feedback from each other. The power of social media applications is that they offer students an opportunity to choose and use various tools that are most suitable for their individual learning styles and that can help to improve their academic success. Social media tools encourage students to communicate with each other, express their creativity, and share (Raut & Patil, 2016). Therefore, social media is a platform that allows users to create information, and share it with others, and also encourages individuals to join social networks (Baishya & Maheshwari, 2020). Social networks have changed the way we communicate with each other and share information. Furthermore, social networks offer new opportunities to individuals for interpersonal collaboration and sharing (Murray, 2008). The development of mobile technologies has increased mobile learning practices. Most teachers and students rely on mobile devices to connect to the internet and reach various sources of information and news. Hence, mobile learning has brought convenience and mobility to the educational process (Onyema & Deborah, 2019). On the other hand, mobile devices have gained an important place in education as well as in every aspect of our lives (Poçan et al., 2021) because mobile learning makes it possible for students to reach information in different periods of time. As a result, location or distance is not a barrier for students anymore. In fact, mobile learning is related to learners rather than technology. In this case, students are mobile and at the center of learning. Wireless mobile devices are small enough to be carried.

Mobile devices can be used anytime and anywhere to share information, complete a task, collaborate on a project, or interact (Ally & Prieto-Blázquez, 2014). For example, students can benefit from their mobile phones in many ways such as texting each other, taking and sharing photos or videos, reading news, or checking the agenda (La Hanisi et al., 2018). Particularly in recent years, digital communication has become increasingly popular among students and teachers via channels such as e-mail, SMS, Facebook, Twitter, and WhatsApp (Bouhnik & Deshen, 2014). The fact that mobile technology is available everywhere has drawn teachers' attention to using mobile technology as educational tools. One of the popular applications of mobile technology is WhatsApp (Aburezeq & Ishtaiwa, 2013). Today, the WhatsApp application is one of the most popular communication channels among all strata of society (Agustin & Sari, 2021) because WhatsApp is a free, instant messaging application that is user-friendly and works on various platforms such as iPhone and Android. Thus, the application is preferred by students to text and share multimedia messages such as photos and videos, and it is very popular (Kustijono & Zuhri, 2018; Gon and Rawekar, 2017; Barhoumi, 2015; Johnson & Ewur, 2014). Moreover, further information can be reached in real-time, and sharing this information via technology is both instant and easy (La Hanisi et al., 2018).

WhatsApp instant messaging even facilitates collaboration between students who connect to mobile classes from school or home.

WhatsApp groups can interpret the subjects learned or easily share the information via messaging. WhatsApp offers students an opportunity to create a classroom broadcast or to broadcast their works in the group. In this way, information is easily created via WhatsApp instant messaging, and it can be shared with all members of the group (Barhoumi, 2015). WhatsApp can be regarded as a social network that enables people to reach a vast amount of information fast (Warner, 2018). WhatsApp allows communication among group members without the need for space and time. Members are free to choose when to reach the broadcast information. They can view other group members and communicate with them regarding the information given at a particular time (Clavier et al., 2019). Coronavirus is an infectious and fatal disease that first appeared in Wuhan, China in 2019. Covid-19 affected educational activities adversely as well as all other aspects of life. It hindered academic activities seriously, and most schools around the World were closed because of this (Onyema et al., 2020). During this process, students and teachers adopted various learning-teaching habits. For example, the WhatsApp application started to be used in classes as an online learning environment, one of which is Math class. Math is a universal science that is influential in the development of modern technology and can improve the power of human thinking (Sari & Saputri, 2020). Although Math may seem to be the totality of simple operations, it is one of the indispensable main parts of technology and technological developments (Işık et al., 2008). Math is one of the compulsory school subjects, and it has an important place in the school curriculum (Agustin & Sari, 2021). During the pandemic, teachers used WhatsApp actively in Math classes to share information, homework, problems, or different announcements, also to answer students' questions. Math is really important for humanity, but many people have anxiety or fear about learning. Modern technology can facilitate teaching Math (Afolabi & Durodola, 2018). In this context, it is important to research the effects of WhatsApp, used as an online learning environment, in Math classes from teachers' and students' points of view, and to get their opinions and suggestions. Hence, it is expected that the findings of this study could help and be an example for researchers and teachers who intend to use social media tools as a learning environment.

This study was conducted to get teachers' and students' opinions about using WhatsApp in Math classes in high schools. In line with this general purpose, answers were sought to the following questions:

1. For what purposes do teachers and students in high schools use WhatsApp in Math classes?
2. What are teachers' and students' opinions about using WhatsApp in Math classes in high schools?

