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Synchronous and Asynchronous Teaching Tools during Online Learning in the Subject of Mathematics

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Abstract
The COVID-19 pandemic forced massive and unexpected changes in educational institutions, instead of the teaching process taking place in schools, schools were suddenly closed as a preventive measure to prevent the spread of the virus COVID-19. This resulted in a new challenge for students as well as teachers, where lessons from school were shifted to online learning through the internet. The most difficult task of the teachers was to choose the most suitable electronic platforms for their students. Aims of this research is to reveal students' perceptions of what are the most prefered learning tools during online learning in the subject of mathematics developed in pandemic times. The methodology of this research is the mixed method. The sample of this research study is represented by the students of music high school in Prizren/Kosovo, about 50 participants. Quantitative and qualitative data were collected through the survey, respectively the questionnaire. The results of this research show that students prefer synchronous learning tools, such as Google Meet and Zoom, to asynchronous Google Classroom and email ones. Also, the results show that synchronous and asynchronous online learning tools have a significant role and positive correlation with online learning held in the subject of mathematics.

Keywords
Asynchronous platforms, Mathematics, Online learning, Synchronous platforms, E-learning

INTRODUCTION

The rapid spread of the COVID-19 virus was a global concern. As a precautionary measure to curb this explosion, educational institutions in Kosovo announced the closure of schools during the implementation of the order of health institutions. With the closure of schools due to the COVID-19 pandemic, the Ministry of Education announced the continuation of the online learning process. Online learning can take place in two ways; Synchronous Online Learning and Asynchronous Online Learning. Synchronous approach means that the learning process takes place in real time, which requires the commitment of the teacher and the student at the same time, but can be from different places (Singh & Thurman, 2019). The synchronous learning tools we used during the pandemic period were online learning: Google Meet, Zoom, etc. As with the face-to-face environment, students in synchronous online learning can ask direct questions and receive instant feedback. In contrast, the asynchronous approach does not require real-time interaction (Singh & Thurman, 2019). Asynchronous online learning is the place where teaching materials are posted online, and students work through them in their own time, communicating with each other and teachers through discussion boards or forums, or even by email. The asynchronous learning tools we used during the pandemic period were online learning: Google Classroom, email, etc. With an asynchronous way of teaching, the student can work on the tasks at any time that is convenient for them.

Regardless of when participating in synchronous or asynchronous online learning, or what both offer, there are certainly some unique benefits to each. For example, some students like synchronous learning because they want to feel involved, in real time, with the classroom experience. They may find it rewarding to ask a question or offer a comment and get immediate feedback. For some students, real-time communication may provide them with the educational experience they need to practice. For others, asynchronous learning may be more appropriate. Many students need more time to form their opinions or consider all sides of an issue before offering an opinion. In synchronous lessons, these students may be stuck by faster typists and spontaneous thinkers. In asynchronous learning, students can work at their own pace. Another benefit of asynchronous study is that the work schedule is on the brisk side, or if you work multiple shifts, you may not need to worry about engaging at a set time, as your schedule can be adjusted to suit your real life.

Some of these options can be used in synchronous online learning:
Chat: Synchronous chat rooms allow multiple users to log in and interact. This is a great way to ask questions and to share resources and insights.
Voice (telephone or voice-over IP): is a method and group of technologies for the delivery of voice communications and multimedia sessions.
Video or web conferencing: Using your webcam, you could talk to your professor face to face, share media (like documents, presentations, and poll questions) and more.
Live Streaming: Some synchronous learning programs may go a step further in emulating the traditional classroom, by live streaming your professor's lecture, as if you were sitting in the classroom with them.
On the other hand, in asynchronous online learning some of these options can be used:
Digital Curriculum Materials: This can be anything from loaded PowerPoint presentations, document sharing, podcasts and video uploads.
Email: It's a great tool for asking questions, keeping in touch, and receiving materials, updates, reminders, and even assessments.
Social Networking: Online learning courses now incorporate social networking in order to enhance collaboration and learner interaction.
Wikis and Collaborative Documents: Facilitate group work, creating a central hub for you and your classmates to work together on a shared project.

