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## APPLICATION OF DIGITAL TECHNOLOGY IN MUSIC TEACHING

**Abstract:** *Modern teaching of any subject, including music teaching, with regard to the new technological age and digitization implies, in addition to the use of traditional teaching aids (e.g., traditional textbooks), the application of digital technology (e.g., digital textbooks). The computer has become an almost irreplaceable aid of digital technology in teaching, but its purpose is not to replace the teacher but to supplement his teaching. Currently, when the Internet is available almost everywhere and almost everyone has access to a digital technology device with Internet access, distance learning has become a common way of teaching and learning. Digital technology played a large role in remote music lessons during the COVID-19 pandemic. As part of the work, an anonymous questionnaire survey was conducted on a sample of 43 music students. The goal of the research was to determine students' attitudes about the use of digital technologies in future educational work and their self-assessment of knowledge and skills for using digital technologies. The results showed that the majority of students were assessed as digitally competent but that they mostly developed their competence through independent work. At the same time, they expressed positive attitudes toward the use of digital technologies in their future educational work. It can be concluded that academic institutions should consider introducing courses that would develop the digital competence necessary for successful operation in today's digital age.*

**Keywords:** *digital competence, digital technology, music teaching, students of music.*

## INTRODUCTION

Human life is almost unimaginable without digital technology, which is used daily in society and the economy. Therefore, one of the key competences for lifelong learning, according to the recommendation of the Council of the European Commission (European Commission; EC, 2018), is digital competence, which includes "the safe, critical, and responsible use of digital technologies and handling them for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), security (including digital well-being and cybersecurity-related competencies), intellectual property issues, problem solving, and critical thinking" (EK, 2018, p. 11). According to the Review of Digital Results for 2017 (EK, 2018), the digital skills of 44% of the population of the European Union are at a low level, and 19% of the population do not possess them at all, which was a signpost that it is necessary to act in the field of acquiring the digital competences of the population of Europe and at the same time, on teacher training. For this reason, the Joint Research Center of the European Commission created the European Framework for the Digital Competence of Educators (DigCompEdu) (Redecker, 2017), which describes what it means to be a digitally competent

educator and provides guidelines for the development of the digital competence of educators at all levels of education. The six areas of the *DigCompEdu Framework* encompass various aspects of the professional activities of educators: "1. area: *professional engagement*: Use of digital technologies for communication, collaboration and professional development. 2nd area: *digital resources and materials*: Finding, creating and sharing digital resources and materials. ; 3rd area: *learning and teaching*: Management and organization of the application of digital technologies in learning and teaching. ; 4th area: *monitoring and evaluation*: Use of digital technologies and application of strategies that achieve the improvement of monitoring and evaluation. ; 5th area: *empowering students*: Use of digital technologies for better student involvement, personalization of their learning and active student participation in the learning process. Area 6: *Facilitating the development and guidance of students' digital competences*: Facilitating the creative and responsible use of digital technology so that students find information, communicate with others, create content, ensure their own well-being and are able to solve problems" (Redecker, 2017, p. 18).

According to the *DigCompEd Framework*, digital technology can be defined as any product or service that serves to create, view, distribute, adapt, store, reaccess, transmit and receive information electronically in digital form. In accordance with the aforementioned definition, the umbrella term "digital technologies" includes:

- 1) computer networks (e.g., the Internet) and all services that support them (e.g., websites, social networks, online libraries)
- 2) all types of software (e.g., programs, applications, virtual environments, games), both those available online and those stored on a local computer
- 3) all types of hardware or "devices" (e.g., personal computers, mobile devices, interactive whiteboards and displays)
- 4) all types of digital content, e.g., files, information, and data (Redecker, 2017).

According to the *DigCompEd Framework*, digital technology is divided into:

- 1) digital devices
- 2) digital sources and materials (= digital files + software + online services)
- 3) files.

For the purposes of education, digital devices are personal and portable computers, telephones, mobile phones, interactive panels and screens, televisions, projectors, and cameras, while educational digital sources and materials and data sources are online information, network stations, platforms, multimedia content (images, sounds, and videos), learning materials, (online) games, quizzes, educational software, applications, programs, virtual learning environments, and social networks (Redecker, 2017).

