

VYTAUTAS MAGNUS UNIVERSITY

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**THE DEVELOPMENT OF MUSIC TEACHERS' INFORMATION AND
COMMUNICATION TECHNOLOGY COMPETENCIES IN THE
CONTEXT OF CHANGING EDUCATIONAL PARADIGMS**

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VYTAUTO DIDŽIOJO UNIVERSITETAS

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LIST OF CONCEPTS

Application (APP): mobile applications consist of software/set of programs that runs on a mobile device and perform certain tasks for the user. The mobile application has been widely used for its vast functioning area like calling, messaging, browsing, chatting, social network communication, audio, video, game etc (Rashedul, Rofiqul & Mazumder,2010)

Business to Customer (B2C): business-to-business (B2B) describes commerce transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer. B2B Ecommerce can save or make the company money. B2B is also used in the context of communication and collaboration (Kumar & Raheja,2012).

Competencies: required for a position are identified through job analysis or task analysis, using techniques such as the critical incident technique, work diaries, and work sampling. Competencies include all the related knowledge, skills, abilities, and attributes that form a person's job (Robinson, 2010).

Competency: is a combination of knowledge, abilities, skills, experiences, and behaviours that leads to effective performance in an individual's activities. Competency is measurable and can be developed through training. Holistic competency is an umbrella term that includes various types of generic skills (e.g., critical thinking, problem-solving skills), positive values, and attitudes (e.g., resilience, appreciation for others), which are essential for learners' lifelong learning and whole-person development (Chan & Yeung, 2020).

Customer to Customer (C2C): various platforms facilitate consumer-to-consumer e-commerce, including social media (e.g., Facebook, Reddit), advertisement websites (e.g., Craigslist), and online auction sites (e.g., eBay) (Yrjölä, Rintamäki, et al., 2017).

Information Age: according to the United Nations Public Administration Network, the Information Age was formed by capitalising on advances in computer microminiaturisation (Kluver, 2013), which led to modernised information systems and internet communications becoming the driving force of social evolution (Tuan, 2019).

Distance Learning is the education of learners who cannot always be physically present at school (Kaplan & Haenlein, 2016) or where the learner and the teacher are separated in both time and distance (Anderson et al., 2020). Traditionally, this usually involved correspondence courses wherein the learner corresponded with the school by mail. Distance education is a technology-mediated modality and has evolved with the development of technologies such as video conferencing, TV, and the Internet (Dron et al., 2014). Today, it usually involves online education,

and the learning is typically mediated by some form of technology. A distance learning programme can either be completely remote or a combination of both online learning and traditional offline classroom instruction (Vaughan, 2010).

Hardware. Computer hardware can be divided into the following five major components: operator (Arithmetic Logic Unit, ALU), controller (Control Unit, CU), memory (Memory) input devices (Input Devices) will be external information into the computer, such as keyboards, mice, scanners, etc., output devices (Output) Devices (Output Devices), the results of the calculation will be output to external devices, such as monitors, printers, microphones, etc (Tang, 2008).

Information and Communication Technology (ICT) is an extensional term for information technology (IT) that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as necessary enterprise software, middleware, storage and audiovisual, that enable users to access, store, transmit, understand and manipulate information (Murray, 2011). ICT is an umbrella term that includes any communication device, including radio, television, cell phones, computer and network hardware, satellite systems and so on, as well as the various services and appliances with them such as video conferencing and distance learning. ICT also involves analogy technology, such as paper communication, and any mode that transmits communication (Ozdamli et al, 2015).

Information and Communication Technology Tool includes computers, laptops, tablets, smartphones, printers, scanners, and other digital devices that allow information communication through networks and the Internet. They can provide universal access to education and improve learning, teaching, and management. Some key ICT tools are computers, which process data and give outputs; laptops, which are portable computers; the internet, which connects billions of devices globally; and interactive whiteboards, which allow touch-based control of screens projected from connected computers. Other tools include tablets, such as iPads, smartphones, such as iPhones, digital cameras, and video conferencing software, such as Skype. ICT tools have the potential to enhance education when implemented effectively (Brislin, 2021).

Online Education is increasingly popular in this digital era, especially during the COVID-19 pandemic which forced schools and tertiary institutions to switch to a distance learning model. Platforms such as Zoom and Google Classroom (GCR) have helped many educators provide effective and interactive online education (Sofi-Karim, Bali, AO & Rached, 2023).

Online to Offline is commonly abbreviated as O2O (Biswajit & Mitali, 2020).

Paradigms are universally recognised scientific achievements that, for a time, provide model problems and solutions to a community of practitioners (Kuhn,1996) a pattern or model,

an exemplar; a typical instance of something, an example (Oxford English Dictionary). In software engineering there is a transition from the Rational Paradigm to the Empirical Paradigm (Ralph, Paul, 2018). In artificial intelligence there is a transition from classical AI to data-driven AI (Cristianini, 2014).

Role means a position containing a set of socially defined attributes and expectations that determine appropriate behaviour for an individual or group based on their status in relation to other people or groups (Kenton, 2013).

Software can be defined more narrowly as instructions executed by the computer hardware, or more broadly, including other concepts, tools, and methods needed to build an executable system on computer hardware, such as design documents, specifications, and testing suites (Osterweil, 2013). Tools such as compilers, assemblers, flowcharts, design tools, simulators, and architectural diagrams – some of which are also software - are essential to the design and execution of most computing systems (Tracy, 2021).

Technical Pedagogical Content Knowledge (TPACK) framework is an educational model that describes the intersections between technology, pedagogy, and content for the effective integration of technology into teaching. TPACK became popular in the early 2000s (Angeli & Valanides, 2005).

Music Technology has many applications, such as electroacoustic instruments, digital sound sources, audio workstations, computer-assisted music education, computational musicology, quantitative analysis of music performance, electronic music composition and production, music information retrieval MIR, digital music libraries, interactive multimedia, audio interfaces, auxiliary medical treatment, music robots, audio digital watermarking, etc. (Li & Li, 2019).

Music Teacher Competencies: the 21st century music teacher education has to lay emphasis on instructional design, team building, skill development in new information technologies, new ways to foster creativity and innovation (Davidova, 2019).

INTRODUCTION

Relevance of the topic. Information and Communication Technologies (ICT) are becoming an increasingly integral part of the everyday life of modern society and are making special demands not only on today's learners but also on the teacher. Distance, hybrid, interactive, adaptive learning, and various learning analytics – this seemed like a vision for the future a year ago (Zhang, 2020). Today, it is a reality in which the whole world lives. The knowledge and use of ICT are especially important for teachers, in addition to ICT being a key element of the teaching and learning process. How teachers use it determines whether learners use it inside or outside the classroom (Calderón-Garrido, 2021).

The development of ICT has changed the content of education in general, including the music curriculum. In music, as in other areas, technological progress gives an opportunity to search for new ways of expression. In music education, ICT opens up new possibilities: music and sound can be recorded, created, composed, edited, and played on different instruments, in different sounds, and music can be analysed, new information can be searched on the internet, etc. ((Dorfman & Roblyer, 2015; Minott, 2015). Thus, music teaching/learning has the potential to explore entirely new musical spaces and places. For example, with online learning, the potential for synchronous and asynchronous options enables and empowers teachers and learners in uniquely different ways (Cremata, 2021). ICT can be a great aid in a variety of musical activities. In addition to its role as a tool for networking and communication, it is used to improve the development of technical and musical skills and has the potential to improve communication, efficiency, efficacy, and healthy practice in music learning (Waddell & Williamon, 2019). According to Guillén et al. (2022), the use of ICT in music education has evolved from a supplementary tool to an essential component of teaching and learning. As a result, music teachers are required to have a wide range of ICT competencies, including the competency to use digital resources, create and edit multimedia materials, and communicate effectively with learners and colleagues through online platforms.

The development of ICT competencies of modern music teachers involves a continuous process of learning and development. Teachers can improve their competencies through professional development opportunities such as seminars and conferences, online courses, and collaboration with other educators. A study by Jing (2016) states that music teachers who participate in professional development programs report increased confidence and competency in using ICT in their teaching practice. In addition, the development of ICT competencies of music teachers requires a willingness to adapt to new educational paradigms. Harper (2018) states that

technology promotes collaboration between teachers and learners during learning activities, and teachers who use technology leverage it to maximise their uses of strategies aimed at facilitating learning and promoting learners' exploration of content. Therefore, this change requires a rethinking of the relationships with learners, of methods and tools, and encourages teachers to continually learn and improve. And the role of learners' changes from obedient executors and recipients of knowledge to researching, searching, interested, creating their own identity, and independent learning partners (Jaafar, et al., 2021). This means that traditional methods of music education, such as teacher-directed, student-obedient learning, are being replaced by a student-centred approach that emphasises creativity, collaboration, and the use of technology (Weisheng & Hui, 2022). Music teachers must be able to integrate ICT into their teaching practice to support these new paradigms. Despite the potential benefits of ICT for music education, there is a lack of research on the competencies that music teachers need to effectively integrate technology into their teaching practice. Thus, the role of ICT in the educational process is controversial and the professional application of ICT is a demanding endeavour.

Integrating ICT into music education also requires new assessment methods (Cuervo et al., 2023). Traditional methods such as written examination and assessment of musical performance cannot effectively assess learning in an ICT-rich environment. Music teachers need to develop alternative assessment methods, such as digital portfolios and online quizzes, that meet new educational paradigms and help develop learners' ICT competencies. Klaus (2017) discusses how emerging technologies, such as artificial intelligence, robotics, and the Internet of Things, are transforming the way we live and work. He argues that this technological revolution is not a continuation of the third industrial revolution but rather a new era in which the boundaries between the physical, digital, and biological domains are disappearing. Harari (2018) argues that we are experiencing a paradigm shift towards a world that is increasingly automated, integrated, connected, and data-driven, and this shift will have far-reaching consequences for society and people. Therefore, it can be said that we are currently experiencing a paradigm shift towards an increasingly automated, integrated, connected, and data-driven world with profound implications for society and people. As the world changes, music education inevitably changes, so you need to be ready to learn, live, and work in constant transformation. Therefore, it can be argued that there is a need for new competencies of music teachers (Lasauskiene, et al., 2015, Ghozali, 2020). All these changes require the renewal of educational content and the implementation of new competencies, principles, approaches, and emphases in the music education process. The theoretical works and insights of scientists Reimer (1977) Elliott (1995), Regelski (1996), Ceruzzi (2000), Fullan (2007), Keiler (2018) Bauer (2020), Hu (2021), Ahtola & Juvonen (2023) are

significant for the study of this problem.

These are essential factors in order to clarify the development of information and communication technology competencies of music teachers in the changing context of educational paradigms. Such a study would allow for the identification of effective ways to apply modern ICT, highlight the problems of music education, and improve the professional development of teachers. The dissertation will explore the challenges and opportunities that music teachers face in applying ICT in your educational practice and the ways in which they can develop their ICT competencies to improve teaching and learning outcomes. It will also seek to identify effective strategies to improve music teachers' ICT competencies development and equip them with the necessary resources and training to succeed in the new educational paradigm.

The problem of the research is a lack of research on the competencies of music teachers to effectively integrate ICT into their educational practice. Although there are potential benefits of using ICT tools in music education, knowledge of the specific competencies that music teachers need to develop to integrate ICT effectively is insufficient. The study also focuses on the challenges that music teachers face in applying ICT in their educational practice, examines the benefits as well as limitations of applying ICT in music education, and explores the implications of rapidly evolving technologies and changing educational paradigms for the future of music education. As a result of these considerations, **the following research questions** have been formulated:

1. What competencies are needed for music teachers to be able to use ICT effectively in the educational process, and how can these competencies be developed?
2. What are the main challenges for music teachers when using ICT in their educational process and how can these challenges be overcome?
3. How can application of ICT in music education be effectively measured and evaluated and what are its benefits and limitations?
4. What impact will the rapid development of ICT and changing educational paradigms have on music education in future and how can music teachers adapt to these changes?

The object of the research – ICT competencies of music teachers in view of changing educational paradigms.

The aim of the research – to explore the development of information and communication technology (ICT) competencies of music teachers in the context of changing educational paradigms.

The objectives of the research:

1. To theoretically substantiate the concept of ICT competencies of music teachers in the

context of a changing education paradigm.

2. To investigate learners' attitudes towards the use of ICT by music teachers.
3. To reveal the current situation of applying ICT in music education by music teachers and the factors that influence it.
4. To determine the change in ICT competencies of music teachers in the context of changing educational paradigms.

The methodological approach is based on the ideas of constructive postmodernism, which allows for analysing the reality of the well-being of learners at school through both rationalisation and emotional-reflexive understanding; the approach of reconstruction theory, which gives the opportunity to interpret the expressions of learners well-being in the context of changes in modern school education and to search for a practical, applied model of reflection; the categories of expression that emerged in the paradigms of post positivism and humanistic psychology: holistic education, social and emotional education, positive education.

The methods of the research. The dissertation uses a mixed methods research approach to answer research questions and achieve its objectives. By blending collection and analysis of quantitative and qualitative data, the mixed methods approach provides a more comprehensive understanding of the research topic. The research methods used in this dissertation include *analysis of the theoretical literature, synthesis, interpretation and evaluation of scientific and methodological literature, questionnaire for learners and music teachers, structured interviews, observation of music lessons, statistical data analysis, content analysis, and descriptive analysis.*

Data collection and analysis. Sampling: the sample for this dissertation consisted of music teachers currently teaching primary schools, middle schools, high schools, and vocational high schools as well as school learners in China. Purposive sampling techniques were used in this research to select participants who had experience using ICT in their teaching practices and learners who were exposed to ICT. The sample size was determined by saturation, and data collection continued until no new information emerged from the data.

Data collection: the data collection process consisted of three stages. In the first stage, the questionnaire was tested to collect information about the role of information and communication technology competencies in music education. The data were obtained through small-scale testing and analysed using SPSS tools to refine the survey questions for the next stage. In the second phase, a formal questionnaire was administered to participants to collect quantitative data on ICT competencies and perceptions of the role of ICT in music education and perceptions of educational paradigms. In the third phase, semi-structured interviews with a subset of participants were conducted to collect qualitative data on their experiences with respect to the development of ICT

competency and perspectives on music education paradigms.

Data analysis: data collected from the survey questionnaire were analysed using descriptive statistics to identify trends and patterns in the quantitative data. The data collected during semi-structured interviews were categorised, quantified and analysed using the thematic analysis technique, which enabled to easily identify clear and recurring patterns and themes in the obtained qualitative data. The findings of the two analyses were then integrated to provide a more comprehensive understanding of the research topic.

Validity and reliability: several strategies were employed to ensure the validity and reliability of the study. These included the use of established measures for the survey questionnaire, the selection of experienced and knowledgeable participants, and the use of triangulation to cross-validate the findings from the two phases of data collection.

The methodological basis of the dissertation includes a combination of various research paradigms and approaches:

1. Constructivism: this paradigm emphasises the importance of individual and social construction of knowledge and meaning. The constructivist approach argues that constructivism emphasises knowledge and contextuality, and that reality is co-constructed by the individual and society. This dissertation used semi-structured interviews as well as data analysis to explore the ways in which music teachers' ICT competency is co-constructed through their interactions with technology, learners and colleagues (Fox, 2001; Oliver, 2000). To identify the process of constructing teachers' competency in the use of ICT in different contexts.

2. Pragmatism: this paradigm emphasises the practical application of knowledge to solve real-world problems. The pragmatist approach argues that the development of music teachers' ICT competency is driven by the need to adapt to changing educational paradigms and to improve learning outcomes (Pfeiffer, 2003; Omerod, 2006). Case observations were used to provide an overall picture of the actual effectiveness of music education in the use of ICT by teachers.

3. Mixed methods: this approach combines quantitative and qualitative data collection and analysis techniques to provide a more comprehensive understanding of the research topic. The mixed methods approach allows for the collection of both objective indicators of ICT competency and subjective descriptions of teachers' experiences of using technology (Bryman, 2006; Creswell & Plano Clark, 2011).

This dissertation is student-centred and makes theoretical and methodological provision for the development of music teachers' ICT competency. From a constructivist perspective, this study offers a deep and well-rounded understanding of a wide range of participants' experiences, such as factors that affect the use of ICT by music teachers and the evolving role of music teachers in

the changing educational paradigm. By combining a practical guide with a mixed methods approach, the research demonstrates that the findings are not only relevant in theory but also offer practical solutions to real-world problems. Given the study's limited timeframe and the unique characteristics of the language and sample, additional research is essential to fully understand this complex phenomenon.

The relationship between theory and practice is fundamental to the development of ICT competencies of music teachers. Theory provides the conceptual framework and principles that guide the use of ICT in music education, while practice provides the context and opportunities for teachers to adapt and develop their skills. The dissertation examines the relationship between theory and practice in several ways:

1. **Theoretical foundations:** the dissertation determines the theoretical foundations of ICT in music education; a literature review was conducted. This entails theories of music learning, teaching and use of technologies in the teaching learning process. Based on the theoretical framework one can analyse the contribution of ICT in music education and can also ask research questions and hypotheses.

2. **Practical application:** using a case study or action research, the dissertation explores how music teachers apply theoretical concepts in their teaching practice. This includes investigating how teachers use ICT for school student learning, how they integrate technology into lessons, and how they develop their ICT competencies over time.

3. **Bridging the gap:** the dissertation also explores the challenges and opportunities associated with bridging the gap between theory and practice. This includes investigating how music teacher education programmes could better prepare teachers to integrate technology into their teaching practice, as well as examining factors that support or hinder the implementation of technology in the classroom.

In general, the link between theory and practice is a key factor in developing the ICT competencies of music teachers. In this way, the theoretical approaches that the dissertation will investigate regarding the applications of ICT in music education and the practical implementation of ICT concepts can help in extending the available knowledge and practise on how to effectively use technology for promoting the improvement and meaningful use of ICT in music education.

Scientific novelty and theoretical significance of the dissertation. 1. The theoretical innovation of the music teacher competency model, the thesis proposes a hypothetical premise through literature analysis that the role of the music teacher is likely to remain constrained by existing classical educational concepts, which is not in line with the modern educational paradigm that emphasises advanced educational concepts that promote personal growth and learning of

learners. This statement reflects a tension that exists in the field of music education: between the limitations placed on the role of the music teacher by the traditional classical philosophy of education and the demands of the modern educational paradigm that emphasises individual development of the learner and self-directed learning. Music teacher education programmes are firmly rooted in traditional conceptions of teaching and education (Zamorano-Valenzuela and Serrano, 2022) Emphasis is placed on authority: the music teacher usually acts as an authority on knowledge and as a transmitter of skills, and teaching is centred on teacher-direction. Focus on technicality: teaching objectives are mainly focused on the mastery of skills (e.g., performance standards, sight-singing and ear-training, and knowledge of music theory), with less attention paid to learners' creativity and emotional expression. Monistic standards: the evaluation system is more inclined to use fixed standards (e.g. examinations, competitions) to measure learners' performance. And the characteristics of modern education paradigm: advocating learner-centredness: focusing on learners' interests, potentials and individual needs, and encouraging them to take the initiative to explore and express themselves in learning. Integration and diversity: focusing on emotional experience, cultural background and social significance, giving more humanistic value to music learning rather than limiting it to the teaching of technical skills. Diversity of assessment: Emphasis is placed on process assessment and multi-dimensional assessment rather than single outcome orientation. Teacher-centred teaching: in the traditional music education system (e.g., piano and violin teaching), the teacher tends to dominate, and the curriculum is designed around techniques, repertoire and performance standards. This model may neglect learners' autonomy and creativity. For example, many music examination systems (e.g., ABRSM, national music examinations) focus on technical difficulty and standardisation, resulting in teachers being more inclined to 'train for exam technique' than to develop learners' musical perception and expression, and their short-term goals tend to be examination skills Hanne, Bendik & Silje Hanne, Bendik, & Silje (2023). Through this analysis, it is evident that while classical educational philosophy has its irreplaceable value in music education, the lack of integration with modern educational paradigms can limit the development of the teacher's role, thus failing to fully contribute to the growth and learning experience of learners. Therefore, it is particularly important to develop music teachers' ICT competencies in the context of changing educational paradigms. Based on theoretical ideas proposed by authors such as (Martin, 2019; Zhao & Bryant, 2017; Gibson & Ifenthaler, 2017; Cao & Zhang, 2012; Zawilinski, 2009; Mishra & Koehler, 2006) innovated a model of ICT competencies for music teachers in the changing educational paradigm. The model emphasises the following competencies: a) student-centred learning; b) collaborative learning; c) digital literacy; d) technology integration; e) critical thinking and problem solving; f) pedagogical

innovation; g) global awareness. And these competencies needed by music teachers are the directions that need to be focused on in the future development of music teacher competencies.