The reality is, effective teaching and learning in online learning requires a combination of synchronous and asynchronous learning. From our experience in implementing online learning in math we have focused more on synchronous learning tools like Google Meet and Zoom, while asynchronous ones Google Classroom and email services. Therefore, the field of study focuses on students' perceptions of synchronous and asynchronous online learning and addresses questions such as when, why and how to use these two ways.

LITERATURE REVIEW

In this article a number of research papers were reviewed in order to address the topics of synchronous and asynchronous online learning and which one is most popular with students in the subject of mathematics. The literature review will provide a useful framework for understanding the diverse responses of local and international authors to synchronous and asynchronous online learning.

Various integration platforms and the Internet enabled online learning to be conducted with synchronous and asynchronous access. Characteristics of lectures using the synchronous approach are teacher-student interactions performed simultaneously using the web platforms of a chat room or video conference. A feature of the asynchronous approach is that such interactions are performed flexibly and should not be at the same time maximizing discussion forums or independent learning (Ui, 2020). However, according to Azhari and Fajri (2021) show that the lack of technical guidance led teachers to implement different strategies in online learning. The implementation was mainly influenced by their ability to operate with technology, internet connection stability and student financial support. Factors caused 83.9% of teachers to use mainly WhatsApp or Google Classroom (asynchronous access) as a favourable online learning platform. Moreover, the ability of teachers to transform face-to-face learning activities into online learning also influenced implementation (Azhari & Fajri, 2021).

Using synchronous communication creates an opportunity for students to build relationships with teachers and their classmates. The data shows that students value online learning, which includes a reality component, and they succeed when a teacher gives high quality instruction about an authentic learning experience. It is important for the teacher to create an online environment that is engaging, organized, and provides opportunities for students to practice real-world skills and provide an assessment of their learning through feedback on their activities (Dutton, Ryznar, & Long, 2019). Synchronous teaching and learning or real-time teaching-learning is multifaceted and can be conceived in both short and long form, depending on the purpose and platform of learning. In a longer form, for example video conferencing online or web conferencing programs where multimedia like audio and video are used in addition to interactive tools like chat and whiteboard (Jiyoon & Peggy, 2019). According to Yang et al. (2019) emphasize that synchronous online learning provides students with a better learning experience and wider access to information (Yang, Yu, & Chen, 2019). Hong (2020) says the biggest challenge is how to use synchronous learning to promote those connections without allowing face-to-face sessions because of the need to expand physical distance (Hong, 2020).

Much of the traditional teaching in mathematics is still done through lecture-style classes, which are usually given orally and through the use of blackboards. This type of instruction translates well into materials that student's study asynchronously, usually before a class session. For example, teachers may record videos or share their lecture notes so that students can understand them in their own time before class meetings. However, to achieve mastery of mathematical concepts, it is essential that students have sufficient practice and exposure to problem solving. Problem-solving activities work well in synchronous, collaborative sessions, allowing for efficient face-to-face time with teachers, who can provide direct feedback. Virtual classroom synchronous time is also effective in clearing up any misunderstandings and developing discussions that relate to the current topic being addressed. (Levitt & Tambasco, 2020).

Using asynchronous and synchronous approaches to research can be a solution to the learning problems during the Covid-19 pandemic. First, approaches combined chat room and video conferencing platforms. Using the chat platform

was to minimize internet cost and connection restrictions, while the video conferencing platform would address the lack of understanding in online learning (Azhari & Fajri, 2021; Fatoni, et al., 2020). Second, the approaches encouraged students to learn independently using videos, e-books, and textbooks and to discuss materials and problem-solving in groups. It was conducted before the synchronous meeting to overcome the lack of interaction between students (Suryaman, et al., 2020). Third, the approaches encouraged students to be active by presenting and discussing solutions during synchronous meetings. Meeting time was limited to one hour for video conferencing activity and two hours for discussion on chat rooms platforms. This was done to overcome the problems of concentration difficulties if online learning was carried out for a long time (Fatoni, et al., 2020). As suggested by Kaup et. al (2020), different subjects need different approaches to learning through the internet. This presents an area for the work of using hybrid learning which is a combination of synchronous and asynchronous online learning, so it will be more effective in the teaching and learning process (Kaup, Jain, Shivalli, Pandey, & Kaup, 2020).