## **DIGITAL TECHNOLOGY FOR THE PURPOSE OF EDUCATION AND EDUCATION**

Today's teaching of any subject in view of the new technological age and digitalization, in addition to the use of traditional teaching aids, cannot exclude the use of digital technology. Kučina Softić et al. (2021) believe that educational institutions still have not sufficiently "recognized the possibilities brought by new technologies in relation to the design and delivery of lessons, improving quality, and reducing costs" (Softić et al., 2021, p. 46). Digital technology for the purpose of education can be used in:

- classical-classroom – traditional teaching
- mixed-hybrid teaching (combination of classical teaching and teaching supported by digital technology)
- distance learning (learning and teaching take place entirely with the help of digital technology) (Bates, 2020, as cited in Kučina Softić et al., 2021).

Bates and Poole (2003) are of the opinion that the challenge for teachers is how to use digital technology for the purpose of improving the quality of learning, achieving learning goals in accordance with the specific needs of individual students, and ensuring the best ratio of traditional classroom teaching and teaching supported by digital technology. Brown et al. (2019) believe that digital technology is mainly used by teachers as a supplement to teaching and not as a substitute for traditional classroom teaching. They

point out that traditional teaching models still dominate despite the advantages and great possibilities of digital technology.

Digital technology can help students become more active in the learning process, i.e., they can construct their own knowledge in accordance with the constructivist theory of learning (Elliott et al., 2000), which assumes that the student constructs his own knowledge through his own activity based on observation and personal experience. Therefore, the introduction of digital technology into the educational process enables a paradigm shift from one in which the teacher is at the center to one in which the student is at the center. The teacher thus takes on the role of mentor and coordinator of the educational process, and the student becomes an active participant who takes responsibility for his results (Kučina Softić et al., 2021). Student-centered learning focuses on the satisfaction of student needs, while teacher-centered subject-centered learning focuses on the transfer of knowledge (Clasen & Bowman, 1974). In student-centered teaching, the teacher's role changes, i.e., his role is to:

- "sets clear learning outcomes for each lesson and each learning activity
- uses active learning more often than formal lectures, dictations and formal presentations and encourages asking questions, experimenting, and developing creative ideas and solutions
- in addition to textbooks, it uses a wider range of learning materials that are adapted to the different needs of individuals in the class
- assists students in selecting appropriate resources to support their learning inside and outside the classroom
- develops learning materials designed to help students learn in an active way
- includes opportunities that, in the learning experience, rely on learning that is based on the use of digital technology
- incorporates opportunities for students to continuously improve their intrapersonal and interpersonal skills in learning experiences
- encourages group work and manages collaborative group situations
- supports each student without taking control
- it helps students to manage the speed of their learning, in order to achieve learning outcomes effectively and in a reasonable period of time" (Swainger et al., 2008, p. 38).

Digital technology played a large role in distance learning during the COVID-19 pandemic. The paradigm of student-centered teaching should also be present in distance learning. Distance learning is not new and has been used for many years. It is described as a special way of teaching in which students and teachers are spatially and/or temporally distant from each other (Miražić-Nemet & Surdučki, 2020). One of the ways to implement inclusive education is through distance learning. Namely, Čaušević (2010) states that distance learning can be organized for children with disabilities who are unable to attend classes at school due to their physical limitations.

Distance teaching has advantages such as saving students' time and improving learning efficiency; freeing participants from space and time dependence; no time is needed to go to the place of attending classes; students can freely choose the time to watch pre-recorded teaching content and thus organize their time more freely; the student's learning process can be more individualized; that is, students can, if necessary, repeat parts of lessons or skip some content. Disadvantages of distance learning include a lack of participation and insufficient motivation among students, a lack of timely communication between students and teachers, and, consequently, a lack of exchange of ideas, different quality of the internet; and different constructions of teaching platforms that also limit the effectiveness of distance learning (Bergmann & Sams, 2012).

To avoid the disadvantages of distance learning and to make teaching as useful as possible for students, teaching methods in distance learning cannot be identical to those in classroom teaching. Bergmann and Sams (2012) suggest organizing distance learning according to the "flipped classroom" model, which implies that students get to know the teaching content at home, and at school they deepen their knowledge by practicing and solving problem tasks and interacting with the teacher and other students. Ng et al. (2021) believe that the "flipped classroom" allows more time for collaborative activities, and

Kučina Softić et al. (2021) point out that the flipped classroom supports the application of a student-centered teaching paradigm in which students take responsibility for their own achievements and the emphasis is on developing problem-solving and critical thinking skills.