2. The chosen empirical research method – the grounded theory – is relevant. The strategy of grounded theory strategy is well suited to analyse understudied phenomena (Charmaz, 2011). ICT competency development of music teachers is a competency developed by music teachers in a changing educational paradigm, reflecting the cultural specificity of music teacher education. This study emphasises the ICT competencies of music teachers in the context of changing educational paradigms, i.e., it examines the role of participants in using ICT in the context of changing educational paradigms and one of the competencies that needs to be continuously learnt in the subsequent training of music teachers. Grounded theory research in the field of music education is a popular area of research and is of increasing interest to music education researchers (e.g., Hesterman, & Heald, 2017; Kirschner, & Selwyn, 2017; Mishra, & Koehler, 2006; 2009; and others).

3. Using empirical research using mixed methods to approach data, Creswell (2023) notes that qualitative methods are used to explore ideas in depth, often resulting in new structures of meaning. On the contrary, quantitative methods assume that research questions can be statistically quantified. The main purpose of quantitative methods is to test predefined hypotheses. Finally, mixed methods combine qualitative and quantitative research. A questionnaire and interview questions were designed based on the model.

4. A dynamic development model of music teachers' ICT competency is proposed: it reaffirms that the ICT endowment for music teachers is not static but continually evolving. It grows alongside technological advancements, shifts in teacher training and educational requirements, and the ongoing professional growth of teachers themselves. It offers a new vision for analysing the theory of music 'teacher education proposing the developmental perspective and ICT competency as a dynamic process due to an evolving nature of educational technology and that of teacher roles. Integrating ICT competencies with the professional needs of music teaching: The model maps these general competencies with the specific requirements for music education, offering the following multidimensional ICT competencies that are deemed necessary for the music teacher as a participant in the teaching process: technological literacy and technical skills, knowledge of the pedagogy of ICT use in music education, information literacy and skills in organising and processing information, musical proficiency, and lifelong learning. This provides a comprehensive framework for academics to help understand how music teachers can effectively integrate ICT tools in the classroom to improve music teaching and learning. Redefining the relationship between teacher roles and educational paradigms: analysing the new roles of music

teachers in ICT environments (e.g., e-facilitator, mentor, process facilitator, etc.), the model further contributes to rethinking the role of the teacher, especially how to play a guiding role as a teacher in the information technology era. This contribution provides more profound thinking about educational theories, especially in terms of the ways of interaction between teachers and learners, and innovations in teaching methods. Emphasis on teacher collaboration and changes in educational philosophy: the model suggests that teacher ICT competency depends not only on the improvement of their individual skills but also needs to be strengthened by collaborating with other educators and participating in continuous professional development activities. This argument emphasises teacher collaboration and a change in educational philosophy and promotes a focus on teacher group collaboration and joint progress in educational theory. Practical guidance for ICT integration in music education: analysing how ICT means can improve music teaching and learning, the model provides a theoretical framework as well as practical suggestions for ICT integration in music education, especially how to enhance learners' learning interests and abilities through online resources, tools, and platforms.

The analysis introduces new developments to the scientific theories of music teacher competencies particularly with regard to the process of ICT competency dynamism, teacher transformations and newer educational paradigms, which contour the direction of music education in the information age. These contributions not only contribute to the theoretical development of music education but also bring in fresh insights and ideas about the music education process and strategies into the methodological practise.

Practical significance of the research results. Aspects summarised by the researcher on the development of ICT competency of music teachers in the context of changing educational models. The dissertation presents a grounded theory of the ICT competencies of music teachers, which is relevant to the implementation of the goals of music education. The aim of the dissertation study was to explore and understand the development of music teachers' information and communication technology (ICT) competencies in the context of changing educational paradigms. The study aims to a) investigate the current status of music teachers' ICT competencies; b) examine the factors that influence the use of ICT by teachers in music education in the context of changing educational paradigms; c) identify the challenges and barriers faced by music teachers in developing ICT competencies in the future; d) identify the challenges and barriers faced by music teachers in developing ICT competencies in the future; e) identify the challenges and barriers faced by music teachers in developing ICT competencies in the context of changing educational paradigms. The basis is the idea of constructive postmodernism, which is able to analyse the reality of the music teacher through rational-empirical and affective-reflective

understandings, the methodology of reconstructionist theory, which offers the opportunity to explain the forms of ICT use by music teachers in the context of the changes in modern schooling and seeks a practical, applied model of reflection; post-positivist and humanistic psychology categories of expression that emerge from the paradigm: holistic education, social and emotional education, and positive education. This dissertation focuses on Chinese music teachers as an example for investigation and analysis. The findings suggest that the use of ICT by teachers is bound to develop in the educational paradigm. For this reason, we propose a competency model for music teachers, with the aim of having a clear learning development direction for the development of music teachers' ICT competencies in the future. The results of the factor study reveal the influence on the use of ICT and the role of music teacher ICT competency in the changing educational paradigm. Since only Chinese music teachers and learners were used as the survey sample, there were no sample data from international music teachers. The findings open opportunities for the further development of comprehensive research on ICT competencies of music teachers.

Structure and scope of the dissertation. The dissertation consists of four parts. The theoretical part of the dissertation analyses the theoretical background of ICT competency of music teachers and describes ICT competency of music teachers as a component of professional competency, the content and structure of ICT competency, and the context and problems of using ICT competency. The section on the music education paradigm analyses the definition of music education paradigms, the analysis of the current situation, the role of the music teacher in the change in the educational paradigms, and the change in the ICT competency model for music teachers in the context of the educational paradigms. The research methodology section describes the research design and organisation, the research methodology, ethics, data processing, the research methodology, the reliability, validity, and representativeness of the sample. The findings of the dissertation present the data results of the qualitative and quantitative studies, analyse the results of the study of music teachers' IT competency in the context of changing educational paradigms and music teachers' understanding of the changing paradigm of music education, and the ethical quality assurance of the research results, as well as the limitations of the study. The empirical part of the dissertation discusses the results of the grounded theory constructed during the dissertation research. The discussion section analyses the findings based on the categories and theoretical considerations of the constructed grounded theory. The dissertation concludes that the direction of development of ICT competencies of music teachers. The structure of the dissertation on the development of music teachers' ICT competency in the context of the changing educational paradigm consists of an introduction, a theoretical and methodological section, results, discussion,

and conclusions in writing the dissertation. An empirical study was first conducted using grounded theory, and the constructed grounded theory categories and subcategories indicated the topics to be explored in the theoretical part of the dissertation.

Limitations of the research. Easier access to resources and channels for Chinese music teachers due to the researcher's ease of data access and lower data acquisition costs. Collaboration with local schools, education departments or music education organisations can be more actionable. Language barriers and geographical constraints make international data collection more difficult; therefore, the researcher only collected data on music teachers in China. Moreover, data collection on an international scale usually requires more financial support and time commitment, and selecting only Chinese music teachers helped to complete the study within limited resources. International surveys involve complex procedures such as translation, cross-country communication, and questionnaire distribution, which increase the cost of the study. By collecting data in the home country, the research cycle can be shortened and less difficult to organise. Also, as a pre-preparation study for international comparative research, may serve as a basis for international comparative research by first collecting data on Chinese music teachers and subsequently expanding to other countries for cross-cultural comparisons. Preliminary analyses of data from Chinese teachers may provide a theoretical or practical basis for designing an international sample survey, and the collection of local data provides initial experience in verifying the validity of the research instrument. The fact that the data originated only from Chinese music teachers may have resulted from ease of data access, resource constraints, and a focus on local issues. Although this design provides insight into the current state of music education in China, it may also present limitations of underrepresentation and generalisation.

1. Insufficiently representative data: the data sources are limited to China, making the results of the study only reflective of the situation under a particular culture and education system, making it difficult to generalise to other countries or regions. It is probably the case that other countries have different philosophies of music education (for instance, creative vs. technical approaches), and these variations are not captured in the study. Given the threat to external validity, factors such as cultural differences, variations in teaching practises, and divergent conceptions of education could reduce the extent to which the results of the study can be generalised to other classrooms or students.

2. The homogeneity of cultural background: there is a strong connection of Chinese music education with the traditional culture, and therefore research in China can be culturally biased towards certain practices and values in music education, while not being very sensitive to multicultural. There are differences in the technical skills orientation in Chinese education (e.g.,

the examination system) that may be different from countries that present musical creativity and cultural experience. Considering what is expected of music teachers in terms of the roles that they are going to play in a society, music education has different characteristics round the world, and this research has failed to capture these diversities.

3. Limitations of the sample characteristics: economic, educational and cultural diversity within China may also have not been fully controlled or measured, which makes findings more parochial than cosmopolitan. It may be argued that due to the disparities that exist in the distribution of music education resources between large and small urban centres, children in small urban centres may be greatly overestimated and children in rural areas may be greatly underestimated. The socio-economic status of students in different states determines the teaching approaches of music teachers and learners' attitudes to learning, these aspects may not be captured by this study due to the sampling method used.

4. Limitations of academic perspectives: there is a lack of cross-cultural or international perspectives to verify the uniqueness of music education in China and to make connections with global trends in music education. The results of the study may remain at the local level and do not reveal the universal laws or global applicability of music education. If the topic of research concern (e.g., the cultivation of creativity in music education) has been discussed more internationally, but cross-cultural validation or dialogue is not possible in this study.

5. Limited understanding of the target group: the fact that the sample included only teachers and learners in China may have resulted in analyses of certain educational phenomena being confined to the Chinese context, ignoring the prevalence or variability of similar phenomena in different cultures. Learners' learning habits may be influenced by China-specific educational models, and these results are not applicable to other educational systems. The roles and responsibilities of music teachers are influenced by the specific expectations of Chinese society, and the findings cannot be adapted to the study of teacher roles in an international context.

The limitations of using only survey data from Chinese music teachers and learners are mainly in terms of representativeness, cultural homogeneity, lack of sample diversity, and lack of international comparative perspectives.

The total length of the dissertation is pages 185 (excluding appendices), 15 figures, 64 tables, 307 references were used.

Approval of dissertation work. Scientific articles on the subject of the dissertation:

1. **Sun, H.**, Abramauskienė, J. (2024). The Role of the Music Teacher's in the Context of Changing Educational Paradigms. *Music Science Today: the Permanent and the Changeable*, 8 (16), 66-74. Daugavpils, Daugavpils University (Latvia).

2. **Sun, H.**, Abramauskienė, J., Yao, Z., & Sun, B. (2024). The Transformation of Education Paradigm from the Perspective of Music Teachers: The Impact and Application of ICT. *Art and Performance Letters*, 05(02), 22-28. <http://dx.doi.org/10.23977/artpl.2024.050204>

3. Sun, B., Rauduvaitė, A., **Sun, H.** & Yao, Z., (2024). The Practice of Cooperative Learning in Music Education: Optimization and Improvement of Learning Strategies. *Transactions on Comparative Education*, 06(02), 83-90. DOI: <http://dx.doi.org/10.23977/trance.2024.060212>.

4. **Sun, H.**, Abramauskienė, J., (2023). Online Course on Music Education Resources to Promote the Development of Music Information and Communication Technology. *Music Science Today: the Permanent and the Changeable: scientific papers*, 2023, 7 (15), 84 – 91.

5. **Sun, H.**, Abramauskienė, J., (2022). The Role of Information and Communication Technology in Music Education. *Music Science Today: the Permanent and the Changeable*, 6 (14), p. 106-113. Daugavpils, Daugavpils University (Latvia).

Scientific reports on the subject of the dissertation:

1. Sun, H., (May 11-12, 2023), The 18th International Scientific Conference “Music Science Today: The Permanent and the Changeable”. Report “*The Role of the Music Teacher’s in the Context of Changing Educational Paradigms*”, Daugavpils (Latvia).

2. Sun, H., (March 16-17, 2023), The 9th International Conference on Education 2023 (ICEDU 2023), "Equitable Education in the Post-Pandemic World". Report "*A New Teaching Paradigm Model for Music Teachers: Integrating Information and Communication Technology into the Music Teaching*", Bangkok (Thailand).

3. Sun, H., (August 02-03, 2022), The 5th National Music Education Conference "Wanye Bei" paper selection. Report "*The Use of Information Technology in the Curriculum of Music Teachers in Primary and Secondary Schools During the Epidemic Period*", The Journal of Music Education in China (China).

4. Sun, H., (May 05-06, 2022), The 16th International Scientific Conference “Music Science Today: The Permanent and the Changeable”. Report “*Online Course on Music Education Resources to Promote the Development of Music Information and Communication Technology*”, Daugavpils (Latvia).

5. Sun, H., (May 06-07, 2021), The 15th International Scientific Conference “Music Science Today: The Permanent and the Changeable”. Report “*The Role of Information and Communication Technology in Music Education*”, Daugavpils (Latvia).

6. Sun, H., (May 14, 2021), International Scientific Doctoral Student Conference “Educational Science and Practice Today and Tomorrow”. Report “*Music Teachers’ and Students’ attitude to Information and Communication Technology in Music Class*”, Kaunas.

1. THEORETICAL BACKGROUND OF MUSIC TEACHERS' ICT COMPETENCIES

1.1. ICT competency of music teachers as a component of professional competencies

The music teacher competency structure is a dynamic scientific system that embraces a number of competency indicators necessary for future music teachers and is a dynamic structural system that travels through continuous practice and learning (Zhang, 2002). A large number of researchers have outlined and summarised the content of music teachers' competencies at different levels of different dimensions.

Guo (1995) argues that the competency structure of teachers is not a unidirectional pile of a certain aspect, but a scientific structural system, mainly composed of three aspects: personal quality, professional quality, and musical competency. According to Zhang (2002), the personal quality of music teachers is the basis of the competency structure of primary and secondary school music teachers; professionalism is the general competency that music teachers must have to carry out parenting activities; and musical competency is the unique competency of music teachers to engage in music teaching and guide learners' esthetical experience of music. The goal of music teaching is to provide teachers with the opportunity to develop their professionalism and skills. The goal of teaching music is part of the professional competency required of teachers, and the esthetical and beauty education of learners is to a large extent in the competency of teachers to adapt to the requirements of society. Chen (2023) states that music teachers should have good morals and good values, as well as excellent musical aesthetics, the competency to regulate their own psychology and professional skills.

Jing (2015) emphasises that the competency structure of music teachers is different from that of teachers of other disciplines, in addition to having rich teaching experience educational knowledge, and educational skills also need to have rich musical knowledge. Zhang (2017) claims that music teachers in the new era need the competency to organise teaching, the competency to innovate teaching methods and the competency to organise musical activities, to establish a deep professional knowledge of music, technology, and skills as the fundamental condition, and to establish a deep professional knowledge of music. Yao (2017) points out that music teachers are skilled in the competency to apply professional theoretical knowledge, professional practice, and should have the competency to organise the classroom, the competency to express themselves verbally, and the competency to use modern teaching equipment skilfully. Davidova (2019) claims

that teacher competency should be reflected in the emphasis on instructional design, cooperation among teams, music teachers' skill acquisition of new technologies, and the competency to develop creative and innovative approaches.

From the above-mentioned analyses of the competencies of the music teacher, it is clear that with the passage of time and the development of society, music teachers must continue to enrich themselves while teaching their learners and knowing how to continuously strengthen their own learning is the competency that they should have as a qualified music teacher. Teachers no longer aim to teach music knowledge and skills, but require learners to learn and explore actively, focusing on cultivating learners' innovative spirit and practical competency. The comprehensive competency of music teachers has been divided mainly into two aspects: professional competency and good teaching competency. Professional competency is piano competency, singing competency, dance competency command competency, and choreography competency, teaching competency is creativity competency, language expression competency, organisational management competency, general information technology competency, and scientific research competency (Wang, 2019).

Different researchers have different results on the analysis of music teachers' competency in different dimensions. From the perspective of the connotation and definition of teaching competency, Dineke (2004) asserts that teaching competency is a comprehensive personal characteristic that supports the knowledge, skills, and attitudes needed to achieve effective teaching performance in a variety of teaching environments. The technical level includes professional skills, intellectual skills, and communication skills; the personality level is about personality and motivation (Zhong, 1998). The teaching competency includes planning ability, teaching skills, competency to evaluate learners, professional knowledge, and professional responsibility. Ronald (1993) states that teaching competency should include six skills: academic competency, planning competency, management competency, expression and communication competency, evaluation and feedback competency, and interpersonal competency. Franziska (2009) points out that teaching competency includes four dimensions, namely subject knowledge, teaching diagnosis, teaching method application, and teaching management.

From the perspective of work content, Wang (1980) emphasises that teaching competency refers to the competency of teachers to diagnose the learning prerequisites related to the subject of the course and to guide the learning process according to the continuous diagnosis; to be able to make curriculum decisions in relation to learning objectives, to formulate learning arrangement, based on the analysis of learning preconditions, individual learning process, and learning goals, mobilises learners to actively participate in learning; can carry out effective classroom

management for the smooth progress of teaching and learning.

Music teachers are different from other disciplines of education; not only teaching experience, teaching knowledge, and educational skills, as well as musical knowledge. The competency structure of music teachers is a dynamic and open system. With the development of music education and related disciplines, it is constantly adjusting and expanding itself. With the development of music education and related disciplines, it is constantly adjusting and expanding itself (Zhang, 2002). Now, with the development of science and technology, music education is changing from traditional music education to technology music education, and any country in the world should better use technology to communicate and learn from each other.

This major technological change makes us pose new challenges to teaching ideas, teaching concepts, teaching methods, and implementation methods of music education, and makes music educators re-examine music Teacher's own teaching competency. Explore the scientific system for the knowledge and competency structure of music teachers in primary and secondary schools in the 21st century to meet the requirements of future educational development. The competency structure of music teachers in the 21st century is not a stack of one-way skills, but the scientific structural system is mainly composed of three aspects: personal competency, professional competency, and music education competency (Guo, 1999). Music education competency includes three aspects: the practical competency in teaching, the competency to innovate in teaching, and the competency to grasp the psychological characteristics of learners, aspects of composition (Zhang, 2021).

By inductive analysis of these studies, it is not difficult to find that relevant research focuses on two major aspects, one is to explore what is the teaching competency of music teachers, "That music teacher should have creative teaching competencies, including teaching design competency, teaching language, classroom management and organisation competency, modern teaching technology application competency, and educational evaluation and evaluation competency" (Zhou & Du, 2012, p. 48). The second is the discussion of how to improve the teaching competency of music teachers. "To improve the teaching competency of music teachers, it is necessary to improve the comprehensive quality of music teachers in colleges and universities; change the way of training teachers' teaching competency, advocate cooperation and mutual assistance; improve self-learning and reflection competency; create a positive school teaching culture; make full use of modern educational technology, etc." (Wang, 2011, p. 61).

The one with the highest proportion of these three structural systems is also the most important learning link for music teachers to grow. In today's rapid development of information and communication technology, how to make good use of ICT should also be a measure of a music

teacher's teaching competency. In the information age, music teachers should actively adapt to social development, master the basic principles and basic techniques of music teaching design, use the basic principles and skills they have mastered to coordinate teaching, and use ICT technology to innovate teaching to make their music classrooms more interesting and colourful. The information environment has presented new requirements for teachers. The advent of the information age has changed the authoritative form of music teachers and also forced teachers to change "indoctrination" education to "communication" education, that is, to communicate with learners through music and then change it into spiritual guidance authority (Wang, 2015).