MATERIALS AND METHODS

Purpose of the Study

The use of technology today, along with the global crisis the world is experiencing from the COVID-19 pandemic, makes online learning a necessary teaching method. This means the implementation of new didactic strategies and pedagogical approaches. Most teachers and students face various challenges when switching to online learning. Teaching and learning mathematics online is particularly problematic and if we were asked this question a few years ago, we would have said that the online learning process in mathematics is impossible to develop. However, switching to online learning as an obligation by educational institutions, it was seen that even mathematics is definitely feasible and can even be excellent through choosing the right digital learning tools. In this article, we aim to share some of our experiences and recommend the use of online platforms to assist teachers and students in choosing the right online learning tools for the subject of mathematics.

There are various communication platforms that can be used in the online learning process, synchronous or asynchronous. Their choice depends on several factors, including the preferences of teachers / students, technical requirements and the availability of technological equipment or a decision of the educational institution to use a unified communication tool within all lessons taught in online learning. Therefore, this research aims to reveal students' perceptions of what are the most popular synchronous or asynchronous teaching aids during online learning in the subject of pandemic math. This study also aims to highlight the significant role of synchronous and asynchronous teaching tools in online learning, as well as to reflect the correlation of these tools with online learning developed in the subject of mathematics.

Research Questions

1. What are the students' perceptions of the synchronous teaching tools used during the online learning in the subject of mathematics?
2. What are the students' perceptions of the asynchronous teaching tools used during the online learning in the subject of mathematics?

Research Hypothesis

Hypothesis 1: Mixed teaching tools (synchronous and asynchronous) used during online teaching in mathematics have more effect compared to using one of them.
Hypothesis 2: Synchronous and asynchronous teaching tools play a significant role in developing online learning in mathematics.
Hypothesis 3: Synchronous learning tools are more popular with students compared to asynchronous ones in mathematics during the online learning process in the pandemic period.
Hypothesis 4: There is a statistically significant correlation between teaching tools of synchronous and asynchronous with the math online learning.

Method

Using online learning to teach math offers the opportunity to change traditional teacher-centered, student-centered patterns by collaborating, reflecting, and supporting students who are isolated in this COVID-19 pandemic time. Synchronous and asynchronous online learning approaches should be used to make online learning as effective as possible. Therefore, this research incorporates an approach of mixed methods, ie quantitative and qualitative approach. Quantitative analysis will produce some concrete results through statistical calculations, while qualitative analysis will give an in-depth understanding of reality. This method will provide a reflection of students' experiences from online learning and will reflect their perceptions of synchronous and asynchronous learning tools.

Participants

Participants in this study include students of the music high school "Lorenc Antoni" in Prizren/Kosovo. The selected sample includes 50 students of grades X, XI and XII. The selected participants are a deliberate sample, as it represents students who participated in online learning in the subject of mathematics during the pandemic period. The students

participated in this research were 33 females and 17 males, respectively 66% female and 34% male (M = 1.34, SD = .479). The students were from grade X, XI and XII of high school, so their participation by age varies with 23 students or 46% of 16 years old, with 25 students or 50% of 17 years old and 2 students or 4% of age 18 years old (M = 1.58, SD = .575). In terms of knowledge of technology used in our sample are included 7 students with basic skills of using technology or 14%, 35 students with average skills of using technology or 75% and 8 students with advanced skills of using technology or 16 % (M = 2.02, SD = .553). From this variety of sample, we are noticing that we have more female students, which can be argued to be a professional music art school where we can understand their perceptions about online learning tools. Also, the students were in an adult age, which can give their thoughts as real as possible for our study. And finally, as an important indicator for this research are the knowledge of the use of technology, from where we are noticing that most of the students from the selected sample are having sufficient knowledge of the use of technology, which can give more accurate results for the generalization of the findings of this study.