2. Methodology

2.1. Research Model / Design

This study is a qualitative one. Qualitative studies are those in which qualitative data collection methods such as observation, interview, and document review are used, and processes are followed to reveal perceptions and incidents realistically and wholly in their natural environment (Yıldırım & Şimşek, 2016). In this study, teachers' and students' opinions about using WhatsApp as one of the social media tools in Math classes in high schools were examined.

2.2. Data Collecting Tools

Research data were collected via interviews with teachers and students. Two different semi-structured interview forms were created for this. In order to create these forms, a literature review was carried out, and then questions were written. Besides, a criterion was determined for the selection of the course, teachers and students: Math classes in high school where WhatsApp was actively used by participants. Semi-structured interviews are those which are as strict as structured interviews, and not as flexible as unstructured interviews. They fall between these two extreme forms (Karasar, 2009). Once the interview forms were prepared, they were presented to three experts in the field (two lecturer from the university and a Math teacher) for review. For the pilot scheme of the interview forms which were edited according to experts' reviews, one teacher and two students were interviewed, and discussions about the questions were held. Then, the final drafts of the interview forms were completed, and the main applications of the interview forms started. Math teachers in the selected school were contacted, and they

were informed about the study. Six Math teachers in the school volunteered to participate in the study. Afterwards, the subject and aim of the study, which was to be conducted in the 9th, 10th, 11th, and 12th grades of the same school, and what was expected from students were explained. Then students who would volunteer to participate in the study were determined. Besides, students' parents were informed, and parental consent was received. Face-to-face interviews with teachers and students lasted 25 minutes on average. Participants' consent for volunteering was received before the administration of the interviews, and also volunteering participants' voices were recorded during the interview. Furthermore, voice records were shared with the related participants, their consent was received, then other interviews were administered. Interviews were administered in the school environment, out of class hours, in the place and time determined by the participants.

2.3. Participants Characteristics

Participants of the study consist of 6 Math teachers working in a high school in Ankara and 40 students from different grades studying in that school in the 2021-2022 School Year. From each grade, 10 students (5 females, 5 males) were chosen. Convenience sampling method was used for the formation of the study group. Convenience sampling provides the researcher with speed and convenience. The researcher chooses a close and easily accessible situation (Yıldırım and Şimşek 2000). In this study, voluntary participation and active use of WhatsApp by teachers and students in Math class were taken into consideration.

Demographic profiles of teachers and students in the study group are given in Figures 1 and 2 below.

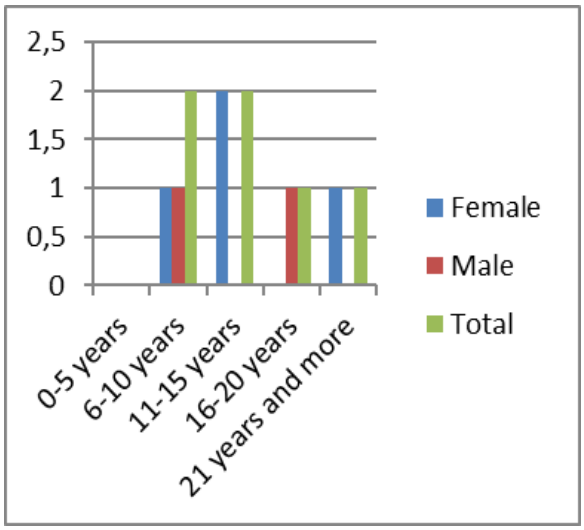

Figure 1: Demographic Profiles of Teachers

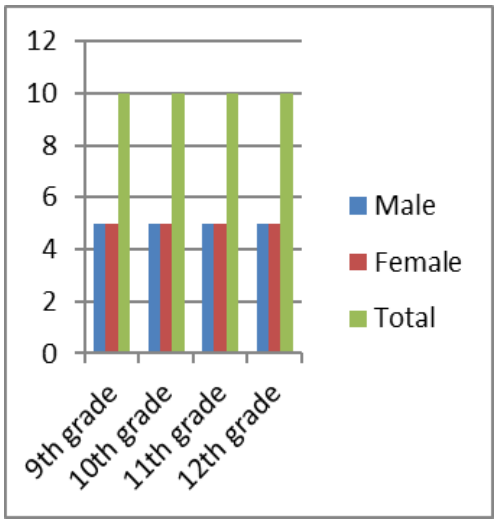

Figure 2: Demographic Profiles of Students

2.4. Data Analysis

For data analysis, interview forms were coded first (Teachers T1, T2 … T6 and Students S1, S2 … S40). Besides, all voice records of the participants who consented were transcribed. Collected data were analysed using descriptive analysis technique. Descriptive analysis is a technique in which the collected data are summarized and interpreted according to previously determined themes, direct quotations from the participants are frequently used in order to express them conspicuously, and the findings are interpreted within a cause and effect relationship. While the data can be organized according to the themes determined in line with the research questions, they can also be presented by taking into consideration the questions and dimensions used during the interview and observation processes (Yıldırım and Şimşek, 2016). A frame was formed by arranging the collected data according to the themes determined in line with the questions used in the interview process. Teachers' and students' answers were interpreted and organized according to this frame, and the answers were gathered in a meaningful and logical way. Direct quotations from some of the participants' answers were also included when necessary.