## DIGITAL TECHNOLOGY IN MUSIC TEACHING

Unlike teachers, students are raised in a digital world, and students of all ages use digital technology in every aspect of their lives. This is why the application of digital technology in teaching is becoming increasingly important because the use of digital technology for educational purposes stimulates students' curiosity, increases their engagement, and leads to better learning and understanding. These factors are a priority for every effective teacher, and today traditional teaching methods are being adapted to the needs of 21st century students (Pavlova, 2022). In the context of music lessons, this would mean that "the teacher must first of all get to know the teaching aids that are intended to be used in the lesson, but also choose the appropriate stage of the lesson in which to incorporate such aids. The application of teaching technology in music teaching must be a carefully planned, methodical procedure" (Dobrota, 2016, p. 13).

In music lessons, it is possible to apply different digital technologies with regard to different contents and activities of music lessons, i.e., types of music lessons. Namely, music lessons can be for the purpose of general education or for the purpose of music education. In particular, in the Republic of Croatia, the subjects Musical culture in primary schools and Musical art in high schools are taught in general education schools (Ministry of Science and Education; MZO, 2019). Professional music education takes place in music schools where there are numerous music subjects organized as teaching instruments (individual or group), singing (solo or choir), and theoretical music subjects (Solfeggio, Polyphony, Harmony, Music Theory, History of Music, Musical Forms) (Ministry of Science, Education and Sports; MZOS, 2008; MZOS, 2006). Although there are a large number of subjects, it can still be stated that musical activities such as singing, playing, listening to music, music creation, and the acquisition of knowledge and skills in the field of musical literacy and musicological content are carried out within the mentioned subjects. For this reason, we will look at digital technology in relation to musical activities and content rather than through subjects. Digital technology is used in music teaching to present content through presentations, as a source of content available via the Internet, for interactive posters, quizzes for repeating and checking knowledge, musical computer games, digital manuals and textbooks, for the use of music programs and applications, etc.

Pavlova (2022) suggests some of the digital tools that she believes encourage responsibility, cooperation, and appreciation and that can be used by teachers and students. *Prezi* is a digital tool for creating interactive presentations that, according to Pavlova (2022), due to the possibility of zooming, leads to more convincing, effective, and interesting presentations than presentations made using PowerPoint. Presentations in music lessons can be used for all teaching content because they can be used to present video and audio recordings, sheet music, photos of musical instruments, orchestras, ensembles, traditional costumes, etc. *Glogster* is a digital tool that helps students learn using *visual* content, but this application also enables the creation of multimedia posters by combining text information, photos, audio, and video (Pavlova, 2022). Given the possibility of implementing audio and video recordings, *Glogster* is interesting for teaching music because it can be used for numerous musical topics (acquaintance with composers, musical genres, traditional music, etc.). *A padlet* is a digital whiteboard that allows students and teachers to display various images, videos, text files, links, and the like. Digital classroom tools such as *Padlet* motivate students to work together and think as a team (Pavlova, 2022). For the stated reason, *the Padlet* digital board can be used in music lessons for joint work during the realization of various musical projects in which the teamwork of students is expected in accordance with their individual tasks. *Schoology* is a free-to-use learning management system that allows teachers to create and distribute materials, monitor and evaluate student progress, etc. In *Schoology*, a teacher can organize content, embed multimedia in assignment descriptions, record audio or video within the platform, have a journal grade, set rules for completion, etc. (Pavlova, 2022). Due to the aforementioned characteristics, *Schoology* can be used as a supplement to classroom music lessons or in cases where the need arises to organize music lessons remotely.