Data Collection and Analysis

The current research used mixed data, i.e., quantitative and qualitative data. Tha daata wa collected through questionnaires sent to high school music students. The collected quantitative data shows students' preferences for synchronous or asynchronous learning tools. Qualitative data will show the deeper perceptions of students about these teaching aids during the online learning developed in the subject of mathematics. The student questionnaire was specially designed for this study and was also designed to be as short as possible. The statements in each closed question of the questionnaire were identical, except for the format of open-ended questions. The answer to each of the closed question evaluation questions was based on a 5-point Likert scale, with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. For the qualitative data after the analysis of each question in the questionnaire, a further exploration was made of the open-ended questions to answer the research questions and hypotheses. Specifically, we used multi-level coding in the classification of codes from open-ended questions.

To prevent the spread of COVID-19, these surveys were conducted online compiled with Google Forms and their distribution was electronic via the link. This form allowed data to be collected through real-time surveys.

Data analysis consists of equal weighting, as the research has equal importance both quantitative and qualitative data, which have equal emphasis within this study. The questionnaire described above collected quantitative data using a Likert scale, and the results of this data were used to compare specific likes between two learning modes, direct synchronous and asynchronous online, to determine if there were differences is importance. Therefore, before testing the hypotheses and adapting the final model, quantitative data analysis was done through descriptive and inferential statistics. Specific descriptive statistics were the results, frequencies, means, standard deviations and t-tests to confirm or refute our hypotheses set out in this study. Specific inferential statistics, on the other hand, were correlation and regression analysis. Quantitative data was counted and compared using descriptive statistics and a standard t-test to see if there was a significant difference in data results between these approaches that where used. Whereas, the analysis of the t-test had a level of 95% reliability, and if the value $\alpha < 0.05$ then we can support the hypothesis presented, otherwise we would reject it. Also, for this data by means of Pearson correlation it is tested whether there is a relationship between synchronous and asynchronous online learning tools to online learning.

The program used for statistical analysis for quantitative data was the Statistical Package for Social Sciences (SPSS). However, the analysis of qualitative data was interpreted narrative from the data collected for this research.

The Scale

In quantitative and qualitative research, validity and reliability is very important. Moreover, the data analysis process was controlled by an external researcher. The research findings on validity were interpreted along with the research results and similarities and differences were discovered. Participants' direct comments were included in the interpretation of the data on the reliability of the research. Also, the data was analyzed and questions were addressed to the participants impartially and the answers were obtained without any intervention. Also, while participants provided personal information, each participant's details will remain anonymous and confidential.

RESULTS

After analyzing the results, a variety of responses are seen among the synchronous and asynchronous online learning tools liked by high school music students in the subject of mathematics during the COVID-19 pandemic period. These results analyzed from the data collected from the questionnaire result in the findings of our study as follows.

For the question during the online learning in the pandemic period in the subject of mathematics student’s which platform they liked, the following findings emerge shown in Fig. 1. As we can see from Fig. 1, the most popular synchronous platform for half of the participants was Google Meet, followed by the Zoom platform. On the other hand, the most popular asynchronous platform for more than half of the students was Google Classroom, while email services are not so much preferred by students for online learning in math. Also, analyzing the diagram above, they see that 92% of students prefer synchronous online teaching tools, compared to 72% asynchronous online teaching tools in mathematics.

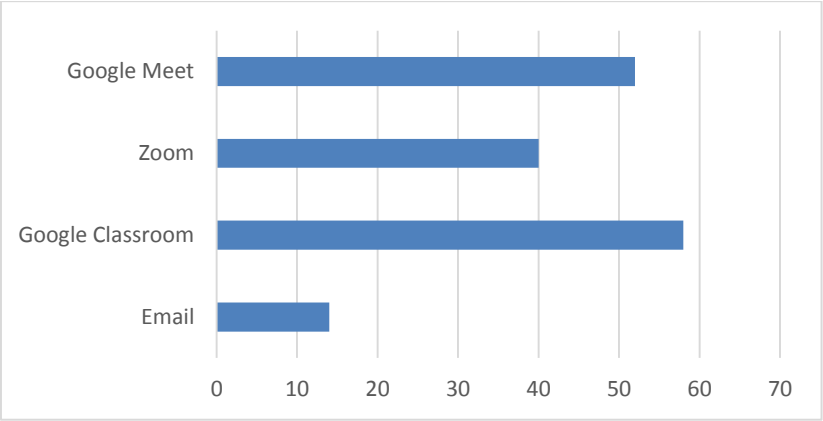

Fig. 1 Results from online platforms liked by students

Also, analyzing the answers grouped by the questionnaire in relation to synchronous learning tools, the following results emerge:

The students' answers show that in online learning in the subject of mathematics about 92% of them agree that they have developed real-time learning through video presentations on the whiteboard and that it was a very effective method for them, while only 8% do not stand for it. statement (M=4.49, SD= .649). Discussions and reactions to online learning in the subject of mathematics by both teachers and students have been immediate and effective show that 47 students agree, while only 3 of them are neutral (M=4.32, SD= .587). Almost the majority of 98% of students state that the assessment in online learning in the subject of mathematics was direct and transparent, while only 2% have no attitude (M=4.55, SD= .542). Also, 90% of students say that online learning in math allows them to ask questions continuously while learning is ongoing, while 8% are neutral and 2% that online learning in math does not allow them to ask questions continuously while the lesson was going on (M=4.36, SD= .722). Analyzing the above results, we see that these questions serve to understand students' perceptions of synchronous teaching tools liked in the subject of mathematics. Therefore, if we generalize these questions, we can get the following general findings for online synchronous teaching tools in the subject of mathematics:

Table 1 Students' perceptions of synchronous learning tools

	N	Minimum	Maximum	Mean	Std. Deviation
Synchronous	50	4.00	5.00	4.5000	.50508
Valid N (listwise)	50				

From Table 1 we are noticing that the average is 4.5 and a standard deviation of .51 indicates that most students like the synchronous learning tools used during online learning in mathematics.

From the open question what perceptions students have about online learning tools like Google Meet and Zoom used during the pandemic period in math subject matter these answers emerge. Students think that they are platforms that gave you great opportunities for contact and development of online learning. The students emphasize that they were very efficient and were very satisfied with both teaching tools. They show that Google Meet seemed simpler and easier to engage in learning, and it was more practical. Google Meet and Zoom have been the most efficient platforms for online learning. These teaching tools were very necessary and very important during the pandemic period, says one student. Another student points out that the Zoom platform and especially Google Meet, during the time of the pandemic has affected the learning of the subject many times more than some previous methods such as watching various videos of teachers explaining the subject on social networks like YouTube. They show good results in the lesson and were quite understandable and easy to use by all students and think that they are very good platforms for online learning, especially in the subject of mathematics, students say.

On the other hand, by analyzing the answers grouped by the questionnaire in relation to asynchronous teaching aids, the following results emerge:

Students' answers with about 96% show that the lectures and exercises were sent by the math teacher in time through online platforms, while only 4% of them have no answers (M=4.77, SD= .425). About 98% of students state that they have sent homework digitally to the math teacher when we have completed it, and 2% of them do not have a position on this statement (M=4.58, SD= .539). However, 46% of students state that they did not learn as much through the materials sent offline from the subject of mathematics as they would have learned in school, 22% are neutral and only 8% of the participants state that they have learned so much through the materials sent offline from the subject of mathematics how much they would have learned in school (M=3.34, SD=1.256). Online learning in the subject of mathematics has given the opportunity to engage in interdisciplinary works and projects related to music, learning and applying new knowledge and skills expressed 82% of students, while 12% are neutral and only 2% think the opposite (M=4.38, SD= .789). According to the above results we see that these questions serve to understand students' perceptions of asynchronous teaching tools liked in the subject of mathematics. Therefore, the following general findings emerge for synchronous online teaching tools in the subject of mathematics:

Table 2 Students' perceptions of asynchronous learning tools

	N	Minimum	Maximum	Mean	Std. Deviation
Asynchronous	48	3.00	5,00	4.4583	.54415
Valid N (listwise)	48				

From Table 2 we are noticing an average of 4.46 and a low standard deviation of .54 indicating that students also like the asynchronous learning tools used in online learning in mathematics.