The 21st century is an era of information explosion. With the continuous development of online university education and online courses, many scholars have also conducted research on the online training environment for music teachers. An increasing number of music courses have joined the area of online teaching. However, questions remain regarding whether this learning environment is conducive to the training of music teachers, how to effectively implement online music teaching, and which types of music courses are more suitable for online instruction. These issues have prompted a growing number of researchers to discuss them in depth (Sherbon et al., 2005). A study of distance learning and music teachers also presented relevant views on the challenges faced by online music teachers (Hebert, 2007). The environment of normalisation and student-centred teaching reform make the training of music teachers' teaching competency extend forward. Information technology has become the main presentation method of current music art and will inevitably become the main presentation method of music content in the process of music education. Information technology integrates various esthetical elements such as sound, electricity, light, and shadow and can guide the learners' sense organs to be fully open to the music itself. In the process of music teaching, in the P2P (point-to-point) communication environment created by normalisation, the status of teachers and learners is equalised, the communication between teachers and learners presents a two-way trend, and the music knowledge presented by teachers in the normalisation environment is widely used (Liang, 2018).

A contemporary music teacher is hard to imagine without a computer or the Internet. Nowadays, a teacher who is incapable of working on the computer is unlikely to work at school. Therefore, it is important to be interested in, be aware of, and master new information communication technologies and be able to apply them in the process of music education. The application of ICTs in music varies, and the possibilities of their use are great. For example, they can perform the role of instruments or facilitate music composition, performance, recording, and analysis, in audition, vocal expression, instrumental expression, musical language, movement, and dance (Hernández-Bravo, 2016; Eyles, 2018). In most cases, the computer helps to record and

notate music: in notes, matrices, lists, various schemes, or forms of sound waves (Nart, 2016).

The functions of ICT performed in the process of education can be classified and can be applied as teaching and learning aids, a learning environment, a means of communication, a therapeutic support aid, a diagnostic tool, a tool for the performance of administration assignments, etc. (Dudzinskienė et al, 2010). After the learners accept it, they will inevitably give feedback on their autonomous and personalised knowledge to teachers through normalisation. With the help of information technology, music teachers can truly become an extension of learners' sensory devices and become a medium for music to enter the spiritual worlds of learners. The information environment provides a channel to realise the dialogue between teachers and learners.

In this "dialogue", music is the object of two-way spiritual exchange, understanding, and communication between teachers and learners, while information technology is used to stimulate teachers and learners to produce the intermediary of ideological collision, emotional ingenuity, and empirical consensus. The unique interaction and participation in the process of music teaching and aesthetics inevitably require a greater and deeper participation of information technology in the process of teaching practice. The foundations of pedagogical content knowledge (PCK), as described by Shulman, Mishra, and Koehler (2006), led to the development of a new conceptual framework, Technological Pedagogical Content Knowledge (TPACK), which integrates technology, pedagogy, and subject content. The integration of information technology and subject curriculum competency offers theoretical guidance.

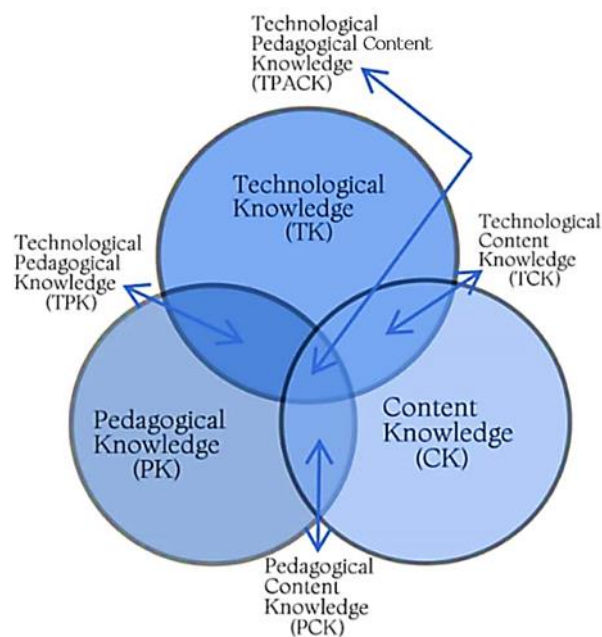


Figure 1. The TPACK framework (by Mishra & Koehler, 2006)

This framework contains three core elements, namely, technological knowledge (TK),

subject content knowledge (CK), and pedagogical knowledge (PK); and four composite elements, namely, subject pedagogical knowledge (PCK), technology-based subject content knowledge (TCK), technology-based pedagogical knowledge (TPK), and integrated technology-based subject pedagogical knowledge (TPACK).

The knowledge structure of future teachers is no longer limited to the traditional model of "subject knowledge + pedagogical knowledge but emphasises the structural characteristics of multi-layer composite (Gu, 2017). Falloon (2020) proposed the TDC theoretical model, which was adapted based on the TPACK theoretical model, highlighting the important role of digital technology in teacher competencies, as shown in Figure 2.

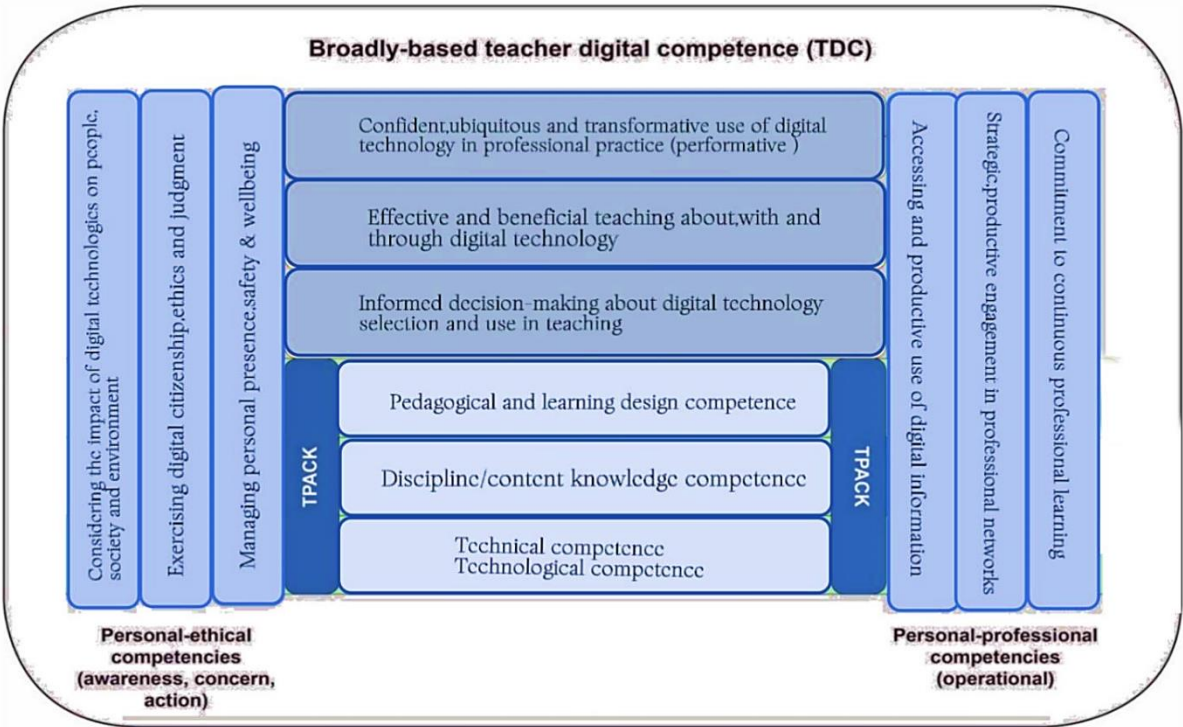


Figure 2. The framework of teacher digital competency (TDC) (by Falloon, 2020)

The blue section shows the main elements of the TPACK and the vertical dark blue section indicates its integrated nature in forming the competencies and skills needed to use digital technologies for discipline-based learning. Technological competency refers to an in-depth knowledge of operating various digital technologies (e.g., mobile devices, apps, web services), technological competency in theoretical understanding related to the role and potential of digital technologies in teaching and learning, and knowledge of the underlying principles that support their integration into educational settings (Falloon, 2020).

The TPACK framework for music education is structured to integrate technology into music

teaching and learning through the main ways in which learners engage with music. The main forms of participation in music include composition (composing, improvising); performance (singing, playing instruments), and response (listening, analysing, and evaluating), and in higher education, these modalities constitute different branches of the music discipline (Yang, 2019). The use of ICT in music education needs more attention, and the skills of teachers to apply technology correctly are the most important to maximise the use of technology in learning activities, and TPACK can be used as a reference to demonstrate the relationship between the three fundamentals of technology, pedagogical, and content knowledge that music teachers must have (Wibowo, Masunah, Karyono & Milyartini, 2021). In summary, based on the TPACK theoretical framework music teachers should have integrated professional competencies, which can be divided into three main types: namely, technical knowledge (TK), subject content knowledge (CK), and pedagogical knowledge (PK), one of the three aspects is missing, and it is extremely important that music teachers in the 21st century have integrated competencies. Among these, the ICT competencies of music teachers include knowledge, abilities, attitudes, values, and other personality traits that determine the successful use of ICT in teaching activities.

In summary, the ICT competencies of music teachers in the scientific literature are interpreted in various ways. Some authors emphasise the importance of a person's knowledge and abilities, while others emphasise the ability to apply acquired knowledge, skills, and experience in practical activities. However, other authors distinguish the characteristics and values of a person. Competency, as the main goal of education, includes the integral unity of a person's knowledge, abilities, skills, and attitudes. In the education system, the level of competencies shows whether the learner has acquired certain competencies required for the profession. Competencies required for a defined broader activity form the qualification acquired by a person can work efficiently and qualitatively - competently - according to the relevant profession. The teacher's ICT competencies is an integral part of the entire professional competency. The ICT competencies of a music teacher is a dynamic competency, the change of which is caused by the change of technologies, the peculiarities of their integration become apparent at different stages of technology integration.

1.2. Content and structure of ICT competencies for music teachers

In the era of the rise of information technology, music education has been deeply affected, triggering a series of teaching reforms. The new teaching theory requires learners to transform from passive recipients of external stimuli to proactive learners who actively process information

(Zhou, 2021). This includes fostering collaborative learning and creating a social educational environment. As traditional teaching methods are challenged, the quality of music teachers is being re-evaluated in the context of contemporary needs. The focus is on lifelong learning and continuous professional development. Media are always invented and created according to the needs of society, and mastering the operation and use of various media ensures that one keeps pace with society's technological demands (Wang, 2019). Therefore, in the age of information, selecting the appropriate media to transmit music information to learners based on their learning needs, and developing teaching software according to the characteristics of music instruction and the needs of learners should constitute essential professional qualities for qualified music teachers.

The Education Normalisation 2.0 Action states that building a digital campus in the context of Music Education 2.0 also requires that the online teaching environment be included in the construction standards for school conditions and that digital education resources be included in the scope of requirements for equipping teaching materials in primary and secondary schools (Circular of the Chinese Ministry of Education on the Issuance of the Education Normalisation 2.0 Action Plan, 2018). Therefore, in music teaching, the construction of music teachers' normalisation teaching competency should consist of the following three aspects:

1. Knowledge structure competency: "Only the three-element ring composed of a subject, teaching, and technology knowledge is the best teacher's knowledge structure" (Yan & Li, 2012, p. 58). In music teaching, the teaching competency in the information age comprises three levels of knowledge structure: "the knowledge base, which includes subject knowledge, general teaching method knowledge, subject teaching knowledge, and teaching technology knowledge; the main body of knowledge, which encompasses information science subject knowledge and information teaching method knowledge; and the highest level, which is information science knowledge" (Wang, 2021, p. 105). The first-level knowledge structure, that is, the knowledge base, has disciplinary attributes and is the disciplinary knowledge of the relevant professional theories, teaching methods and skills of the music discipline. The second and third levels include three modules of knowledge in addition to professional knowledge: knowledge of information chemistry, knowledge of information pedagogy, and knowledge of information chemistry teaching. The knowledge modules included in the second and third levels above are a new form of knowledge and a kind of information technology knowledge. They are an indispensable and very important knowledge system that constitutes the information-based teaching competency of music teachers (Wang, 2021).

2. Practical operation competency: the practical operation part of music teachers' normalisation teaching competency includes three aspects:

- basic operating competency includes Chinese and English input, editing, document processing, sending, and receiving e-mails, writing music papers, browsing and downloading teaching resources, etc.

- tool software operation competency involves the mastery of music theory learning software *Music Practice*, *Musician Ship*; *Music Appreciation Software Shocking*; *Solfeggio* software *Ear Master*; *Notation* software *Composer Master*, *Sound Forge*, *Yale*, etc.

- multimedia material processing competency is related to using *Adobe Audition* multi-track editing software to modify, merge, rise and fall, change speed and do other music editing and music processing and production of audio files; using other formats of video files to convert common video formats, such as *MP4*, *WMV*, *MPG*, etc.; using *Sibelius* to make music theory dissertations, piano accompaniment scores, and more;

- the competency to develop multimedia courseware by using *Flash*, *PowerPoint*, etc.

3. Integrating and developing competencies: “In-depth integration of information technology and courses means that information technology and courses are organically integrated with the course structure, course content, course resources, and course implementation, etc., and are an integral part of the course, as well as the course content and curriculum” (Liu, 2001, p. 12). In music teaching, the application of computer and multimedia network technology in education and teaching activities has produced forms of network courses, distance education, multimedia classrooms, and network teaching that are highly integrated with information technology and courses. The emergence of these forms requires music teachers have certain curriculum integration and development competency. For example, in teaching, teachers can use classroom lectures + self-study of teaching resource library + online interaction + micro-drilling, as the main teaching mode, through task driven as the core, teaching resource library combined with classroom lectures to carry out the course. Teaching and learning, to achieve independent learning, cooperative learning, research-based learning, and other models that are respected by the modern teaching concept and adopting resource usage-theme exploration-cooperative learning and other modes to carry out curriculum teaching and learning (Yang, 2022). In addition to the competency to integrate and develop music information resources in the music classroom, music teachers should also pay attention to the integration and development of music teaching resources outside the classroom (Hou, 2022).

A professional and ICT-competent teacher understands how ICT extends to music subject content and how digital resources can be integrated into the learning process to help achieve a subject’s competency goals, as a prerequisite, teachers need to develop their own ICT competency (Kelentri, Helland & Arstorp, 2017). Teachers must understand what learners’ ICT competency

requires and how to develop these skills in these music disciplines. Music teachers who want to use and further develop their ICT competencies can facilitate the development of learners' ICT skills as a tool for learning to facilitate learning and interdisciplinary, based on the interaction between academic content, competency goals, ICT, digital instructional materials, and online resources learning resources. The framework, as a starting point, defines the teaching profession's competency area in Storm No.11 (2008-2009) on teacher roles and education and, therefore, is based on a holistic approach to a broad and complex range of teacher competencies from a digital perspective.



Figure 3. *The visualisation of the professional ICT competencies framework for teachers (by Kelentri, Helland & Arstorp, 2017)*

Figure 3 shows the content of the ICT competencies that music teachers should have, from subjects and basic skills, ethics, pedagogy and subject didactics, learning process leadership, interaction and communication, and reform and development, music teachers of these seven aspects of learning and teaching.

The education of music teachers of the 21st century must focus on instructional design, team building, skill development in new information technologies, and new ways to foster creativity and innovation (Davidova, 2019). Rapid changes and developments in ICT affect all sectors, including positive impacts on the education sector, and it is important for teachers to use technology effectively and keep up with innovations to meet the needs of the new generation. The researchers (Gorgoretti, 2019) highlighted the extent to which technology is integrated into music

education, suggesting the importance of further integrating ICT into music teacher training and the need for on-the-job training to keep existing teachers up to date with innovative technologies Happening. Future research suggests comparing music education practices across cultures and identifying ways to maximise music. Social media is a communication technology and its use in education is a relatively new discussion (Tess, 2013). According to Friedman (2006), ICT includes computer applications, mobile technologies, or recording and communication systems. Forms of ICT include the Internet, computer networks, the World Wide Web, e-mail, and search engines (Friedman (2015)), as well as software tools and hardware systems. Learners, who had experience in learning through digital media, positively assessed its importance. For them, digital media have become a means of motivation for independent research in classes (Gleen, 2015). Furthermore, they also developed an interest in new knowledge in classes, which is not directly related to the teaching content that is taught (Fawns, 2015). This is also shown by numerous studies conducted around the world, in which the importance of educational technology, mainly assistive technology in inclusive curricula, has been identified (Schwartz, 2015; Ghaleb, 2014; Oravec, 2020).

The intervention of information technology has caused profound changes in educational and professional activities in terms of concepts, methods, and operations. At the same time, the needs of the society for learners, the direction of teacher development, and the ways and means of socialising have also changed accordingly (Xie, Chu, Qu & Zhao, 2016). Taking existing research as a starting point, thinking about the new development in the information age, and building the professional competency structure model of vocational education teachers' normalisation (see Figure 4).

In today's information technology era, new media have been widely integrated into music teaching activities. As a music teacher, it is necessary to shift from traditional teaching concepts and thinking and incorporate information technology into music education to enhance the mechanism of music teaching. This involves developing professional knowledge to build musical competency, cultivating a spirit aligned with contemporary values, and innovating approaches to music teaching. Music teachers should establish their digital professionalism according to five sets of competencies: normalisation career guidance competency, normalisation teaching competency, normalisation professional competency, normalisation self-improvement and development competency, and normalisation social interaction and communication competency. Among these, the normalisation career guidance competency is the most specific and foundational, serving as a starting point that informs the other four competencies, which are implicitly embedded in the process of music education and teaching. Normalisation teaching competency and normalisation professional competency are of more general nature.

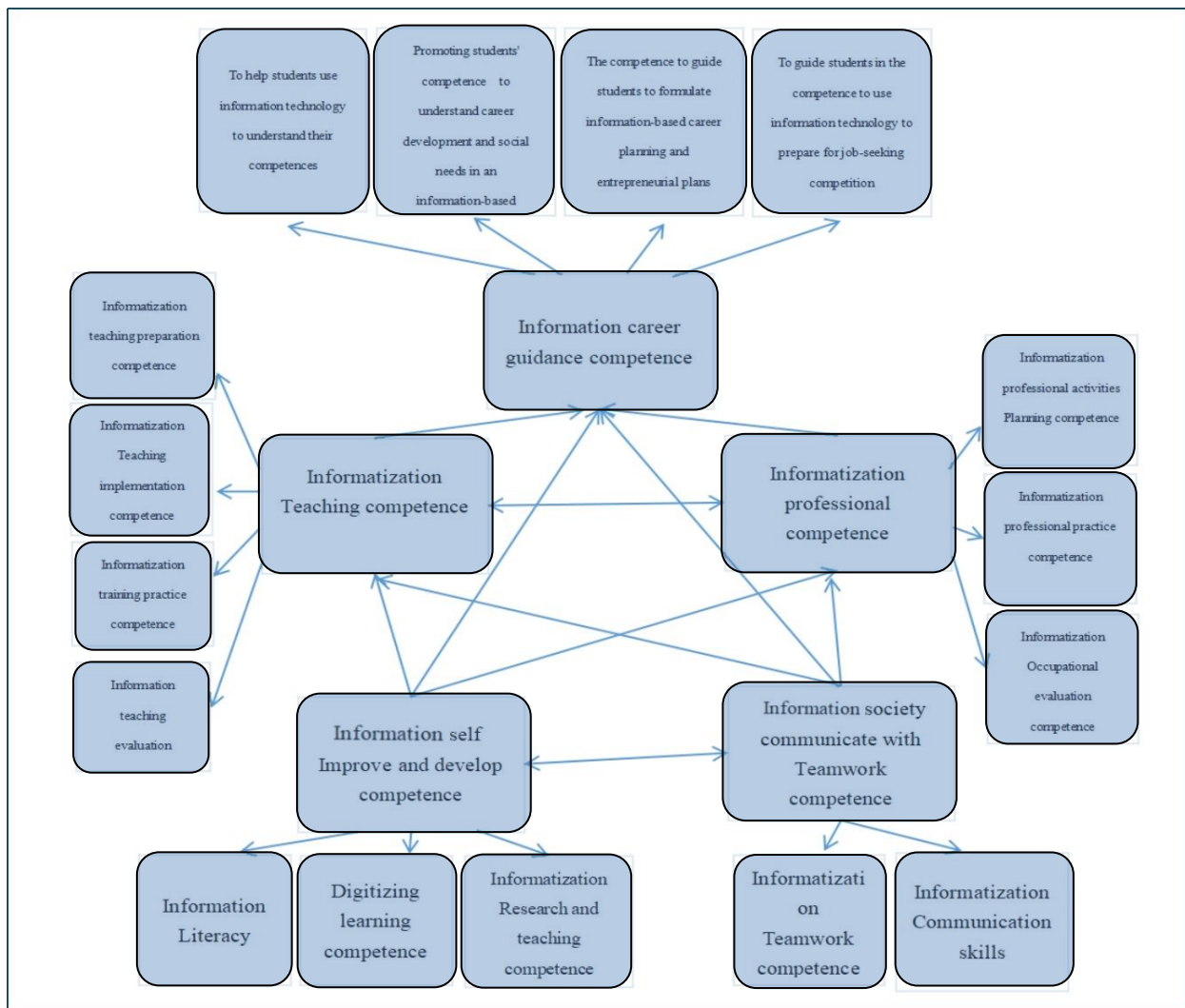


Figure 4. The model of vocational education teachers' ICT competency structure (by Xie, Chu, Qu & Zhao, 2016)

The interaction between the two is the basic guarantee for the professional competency of music teachers in normalisation, pointing to normalisation self-improvement and development competency, normalisation social interaction and cooperation competency, and normalisation competency. The competency of social interaction and cooperation is of special and developmental character, and the two competencies interrelated and essential to support development. They function independently yet are interconnected and indispensable. The relative position between these competencies, as well as the interaction between them, follows a sequence. First, music teachers begin with the competency of normalisation career guidance. This is then supported by the competency of normalisation music teaching and normalisation music occupation. Finally, the competency of social interaction and cooperation is improved to support overall development. Based on five core competencies, 14 competency units are established, collectively supporting the overall structure of music teachers' normalisation professional

competency.