Thomas (2022) suggests different digital tools for the classroom teaching of music. *Chrome Music Lab* allows students to explore creating and manipulating different sounds, i.e., using the *Song Maker app*, students can explore creating songs by considering musical elements such as melody, harmony, tempo, and instrumentation. With younger students, it is possible to create melodies and musical patterns, while older students can complete the melody of a song they are familiar with. One of the most valuable parts of this application is the real-time playback of student work. Playback allows even the youngest students to hear their creations, reflect on their work, and make changes. *Groove Pizza* is an app that allows students to create and connect different beats from different musical styles to compose their own piece of music. Students can create rhythms in Afro-Latin, jazz, techno, rock, and hip-hop styles. These rhythms can be downloaded or shared with different music applications, such as *SoundTrap* or *Noteflight*. The application is especially suitable for working with students in the lower grades of elementary school, but it can be used with other age groups as well. *Semi-Conductor* is an application that allows students to play the role of an orchestra conductor and control the sounds of various instruments. In this way, students get to know the different groups of instruments in the orchestra. By conducting, students can control the dynamics and tempo of a certain composition by moving their hands high for louder dynamics, low for quieter dynamics, and at different speeds to control the tempo of the composition. *MusicPlay Online* is a teaching tool that offers music lessons, games, and instruments. Games such as *Major or Minor*, *High or Low*, *Note*, *Name Memory*, and many others provide supplemental activities to different lessons and give students instant feedback. The lessons contain videos of songs, quizzes, and rhythms that students and teachers can use to practice and learn different musical content.

Ascione (2021) also suggests some tools for the purpose of music education. *Moosiko* is a tool intended for distance learning guitar teachers and aims to strengthen student motivation and facilitate assessment. Students can choose from over 220 popular songs and play them at their own pace, resulting in greater engagement at home and in the classroom. *EarSketch* offers free resources for teachers to help students learn about digital music technologies. Students can use pre-recorded sounds or create their own and create studio-quality music. *Little Kids Rock* offers free resources for music teachers divided into lessons without and with instruments, including guitar, ukulele, keyboards, and bass. *Pinkzebrin* is a free template for creating your own virtual choir recording.

From the mentioned applications, it can be seen that digital technology can be used for teaching playing and singing at a distance and through recorded video lessons. Dumlavwalla (2020) gives recommendations for high-quality teaching using distance learning; that is, he points out its advantages and disadvantages. The advantages of remote playing lessons are that teachers can teach students outside of their immediate geographic location, and students have a choice of teachers, i.e., they are not limited to only those in their local area. Also, students who live in remote areas and might not have the opportunity to work with a qualified teacher have the possibility of quality playing lessons through distance learning. Working families have the opportunity to have their children have lessons at home and not have to take them to music lessons outside the home. Given that playing teachers are not physically present, students need to take more responsibility for their music learning and become more independent, and teachers engage in self-reflection and pedagogical development due to adaptation to a new environment.

Although distance learning has become more popular, its disadvantages should also be noted. For example, the lack of physical presence can be a problem for both teacher and student due to the impossibility of talking and demonstrating related to the physical aspects of playing and building an intimate relationship with the student. Also, if no MIDI connection is used (the teacher and/or student are using an acoustic piano), the latency causes the sound to be delayed, and this means that it will be difficult for teachers to teach their students while they are playing; also, teacher and student cannot play in duet. In addition, it is difficult to assess tone quality during remote playing lessons (Dumlavwalla, 2020). Işıkhan (2017), Akarsu (2021) and Sağer et al. (2020) also point out the poor sound quality and the problem of sound synchronization in group activities like singing or playing because harmonious sounding is disturbed. Akarsu (2021) believes that individual musical activities can be carried out more easily through distance learning compared to group ones.

## **OVERVIEW OF PREVIOUS RESEARCH: APPLICATION OF DIGITAL TECHNOLOGIES IN MUSIC TEACHING**

The COVID pandemic has forced music teachers to organize music classes remotely, so recent research has largely dealt with the above topic and not with the application of digital technology in traditional music classes. Nevertheless, Mičija Palić (2022) examined the self-assessment of the digital competences of music school teachers in the Republic of Croatia and determined that the teachers considered themselves to be the most competent to work in the school environment, while they rated their own teaching and learning with the application of digital technologies as low. The results showed that almost 90% of the research participants stated that they acquired digital competences independently, and a quarter acquired digital competences by attending education during elementary or high school education. Less than a fifth of teachers acquired digital competence during their studies, and more than half feel the need for additional education. As for the use of information and communication technology during the preparation and implementation of music lessons, most of them, i.e., about a third of teachers, use digital technology for 20% of the content they work with students on.