3. Results

Research data are presented under two main headings: "For what purposes do teachers and students in high schools use WhatsApp in Math classes?", and within this context, "What are teachers' and students' opinions about using WhatsApp in Math classes in high schools"?

1. Findings regarding *for what purposes do teachers and students in high schools use WhatsApp in Math classes?* are given in Table 1 below.

Table 1: Situations where WhatsApp is used in Math classes

	Teachers		**Students**	
	f	**%**	**f**	**%**
Communication (family, teachers, students)	6	100	35	87.5
Sharing information, homework, pdf documents	5	83.3	17	42.5
Making announcements	4	66.6	-	-
Sharing about solving problems (Photos, videos)	2	33.3	26	65
Distance Teaching	2	33.3	-	-
Instant feedback	-	-	8	20
Spare time activities	-	-	2	5

Participants stated that they used WhatsApp mostly to communicate (with teachers, students, and parents) fast and easily. Teachers stated that the application was useful, particularly for instant announcements to students. Besides, teachers remarked that they used the application in Math classes for various purposes such as informing students, sharing class notes/documents, and solving some problems. On the other hand, students used WhatsApp to share difficult problems with their teachers when they couldn't solve them, and to see the solution to the problems again. Students also preferred the application for different purposes such as communicating with their teachers and classmates fast, getting information about the class, and getting instant feedback for the problems shared. Similar to teachers' responses, students stated that they used the application to share subjects of the course and solve difficult problems. Different from teachers' responses, students pointed out that they used the application to share photos and videos, and do spare time activities. (S35) stated "*I use WhatsApp a lot to communicate with my family and friends*"; another participant (S39) remarked "*My friends and I use the application to solve problems or share videos about the class*"; and (S24) said, "*I use the application for online classes and assignments*".

2. Findings regarding *What are teachers' and students' opinions and suggestions about using WhatsApp in Math classes in high schools?* are presented as positive and negative opinions in Table 2, Table 3, and Table 4 respectively.

Table 2: Opinions about sharing and solving Math problems on WhatsApp

	Teachers		**Students**	
Positive Opinions	**f**	**%**	**f**	**%**
Sharing solutions instantly	4	66.6	-	-
Getting quick and easy responses to questions	-	-	27	67.5
Individual problem solving	2	33.3	6	15
Seeing different question types	-	-	11	27.5
Negative Opinions				
Not so productive as face-to-face teaching	4	66.6	10	25
Difficulty in communicating in large groups	2	33.3	15	37.5
Not understanding the solution of problems	1	16.6	7	17.5
Systemic problems (internet problem, sharing files)	-	-	9	22.5
Messaging box being closed	-	-	2	

5

Other	-	-	2	5

Teachers stated that WhatsApp was useful in terms of sharing solutions to problems fast and easily, and getting instant feedback from students. However, about Math classes, they pointed out that the process was not as productive as face-to-face education. Students stated that the application was useful since they could get instant responses from their teachers, individual problem solving was possible, and they were able to see different question types, but they also emphasized that as the number of students increased, the communication became more difficult. Some of the responses regarding this are as follows: "*Our teachers sometimes close messaging box in group settings. Then we cannot send messages to the group, so we cannot ask questions*" (S10). "*Our teachers should always keep messaging box in the class group open for us*" (S21). On the other hand, some of the students suggested that teachers share solutions to the problems not only by texting but also by video calling or sharing solutions with videos. Students think this would be more useful. Finally, they stated that it would be much better if the application worked offline as well because it requires the internet.