According to many authors, the structure of ICT competencies of a teacher is linked by common components: subject and pedagogical-psychological preparation, management of the educational process, communication and cooperation with the participants of the educational process, improvement of professional competency. Therefore, it is important to highlight the specific characteristics of the ICT competencies of a music teacher that are relevant in the education of a music teacher. Based on the theoretical ideas of the researchers (Denis, & Tucker, 2021; Kirschner, & Selwyn, 2017; Mishra & Koehler, 2006; 2009; Xie, Chu, Qu & Zhao, 2016; Kelentri, Helland & Arstorp, 2017 and other), the content and structure of ICT competencies for music teachers could be organised into several categories:

- **Technological ICT competencies:** these refer to the knowledge and skills required to use different technology tools and applications in music teaching. Technical competencies include competency to use music software, digital recording equipment, and online databases, as well as competency to troubleshoot technical issues. Music teachers should also be familiar with basic computer skills such as word processing, creating and managing folders, using email, and using the Internet.

- **Pedagogical ICT competencies:** these refer to the knowledge and skills required to use technology to enhance music teaching and learning. Pedagogical competencies include the competency to design and develop digital learning materials, use technology to provide personalised learning experiences for learners, and integrate technology into music lessons to improve learner engagement and learning. Music teachers should also have the competency to critically evaluate and use digital resources for teaching, including online databases, music streaming services, and open educational resources.

- **Social ICT competencies:** these refer to the knowledge and skills required to communicate and collaborate effectively using technology tools. Communication and collaboration competencies include the competency to use email, instant messaging, and video conferencing tools to communicate with learners and colleagues, as well as the competency to use social media platforms and other online tools to engage with a broader community of music educators. Music teachers should also be able to use online teaching platforms to deliver virtual lessons, interact with learners, and distribute learning materials.

- **Information management ICT competencies:** these refer to the knowledge and skills required to manage and organise music-related information using technology tools. Information management competencies include the competency to conduct research online, evaluate online resources, and use online databases to support music teaching and learning. Music teachers should

have the competency to create multimedia presentations and recordings that incorporate audio, video, images, and text.

- **Music-specific competencies:** this refers to the skills and knowledge necessary to excel in the field of music. Music teachers should be proficient in using music-specific software, such as notation software Sibelius, digital audio workstations DAW, and music theory software.

- **Continued professional development competencies:** this refers to the ongoing process of learning and development to maintain and enhance professional skills and knowledge. Music teachers should be committed to continuous professional development in the area of ICT, staying up to date with the latest trends, technologies, and best practices.

In general, this model of ICT competencies for music teachers emphasises the importance of integrating technology into music teaching and learning in a meaningful and effective way. By developing competencies in these areas, music teachers can provide their learners with a rich and engaging learning experience that is grounded in both musical content and effective pedagogy.

A closer look at empirical characteristics was assigned to each criterion (see Table 1).

Table 1. *The content and characteristics of ICT competencies of music teachers*

Criteria	Empirical characteristics
1. Technological ICT Competencies	1.1. Competencies in using word processing, creating and managing folders, using email, and navigating the internet (basic computer skills).
	1.2. Competencies in using music software, digital recording equipment, and online databases, as well as the ability to troubleshoot technical issues.
2. Pedagogical ICT Competencies	2.1. Competencies in using ICT effectively to support teaching and learning, including selecting appropriate tools and resources, and integrating ICT into music lesson plans and activities.
	2.2. Competencies in creating engaging and interactive digital content for classroom use, such as videos, podcasts, and interactive presentations.
	2.3. Competencies in using technology to assess and evaluate learner learning outcomes, such as through online quizzes, tests, and portfolios.
3. Social ICT Competencies	3.1. Competencies in using email, instant messaging, and video conferencing tools to communicate with learners and colleagues.
	3.2. Competencies in using social media platforms and other online tools to engage with a larger community of music educators.
	3.3. Competencies in using online teaching platforms to deliver virtual lessons, interact with learners, and distribute learning materials.
4. Information Management ICT Competencies	4.1. Competencies in information skills and their application, including the creation of multimedia presentations and recordings that incorporate audio, video, images, and text.
	4.2. Competencies in conducting online research, evaluating online resources, and using online databases to support teaching and learning.

5. Music-specific Competencies	5.1. Competencies in using elements of the language of music, such as melody, harmony, tempo, dynamics, rhythm, and form, and knowledge of how to apply them using ICT.
	5.2. Knowledge and competencies in using music-related software such as notation software, digital audio workstations (DAWs), and music theory software.
	5.3. Knowledge of the history and cultural context of different genres of music, as well as the contributions of important musicians and composers.
6. Continuous Professional Development Competencies	6.1. Competency in critically reflecting on one's own performance and identifying areas for improvement.
	6.2. Competency in adapting to new situations and learning quickly in response to changing circumstances.

This prepared structure of ICT competencies for music teachers could help prospective music teachers to better assess their chances of working as a music teacher in a general education school.

In summary, the content and structure of ICT competencies for music teachers, based on literature and theoretical analysis, should encompass technical, pedagogical, social, information management, music-specific and continuous professional development competencies. By acquiring these competencies, music teachers can effectively use technology to strengthen music teaching and learning, offer engaging and personalised music education, and prepare learners for success in the music industry or further music studies. ICT learning cannot be overlooked in the future of music education; it is an essential aspect of music teachers' competencies. Therefore, music teachers should prioritise developing their ICT skills and continually refine their competency structure.

1.3. Context and challenges of music teachers' competency in the use of ICT

The first information revolution originated with the birth of the written word. People learnt music by recording it in writing and teaching it face to face through oral transmission from music teachers. During the second information revolution, with the invention of writing systems and the advent of printing, music began to circulate in different regions (Dewar 1998). In China, ancient records of music can be found, where people documented the movements of performances and the positions of sounds as they were played. In the West, people recorded musical compositions on a pentatonic scale so that they could be transmitted. The third information revolution marked a significant leap in music education (Gouzouasis, Bakan 2011). With the appearance of radio and television, music education became increasingly rich and diverse, freeing us from heavy and complicated book records. Communication technology allowed for the broader dissemination of

music education. In the fourth information revolution, with the emergence of artificial intelligence and electronic computers, ICT has become integral to future education (Gao, 2020). Therefore, the roles of traditional education concepts, teaching methods, and teaching organisation forms have undergone earth-shaking changes. Since the mid-1990s, the integration of information technology and curriculum has been a hot and important research topic in the field of education at home and abroad, but its historical origin can be traced back to the early 1960s to the mid-1980s. Computer-assisted instruction was also the initial stage of integration of information technology and curriculum. In 2007, UNESCO launched *The Next Generation of Teachers Project* (Fu, Ge, 2008), and in January 2008, at the Young Talent Exchange Conference held in London, the UNESCO "Teacher ICT Competency Standards" were released to education ministers and media from more than 100 countries.

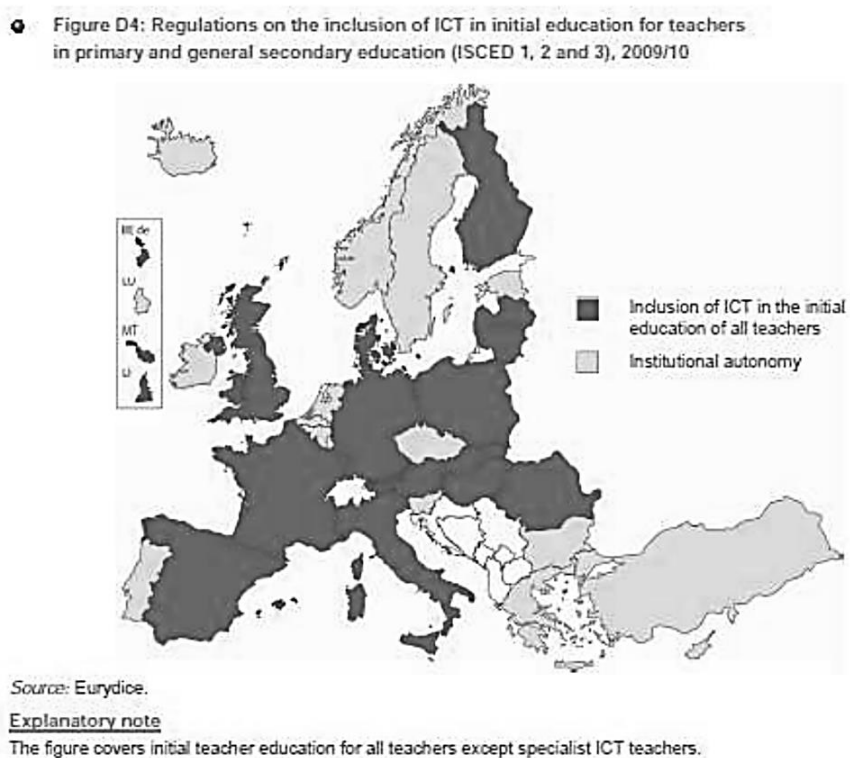


Figure 5. The scope of use of the ICT-CFT framework in European countries (2011).

After more than three years of applications and feedback from thematic experts and users around the world, UNESCO launched the ICT Competency Framework for Teachers (hereafter referred to as the “ICT Competency Framework”) at its 36th General Conference in November 2011 (UNESCO ICT Competency Framework for Teachers, 2013). As the second edition of UNESCO’s “ICT Competency Framework for Teachers”, the ICT-CFT Framework has been revised and expanded in terms of topics, structure, and content, building on the 2008 edition of

the ICT-CST standards. In addition, Italian Ministerial Decree No. 249/2010 (Regulation Establishing the Necessary Conditions and Disciplines for Initial Teacher Training) reorganised the initial teacher training of all Italian school teachers to align it with developments in other European countries (see Figure 5).

And learners, also born in the modern era, realise that they are more comfortable in an online environment. While traditional classrooms allow our learners to expect piano lessons to be in the same room, sitting together, where we teach, perform, instruct and learn, online learning has become a viable option. Humans are resilient and adaptable; with thoughtful planning and care, we can help our learners adjust to online learning, allowing them to continue developing their piano skills through online music resources (Pike 2020). In '*China's Education Modernisation 2035*', issued by the State Council of China, explicitly calls for the achievement of goals in four areas: high-quality development, integration of science and technology, cultivation of talents, and sharing of global resources (2023). Competency has been significantly strengthened, the innovation of teaching methods and educational models has continued to deepen, and the role of normalisation in promoting educational reform has been fully manifested. The normalisation competency of Chinese music teachers is divided into two stages; one is the analogy age represented by tapes and records, and the other is the digital age represented by computer networks (Zhu, 2016). And "now China's music education has basically achieved normalisation in three aspects:

- normalisation of music teaching equipment;
- normalisation of music teaching media;
- normalisation of music teaching methods" (Zhu, 2016, p. 3).

Music is a highly practical subject with a high degree of comprehensive normalisation. Music teachers can obtain music materials through recording, downloading, purchasing, copying, etc., and comprehensively use various ICT in lesson preparation, teaching, and extracurricular music activities, means to play, edit, and make music. The ICT competency of music teachers is the most important and most in need of strengthening in the professional development of music teachers. The improvement of the ICT competency of music teachers is a systematic project; the concept should focus on the esthetical experience of music, and the music discipline and ICT should be highly integrated; have the competency to comprehensively use various information equipment to solve music education and teaching; have the competency to comprehensively use general and professional computers. The competency in using software to develop courseware and music (Hai, 2016). Huang (2021) assumes that artificial intelligence education plays a very important role in the basic stage of learners, analyses the components of key competencies, designs relevant

questionnaires, and finally draws the conclusion that artificial intelligence courses can significantly improve learners' key competencies, particularly in learning music as a new form of communication. In this context, music teachers demonstrate knowledge and understanding not only of the music discipline, but also of:

- communication and positive relationship building;
- communication with parents, colleagues, musicians, composers, and professionals in other fields:
- based on three pedagogical principles (individualisation, engagement, and productivity, and through an artistic/cultural approach to the music education process) to develop the creativity and social skills of learners (Davidova, 2019).

Furthermore, providing music teachers with intelligent learning resources through intelligent learning environments develops the key competencies of teachers and guides them to develop in a high-quality, professional and innovative direction (Wilson-Daily, Feliu-Torruella & Romero Serra, 2021). The ICT competency of music teachers includes the following aspects:

- have the concept of deep integration of music discipline and information technology;
- proficient in the installation and use of various music information equipment;
- have the competency to use conventional computers and be proficient in office and courseware production software;
- have competency in professional digital music editing and production;
- have the competency to make music scores;
- have the competency to produce interactive courseware;
- have the competency to process video (Daily et al., 2021).

Keeping pace with the times and embracing the concepts of new technologies is essential. These qualities are important both in terms of competency and mindset. The concept shapes the quality, and the competency determines the quality. A music teacher with good information literacy can use information technology to complete various music teaching activities with high quality and efficiency and grow into a good teacher with excellent business skills (Zhu, 2016). Su (2022) states that the small scope of application of normalisation and improper application methods are the problems of music teachers using ICT now. According to Atabek(2019), "The integration of technology into music education is not without its problems, and there are many obstacles that must be overcome" (p. 4). Some of the main challenges include limited access to technology, lack of training and support, time restrictions, difficulties in integrating technology with existing curricula, and technical issues. Addressing these challenges requires a

comprehensive approach that includes adequate funding, training and support, and incorporating ICT competencies into music teacher education programmes (Webster & Rickels, 2017). In addition, it is important to promote a culture of continuous learning and experimentation, where music teachers feel comfortable and empowered to explore new technologies and incorporate them into their teaching practice (John & Pamela, 2009).

Many authors (Szczyrba-Poroszewska et al., 2024; Gijbers & van Schoonhoven, 2012; Punie, Redecker, 2017; Scott, 2015) point out that at this stage, it is important to consider existing music teachers and identify new competencies for music teachers and ways to train new teachers for various types of music education institutions. Talking about the nature of teaching, teacher training, and teacher competencies, the European Commission (2013) identified six paradigms that should be seen as integrated and complementary aspects of the profession: teachers as reflective media, teachers as knowledgeable experts, teachers as skilled experts, teachers as classroom actors, teachers as social agents, and teachers as lifelong learners. In the context of the age of ICT education, “it also enhances individuals’ social resilience and cultural awareness, allowing them to build individual and collective identity, tolerance and acceptance, and appreciation for others” (Wright & Leong, 2017, p. 22).

The new COVID-19 pandemic has forced many music teachers and learners to adopt online music education as a method of teaching and learning. However, a new educational model, it is believed that online music education provides the material conditions necessary for the large-scale dissemination of music knowledge, improves the fairness of education, and promotes interaction and collaboration among participants in teaching activities (Zhang, Diao & Fu, 2021). Online music education is a comprehensive music learning platform for people with different music education backgrounds, using the Internet as a communication medium (Bai 2016). Learners are free to choose the music courses they are interested in without the constraints of time and space. That online music learning is conducive to promoting learners’ understanding of their own learning; learners can choose courses that they are interested in or have expertise in and can also help learners conduct secondary learning or even multiple learning (Li, 2021). With self-directed learning, learners’ subjective enthusiasm can be greatly enhanced. Zhang (2021) states that online music education can be divided into three types, B2C, O2O, and C2C. The author points out that this model has its own advantages and disadvantages, which will be discussed below.

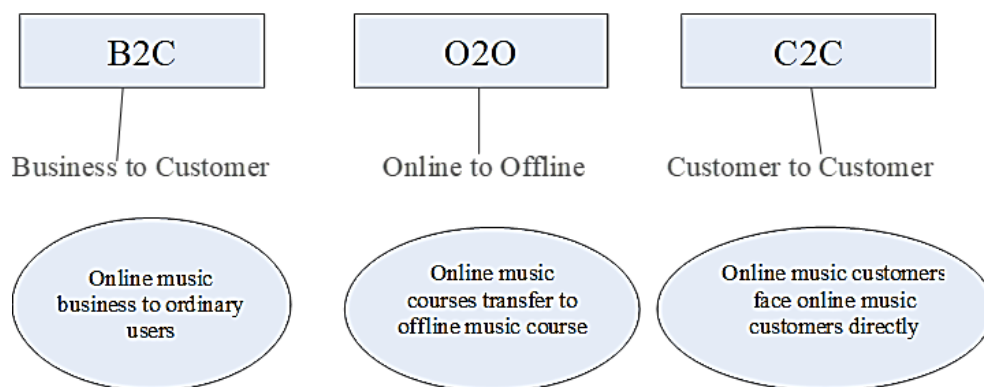


Figure 6. *The model of online music education (by Zhang, 2021)*

B2C refers to the online music platform or the music education platform independently developed by the university that belongs to the business model; this mode requires the platform to have strong curriculum development capabilities and authoritative teachers to join and is suitable for learners who have a certain foundation and have clear goals for their own music learning. The O2O mode is the transfer from the online to offline mode. For example, music teachers who implement online learning use open online teaching resources such as MOOC (Massive Open Online Course). MOOCs can be transformed into powerful distance learning tools that improve learner engagement with online courses through open access to information and authentic knowledge (Triantafyllou, 2021). The O2O online music education model brings more abundant learning resources and learning experience to offline learners. It is a way to improve teacher teaching competency through teacher communication. It is often used in school music education. C2C's online music education model means that customers can communicate and learn directly face-to-face through a certain platform. For example, online course software such as *Zoom, Teams, DingTalk, and Tencent Meeting* is often employed. Learners can better communicate with teachers and customise their own music learning programmes. The course can be reviewed and studied, making this approach suitable for learners who may not have clear goals and need more convenient communication with teachers.

Having so many different media and music resources available for analysis, some music teachers have a hard time deciding which favourite pieces, or even favourite genres, they want to study. In some cases, diversity itself creates problems and learning opportunities (Schmidt-Jones, 2018). This is why music teachers should be more careful when selecting open resources and various information communication technologies. *Xiaoyezi Partner, Homework Club* and *Ape*

Counseling are used for B2C online music education software. This software is launched by various platforms for online education and the acquisition of various disciplines. Among them, the *Xiaoyezi Partner* is only for music learning. This software is different from other learning subjects, music online education is real-time interaction. Through the software, music teachers can directly face learners for teaching and music practice and timely correct learners' mistakes. *Homework Club* and *Ape Counseling* are more aimed at other types of learning. When using this software to learn, material is learnt through videos recorded by teachers. There is no real-time interaction, but learners can learn repeatedly using the software and leave a message on the platform. For O2O online music education models such as *MOOC* and *Classical-piano* are used and these online music resources are more conducive to the learning of music teachers. Music teachers can enrich classroom activities and improve teaching quality through the rich music teaching resources on the learning platform. The C2C teaching mode is more of a platform software used by learners and teachers in class during the COVID-19 pandemic. It transfers classrooms from offline to online, and teachers and learners work directly face-to-face. The C2C teaching model is more of the platform software used by teachers and learners in the classroom during the COVID-19 pandemic, such as *Zoom*, *Tencent Meeting*, *DingTalk*, and *Teams*. Offline classrooms are transferred to online, and teachers and learners work directly face-to-face, with B2C and O2O models. The key difference in the online C2C model of music education is that a music teacher must engage with multiple learners in real time. Effectively teaching music knowledge to a large number of learners simultaneously and keeping them focused presents a challenge for music teachers. This model requires teachers to relearn and further develop their mastery of online education tools and teaching methods specific to the online music education model.