However, from the open question of what perceptions you have about online learning tools like Google Classroom and the email communication services used during the pandemic period in the subject of mathematics, these answers emerge. One student points out those asynchronous learning tools are perfect and very easy and efficient to use. Others think they are too good and practical to use. They point out that Google Classroom and email during our time away from school was a great help for distance learning and that it helped them a lot. Another student recounts the experience that Classroom helped them easily do their homework through the photos sent. Also, I think they have been very useful because through them they have submitted our assignments and seminar papers. However, there were students who point out that it was not good at all and that Google Classroom and email services did not arouse more interest.

The research results show that female participants like synchronous learning tools with an average of 4.52, compared to male with 4.47. Also, 16-year-olds like synchronous learning averages with an average of 4.52, 17-year-olds with 4.48, and 18-year-olds with 4.50. Also, students with basic knowledge level like synchronous learning tools with an average of 4.53, those with average knowledge level of 4.51 and those students with advanced knowledge in the use of technology have an average of 4.50. On the other hand, female students like asynchronous learning averages with an average of 4.45, compared to male with 4.47. Also, 16-year-old students like asynchronous learning averages with an average of 4.52, 17-year-old students with 4.43 and 18-year-olds with 4.00. Also, students with basic knowledge level like asynchronous learning tools with an average of 4.14, those with average knowledge level of 4.52 and those students with advanced knowledge in the use of technology have an average of 4.50.

Analyzing the results of the t-test to see if synchronous and asynchronous teaching aids play a significant role in online learning in mathematics, the following findings emerge:

Table 3 One-Sample Test

	Test Value = 0					
	t	df	Sig.(2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Synchronous	63.000	49	.000	4.50000	4.3565	4.6435
Asynchronous	56.764	47	.000	4.45833	4.3003	4.6163

From the results of Table 3 we are noticing an average for synchronous teaching aids is slightly higher of .04167 compared to asynchronous teaching aids from students' perceptions. Also, the significant significance score from the t-test is .000 for both synchronous and asynchronous teaching aids, which is less than .05 previously defined as the 95% confidence level for this research.

To analyze whether variables such as gender, age and technological knowledge affect students' perceptions of synchronous and asynchronous learning tools, we provide the results from ANOVA. From the results analyzed through ANOVA we are noticing that variables such as gender with F= .086 and p= .771, age with F= .059 and p= .808, as well as technological knowledge with F= .064 and p= .801, show that there are no significant differences between men and women, between the ages of 16, 17, 18 and 19, as well as between basic, intermediate and advanced technological knowledge that can affect perceptions of liking synchronous learning online tools in the subject of mathematics, since the significant was greater than the value determined by 0.05, ie p>.05 in all cases. On the other hand, variables such as gender with F= .242 and p= .786, age with F= .657 and p= .524, as well as technological knowledge with F= .837 and p=.440, show that there are no changes. between men and women, between the ages of 16, 17, 18 and 19, as well as between basic, intermediate and advanced knowledge of technological knowledge that may affect perceptions of liking online asynchronous teaching online tools in mathematics, since the significance in all cases was greater than the value determined by 0.05, i.e., p> .05.

Table 4 Correlation between synchronous teaching tools to online learning

		Synchronous	Online learning
Synchronous	Pearson Correlation	1	.195
	Sig. (2-tailed)		.183
	N	50	48
Online learning	Pearson Correlation	.195	1
	Sig. (2-tailed)	.183	
	N	48	48

From the results of Table 4 we are noticing that there is a positive and moderate correlation with .195 and significant of .183 between synchronous teaching aids and online learning in the subject of mathematics analysed from the views of high school music students.

On the other hand, to analyse whether there is a relationship between online learning and asynchronous learning tools, we are giving the following Pearson correlation results:

Table 5 Correlation between asynchronous teaching tools to online learning

		Synchronous	Online learning
Synchronous	Pearson Correlation	1	.111
	Sig. (2-tailed)		.453
	N	48	48
Online learning	Pearson Correlation	.111	1
	Sig. (2-tailed)	.453	
	N	48	48

From the results of Table 5 we are noticing that there is a positive and moderate correlation with .111 and a significance of .453 between synchronous teaching tools and online learning in the subject of mathematics developed during the COVID-19 pandemic period.