Table 3: Opinions about sharing homework on WhatsApp in Math Classes

Positive Opinions	**Teachers**		**Students**	
	f	**%**	**f**	**%**
Easy communication (teachers, students)	3	50	21	52.5
User-friendly (fast, effective)	1	16.6	5	12.5
Determining subjects to study	1	16.6	13	32.5
Instant feedback	-	-	8	20
Not forgetting assignments	1	16.6	2	5
No space-time restrictions	1	16.6	4	10
Motivating for the class	1	16.6	-	-
Negative Opinions				
Difficulty in checking homework	4	66.6	-	-
Homework occupying too much space on the phone	3	50	-	-
Not getting responses for the parts not understood	-	-	15	37,5
Communication problems	1	16.6	28	70
Systemic problems (internet, uploading pdf etc.)	-	-	7	17.5
Addiction to mobile phones	1	16.6	-	-
Other	-	-	5	12.5

Teachers stated that the WhatsApp application had positive contributions in terms of facilitating communication in sharing assignments, instant and effective feedback, not forgetting to submit homework , and being motivating for the class. On the other hand, the very first negative opinion is difficulty in checking assignments. For example, the opinion that when so many messages are sent at the same time, it is difficult to notice the assignments and check them was expressed by (T2) as follows: "*When we want students to send their assignments back on the application, it becomes really hard to follow them in large groups. When there are too many messages on the application, some students' assignments may not be noticed*". Besides, teachers pointed out that assignments occupied too much space on the phone, and also it caused addiction to mobile phones. The finding that students' constant exposure to mobile phones could lead to addiction, and that students may even want to take photos of the information on the board instead of writing them in their notebooks were expressed by (T4) as follows: "*During the pandemic, students were always directed to use their mobile phones to communicate and submit assignments. After a while, this situation caused addiction to mobile phones. Some students even wanted to take photos of class notes or information about assignments written on the board instead of writing them on their notebooks"*. Students stated that WhatsApp facilitated communication when sharing assignments, but sometimes problems in communication could occur. For example, students' assignments could not be noticed among so many messages sent at the same time, and sometimes there could be systemic problems such as the loss of the internet connection or being unable to upload documents. Thus, they suggested that there could be warnings for unanswered messages by teachers or that each document shared by students could be stored separately on the phones. Furthermore, the

feature of creating a separate filing system for documents sent by each student was also suggested by teachers. According to participants' suggestions, this could make checking assignments much easier. Students also suggested that teachers reply to individual messages sent outside the group and unblock students' posts in groups. Another suggestion was that assignments should be written with highlights (colourful and capital letters, using shapes or charts), and there should be a question-answer session about the assignments, for which a particular day or hour could be determined. A solution to the constant problem with the internet connection was also highlighted among suggestions.

Table 4: Opinions about sharing Math course content on WhatsApp

	Teachers		**Students**	
Positive Opinions	**f**	**%**	**f**	**%**
Sharing fast and easily (videos, photos, etc.)	3	50	17	42.5
Providing additional sources	2	33.3	11	27.5
Informing before the exams (subjects, dates, etc.)	1	16.6	8	20
Revision for subjects not understood	-	-	9	22.5
Negative Opinions				
Not being as effective as face-to-face education	5	83.3	27	67.5
Not including online testing programs	1	16.6	4	10
Systemic problems (uploading and opening documents)	-	-	8	20
Lack of communication (late or no feedback, etc.)	-	-	11	27,5

When students and teachers were asked for their positive or negative opinions about sharing Math course content on WhatsApp, the very first response from teachers was to share fast and easily. Besides, they stated that they could provide students with additional sources, which could work as a revision for students. Both students and teachers stated that WhatsApp could not be as effective as face-to-face education and that there should be online testing programs. Teachers suggested that there should be an update and recovery about the speed of uploading and opening documents on the application. Students drew attention to the positive feature of the WhatsApp application in terms of providing additional sources for them to study subjects. Moreover, revision of subjects student could not understand in class, and sharing easily and fast were among other positive opinions. However, students mentioned some systemic problems. For example, one student stated "*Some features for Math classes can be added to WhatsApp. One of these can be a special keyboard for writing symbols used in Math. Or online testing programs can be added*" (S33). Students also suggested that teachers should share recorded video lessons with their own voices. Regarding this, (S17) stated "*Our teachers answer our questions by texting back. If our teachers could video record themselves, teach with their own voices, and share them with us, it would be much better for us*". Another student (S14) responded, "*I become more and more interested in Math as documents, assignments, and subjects are shared on WhatsApp*".