ICT has become an integral part of modern education, including music education. However, music teachers may face several challenges in using ICT competencies effectively. Some of the key issues include:

- limited access to technology: not all schools or music departments have sufficient funding to provide teachers with access to the latest technology and software, making it challenging for them to integrate technology into their teaching;
- lack of training and support: many music teachers may not have received adequate training on how to use technology effectively in their classrooms. Additionally, they may not have access to ongoing support and professional development opportunities to keep up with new developments in technology;
- time constraints: music teachers may feel that they have limited time to learn and integrate

technology into their teaching, especially if they are already busy with other teaching responsibilities;

- integration with existing curricula: integrating technology into existing music curricula can be challenging, as teachers may struggle to find ways to incorporate new tools and resources while still meeting their curricular goals;
- technical difficulties: technical issues such as hardware and software malfunctions can create barriers to the effective use of ICT competencies by music teachers.

With the continuous development of the times people have experienced the first industrial revolution all the way to the fourth industrial revolution, the competency of music teachers is constantly changing, in the old days of word of mouth to the present, teachers are constantly learning and cultivating the competency that is changing because of the development, and in the process of learning, they will be faced with different challenges, the emergence of ICT has changed the mode of teaching of music teachers as well as the scope of competency of music teachers, the teachers need to keep learning. Teachers need to learn continuously, and schools need to cultivate music teachers with ICT teaching integration skills, conduct in-depth research on teaching practice, strengthen the equipment of hardware and facilities, introduce new technologies, and enhance the school's teaching force. In short, ICT helps teachers to integrate the mode of teaching the content of the music subject, to conform to the development of the times, to follow the footsteps of the information advancement, and to better adapt to the needs of the development of the information society, and to further carry out the concept of education that is constantly updated with the support of information technology. It effectively helps learners to learn independently and explore spontaneously, as well as helping them to improve their sense of innovation and ability, and to fully demonstrate their independent thinking in their emotional experience. ICT teaching integration technology is an updated and inevitable choice for the teaching mode in the information technology environment.

Based on the background and problems, the ICT competencies of music teachers are very important in music education. Today, music teachers have proficiency in the use of ICT, application methods, professional ICT knowledge training, and professional music production software. In general, addressing these challenges requires a comprehensive approach that includes providing adequate funding, training, and support, and incorporating ICT competencies into music teacher education programs. Furthermore, it is important to promote a culture of continuous learning and experimentation, where music teachers feel comfortable and empowered to explore new technologies and incorporate them into their teaching practice.

2. PARADIGMS OF MUSIC EDUCATION

2.1. Definition of the music education paradigm and analysis of the current situation

The importance of education as a key aspect of human development cannot be overestimated. However, educational methods and approaches can vary greatly depending on the underlying educational paradigm. The term "paradigm" was originally introduced by the American physicist Kuhn (1957). He explained that he had used this term in a general education course that he had been teaching at Harvard University since 1949. This course was intended for learners who were not pursuing a scientific career, and Kuhn (1957) used the term "paradigm" to teach them technical facts and theories. Today, the concept of paradigm is widely used in various fields of philosophy and in disciplines such as economics, management, and literature. The paradigm theory of Kuhn (1957) comprises three core concepts: the scientific community, incomprehensibility, and revolutions in science. In addition, Kuhn (1957) explains the nature of what truly constitutes conventional science. A paradigm can also be recognised as a paradigm accepted by the general public or as a scientific and technological milestone by certain scientific communities. This recognition makes it a prerequisite for the gradual progress of scientific and technological endeavours within a certain time frame (Yuxi, 2018). The systematic study of Kuhn's paradigms was conducted by the British philosopher of language Masterman (1965). He has compiled a list of 21 paradigms, which were formulated by Kuhn (1957) and are each associated with different meanings. These paradigms can be divided into three categories or aspects:

- a set of beliefs, valid metaphysical speculations, a norm, a novel perspective, something that characterises a broad field of practice, it constitutes a philosophical paradigm or meta-paradigm;
- a scientific habit, an academic tradition or a specific scientific achievement, it is a sociological paradigm;
- a tool for an effective demonstration, a problem-solving method, an analogue representation, it serves as an artificial paradigm or a constructed paradigm.

The American education researcher Zeichner (1983) claims that different paradigms in teacher education entail different theories and practices. A paradigm essentially represents a particular worldview. Different paradigms lead to different theories and practices. Within these paradigms, the nature, functions, and roles of education are interpreted differently and influence the design of placements and school experiences (He & Li, 2009). According to Kuhn (1981), the term "paradigm" refers to a research culture characterised by a set of beliefs, values, and

assumptions that a group of researchers share as common ground in their study of nature and behaviour. Thus, paradigm implies patterns, structures, and frameworks or systems of scientific and academic ideas, values, and assumptions (Olsen, Lodwick, and Dunlop, 1992:16). This definition was formulated by Fullan (2007). Paradigm shifts are often due to "scientific crises" characterised by conflict and new directions (Lindholm, 1979). It has also been argued that science and culture undergo a gradual paradigm shift, which is associated with the concept of fragmentation of reality into dimensionless domains of knowledge or information (Tynjälä & Häkkinen, 2005).

Paradigms are defined differently across various disciplines, and the definitions of paradigms in music education also vary. Music, as a distinct form of education, is expressed through the art of music and has its own unique forms. Ahtola & Juvonen (2023) state that music education, even if it is not exactly the hard sciences, can lead to sudden empirical discoveries. A socio-cultural critique of music education can represent a new direction for researchers and initiate a new research tradition. Väkevä (2007) suggests that Reimer's esthetical philosophy of music education is a paradigm that represents a universally accepted concept. In the field of music education, the term paradigm refers to a change in the philosophical focus of music education. According to Westerlund (2003), esthetical music education is the main paradigm, but practical music education is its difference. The frameworks of music education were formed based on their historical, social, and cultural background. This establishes the use of different ways and the philosophy of music.

The philosophy of music education also developed over time. In ancient Greece, the predominant ideological focus of music was the imitation theory, according to which music education represented people's imitation of certain aspects of the real world (Xie, 2006). During the Romantic period in the 17th and 18th centuries, the prevailing view was that "music is an art of expression" (Yu, 2000). This view assumed that music goes beyond sound and primarily conveys human emotions and encompasses the meaning, value, thoughts, and feelings evoked outside the musical work. In the late nineteenth century, as the Romantic musical current waned, positivism emerged, and Hanslick (1891) stated that music is a form of expression, an art that can evoke emotion. He argued that this emotional stimulation was not the main purpose of music and that people appreciated music in order to experience its inherent beauty. The American music educator Elliott (1990) suggests that music education is a philosophy of practice. He emphasises that music is an actual activity that is present in different cultures. Music is no longer just learning musical works, but also learning music as an activity, as a complete event, focusing on the practical perspective of music as well. In the 1950s, when educational reforms in the United States of America were initiated, music education faced several challenges. Scholars such as Britton,

Reimer, and Schwadron, together with others, developed a new esthetical paradigm for music education and debated at length considering the whole spectrum of music education. Reimer (1970) philosophy of music marks the beginning of a new wave of music education theory that focused on the contribution of music to our individualism in the United States.

Haack (2020) argues that the unexploited potential of esthetical education needs to be explored. He has focused exclusively on an aesthetic philosophy of music, which has emphasised art for art's sake and limited the potential social functions of music. The philosophy of music has evolved in response to social needs such as multicultural education, education of the disabled, and inclusion (Xie & Yu, 2006). In the 1980s, the call for "functional music education" gained momentum, along with the trend of "music for every child" (Liu, 2004). The paradigm shift in music education reflects the changing view of learning as a holistic psychosocial process with broader contextual considerations (Ahtola & Juvonen, 2023). In recent years, sociocultural critics have sought new interpretations of the paradigmatic state of music education, drawing on the pragmatic philosophical tradition of Dewey (Westerlund, 2002, 2003a, 2003b; Väkevä, 2004, 2006). The different philosophical approaches bring about different perspectives of the educational paradigm of music and subsequently influence our perception of the purposes and functions of music education. The development of each theory is a product of the social background, cultural pattern and historical condition of its era. So, it is the question of examination of educational paradigms and how music education contributes to these paradigms instead of clear affirmation or rejection of philosophical views. This perspective is all about the role of music education, as well as the social and cultural values that can be gained through music education.

This dissertation, on the other hand, has not visualised or taken sides for either the esthetical or functional motive. In opposition to this, this work aims to particularise the pedagogy of music teaching, which acts as a factor of transforming paradigm. This transition is interconnected with variables such as determination, endurance, building self-efficacy, mastering learning, experiencing victories, and the creation of a powerful imagination used in problem-solving. These features comprise the fundamentals of varying successful methods of music education as stated by Bandura (1997) and Eccles et al. (1998). The approach to music education is not necessarily a completely new paradigm but represents a significant change in the way music education is thought and practised. This shift is underpinned by changes in pedagogical perceptions, musical ideas, compositional approaches, knowledge of music theory, the use of new digital tools, the application of programmes to manipulate musical material, and the way music is presented (Ahtola & Juvonen, 2021).

The modern paradigm of music education encompasses global, marginalised, differentiated, phenomenological, interpretative, ecological, multicultural, and multidisciplinary intersections (Guan, 2016). In 2020, UNESCO published a statement on the Education Vision 2050 entitled "Learning to Live with the World: Education for Future Survival" This statement asserts that the fundamental solution to the Anthropocene ecological crisis is to transform the way we live in the world, moving from domination to symbiosis. She emphasises that education is the linchpin of this change. To fulfil this historical mission, the education paradigm must be turned on its head – from an anthropocentric pedagogy to a non-anthropocentric pedagogy (Yang, 2022).

In the context of Finnish schools, there were simultaneous changes in pedagogical thinking, curriculum design, learning research, technological developments, and teachers' perspectives. These transformations, mainly due to curriculum revision but then also co-influenced by social changes, have gradually changed the mood in classrooms and schools (Ahtola and Juvonen, 2021). In the digital era, people can publish their homemade music on such platforms as Spotify, Soundcloud or YouTube and gain revenue from it. The usage of such platforms has increased significantly. During the COVID-19 pandemic, people in Spain, Italy, and the United States turned to musical activities as an effective means of coping (Hansen et al., 2021). Ultimately, the International Music Education Association states that it is art that turns people into citizens today (Yang, 2020). Nettle (2004), an American music anthropologist, supports the idea that through music education people may develop a global understanding of music, and consequently, get the Competency to understand, appreciate and relate to the various musical traditions existing in the world. North America is witnessing a shift in the music education paradigm. Critical music education, which was heavily blamed for the failure to diversify music education and social justice promotion programmes, is now evolving into multicultural music education. This conception of education based on decentralisation, social justice, and critical theory resulted in the inversion of the foundations of white supremacy, which are the root of multicultural music education (Freire). It targets the values, structures, and behaviours that keep systemic racism and other social oppression, and seeks to change them (Guo, 2020). In the Canadian context, the dominant paradigm in music education revolves around ensembles that often follow a rehearsal model. These ensembles are usually led by a teacher who directs activities primarily within the framework of Western classical sensibilities (Bartel, 2004). In this environment, technique is often prioritised over musicality (Bartel and Cameron, 2004), and cognition is prioritised over playfulness (Kennedy, 2004). The curriculum focuses largely on the reproduction of music composed by others and places little emphasis on composition (Kennedy, 2004). The genre of Western classical music becomes a dominant repertoire, and Western scores are prioritised over aural

communication. However, this conventional framework of music education is challenged in certain Canadian and American programmes. In addition, the integrated approach we have is in stark contrast with the curricula in the Nordic countries and the UK, as these programmes cover a wide range of different topics (Hess, 2014).

Most music educators follow either the behaviourist or constructivist paradigm, which offer descriptive theories of learning methods, but are not universally applicable to all learning situations. These two paradigms complement each other well in the context of music education and provide a clear and comprehensive explanation of the nature of music education and the teaching process for greater effectiveness and efficiency (Åzgul, 2015). With the continuous progress of music education, people continue to explore and discuss the music education paradigm, and more detailed research directions have emerged on the music education paradigm. Learners also changed in the second half of the twentieth century as music education started investing in a syllabus with aims and objectives, as well as the activities and outcomes expected in the process. The goals of music teaching involve mainly singing by ear (in a pedagogical sense rather than an artistic sense) and then note-based singing aimed at acquiring musical literacy is gradually changing (Vidulin, Plavšić, & Žauhar, 2020). Teaching and learning techniques have also been designed for education of all types, from basic education to the advanced level. In other words, it is possible to speak about new roots of musical philosophy that were created.

In the educational systems of the successor states of Serbia, the basic concepts of primary, secondary and higher education were retained. Compulsory primary education and free arts education are regulated by law and are accessible to all learners under fair conditions. The purpose of arts education is to foster and facilitate intellectual, emotional, social, creative, and esthetical development. Art education provides a better chance of experiencing learning, acquiring knowledge and skills, and a holistic approach, which in the end results in the assessment of one's own artistic abilities (Nacionalni kurikulum za umjetničko obrazovanje, 2017). Music learners are introduced to an interdisciplinary approach to music education through the use of the Sibelius software application. Active learning exercises provide learners with a stimulating and creative learning environment, using computerised music education not only as a tool for workshop activities, but also as a means to prepare learners for the challenges of today's world (Belibou, 2018).

For each expert, the understanding of the music education paradigm is a different context. Others, still, suggest that the music paradigm is not a model, but rather a more sophisticated understanding of the music paradigm. In recent years, two paradigms have emerged in music education: the esthetical paradigm, which was earlier developed and came under attack in the

1980s, and the practical paradigm that gradually came into being in the 1990s. The schools of thought of two paradigms claim their own truths and positions, explain what they understand as the essence and character of music, define tasks and focal points for music education based on their perspectives; this is significant for the given social and scientific field. Maintaining the competency and unity of music education is the core mission of the esthetical paradigm, but the practical paradigm refers to expanding human's horizons in music and music education (Jing, 2015).

Nowadays, the paradigm of music education is the focus of many researchers. They suggest that new changes should be introduced to this paradigm. Music and the digital world are closely intertwined, and therefore, music education must be brought to the present (Belibou, 2018). Music studies should strive to change the theoretical framework of their study. Thus, the integration of sociocultural education as a foundation for music education defines an essential paradigm shift. More recently, pragmatist philosophy has been hailed as an important resource in socio cultural music education approaches. This recognition gives some understanding of the importance of cooperation in education, especially in the framework of music education (Ahtola and Juvonen, 2023).

Education through the use of ICT has become standard practice across nations including the UK, the US, and China (King and Evanjelos, 2016; Lin, 2014; Webster 2002; Rudolph et al, 2023; Aldama & Pozo, 2016). The Big Data era has been characterised by an ever-growing potential of digital technology, which is set to redefine future education and even influence our lives and educational systems at a fundamental level. Music education as a field is at the beginning of the "paradigm shift" that gives researchers many uncovered opportunities (Xin, 2017). Wei (2021) claims that information technology allows creative educators to free themselves from redundant tasks and focus on their main duties of teaching. This shows the freeing potential of technology. The breakthrough in applying big data technology guarantees changes in people's lives, learning models, the relationship between teachers and learners, in classes. Such changes will result in a reduction in classes, increased homogeneity in communities around schools, and more individualised educational support; this will be a significant departure from the industrial age of education (Wei, 2017)).

However, the evolution of ICT has greatly altered the music meaning in an educational setting. This has revolutionised the way we learn and is understandable if you are unaware of the changes. Today, there is a demand to expand our learning techniques by incorporating both new and traditional approaches (Å-zgul, 2015). Garnett (2013) argues that music education is correlated with cognitive progress. Both performance and academic music programmes fit into either

behaviourist or constructivist educational frameworks. Behaviourist approaches are embedded in behaviourist psychology that stresses the acquisition of musical technicalities and skills, and constructivist paradigms follow constructivist psychology that is based on the construction of mental representations. Due to strong research and evolving teacher perspectives, the content and methods of music education in schools are evolving, leading to a shift from traditional reproductive music education to a more productive approach (Siiri & Antti, 2021).

The current situation of the music education paradigm is characterised by several challenges:

- **Global perspectives:** a global perspective is being introduced in music education. Music is recognised as a universal language that goes beyond the limits of the country. This has also led educators to include different musical traditions in their curriculum from many parts of the world (Yang, 2020). This global exposure to music deepens the learners' understanding of music and its cultural value.

- **Music curriculum evolution:** music education has undergone many modifications during the recent years (Vidulin, Plavšić, & Žauhar, 2020). Educational objectives, tasks, and intended outcomes are factors that shape modern music education. The largely on-ear pedagogical singing in the past has now opened up more to note-based singing as a musical literacy tool.

- **Diversity of the paradigm:** music instruction is no longer simply about a single approach. It is not a single paradigm but encompasses a wide range of paradigms, such as the esthetical paradigm and practical paradigm in the text. This variety points to different philosophical and pedagogical orientations towards music education. Educators generally incorporate different paradigms to offer a comprehensive course in music education (Jing, 2015).

- **Personalisation and student-centred learning:** the bespoke student-oriented methods are changing into collaborative learning models in music education. Learning must be personalised according to each learner, with different goals, areas of interest, and preferred learning styles. Technology makes the idea of personalised learning feasible. In line with existing patterns of education that entail higher levels of responsibility and agency of learners (Siiri and Antti, 2021), this transition also corresponds to these trends.

- **Research-driven changes:** nowadays, music education reforms increasingly take research findings into account. Researchers focus not only on teaching techniques, cognitive development, and the impact of music education on various aspects of learner development (Siiri and Antti, 2021). Research-driven approach is producing the evidence that can be used to make changes in the curriculum and teaching practices.

- **Shift towards a socio-cultural perspective:** there is a rising awareness of the relevance of cultural-social perspectives in the field of music education. This approach highlights the

cultural and social contexts of music, recognising the diversity of musical traditions and experiences (Siiri and Antti, 2023). Educators are commonly adopting this method nowadays to make music education more diverse and in tune with learners of different cultural origin.

- **Integration of technology:** now technology is part and parcel of music teaching. The way learners are taught and learn music through digital tools, software, and online media has changed (Xin, 2017). With this integration, music education could be advanced as learners will be able to explore new ways of creating, writing, and enjoying music. However, the downside is that it presents problems of access, digital literacy, and ensuring that technology serves well the goals of education (Wei, 2017).

The sum of the music education paradigm that is currently active is global perspectives, curriculum development, paradigm diversification including personalisation, student-centered approach, application of research and the cultural approach, as well as the integration of technology. Recent studies confirm the need for a change in the music education system, especially due to increased acceptance of technology usage. Innovative technology can be used to improve knowledge exchange and personal learning, thus narrowing classrooms, strengthening communities, and also individualising educational support. Development like this, which is as a consequence of the findings of research, as well as by the maturity of the teacher, make us to teach music from effectiveness and using artistic means and not just repetition of outcomes only. The way this music is used in education shows that musicians are still evolving, and the ways of teaching music are changing to fit current cultures, inclusive and customised through using the latest technological possibilities, and scientific research finally leads to an increase in the quality of teaching and learning.