Hodžić-Mulabegović et al. (2021) conducted a survey among Solfeggio teachers of primary and secondary music schools and music academies in Bosnia and Herzegovina, Croatia, and Serbia on the implementation of distance Solfeggio lessons. They concluded that it is necessary to ensure the possibility of continuous improvement of teachers' digital competences because, during the pandemic, teachers felt "left to their own devices". It was concluded that most activities are almost impossible to perform via distance learning, especially those that are realized in real time, i.e., synchronously.

Ristivojević and Svalina (2022) conducted research in music schools in Croatia and Serbia in order to examine the attitudes of music teachers about vocal-instrumental and theoretical distance learning. Teachers who teach instrumental and vocal classes were assessed as more competent for teaching at a distance compared to those who teach theoretical music classes. Also, music teachers are of the opinion that the transfer of complete knowledge is not possible through technology, but most of them are open to the possibility of using ICT.

Svalina (2021) conducted research in music schools in Croatia, in which instrument teachers participated. The results of the research showed that teachers think they do well in distance learning, especially the youngest ones. In their future work, teachers would keep audio and video recordings of students' playing, passing audio and video materials to students, their own recordings of the performance of parts of compositions or complete compositions, and also holding classes remotely in situations when students are ill or have missed class for some other reason.

Papić et al. (2022) investigated the digital competences of Music Culture teachers. The research results showed that during the pandemic, music teachers used specialized digital tools such as Finale, Sibelius, Encore, etc., and almost half of music teachers used some of the digital tools in every lesson. Most music teachers are aware of the constant need for lifelong learning and professional development, especially with regard to specialized digital tools for teaching music and developing their digital learning strategies in a virtual or traditional environment.

According to the research conducted by Šulentić Begić et al. (2022), Music Culture teachers are of the opinion that they have the competences to teach music remotely, but they believe that they did not acquire these competences during their studies. The authors conclude that academies that train future teachers should prepare students for different situations, such as the current pandemic, in order to successfully overcome obstacles that may arise when teaching music.

Kaleli (2020) points out that future music teachers in Turkey should attend courses during their studies where they will develop the necessary competencies for working with computer programs and software. Kibici and Sarıkaya (2021) state that Turkish music teachers in the upper grades of primary school are considered to be averagely competent for remote teaching, while the results of research conducted by Moscardini and Rae (2020) showed that as many as two-thirds of music teachers in Scotland believe that they are not competent enough to conduct remote music lessons.

In Serbia, Jeremić (2022) examined the attitudes of future teachers of Music Culture regarding the realization of university music classes under the conditions of using the online platform Microsoft Teams (MST). The results of the research showed that the students agreed in their assessments that university music teaching at a distance contributes to the acquisition of their professional competences for the adoption of teaching content in Music Culture classes.

Akšamija and Ploskić (2023) conducted research in Bosnia and Herzegovina, the aim of which was to examine not only the experiences and digital competences of the participants but also their opinions and attitudes about the future of their professional training in this area as well as the future use of digital technology in music teaching. Music teachers in primary and high schools, teachers of primary and secondary music schools in Sarajevo, students, teachers, and associates at the Music Academy of the University of Sarajevo participated in the research. Research participants showed a high level of use of digital tools and technology in the time before the COVID pandemic, while the representation of the use of platforms and applications related to the field of music was extremely low. This practice changed significantly during the pandemic period, and the participants used digital technology to a much greater extent in music lessons and have positive attitudes about its use in the teaching process and in the future. Students also emphasize the importance of strengthening the digital competence of teachers. They believe that they need additional education in this area during their studies.

In the framework of this work, research was carried out on the future of music teachers wanted to know if they considered themselves digitally competent.

## **METHODOLOGY**

### **Aim and research hypotheses**

The aim of the research was to determine the attitudes of music students regarding the use of digital technologies in future educational work and their self-assessment of knowledge and skills for the use of digital technologies. The research was based on the following hypotheses:

H1a: Students are assessed as competent in accessing information using digital technologies.

H1b: Students are assessed as competent in communicating using digital technologies.

H1c: Students are assessed as competent in creating content using digital technologies.

H1d: Students are assessed as competent for the safe use of digital technologies.