At 76% of students are optimistic that in addition to face-to-face teaching with physical presence in school it is good to use online teaching in mathematics, while 24% of participants think that teaching should take place only in physical presence at school.

DISCUSSION

There are many different forms of distance education delivery modalities used today. Among the most common are synchronous and asynchronous online learning. Research has been conducted investigating various aspects of these delivery modalities. However, there seems to be a gap in the literature for their specific comparison. The purpose of this study was to ascertain how the synchronous and asynchronous modalities of online learning delivery were perceived in music high school students for the mathematics subject developed online during the COVID-19 pandemic period.

Both forms of online learning covered in the paper have their benefits, however, as the results of our survey have shown, synchronous online learning turned out to be more popular in learning mathematics, as it is more efficient in time, accommodates communication in real-time, provides immediate feedback, encourages students to participate more actively in the learning process and boosts their motivation for online learning. The results of the research are showing that the synchronous learning tools Google Meet with 52% and Zoom with 40%, were more liked by students in the subject of mathematics, compared to the asynchronous online learning tools Google Classroom with 58% and email services with 14%. Therefore, our findings are consistent with Fitria's results, as she points out that Zoom as a synchronous online learning tool was more perceived by Indonesian students (Fitria, 2021). Also, from the findings of the other research, it is emphasized that synchronous teaching tools help to motivate students for the subject of mathematics (Orhani, 2021). From our findings it has been observed that a small difference in favour of the consent of synchronous teaching aids in the subject of mathematics compared to asynchronous. But, according to the most convincing answers from the open-ended questions, we are noticing that we can confirm our hypothesis that synchronous teaching aids are more popular with students compared to asynchronous ones in mathematics during the online learning process in the pandemic period.

This research further shows that students believe that when studying through synchronous online learning there is the possibility of experiencing substantially similar or alternative means of education, as is done in the physical classroom environment. The results of the study emphasize that students have very good skills to use different tools and technologies, enable them to participate more easily in online learning. It has been shown that good knowledge of technology use is necessary for students to be successful in online learning because they need to have some convenience in using computer and web. Also, from the results of Table 1 it is noticed that synchronous learning has an average of 4.5, which shows that students motivate for learning and like synchronous learning tools. But, even from the students' answers to the open-ended questions, they had very positive perceptions about synchronous learning tools such as Google Meet and Zoom, so we can also answer the question posed for this research that students' perceptions of synchronous learning tools used during online learning in the subject of mathematics were positive.

Another important element of this study was that it addresses the asynchronous approach to online learning practices. The articles demonstrated results similar to our research where in terms of homework and project aspects the results show that the asynchronous online learning approach was used, through the Google Classroom platform and email service. These results are consistent with the results developed in Germany by Wößmann and et al. (2020) where asynchronous digital tools were used specifically for the assignment of tasks (Wößmann, Freundl, Grewenig, Lergetporer, Werner, & Zierow, 2020). On the other hand, our results and the study in Germany contradict the findings developed in Spain by Rodríguez-Muñiz and et al. (2020), as Spanish teachers seemed to distinguish their choice by means of synchronous means through video-conference (Rodríguez-Muñiz, Burón, Aguilar-González, & Muñiz-Rodríguez, 2021). Therefore, from the results and discussion we can say that students' perceptions of asynchronous teaching tools used during online learning in mathematics were of a positive nature, where these teaching tools had an impact on the progress of online learning in mathematics.

From the findings of our research and in our opinion support the study of Mukasa-Lwanga and Goosen (2018) who concludes that variations of web-based technologies used by individual educators would hinder the achievement of study objectives (Mukasa-Lwanga & Goosen, 2018). Thus, institutions should encourage their lecturer to use appropriate online learning platforms in institutions, as well as limit the number of online platforms used. Also, from the results of Tables 1 and 2 we are noticing that the averages are almost equal to each other which shows that the teaching tools used together are more likely in the efficient development of online learning in the subject of mathematics. From the answers to the open-ended questions come the same findings, that students prefer the learning tools Google Meet, Zoom, Google Classroom and email services. Therefore, from these findings we can confirm the hypothesis that the mixed teaching tools (synchronous and asynchronous) used during online teaching in mathematics have more effect compared to the use of one of them.