2.2. Role of music teachers in the context of changing educational paradigms

Technology development at a dynamic pace, abundant information sources, and the ability to access media are the factors that are changing the positions of learners and teachers. As stated by the authors (Keiler, 2018) and (Cook-Sather et al., 2020), teachers are moving away from the position of the encyclopaedia; they are now seen by their learners not as reservoirs of knowledge, but as guides and support staff of their research and inquiry process. This shift creates the condition of reinvestigating the relationships with learners, teaching methodologies, and tools that force teachers to engage permanently in learning and improvement. On the one hand, as (Morris,

2019) states, there are changes in the role of learners who move from obedient auxiliary and knowledge reproducers to independent and inquisitive learners who explore and construct their identities. Along with these changes, we observe a modernisation of educational content, with new ideas, approaches, and priorities being incorporated into the learning process. Instead of the classic passive knowledge intake by learners, active learning emerged during this era (Yang, 2019). A music teacher must be flexible and continue to adapt to the relationship she has with her learners while searching for effective teaching techniques. They always experiment with learning, find the right educational strategy, and use creative classroom methods. Today, we are witnessing a shift from the traditional teacher-centred approach to a student-centred one, where the teacher's role evolves from merely leading the learning process to also acting as a guide and helper. The fundamental principles of teaching now transform the educational process, with the teacher serving as a facilitator of critical thinking, creative activity, and teamwork. This involves the adoption of a blended learning strategy where both face-to-face and online delivery methods are used to provide flexible and customised learning possibilities (Singh, Steele, and Singh, 2021). Collaborative learning activities such as ensembles, performances, and group projects are maximised in the music classroom to develop learners' social skills and create a sense of community in the class (Gaunt & Treacy, 2020).

Along with innovations in education, music teachers have also shifted their approach towards greater engagement and collaboration (Merrick & Joseph, 2023). They are no longer the only knowledge source but encourage learners to explore and develop their understanding (Brown, 2005). Technology applications in music education, such as the use of science, tech tools, the internet, and online courses, offer formal and informal learning opportunities for learners. Offline courses have also become quite common, using technology to enhance musical literacy and motivation. The use of ICT in music teaching has greatly altered the basis of how learning is carried out. Improvements such as increased learner participation, variety of resources, collaborations, professional development, innovation, personalise learning, assessment, global exposure, inclusivity, and access to music are among the effects of the use of ICT. The teacher who uses the digital platform nowadays brings a real-time and active learning environment that will lead to a new educational model, in which music is now being connected by digital tools.

The teacher's role is closely associated with the various tasks they perform (Edmonson and House, 2000). A good example is the model by Harden & Crosby (2000), which identifies 12 roles for medical education teachers. These roles encompass six distinct types of tasks that teachers may engage in: implementing, taking actions, sharing information, creating resources, planning, evaluating and more. Various researchers have employed different metaphors to describe teacher

roles. For instance, Kaboody (2013) proposes roles such as initiator, facilitator, motivator, ideal model of the target language speaker, mentor, consultant, and mental supporter.

Teaching in an ICT environment involves educators in the area of ICT. The ubiquitous feature of ICT makes it possible to create current content, authentic, and multimodal materials, and breaks the barriers of physical boundaries of the classroom. Certain teacher functions, as expressed by the researchers (Murchú, 2005), are similar to those witnessed in traditional learning while others are unique to ICT environments like instructional designer, trainer, collaborator, team coordinator, advisor, monitor, assessment specialist, learner and silent partner. Wang (2015) observes the shift of teacher roles in a 3-phase model (pre-, during-, and post-task phases). In the pre-task phase, technical and social roles establish the leading role and then it changes to the monitoring and motivation. As the learners engage in the task, the roles of motivation, monitoring, and task support will be emphasised. Then in the post-task phase, the teacher is primarily a language guide and can incorporate motivational, monitoring, and social roles (Wang, 2015). A different model that encapsulates different stages is Salmon's (2013) model of five stages for online learning, where the teacher is referred to as a moderator and instructor. In addition, Goodyear et al. (2001) view the roles of an online teacher as facilitator, adviser, assessor, researcher, content facilitator, designer, and manager/administrator. Podgorek et al. (2019) introduce a model (see Figure 7) with 12 identified roles: 1) facilitator, manager, mentor, 2) guide, 3) lecturer, information provider, 4) assistant, 5) motivator, 6) planner, 7) monitor, 8) technical supporter, 9) assessor, evaluator, 10) resource developer, 11) creator of a friendly social environment, and 12) language role model.

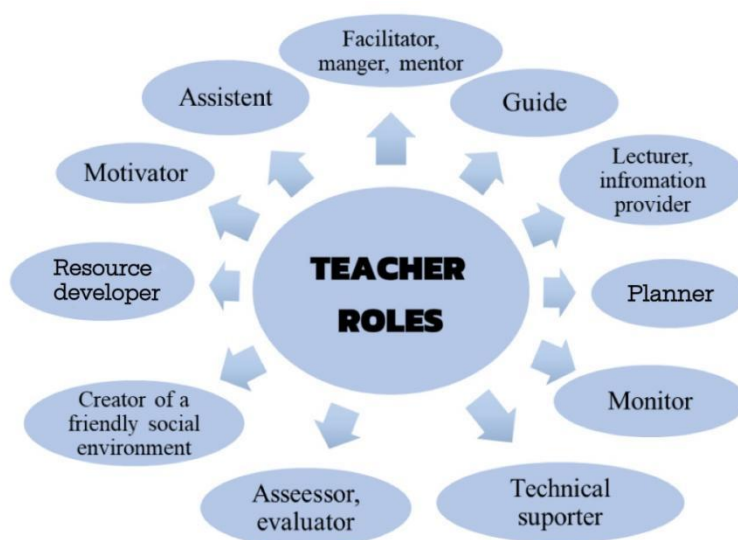


Figure 7. The model of teacher roles (by Podgoršek, Starčič & Kacjan, 2019).

The role of teachers is multi-faceted and varied depending on the specific tasks and situations. There are different types of models and metaphors to explain these roles, highlighting activities such as facilitation, information provision, or assessment. The technology and computer-assisted learning that was introduced has changed the role of teachers from knowledge providers to facilitators. Roles can change for a single class as the instruction moves from one phase to another. According to Podgoršek et al. (2019), the model evaluates the 12 identified roles of teachers and task, which includes facilitating, mentoring, providing information and language role models. These positions speak for the dynamic nature of learning and the need for teachers to move with changing educational paradigms and technologies.

With the rapid progress of science and technology and the continuous change of society, the professional role of music teachers is also experiencing unprecedented transformation and reshaping (Wang, 2023). The traditional way of teaching music, which is based on face-to-face teaching and relatively fixed and single content, is clearly unable to meet the increasingly diversified learning needs of modern learners (Ghozali, 2020). Music teachers need to acquire not only professional skills in the performing arts, but also the competency to use the best information systems in teaching activities (Sizova et al., 2018). Teachers' competencies are also reflected in the use of ICT, as well as in the establishment of a value system and the development of positive qualities in learners based on a personal example, harmonising independent practice with innovation and continuous professional progress (Djurđanović & Štošić, 2017).

The development of educational technology informatics competencies of music teachers must keep up with the development and progress of technology (Miao, 2022). Therefore, music teachers must constantly broaden their horizons and upgrade their professional skills, especially in information and communication technology (ICT) to keep up with the ever-changing changes in the field of education. Today's trends in education are determined by the global wave of digitisation, the availability of e-educational resources and multifunctional devices has stimulated teachers around the world to upgrade to digital teaching and learning technologies (Kampa, 2021). Modern researchers describe a wide variety of online courses such as MOOC, BOOC (Big Open Online Course), DOCC (Distributed Open Collaborative Course), LOOC (Small Open Online Courses), MOOR (Massive Open Online Research) and SPOC (Small Private Online Courses) (Naert, 2015). In 2004, the concept of blended learning was first introduced in China by Kekang (2004).

Traditionally, blended learning refers to the combination of various learning styles, for example, the use of audio-visual media combined with the traditional learning style, the computer-assisted learning style, and the computer-assisted learning style. Blended learning in the

traditional sense refers to the combination of various learning styles, such as the use of audio-visual media and traditional learning styles, computer-assisted learning styles and traditional learning styles, and independent learning styles and collaborative learning styles. Therefore, in developing the professional skills of future music teachers, it is a need to learn to find and design online resources that provide close teacher-learner interaction, as well as learner participation and regulation of their professional music practice (Karkina & Mena et al., 2023).

Social music-making is experiencing an unprecedented renaissance through the use of music games, apps, and connected digital tools, and music educators must keep up with these emerging trends in order to keep up with youth culture (Gouzouasis & Bakan, 2011). An overview of recent research in the field of music education shows that from the perspective of educational institutions, music teaching, as well as the professional development of teachers and their competencies to manage music content and teaching skills, is of paramount importance (Valdebenito & Almonacid-Fierro, 2022). In the age of information technology, the professional training of music teachers is strengthened through the use of various information technology means, and the collection and collation of various teaching and training resources from the internet and various types of online teaching platforms (Liu, 2020). Training music teachers in the era of information technology, teachers can learn to master more advanced education and teaching concepts and a variety of information technology education technology means, to effectively improve their overall teaching competency level, especially information technology education competency, but also to optimise the effectiveness of primary and secondary school music teaching to lay a solid foundation (Xiaojing, 2019). Music teachers need to learn to use some music production and sheet music production software, multimedia sound system, electronic whiteboard, all-in-one equipment, piano, software for courseware production, familiar with some basic knowledge of courseware production, and good at collecting or producing courseware materials, making music courseware according to the teaching design, and editing audio materials using some equipment and software (Luo, 2019).

Teachers must continuously improve their ICT competencies to adapt to changes and demands in the field of education. The strategy of cultivating ICT competencies of music teachers should be to improve the information competency of music teachers in a practical way through the flexible use of the public platform of the educational resources service, the use of new teaching methods to improve the information literacy of teachers and learners, and to start from multiple ways and perspectives (Huang& Liu, 2021). One of the determinants of a teacher's success in using technology in the classroom is related to the teacher beliefs, attitudes, and confidence in personal abilities and performance, and these perceptions are largely developed during the

teacher's initial ICT training (Crawford, 2008). To achieve these successes, ICT, subject-related and pedagogical content must be interrelated (Haning, 2016).

Lastly, intercultural and multicultural music education promotes changes in music teachers' teaching styles, and for teachers, more opportunities for international exchanges enable music teachers to be more exposed to foreign music cultures and foreign models of music education (Miao, 2022).

Therefore, training and education for music teachers are also particularly important. Relevant departments and organisations should strengthen the training efforts for music teachers' ICT skills, help them master the latest education technology means, and improve their professionalism and teaching competency. At the same time, it is also necessary to provide music teachers with more comprehensive and systematic guidance and support in light of the latest educational theories and practices to help them better cope with the challenges and opportunities brought about by educational changes. Specifically, the ICT competencies of music teachers cover many aspects. In the subsequent ICT competency training, they need to be proficient in the basic operation of computers but also be able to make flexible use of Internet resources to collect, filter, and integrate all kinds of music education related materials. In addition, they need to learn how to use various educational software and teaching platforms to combine traditional music teaching content with modern technology to provide learners with a richer and more vivid learning experience. Using these ICT skills, music teachers can provide learners with more diverse and personalised learning pathways. They can use online resources and interactive learning platforms to guide learners to explore the world of music on their own and discover their musical interests and potential. At the same time, these modern technological tools can also help learners better understand musical works and improve their appreciation and performance skills.

Against the background of changing educational paradigms, the roles of music teachers have become more diverse and complex. They are no longer just the transmitters of knowledge, but also the guides, inspirers, and motivators of learners on their growth. Music teachers must make good use of their professional knowledge and experience to guide learners to discover the beauty of music and develop their critical thinking and creativity. At the same time, they should pay attention to the overall development of their learners and help them develop good musical literacy and esthetical concepts.

In the 1960s, the focus of researchers shifted from the study of teachers' personalities to the study of teachers' behaviours, i.e. teachers' roles (Brophy, 1989), bearing in mind that teachers' roles depend on the pedagogical philosophy (the nature of the subject matter) and the tasks performed. The simplest categorisation of teacher roles involves the distinction between

educational and pastoral roles. According to some authors (Hebib, 2009), the role of the teacher in teaching is much more complex and depends on the pedagogical goals and tasks, the model of teacher's behaviour, as well as their fulfilment within the scope of intellectual, working, physical, health, moral, esthetical and emotional characteristics of the learners, which are formed in the course of their growth.

Teachers mainly play the role of partners, as well as the role of motivators and evaluators, and teachers should also be good evaluators of learners' performance (Zdravić, 2020). In conclusion, the role of the music teacher is undergoing a profound transformation with the development of technology. From the traditional classroom teacher-learner position distribution that has continued from ancient times to the present, the position of the podium determines that the focus of the entire classroom is gathered on the teacher. The whole teaching process is dominated by the teacher's teaching and the learners' learning and listening (Miao, 2022).

In 2016, the general framework of the Core Qualities for Chinese Learners' Development was released in Beijing, which focuses on fostering the "all-round development of human beings" and clarifies the core qualities that Chinese learners should have in the new era, in terms of the three dimensions of cultural foundation, independent development and social participation (Core Qualities for Chinese Learners' Development). Exploring the true meaning of quality education. Ministry of Education of the People's Republic of China, 2018). The role of the teacher includes the development of the core competencies of learners to enable them to live and work, as well as the provision of additional support to learners who need it to achieve educational goals according to their abilities (Zdravić, 2020). Teachers' leadership becomes more guiding, allowing learners to take greater ownership of their learning time and learning styles, which promotes self-responsibility and accountability for their own learning behaviours (Miao, 2022). Teachers, as designers, guides and facilitators need to be keen observers and quick to adjust the teaching arrangements of the strain. Only in this way, can they better serve the overall development of learners, for the cultivation of innovative spirit and practical competency to make a greater contribution to the music talent (Hu, 2021). However, it should be noted that the transformation of teachers' roles from "teacher-centred" to "student-centred" is a gradual process, which interacts with the development of the times and the progress of society (Miao, 2022). The emergence of ICT has helped music teachers to enter the role change more quickly.

In summary, the role in the community of unity and learning is much more than a boundary. They are facilitators, collaborators, and mediators of personalised instruction. Additionally, the learner-teacher, the knowledge provider and the learning guide are in partnership in the active learning system. Acknowledging these changes helps teachers to be able to equip the learners in

facing issues such as globalisation where everything is seamlessly and interconnected. Thus, it illustrates how music learning and its processes have undergone a significant change at present. The use of technology that can enhance and facilitate the participation of music lessons and help learners fit into the world of music and technology. The role of a music teacher can be complex and multiply dimensional, and it depends on the range of tasks assigned to this educator. There are a few models that have been presented to translate teacher roles, which could reflect their multifaceted positions. Models demonstrate how the role of teachers is changing while operating in the ICT learning environment; they become e-moderators and guides. In addition to this, online teachers are depicted as facilitators, advisers, assessors, and others of processes, which are different roles in the digital era.

2.3. Change of the ICT competencies model for music teachers in the context of educational paradigms

When approaching a productive music education paradigm, previous musical traditions should not be forgotten, but knowledge learnt from the past can be leveraged by adding new music education methods (Ahtola and Juvonen, 2023). Although this is not a "scientific revolution", it can be said to be a "crisis" in traditional music education because of the need for change. Table 2 lists the differences between productive and reproductive music education.

The transformation of the ICT competencies model in the context of an educational paradigm refers to changes in the knowledge, skills, and attitudes that music teachers need to effectively integrate technology into their teaching practice in the context of changing educational paradigms. As Christensen, Johnson & Horn (2011) argue, emerging digital technologies are disrupting traditional models of education and require teachers to develop new competencies that align with the needs and expectations of 21st-century learners.

Traditionally, the ICT competencies focused on technical skills, such as operating software and hardware. However, with the shift towards more learner-centred and inquiry-based teaching paradigms, music teachers' ICT competencies need to expand beyond technical skills to include pedagogical skills, such as designing effective technology-enhanced learning activities, facilitating collaborative learning, and evaluating school student learning outcomes (Kirschner & Selwyn, 2009). The transformation of music teachers' ICT competencies model also involves a shift in teachers' attitudes towards technology. Teachers need to see technology as a tool to support learning and creativity, rather than simply as a means to deliver content. They should be willing

to take risks, experiment with new technologies, and continually reflect on their practice (Ertmer & Ottenbreit-Leftwich, 2010). In addition to this, the reform of the music teacher's ICT competency model is based on recognising the necessity of constant professional development. Teachers will have to be lifelong ICT learners as technology becomes older, the educational paradigm changes, and the learners' needs become more sophisticated (Mishra and Koehler, 2006).

Table 2. *The differences between reproductive and productive music education (by Ahtola & Juvonen, 2023)*

Reproductive music education	Productive music education
<ul style="list-style-type: none"> • The material played in the class consists of previously composed music, familiar classics represented by a range of music styles. • Knowledge of music theory is needed to be able to create music and compose. • Music is learnt by studying, learning to play instruments, listening, and by reading literature. Instrument skills are needed to be able to create music. • Music is made based only on real instruments. • The study of music theory is obligatory, and learning music cultures is teacher-led and does not offer opportunities for creative work. • Creativity cannot be expressed without some knowledge of music theory and instrumental skills. • The learner's musical skills are measured by tests that often cause anxiety and can lead to a negative self-image in music in general. 	<ul style="list-style-type: none"> • The learner is regularly offered opportunities for improvisation, composition, lyricising, arranging, and other creative musical activities. • No need to avoid making mistakes. • Anyone can be a composer; no music theory knowledge is needed. • Instrument skills are not needed to be able to create own music. • Music can also be made using technological applications. • Real instruments can go hand in hand with virtual instruments. • Learning to create different soundscapes using sounds from everyday life. • Creativity can be used immediately in practice. • Anyone can create music that sounds like recorded in a professional studio. • Music can be learnt by playing real sounding virtual instruments. • Music theory and music cultures are also approached in creative ways in which learners can use their creativity. • Motivation rises. • The experiences of success and mastering one's own learning increase. • The self-efficacy beliefs strengthen. • Strengthening social skills through collaborative projects.

Today's structural paradigm of music education is complex and multilayered one affected by a variety of factors, such as technological developments, changing cultural attitudes, and educational policies that constantly change. The current status of the music education paradigm can be evaluated by looking at the purpose, values, and beliefs of different music education paradigms and the impact they also have on teaching and learning.

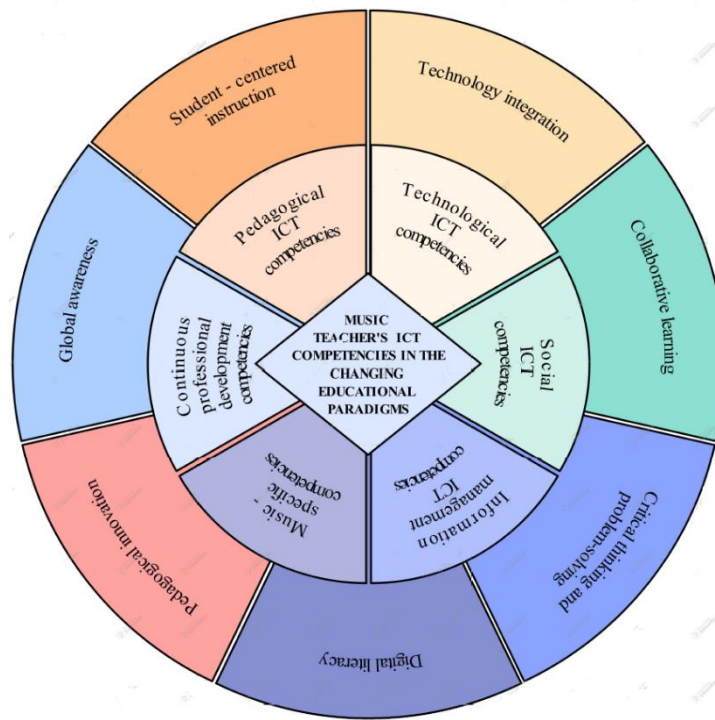


Figure 8. The model of music teachers' ICT competencies in the changing educational paradigms (created by the author)

Based on the theoretical ideas proposed by Martin (2019), Li & Zhao (2018), Zhao & Bryant (2017), Gibson & Ifenthaler (2017), Cao & Zhang (2012), Zawilinski (2009), Mishra & Koehler (2006), and other authors, the Model of Music Teachers' ICT Competencies in Changing Educational Paradigms was developed. The teachers' ICT competency model exemplifies the dynamic and evolving nature of music education and teachers' need to adjust their conduct to match the new requirements imposed by learners and society, as stated by Zhao, Pugh, Sheldon, and Byers (2002). The model emphasises the following competencies:

- **Student-centred instruction:** the teacher achieves this by creating a learning environment that is student-centred, using technology tools such as adaptive learning software, gamification, and digital storytelling.
- **Collaborative learning:** this term implies teacher's creation of collaborative learning among learners by employing technology tools, such as virtual classrooms, online discussion forums, and collaborative writing tools.
- **Digital literacy:** the teacher is someone who is capable of applying and handling digital tools and resources, including social media platforms and online communication tools.
- **Technology integration:** this is the teacher's competency to be able to effectively

integrate technology in music teaching to improve the learners' learning. We also cover different approaches to choosing and using technology tools, as well as creating and implementing technology-supported lessons.