H1e: Students are assessed as competent in solving the problems they encounter when using digital technologies.

H2: Students express positive attitudes about the use of digital technologies in their future educational work.

The hypotheses are based on assumptions derived from the results of other research (Akšamija & Ploskić, 2023; Jeremić, 2022; Svalina, 2021; Šulentić Begić et al. 2022).

### **Sample and data collection**

The research took place during the summer semester of the 2022-2023 academic year. and included 43 final year music students from the Academy of Culture and Art in Osijek. The data were collected through survey. The research was financed by the authors of the paper. The sample of research participants can be seen in Table 1.

**Table 1**

*Description of the sample*

<b>Sex</b>	<b>Female</b>	<b>31 (72.1%)</b>
	Male	12 (27.9%)
	In total	43 (100%)

As seen from Table 1, 43 students participated in the research, slightly more than a quarter of whom were male.

### **Instrument and statistical procedure**

The anonymous questionnaire that the students filled out consisted of questions and statements that sought to determine their sociodemographic characteristics (gender) as well as their attitudes about the use of digital technologies in future educational work and their self-assessment of their own knowledge and skills for using digital technologies. The questionnaire contained a total of 34 items. The questionnaire was compiled according to the Digital Skills Questionnaire (Active Assisted Living; AAL, 2017) of the European program AAL (*Active Assisted Living Programme*), which was adapted and expanded for the needs of this research.

The students' self-assessment of their competence to access information using digital technologies was examined with an instrument consisting of three items on a Likert scale (example: Circle the degree to which you agree with the statement that you know how to search for information on the Internet using a search engine, where 1 means that you do not agree at all with the stated statement, 2 means that you somewhat disagree, 3 means that you neither agree nor disagree, 4 means that you somewhat agree, and 5 means that you completely agree with the stated statement). A self-assessment of students' competence to communicate using digital technologies was examined with an instrument consisting of five items, also in the form of a Likert scale. Furthermore, the self-assessment of students' competence for creating content using digital technologies was tested with an instrument consisting of four items, and the self-assessment of students' competence with the safe use of digital technologies was tested with a four-item instrument. Student self-assessment for solving the problems they encounter when using digital technologies was examined with an instrument consisting of four items, and students' attitudes about the use of digital technologies in their future educational work were examined with a six-item instrument also in the form of a Likert scale. Quantitative data were processed with the computer program SPSS.

## **RESULTS AND DISCUSSION**

### ***Types, frequency of use and competences for using digital devices***

At the beginning of the questionnaire, students were asked to find out which digital devices they use at home, how often and how competent they are to use them (Tables 2, 3, and 4).

**Table 2**

*Using different digital devices at home*

What digital technology devices do you use at home?	that	not	in total
personal computer	17 (39.5%)	26 (60.5%)	43 (100%)
laptop	40 (93%)	3 (7%)	43 (100%)
smartphone	42 (97.7%)	1 (2.3%)	43 (100%)
tablet	13 (30.2%)	30 (69.8%)	43 (100%)
other ICT devices	16 (37.2%)	27 (62.8%)	43 (100%)

As seen from Table 2, students use smartphones and laptops at home most often and tablets least often. At the same time, it is evident that all students use at least one digital device at home.

**Table 3**

*Frequency of use of digital devices*



How often do you use digital devices?		every day	several times a week	once a week	several times a month	once a month	never
device	personal computer	4 (9.3%)	3 (7%)	1 (2.3%)	3 (7%)	10 (23.3%)	22 (51.2%)
	laptop	16 (37.2%)	19 (44.2%)	4 (9.3%)	2 (4.7%)	-	2 (4.7%)
	smartphone	43 (100%)	-	-	-	-	-
	tablet	2 (4.7%)	4 (9.3%)	2 (4.7%)	3 (7%)	6 (14%)	26 (60.5%)
	other ICT devices	2 (4.7%)	5 (11.6%)	4 (9.3%)	8 (18.6%)	9 (20.9%)	15 (34.9%)

Table 3 shows that all students use a smartphone every day, while more than half of them never use a desktop computer or tablet. Also, four-fifths of students use a laptop every day or several times a week.