Overall, teachers and students stated that they used the WhatsApp application effectively in Math classes, and it contributed positively to the learning-teaching process. Within this context, using the application on the phone, communicating fast and easily, sharing documents (such as videos, photos, and voice records) easily, understanding abstract concepts better, and being able to create groups were highlighted by the participants. One of the teachers (T6) remarked "*We all use the feature of sharing class notes on the application. Being in contact with our students constantly enables lifelong learning. Nevertheless, students sometimes say that they have not got the documents shared on the application or that they cannot open them*". Another participant (T3) stated "*Pdf files shared on the application work well as additional resources. Thanks to groups, we can easily reach a large number of students, but sometimes it can be hard to text in large groups*". (T2) stated "*We ask students to submit their assignments on the application. If there are too many messages in large groups, it can be hard to check the assignments, and they may not even be noticed"*. (S5) stated "*Thanks to this application, I can easily get information about my assignments, we come across different question types in the assignments, but we can ask our teachers right away*". (S14) suggested, "*It would be really nice and useful if our teacher could share the summary of the subjects we have studied*". On the other hand, participants drew attention to the problem that the

WhatsApp application cannot be used on every phone, and a constant internet connection is required. Besides, some other negative opinions include the application lacking problem-solving program, the keyboard not including Math symbols, and video chats allowing only a limited number of participants. For example, one student (S29) stated "*The application is not compatible with all mobile phones. When the assignments are not very clear, there may be so many questions. Although it is not as effective as face-to-face education, it is reasonable under current circumstances, and we can keep class notes*". Still another student (S33) noted "*It would be really nice if WhatsApp could be used offline as well. Sometimes the files our teacher sends cannot be opened. Some features for Math class can be added to the application. Math symbols cannot be typed on the application. There may be some additions for this*".

4. Discussion

Findings of the study reveal that the WhatsApp application is mostly used in Math classes in order to communicate fast and easily. Thus, WhatsApp groups have been created among students, teachers, and parents with the participation of a large number of people. WhatsApp facilitates interaction in a group of people who come together for a common interest. It can also facilitate collaboration in learning and teaching, interaction, and active studying (Beguma et al., 2019). Participants stated that they used WhatsApp mostly to share information (such as course content, pdf files, photos, videos, and assignments), solve problems, make announcements, and send and receive instant messages. According to Motiwalla (2007), students use instant messaging as a tool for learning. Thanks to WhatsApp groups, students can share class materials and information about the exams with each other and they can ask questions to their teachers about the subjects they cannot understand (Baishya & Maheshwari, 2020). In this study, teachers and students also highlighted some advantages of the application such as instant feedback and resolution of problems that could not be understood by students.

The findings of this study have similarities with other research findings in the field, or the results support each other. For example, , Akdeniz (2016) found in her study that majority of people preferred WhatsApp for communication. The feature of WhatsApp which offers rich message content and enables voice and video chat is influential in these findings. It was also found in this study that students used WhatsApp to share videos and photos and do leisure activities. The findings reveal that the application was used in Math classes mostly to share documents. Another study conducted by Çağlak showed that the groups created on WhatsApp are mostly schoolmates and family. In these groups, participants shared assignments, information, essays, books, and announcements about classes and school, and they talked about subjects about friends, leisure activity forms, and family issues (Çağlak, 2019). On the other hand, Yiğittürk's (2020) study revealed that WhatsApp groups created in schools were used to communicate fast, share information, and make official announcements. In their study conducted with the participation of prospective Turkish Language Teachers, Maden (2019) found that all prospective teachers used WhatsApp to text on the phone.

Among their reasons for using WhatsApp were messaging fast and easily and sharing audio-visual, written, and video documents. Another study in which the effectiveness of WhatsApp among groups of parents was researched revealed that WhatsApp was an effective tool for communication (Ocak 2019). In their study, Çetinkaya (2017) found that WhatsApp had positive effects on success. Balcı and Tezel-Şahin (2018) found in their study that WhatsApp could be used for communication between teachers and parents as well as for teaching and that WhatsApp facilitated informing parents in large groups fast and easily. Şen-Yaman (2016) found that using WhatsApp in teaching Arabic had a significant effect on academic success. In their experimental study, Agustin & Sari (2021) compared two groups: one used WhatsApp and the other did not use it. Their study showed that the application improved Math skills. In their study, Ofori-Kusi & Tachie (2022) researched the effects of the WhatsApp application on teaching and learning Math, and they stated that the application could be an alternative way when face-to-face education is not possible (such as Covid-19). Jere et al., (2019) researched if WhatsApp was effective in teaching and learning Math. The findings revealed that WhatsApp motivated students and teachers more to share information and that the application could be a way of enhancing interest in Math and increasing learning performance. In this digital age, WhatsApp is becoming more and more popular. Its use in the learning and teaching process has become inevitable.
Suggestions for further research are as follows:

- Effects of WhatsApp application at different levels and in all courses in schools can be researched.
- Training can be given about using WhatsApp more productively in the teaching and learning process.
- Studies on WhatsApp can be analysed, and new studies in different designs can be administered.
- Courses about mobile learning tools and their effective use in education can be included in the curriculum of teacher training programs.

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