- **Critical thinking and problem-solving:** this refers to the teacher's competency to use technology tools to foster critical thinking and problem-solving skills among learners through activities focused on research, data analysis, and visual literacy.

- **Pedagogical innovation:** this involves the teacher's competency to innovate and develop new techniques of teaching using online assessment tools, adaptive learning software, and personalised learning experiences.

- **Global awareness:** this involves learning to understand the interconnectedness of the world and the need to prepare them for integration into a globalised economy.

This model accentuates the criticality of student-centred instruction, collaborative, critical and problem-solving competency, digital literacy, technological integration, pedagogical innovations, and global awareness for teachers of music, as the learning frameworks go towards evolution. Practising innovative music teachers' ICT competencies model in the changing educational paradigms will help music teachers create more competent learners who are equipped for the challenging technological world and who will feel more engaged and enjoy the learning process.

The passage emphasises the multidimensional role of the music teacher in modern education and the far-reaching impact of Information Communication Technology (ICT) on music education.

Music teachers are not only traditional knowledge transmitters, but also inspirers of learners' creativity and emotional expression. Research has shown that music education not only helps learners to improve their skills but also promotes their emotional expression and creativity. According to Gardner's (1983) Multiple Intelligences Theory, the role of the music teacher should also include helping learners to develop multiple intelligences such as verbal, spatial, physical and musical. Teachers need to design programs that stimulate learners' critical thinking and creativity, not only in the arrangement of classroom content, but also in the choice of teaching methods and the creation of educational environments.

Despite the multiple roles and responsibilities of the music teacher, the core of the teacher's role remains 'student-centred'. Educational theorists such as John Dewey (1938) mentioned that education should focus on the development of the whole student, especially in music education. Under this concept, teachers not only need to teach music skills, but also need to pay attention to learners' psychological development and emotional needs, and help learners develop their

personal music experience and deep understanding of music. Therefore, teachers should cultivate learners to find room for self-expression in music by creating an experiential learning environment and develop learners' independent learning ability through critical thinking.

The introduction of Information Communication Technology (ICT) has changed the traditional face of music education. ICT not only provides learners with a global perspective and helps them to be exposed to the teaching methods and explanations of teachers from all over the world but also provides a new platform for interactions between learners and between teachers and learners. According to Hennessy et al. (2007), the use of ICT enhances engagement in student learning and facilitates cross-cultural and cross-disciplinary communication and learning. This technological platform has enabled learners to not only enhance their musical literacy but also promote the development of their abilities in other subjects.

As educational philosophies change, music teachers are no longer confined to the music classroom but are expected to work closely with teachers of other disciplines. Music education in today's education system places more and more emphasis on interdisciplinary integration, especially in the development of learners' comprehensive abilities, with ICT playing the role of a bridge. Multi-disciplinary collaboration not only provides learners with more diversified learning perspectives but also helps them to apply knowledge from different disciplines to real-life situations so as to achieve all-round development.

The continuous development of ICT tools not only provides innovative means for music teaching but also requires music teachers to constantly update their teaching methods and technical skills. The use of ICT makes the classroom more interactive and interesting, thus enhancing learners' interest and participation. Teachers can create unprecedented teaching experiences through online teaching platforms, digital audio workstations (DAWs), virtual instruments and a variety of teaching software. As mentioned by Bennett (2014), effective integration of ICT can stimulate learners' interest in independent learning and promote deep understanding and creative expression of music.

As globalisation accelerates, music education is not limited to cultural and technological developments in one's own country. Teachers need to be globally minded and aware of educational philosophies and technological developments around the world. This global perspective motivates teachers to not only focus on technological and educational innovations within their own countries, but also to communicate and collaborate with their international counterparts to assimilate new pedagogical concepts and technological tools. The development of this global perspective enables teachers to better understand and respond to the challenges of teaching in different educational environments and cultures, and to provide learners with a more

international and diverse music learning experience.

The competency framework for music teachers involves not only professional competency in music teaching, but also a broad range of educational philosophies, interdisciplinary collaborative skills and the application of information technology. Teachers are expected to possess an interdisciplinary knowledge background, flexible teaching methods, critical thinking and problem-solving skills. As technology advances and educational needs change, the competency framework for teachers needs to evolve with the times and develop deeper competencies. These competencies are not only tools for teachers to teach in the classroom, but they are also the foundation for teachers continued professional development.

In summary, the role of music teachers in modern education is multiple and dynamic. The introduction of information and communication technologies has not only changed the way teachers teach but also provided learners with richer and more diverse learning experiences. With the development of the times, the competency framework and educational philosophy of music teachers will continue to evolve and improve, providing learners with a more comprehensive and innovative music education educational paradigm change in music teachers' ICT Competency Model reflects the dynamic and developmental nature of music education. Teachers should possess technological, pedagogical, and student-centred learning, collaboration, critical thinking, problem-solving, and digital literacy competencies in order to properly use ICT tools in the teaching and learning process. Professional development, collaboration with other educators and the use of online resources will be useful tools for music teachers to develop their competencies and integrate ICT tools into the curriculum.

3. METHODOLOGY OF THE RESEARCH

Based on the actual needs outlined in the research questions of this study, a mixed-methods approach is more conducive to achieving depth and addressing the original questions. To ensure the reliability and validity of the research, this chapter elaborates on the research methodology and design, including the definition of the research framework, research ethics, data collection methods, and the reliability, validity, and representativeness of the research sample.

3.1. Research design and organisation

The following research framework was constructed on the basis of the analysis of the literature. Considering the aim of the research, research questions, and objectives, the research relies on a mixed-methods research methodology. The empirical part of this dissertation consists of four sections. The first part used quantitative methods to verify the credibility of the questionnaire by testing it on music teachers and learners, collecting data, and analysing the results. The second part employed quantitative methods to collect data through an adapted questionnaire, which was formally administered to music teachers in primary, middle, high school, and vocational high school settings. The questionnaire used a Likert scale and included single-choice and multiple-choice questions. The third part of the study applied a qualitative research method, specifically semi-structured interviews with primary, middle, and high school music teachers. This part of the empirical study also included database analyses and further qualitative research on selected music teachers through semi-structured interviews. As mentioned above, the entire study targeted music teachers in primary, middle, and high schools. The fourth part involved observational methods to observe three different types of music class content, describe the observations, and identify the teaching methods and models used by music teachers in various environments and with different teaching content. Table 3 describes the research process and its duration.

As mentioned above, the dissertation focuses on analysing the current situation of music teachers using ICT. The literature review is organised around two main theoretical axes: the ICT competencies of music teachers and the changing educational paradigms. Consequently, the concept of ICT competency for music teachers was explained, and its key factors were identified. Competency, as the main goal of education, includes the holistic unity of one's knowledge,

abilities, skills, and attitudes. ICT competency in music teachers is dynamic, evolving in response to technological advancements and becoming apparent at various stages of technology integration.

Table 3. The dissertation design framework

Stage	Process	Time period
Theoretical analysis	Analysis of scholarly literature	2020 October – 2022 January
Four-stage empirical research		
I. Assessment of school student learning in a learning environment where ICT is used by music teachers (Teachers' questionnaire; Learners' questionnaire)	The study adopted a quantitative approach by testing questionnaires with music teachers and learners	2022 February – 2022 May
II. Assessment of the current status of music teachers' use of ICT in the context of changing paradigm education (Teachers' questionnaire)	The study used a quantitative methodology through an adapted questionnaire, a formal questionnaire distributed to music teachers in primary, secondary, high school, and vocational high schools	2023 January – 2024 January
III. Assessment of music teachers' changing roles in using ICT in the context of changing educational paradigms (Teachers' interviews)	The qualitative research through semi-structured interviews with primary, middle, and high school music teachers.	2024 February
IV. Observation of the teaching methods and ICT tools used by music teachers in different settings (Case study)	The case study describes 3 different scenes of music teacher's classroom through observation	2024 June

In the future of music education, ICT learning cannot be ignored; it is already a necessity for music teachers' competency, and music teachers should pay attention and focus on their ICT learning competency to improve their competency structure. Currently active models of music education are summarised in global perspectives, curriculum development, diversity of models including personalisation, student-centred approaches, research applications, cultural approaches, and integration of technology, and the role of teachers in solidarity and learning communities goes far beyond a single line of demarcation. They are facilitators, collaborators, and mediators of personalised teaching and learning, and the ICT Competency Model for Music Teachers reflects the dynamic and evolving nature of music education in the context of changing educational models. Teachers should have the technical skills, pedagogy, student-centred learning, collaboration, critical thinking and problem solving, and digital literacy competencies to be able to use ICT tools correctly in the teaching and learning process.

During the literature review, the deductive paradigm was followed when the literature is examined and ways of solving the problem are formulated based on it. After analysing the literature, questionnaires were distributed to music teachers and learners to assess the current

status of music teachers' use of ICT and learners' attitudes toward teachers' use of ICT. After the preliminary analysis, more in-depth questions were asked, the sample was expanded to include a larger number of music teachers, and then the data was collected. Teaching music teachers were also interviewed to conduct interviews, and after the interviews, the music teachers' first-turn responses were coded and analysis to draw conclusions about the research questions.

To further reveal the development of ITC in music teachers in the context of changing educational paradigms, a three-case study was conducted. In this case, we observe the learners' reactions to the different teaching methods and ICT tools used by the teacher when teaching singing, music appreciation and learning musical instruments, in order to have a better understanding of the content and presentation of the teacher's lessons through the camera. This helped to understand the music teachers' use of ICT, their competency and the transformation of teachers' roles in the changing educational paradigm. This helped to understand the difficulties and challenges faced by teachers after using ICT and what teachers have to do to improve their ICT competency in the future.

In the fourth stage, the observation method was used to observe and describe three cases. In learning songs, the teacher used ICT tools combined with the Orff method to bring the learners to an immersive classroom, so the learners became the main body of the classroom for self-learning and exploring the different parts of the songs; in the music appreciation class, the teacher used Kodály pedagogy to teach the learners the beat in the songs, and then combined the ICT tools to integrate the classroom content to guide the learners. In the music appreciation class, the teacher taught the learners the beat of the song according to the Kodály method and then integrated ICT tools to guide the learners in the classroom, and in the learning of musical instruments, the teacher made animated videos and music games for the learners to learn music knowledge through games. Through observation of the case, it is clear that music teachers change their teaching methods in different teaching environments, and ICT tools in the classroom provide more choices for changing teaching methods and richer classroom content.

The process of the research questions research design scheme (see Figure 9) is as follows.

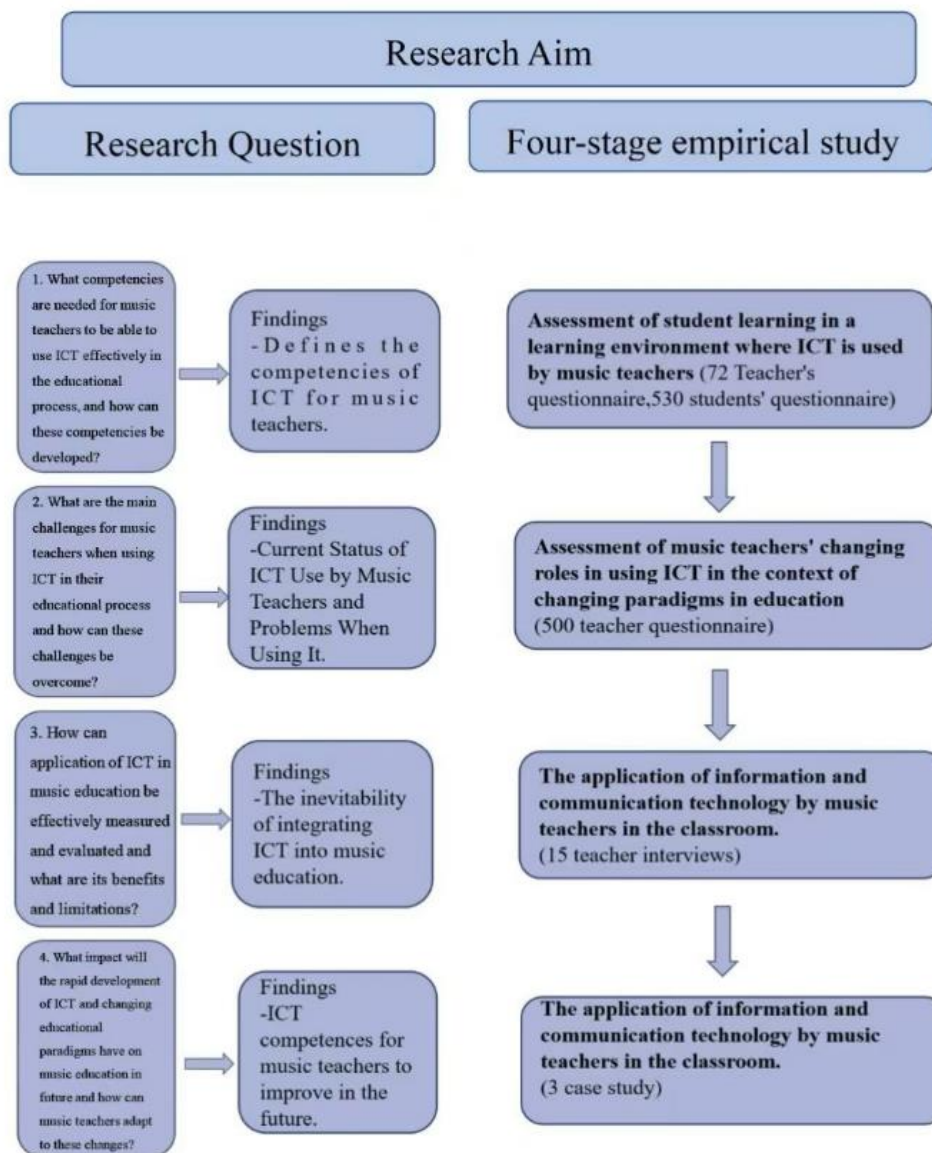


Figure 9. The research design scheme

Based on the above research framework, this study used questionnaires, interviews, and observations to collect data to understand the current situation of music teachers' use of ICT in the classroom, analyse the challenges in their use of ICT, and explore their perspectives on the evolving music education paradigm. The findings aim to provide a basis for promoting the use of ICT among music teachers within this changing paradigm and offer suggestions for future improvements, including identifying factors that affect teachers' ICT use and supporting recommendations to promote ICT integration in music education.

Taking into account the theoretical basis of the topic under consideration, the dissertation was organised as follows:

1. Analysis of the existing literature was performed to understand the theoretical

background of ICT competencies for music teachers and the current situation related to the music education paradigm. This also included conducting a literature review to achieve the research aim, objectives, and research questions.

2. In the first stage of data collection, an exploratory questionnaire was conducted based on the identified problem. The main objective of exploratory research is to develop knowledge and understanding of a topic from different perspectives. It was applied because there was insufficient information on the topic. The exploratory research helped to define the research questions more clearly and explore different perspectives, identifying possible patterns that could guide future research.

3. In the second stage, based on the results of the pre-survey questionnaire, data processing was carried out to reconceptualise the initial data collection, refine the research aim and objectives, and iterate upon them. Additionally, interviews were conducted to gain a deeper understanding of the use of ICT by music teachers within the constantly changing paradigm of music education.

4. In the third stage, based on the analysis of the interviews, the questionnaire was refined, the sample size was confirmed, and the formal distribution of the questionnaire was carried out, along with data collection and processing, to produce the final results.

5. In the fourth stage, using the observation method, three cases of music teachers' classes were observed. The different teaching methods and ICT tools used by teachers in music classes, when teaching songs, musical instruments, and music appreciation, were observed according to different scenarios and content.

3.2. Reliability, validity and representativeness of the study sample

3.2.1. Description of the quantitative pre-survey sample

In this research, a questionnaire was used to find out the current status of music teachers' use of ICT and the problems that have arisen, as well as learners' attitudes towards teachers' use of ICT in music lessons, with a focus on the factors that influence music teachers' use of ICT. Interviews were conducted with music teachers at all grade levels, and teacher interviews included interviews with music teachers in primary, middle, and high schools. The pre-survey was conducted in 2021, the study sample consisted of 72 music teachers from different schools in China, the average working experience of the respondents was 3-5 years, the respondents were university graduates, and all of them had teaching certificates.

Table 4. *The distribution of pre-survey sample*

Variable	Category	Frequency	Percent (%)
Teacher's educational background	Associate's degree	4	6
	Bachelor	58	80
	Master	10	14
Teacher's qualification	Senior lecturer	0	0
	Senior instructor	2	3
	First-grade instructor	12	17
	Second-grade instructor	44	61
	Third-grade instructor	14	19
Teacher's teaching experience	1-3 years	22	31
	4-6 years	24	33
	7-9 years	6	9
	10-15 years	8	11
	16-20 years or more	12	16
Teacher's gender	Male	4	5
	Female	68	95
	Second-tier cities	4	5
	Third-tier cities	18	25
	Fourth-tier cities	50	70
Type of school	Primary school	59	81
	Junior high school	10	14
	High school	2	3
	Vocational high school	1	2
Teacher staffing	Staffing of public institution	63	87
	Personnel agency	3	4
	Labour contract	6	9

The selection of 9-12 year old learners to participate in the questionnaire is based on the cognitive development of the learners: 9-12 years old is an important stage in the cognitive development of learners, based on Piaget's (1932) theory of cognitive development, this age group of learners is gradually from the stage of concrete operations to the stage of formal operations, and they begin to have a certain degree of abstract thinking and logical reasoning, and they are able to understand and answer relatively complex questions. Learners between the ages of 9 and 12 are further developing their verbal skills and are able to understand the meaning of the questions more accurately and respond in writing, which reduces comprehension bias in the design of the questionnaire. Learners in this age group are more likely to be in the upper primary and lower secondary stages, where the school curriculum and activities are more varied, covering academics, arts, sports, etc. The topics of the survey are related to art, music, reading habits, etc. They can provide meaningful responses based on their daily school activities or extracurricular interests. Schools provide an organised environment for the survey, allowing for a more efficient sample of 9-12 year old learners to be obtained, increasing the reliability of the questionnaire

administration and the quality of the responses to be more informative. For these reasons in this study in 2022, we administered the questionnaire to a sample of 530 primary school learners aged 9-12 from different schools in China. as presented in Table 5.

Table 5. *The frequency analysis of learners' demographic variables*

Variable		Frequency	Percent (%)	Mean	Std. deviation
Gender	Boy	258	49	1.51	0.50
	Girl	272	51		
Grades	9 years	338	64	1.55	0.79
	10 years	92	17		
	11-12 years	100	19		

Regarding the research data analysed in Table 4 above and its overview, it reflects the distribution of respondents. The mean represents the central tendency, and the standard deviation indicates variability. According to the results of the frequency analysis for each variable, the distribution generally meets the requirements of the sampling survey. For example, in the gender survey, the proportion of boys was 49% and the proportion of girls was 51%, making the survey results representative of each gender. The grade distribution showed 64% in the fourth grade, 17% in the fifth grade, and 19% in the sixth grade. The results of this survey indicate a bias towards the use of online courses by fourth graders.

3.2.2. Quantitative study of the sample

In contrast, the official questionnaire was distributed online, with a total of 523 surveys issued. The actual number of collected questionnaires was 500. The criteria for eliminating invalid questionnaires were as follows: (1) eliminating questionnaires completed in less than 300 seconds, according to the response time recorded in the background data, and (2) eliminating questionnaires with obvious patterns in the responses. Based on these criteria, 500 valid questionnaires were retained, resulting in a recovery rate of 95.6%.