**Table 4**

*Self-assessment of knowledge and skills for using digital devices*

Assess your level of knowledge and skills regarding the use of digital devices.		very low	low	good	very good	tall	M	SD
device	personal computer	-	1	8	21	13	4.07	,77
	laptop	-	-	6	21	16	4.23	,68
	smartphone	-	-	2	12	29	4.63	,58
	tablet	-	1	14	12	16	4.00	,90
	other ICT devices	2	-	21	10	10	3.61	1.00

Students are assessed as the most competent in using a smartphone and the least competent in using other digital technology devices (Table 4). Also, the research participants declared that they have internet access at home. All students have home internet, while 37 of them (86%) have full wireless coverage, and six of them (14%) have partial coverage.

***Self-assessment of knowledge and skills for using digital technologies***

With the aim of verifying hypothesis H1a that *students are considered competent in accessing information using digital technologies*, the obtained results were compared (Table 5).

**Table 5**

*Self-assessment of competence for accessing information*

Claim/answers (N = 43)	I don't agree at all	I somewhat disagree	I neither agree nor disagree	I somewhat agree	I completely agree	M	SD
I know how to look for information on the Internet using a search engine.	-	-	-	4	39	4.91	,29
I know that not all information on the Internet is reliable.	-	1	2	2	38	4.79	,64

I can save files or content (e.g., text, images, music, videos, audios, web pages) and retrieve them after saving.	-	-	-	5	38	4.88	,32
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Considering the obtained results, which show that almost all students are considered competent, the hypothesis H1a that *students are considered competent in accessing information using digital technologies* is accepted (Table 5).

Hypothesis H1b reads: *Students are assessed as competent in communicating using digital technologies*. The results are shown in Table 6.

**Table 6**

*Self-assessment of competence for communication using digital technologies*

Claim/answers (N = 43)	I don't agree at all	I somewhat disagree	I neither agree nor disagree	I somewhat agree	I completely agree	M	SD
I can communicate with others using a mobile phone, using voice over IP technology (e.g., Skype), email or chat, using basic features (e.g., voice messages, SMS, sending and receiving email, text messaging).	-	-	-	1	42	4.98	,15
I know how to share files and content using simple tools.	-	-	-	2	41	4.95	,21
I know that I can use digital technologies to interact with different services (e.g., government, ministry, bank, hospital, etc.).	1	-	3	7	32	4.60	,82
I use social networks and tools for online communication.	-	-	-	2	41	4.95	,21
I am aware that certain communication rules apply when using digital tools (e.g., when commenting or sharing personal data).	-	-	-	4	39	4.91	,29

In this case too, almost all students assessed themselves as competent (Table 6), so the hypothesis H1b that *students are assessed as competent in communicating using digital technologies* is also accepted.

Furthermore, the obtained results were compared (Table 7) in order to verify the hypothesis H1c that *students are assessed as competent at creating content using digital technologies*.

**Table 7**

*Self-assessment of competence to create content using digital technologies*

Claim/answers (N = 43)	I don't agree at all	I somewhat disagree	I neither agree nor disagree	I somewhat agree	I completely agree	M	SD
I can produce simple digital content (e.g., text, tables, images, and audio files) in at least one format using digital tools.	-	-	1	10	32	4.72	.50
I am capable of performing basic editing on other people's content.	-	-	3	10	30	4.63	.62
I know that content may be copyrighted.	-	-	1	1	41	4.93	.33
I can apply and change simple functions and settings of the software and applications I use (e.g., change default settings).	-	-	6	16	21	4.30	.86

From Table 7, it is evident that almost all students are assessed as competent to create content using digital technologies. The exception is six students who answered neither I agree nor disagree with the statement about knowing how to change application settings. Therefore, the hypothesis H1c that *students are assessed as competent in creating content using digital technologies* is accepted.

Hypothesis H1d reads: *Students are assessed as competent for the safe use of digital technologies*. The results are shown in Table 8.

**Table 8**

*Self-assessment of competence for safe use of digital technologies*

Claim/answers (N = 43)	I don't agree at all	I somewhat disagree	I neither agree nor disagree	I somewhat agree	I completely agree	M	SD
I know how to take basic steps to protect my devices (e.g., using antivirus and passwords).	-	-	4	15	24	4.47	.67
I am aware that my personal data (username and password) can be stolen.	-	-	-	5	38	4.88	.32
I know that one should not disclose private information on the Internet.	-	-	-	1	42	4.95	.31
I know that excessive use of digital technology can affect my health.	-	-	1	5	37	4.84	.43

The vast majority of research participants, that is, almost all students, consider themselves competent in the safe use of digital technologies (Table 8). For this reason, the hypothesis H1d that *students are assessed as competent for the safe use of digital technologies* is accepted.