The results of Table 3 from the t-test show that the significant significance for synchronous and asynchronous online learning tools is .000 less than the level of reliability determined for this research. Therefore, we can confirm the hypothesis that synchronous and asynchronous teaching aids play a significant role in developing online learning in the subject of mathematics. Other articles demonstrated results similar to our research, where we can show that the Shaikh and Raval (2020) survey says that online learning gives students more space to study at their convenience, regardless of time and place to accommodate needs their learning (Shaikh & Raval, 2020).

We found a relationship from the results of Pearson correlation that we are noticing that there is a positive and moderate correlation with r= .195 in relation to online learning and synchronous learning tools. Also, from the results of Pearson correlation we are noticing that there is a positive and moderate correlation with r= .111 in relation to online learning and asynchronous learning tools. From these two findings we can also confirm the hypothesis that there is a statistically significant correlation between teaching tools of synchronous and asynchronous with the math online learning. From this relationship we can say that the choice of appropriate didactic teaching tools synchronous or asynchronous are important in the development of online learning in the subject of mathematics.

The research also shows that most respondents find that in addition to face-to-face teaching with physical presence in school it is good to use online teaching in the subject of mathematics. The results express a high percentage with 76% that online learning as a suitable tool to study with a combination that have face-to-face interaction and with components assisted through online learning.

CONCLUSION

The online teaching method breaks the classic stereotypes of teaching and learning processes, as it modifies space and time, allowing the development of the pedagogical act in any place and at any time. This can be achieved if technological equipment and digital resources are available as well as internet access. In the present research, the aim was to reveal the perceptions of high school music students, what are the most popular synchronous or asynchronous teaching aids during online learning in the subject of mathematics developed at the time of the COVID-19 pandemic. In general, it can be shown that students prefer both online learning platforms, i.e., mixed ones. This means that the proper and efficient use of online didactic tools in the subject of mathematics will motivate and encourage students in the active process of participating in online learning. This fact, in turn, may lead to the view that this type of online learning with synchronous and asynchronous tools is almost identical to direct instruction in the classroom.

Finally, we believe that there will always be a role for synchronous learning, we also believe in the disruptive potential of high-quality asynchronous lectures delivered by world class teachers.

The paper has important implications in the field of education, especially for mathematics teachers who apply online learning. One of the reasons is that these work results are reflecting the benefits of online learning with the effective use of synchronous and asynchronous learning tools. In other words, we can say that there is a harmony in the fact that teaching and learning in the 21st century must functionally include not only information and communication technology, but also must effectively include digital teaching tools, especially those that serve educational purposes. Online learning based on synchronous and asynchronous learning tools has gained importance and thus the need has arisen to have reliable tools to manage and master this type of learning, regardless of face-to-face learning or online learning.

The limitations of this study are that the sample selected was only with the students of the music school, since for these students the subject of mathematics was not the basic field of study. Another limitation lies in the fact that the sample is represented in only one school and one city in Kosovo. Moreover, due to safeguards against the COVID-19 pandemic, the survey was conducted online and that may be a limitation as it was not possible to conduct in-depth interviews through direct survey. Given the research model, the findings cannot be broadly generalized beyond the context of the study. Therefore, research results should be treated with caution.

For future research we suggest that more research is needed into the design of activities and the use of synchronous and asynchronous tools in an online environment, to facilitate active learning and to encourage learning in the subject of mathematics. Similar research should also be conducted in other subjects and at the lower school level, but with a larger scale and wider sample. On the other hand, it is important that further research evaluates the effectiveness and efficiency of synchronous and asynchronous teaching tools, where study results may have implications for curriculum design giving significant role to digital competencies.

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DECLARATION OF CONFLICT
I have no personal, financial or other interest that could, or could be seen to, influence the decisions or actions I am taking or the advice I am giving during my research for this study.

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