Finally, with the aim of verifying the hypothesis H1e that *students are considered competent in solving the problems they encounter when using digital technologies*, the obtained results were compared (Table 9).

**Table 9**

*Self-assessment of competence to solve problems when using digital technologies*

Claim/answers (N = 43)	I don't agree at all	I somewhat disagree	I neither agree nor disagree	I somewhat agree	I completely agree	M	SD
I know how to find support and help when I have a technical problem or when I'm using a new device, program, or application.	-	-	4	11	28	4.56	.67
I know how to solve some routine problems (e.g., close the program, restart the computer, reinstall or update the program, check the internet connection, etc.).	-	-	-	4	39	4.91	.29
I know that digital tools can help me solve technological or non-technological problems.	-	-	3	12	28	4.58	.63
When faced with a technological or non-technological problem, I know how to use the digital tools I have to solve it.	-	-	9	11	23	4.33	.81

In this case, too, the majority of students are assessed as competent, except that one in ten students is not sure if they know how to find support, and one in five is not sure if they know how to use digital tools to solve problems (Table 9). Considering the obtained results of hypothesis H1e that *students are assessed as competent in solving the problems they encounter when using digital technologies* is also accepted.

Taking into account the above results, which show that the majority of students or almost all students are assessed as competent in accessing information, communication, content creation, safe use, and problem solving using digital technologies, we can conclude that their self-assessment of digital knowledge and skills is high. The results are in line with some research (Akšamija & Ploskić, 2023; Jeremić, 2022).

### ***The use of digital technologies in future educational work***

Hypothesis H2 was that *students express positive attitudes about the use of digital technologies in their future educational work*. The results are shown in Table 10.

**Table 10**

*Students' attitudes about the use of digital technologies in future work*

Claim/answers (N = 43)	I don't agree at all	I somewhat disagree	I neither agree nor disagree	I somewhat agree	I completely agree	M	SD
I intend to use ICT in teaching.	-	1	4	9	29	4.53	.77
I believe that the use of ICT in modern teaching is necessary.	-	1	6	15	21	4.30	.80
I intend to use as many different ICT tools as possible.	1	3	10	18	11	3.81	.98
I believe that I developed digital competence during my studies.	6	10	11	12	4	2.95	1.21
I believe that I developed digital competence through independent work and effort.	-	-	1	19	23	4.51	.55
I consider myself a digitally competent future teacher.	-	-	4	9	30	4.60	.66

We can notice that almost all students believe that they developed digital competence independently, and only a third of them think that they developed it during their studies. The obtained results are not in accordance with some other research (Akšamija & Ploskić, 2023; Jeremić, 2022 ). The above is in support of the opinion of Kaleli (2020), who points out that during their studies, students should attend courses where they would develop digital competencies. Although the majority of students spoke positively about the use of digital technologies in their future work, hypothesis H2, which read: *Students express positive attitudes about the use of digital technologies in their future educational work*, was partially accepted.

## CONCLUSION

Currently, when the Internet is available almost everywhere and everyone has access to a digital technology device with Internet access, distance learning has become a common form of formal, nonformal, and informal learning. In addition, digital technology has played a major role in remote music lessons during the COVID pandemic. The results of this research showed that music students are considered sufficiently competent in accessing information, communication, content creation, safe use, and problem solving using digital technologies, but they state that they mostly developed their digital competence through independent work and only to a lesser extent during their studies. Therefore, academic institutions should consider introducing courses that would develop the aforementioned competencies. At the same time, the research participants expressed positive attitudes about the use of digital technologies in their future work.

This research was limited to students from only one Croatian academy, and by including students from other academies, a more complete insight into the self-assessment of the digital competences of future Croatian music teachers would be obtained. Additionally, it would be desirable to examine their opinions and self-assessments about the use of musical tools in teaching. The above could serve as an incentive for similar research in the near future.

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