Given that traditional paper questionnaires are prone to omissions, the electronic format was chosen to mitigate this issue. To ensure the validity and scientific integrity of the questionnaire, the study provided an explanation of the content and purpose in the preface, informing respondents that the survey was anonymous to encourage honest responses. It was also emphasised that all questions should be completed personally by the music teachers. Ultimately, 500 valid questionnaires were collected, maintaining a recovery rate of 95.6%.

Table 6. *The distribution of formal survey sample*

Variable	Category	Frequency	Percent (%)	Mean	Std. Deviation
Teacher's educational background	Associate's degree	57	11.40	2.00	0.49
	Bachelor	391	78.20		
	Master	48	9.60		
	Ph.D.	4	0.80		
Teacher's qualification	Senior lecturer	1	0.20	3.91	0.74
	Senior instructor	17	3.40		
	First-grade instructor	106	21.20		
	Second-grade instructor	279	55.80		
	Third-grade instructor	97	19.40		
Teacher's teaching experience	1-3 years	141	28.20	2.77	1.54
	4-6 years	124	24.80		
	7-9 years	54	10.80		
	10-15 years	70	14.00		
	16-20 years or more	111	22.20		
Teacher's gender	Male	77	15.40	1.85	0.36
	Female	423	84.60		
Classification of cities	First-tier cities	3	0.60	3.60	0.61
	Second-tier cities	23	4.60		
	Third-tier cities	145	29.00		
	Fourth-tier cities	329	65.80		
Type of school	Primary school	317	63.40	1.57	0.88
	Junior High school	115	23.00		
	High School	35	7.00		
	Vocational high school	33	6.60		
Teacher staffing	Staff of public institution	431	86.20	1.32	0.87
	Personnel agency	19	3.80		
	Labor dispatching	8	1.60		
	Labor contract	42	8.40		

The basic information of the 500 music teachers who participated in this questionnaire study is as follows. Based on the results of the analyses, the numerical characteristics of the demographic variables of the sample reflect the distribution of the respondents. The mean represents the central tendency, while the standard deviation indicates variability.

Based on the results of the frequency analysis of each variable, it can be seen that the distribution basically meets the requirements of the sample survey. The data in the figure show that 78% of the teachers have bachelor's degree, and they have received professional music study, of which 56% have the second-level teaching qualification, of which the teaching experience is evenly distributed, with 28% of teachers with 1-3 years of teaching experience, 25% of teachers with 4-6 years of teaching experience, and 22% of teachers with 16-20 years of teaching experience. Data on gender distribution showed that 15% of teachers were male and 85% were female, which is generally consistent with the gender ratio of 2:8 for music teachers in China.

Although 66% of the teachers were located in fourth-tier cities and 29% in third-tier cities, this result is centrally biased towards the distribution of music teachers in third and fourth-tier cities. The type of school in which teachers were employed was predominantly primary and secondary schools, accounting for 63%, while junior high schools accounted for 23%. This indicates that the survey respondents were predominantly primary and secondary music teachers. Regarding the respondents' titles, 86% were part of the professional establishment, indicating that they had undergone a rigorous evaluation and were appropriate for the scope of the study.

3.2.3. Qualitative research sample

Qualitative research methods and ethics used in the study. The research team used an open coding approach to analyse and interpret the data collected. The process of data analysis began with data collection and was transcribed and structured to divide the information into systematic categories and subcategories which were coded, classified, described and interpreted to ensure that the data were analysed in a scientific and systematic manner.

Table 7. The information on interviewees

Number	Type of school	Gender	Teacher's teaching experience	Teacher's educational background
01	Primary school	Female	5 years	Bachelor
02	Primary school	Female	4 years	Bachelor
03	Junior high school	Female	6 years	Bachelor
04	High school	Male	9 years	Bachelor
05	Junior high school	Male	5 years	Bachelor
06	Junior high school	Female	5 years	Master
07	Primary school	Female	7 years	Bachelor
08	High school	Female	3 years	Master
09	Primary school	Female	4 years	Bachelor
10	Junior high school	Male	7 years	Bachelor
11	Junior high school	Female	8 years	Bachelor
12	Primary school	Male	3 years	Bachelor
13	Primary school	Male	5 years	Bachelor
14	Primary school	Female	4 years	Bachelor
15	Junior high school	Female	6 years	Bachelor

During the interview phase, the study strictly adhered to the principles of research ethics.

Participants gave their fully informed consent to participate in the study and signed an informed consent form to ensure that the interviews were conducted voluntarily and that the participants were aware of the purpose and possible uses of the study. This code of research ethics reflects the respect and protection of participants' rights and interests. Fifteen school music teachers were surveyed using the interview method. The focus of these interviews was to gain a comprehensive understanding of teachers' views on and use of the music education paradigm in the classroom, as well as their perceptions of ICT use in the context of the evolving music education paradigm. In addition, the interviews explored the factors influencing teaching and learning strategies in the classroom.

3.3. Research methods, ethics, data collection and processing

Research methods. Early research in music education often used quantitative methods. Much of the work carried out in the mid-20th century related to drills and practice activities, often in relation to pitch discrimination, subjects' competency to recognise rhythms and/or chord progressions, etc. From the 1940s through to the 1980s, researchers focused on improvements in large-scale project design, participant numbers, and data analysis (Roulston, 2006).

In contrast, researchers using qualitative research methods argue that those in the field of music education should explore certain areas of scientific methodology while simultaneously developing the humanities and liberal arts. This combination would provide a wealth of data that should be collected with sufficient rigour and include the necessary contextualisation (Yarbrough, 1996). While quantitative and qualitative research are appropriate for different music education issues, the issue examined in this dissertation can be most simply defined as techniques related to the collection, analysis, interpretation and presentation of digital information (Teddlie & Tashakkori, 2009) that are appropriate for collecting data to analyse the extent to which the use of ICT by music teachers is quantified through the use of data.

Qualitative methods can be most simply defined as techniques related to collecting, analysing, interpreting and presenting narrative information (Teddlie & Tashakkori, 2011). Qualitative (thematic) data analysis involves the examination of narrative data using a variety of techniques, including inductive and iterative processes, categorisation strategies, and contextual strategies, whereas music teachers' understanding of the music education paradigm cannot be quantified using a scale based on each teacher's life context as well as their educational backgrounds, so interviews can be conducted to better understand the music teachers' perspectives on the music education paradigm. Another definition states that mixed-methods research is when a researcher

collects and analyses data, integrates findings, and draws inferences in a research or survey programme using both quantitative and qualitative methods or instruments (Tashakkori & Creswell, 2007). Defining mixed methods as "a research design that uses both quantitative and qualitative methods in the type of questions, research methodology, data collection and analysis procedures, and/or inferences" (Tashakkori & Teddlie, 2003, p. 711).

In Mutch’s study (2009), a preliminary concept map was derived from a survey of the relevant literature and knowledge and experience. Following the initial conceptual map, a survey was conducted to develop a second conceptual framework. This framework was based on empirical data and developed changes for the next phase of the investigation. Continuous data analysis and ongoing conceptual reframing allowed fluid interaction and testing of ideas within a coherent framework. Figure 10. is drawn by Mutch (2009) that outlines how this process was carried out.

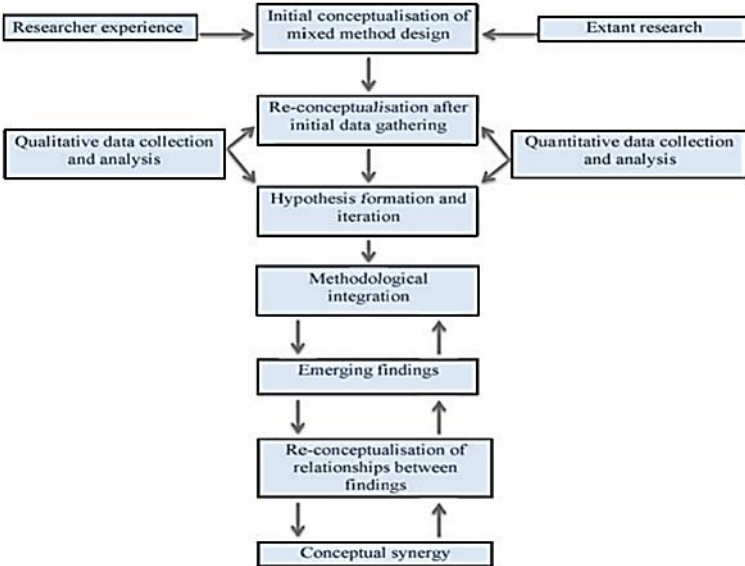


Figure 10. The conceptual diagram adapted by Sammons & Gu (2008)

Creswell and Creswell (2023) state that empirical research often uses qualitative, quantitative or mixed methods to approach data. Qualitative methods are used to explore ideas in depth, often resulting in new constructions of meaning. On the contrary, quantitative methods assume that research questions can be quantified statistically. The primary purpose of quantitative methods is to test predefined hypotheses. Finally, mixed methods combine qualitative and quantitative research in the same study.

Research ethics. In the questionnaire on the use of ICT by music teachers, most of the data is used solely for analysis and not for other purposes. The data provided by the respondents is considered confidential; however, the respondents may be concerned that their privacy could be

leaked and used inappropriately. To address these concerns and maintain professional ethics, the introduction of the questionnaire clearly states that the information will be kept confidential. Respondents are informed of their right to know how the questionnaire data will be used, ensuring transparency and building trust. Ethical principles were followed during the interviews related to the music education paradigm. Research participants are informed about the purpose of the research and the possibility of using the results, as well as recording interviews only after obtaining consent. Confidentiality was also maintained to ensure the security of the information during the study. Participation in the study was voluntary and the creation of a safe environment was one of the main principles to ensure trust and psychological comfort during, before and after the interviews. This study sought to build trust in the foundational relationship with music teachers, and the interpretive assumptions of the qualitative study assumed that the findings should not be taken as “one truth” but understood as a product of social construction. The experiences of the music teachers in this study are not an objective reflection of the reality of the research participants. When it was found that the research participants could be identified, the research did not use the recorded parts of the dialogue but used memos or other means for this purpose.

Fragments of dialogue. During the interviews, the research participants were not informed that the data were obtained from other informants. The research participants were clearly informed about the aims of the study without specifying exactly how the study was conducted. Only when asked about the progress of the study did the researcher reveal some information about further research plans so as not to influence the subjects’ responses.

Data collection and processing. For the questionnaire, since paper forms are easy to misplace and electronic questionnaires can prevent this issue, this dissertation primarily used the online questionnaire software "*Questionnaire Star*" to conduct the survey. To ensure the validity and scientific accuracy of the questionnaire, the researcher explained its content and purpose in the preface and informed the respondents that their responses would remain anonymous to encourage honest answers. All questions were completed by the music teachers themselves. Consent was also obtained from the schools and the parents of the 530 learners aged 9-12 years who participated in the questionnaire. The principles for eliminating invalid questionnaires during data processing were: (1) excluding questionnaires with a completion time of less than 300 seconds, based on the response time recorded in the background data, and (2) excluding questionnaires with obvious patterns of regularity. After pre-processing, the data were analysed using *SPSS Version 29*.

Fifteen music teachers were interviewed and transcribed using telephone interviews, with the help of qualitative research the research data obtained was analysed and interpreted with the help

of open coding methodology of the concept. Qualitative data analysis began with data collection, writing (transcription), and structure. The data were coded as follows, categorised, described, and interpreted. By grouping information into systematised information categories and subcategories (Bitinas, Rupšienė, Žydžiūnaitė, 2008). Presented in tabular form. All data were systematised and justified by defining categories, assigning subcategories, and justifying the responses with statements from the respondents. In qualitative research, it is especially important to respect the research participants: every effort has been made to minimise disturbing them and to do justice to their expressed ideas (Creswell, 2014).

Ethical principle. Ethical principles were followed in the analysis of data, e.g. questionnaire, to ensure the validity, legitimacy and reliability of the research. Ensuring informant consent: before starting the questionnaire, the purpose of the research, the intended use, how to participate, and possible risks and benefits were clearly stated; a short informed consent form was prepared and instructions were inserted at the beginning of the questionnaire, which participants confirmed that they had read and agreed to before continuing; it was ensured that participation was voluntary and that the participant had the right to withdraw at any time without explanation and without experiencing negative consequences; for minors (e.g. learners aged 9-12) written consents were obtained from parents or guardians. Protection of privacy and data confidentiality: it was ensured that no personally identifiable information (e.g. name, surname, specific address, school number, etc.) was provided for the design of the questionnaire. Where such information was required, the purpose was clearly explained: using numbers instead of participant information. Avoiding bias and discrimination: treating all participants fairly. Questionnaires were designed to respect all individuals and to be free from offensive or discriminatory language: avoiding questions that contained gender, racial, cultural, or social bias; ensuring that questions were worded neutrally and did not encourage specific answers; avoiding biased questions such as “Do you think this is a bad approach?”. Neutral statements such as “What do you think about this approach?” were used instead of biased questions such as “Do you think this method is bad?”. Minimizing psychological burden on participants: ensuring that responses to the questionnaire were not linked to an assessment or possible punitive consequences; emphasising to learners, that there were no right or wrong answers and that the aim was to inform rather than to judge the individual. The objectivity and transparency of the results were ensured: data were not used selectively, data that did not meet expectations or results were not included; and the analysis methods met scientific standards; this is done by documenting all stages of the analysis for review or reconstruction. Relevant legal and ethical norms and privacy protection laws were observed.

4. RESULTS OF RESEARCH ON MUSIC TEACHERS' ICT COMPETENCIES IN THE CONTEXT OF CHANGING EDUCATIONAL PARADIGMS

4.1. Analysis of music teachers' competencies in using ICT

To investigate the role of ICT in music education, the following groups of questions were identified: how frequently ICT is used by music teachers; what ICT is used for; preparation of music teachers to apply ICT; the most proven means of ICT application, positive and negative factors of ICT application. Therefore, the first group consisted of questions, which allowed for revealing the frequency of ICT application for educational goals (see Figure 11).

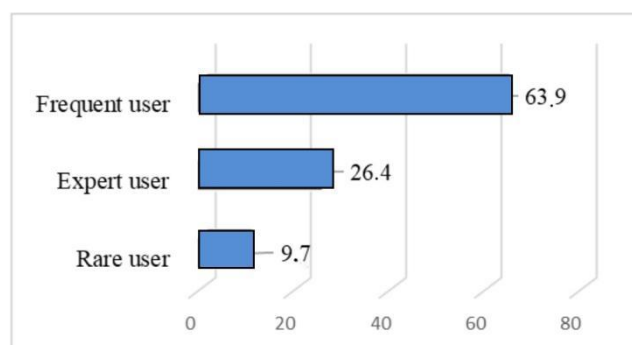
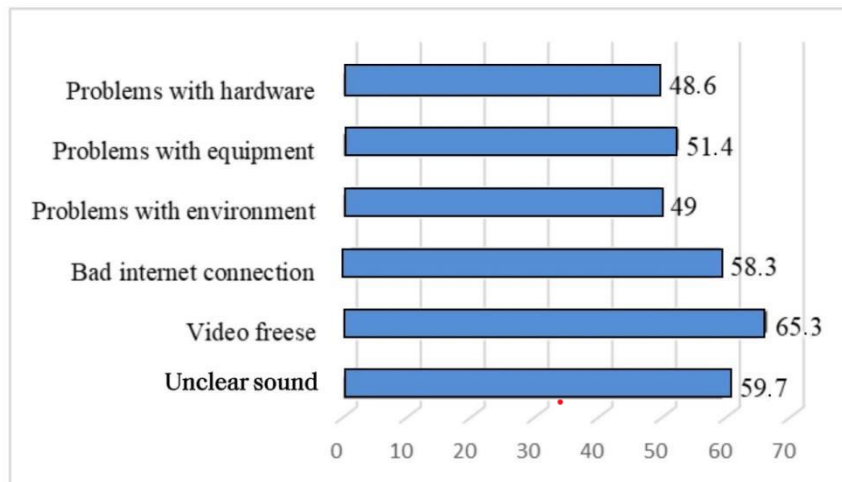


Figure 11. Music teacher's computer proficiency (%)

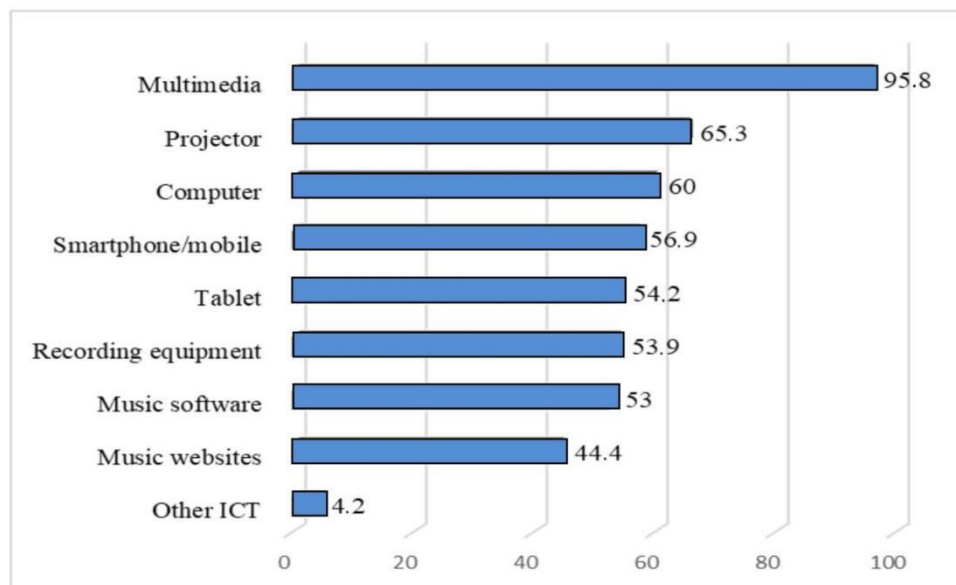
From the research data presented in Figure 11, it can be stated that 63.9% of music teachers use ICT to a frequent, and 26.4% of teachers are experts in ICT. Teacher proficiency in the use of ICT directly affects the effect of the class, so in subsequent teaching, the training for teachers is also very important. Younie et al. (2013) argue that teachers often lack the teaching experience related to integrating the latest technologies into teaching. Gaining this experience requires the support of the school administration, technical assistance, and a reliable technology infrastructure to facilitate the integration process (Kimav & Aydin, 2020).



NB: some respondents marked several variants.

Figure 12. Difficulties in using ICT in music lessons (%)

Research data showed (see Figure 12) that more than half of music teachers believe that difficulties in using ICT in music lessons arise when the video freezes (65.3%), the sound is unclear (59.7%), the internet connection is poor (58.3%), and equipment problems occur (51.4%). The role of ICT in teaching is to enable learners to actively engage in music lessons. Continuity in classroom learning is essential. For example, if a video played to learners in the classroom is intermittent, their attention will be distracted, which will negatively affect the effectiveness of using ICT in teaching.



NB: some respondents marked several variants.

Figure 13. The types of ICT used in music lessons (%)

According to data (see Figure 13), 95.8% of music teachers use multimedia, 65.3% use projectors, 60% use computers, 56.9% use smartphones, and 53% use music software. Integrating multimedia ICT into music education allows for the innovation of traditional music education concepts. Teachers can establish a learner-centred approach and design music education activities based on learners' needs. Using multimedia technology to present music knowledge can stimulate interest in music learning and improve the overall quality of music education (Yang, 2020). It is evident that multimedia is the primary method used in the classroom, as it allows content to be presented in a more comprehensive manner.

Table 8. *The music teachers' attitude towards music learning during Covid-19 (%)*

Factors	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I will require more ICT skills to face similar situations in the coming days/future	58	27.8	9.8	0	4.4
I like taking online lectures more	48.6	29.2	22.2	0	0
I find teaching in the physical classroom more effective than teaching online	41.7	20.8	37.5	0	0
I think that my institution's infrastructure is well-equipped to conduct online teaching and assessment activities	43.1	40.3	16.6	0	0
My institution provided training on how to conduct online lectures and assessments if needed	38.9	31.9	29.2	0	0

Large-scale online teaching became a necessity during the epidemic. The global spread of COVID-19 made it impossible for schools in many countries to conduct in-person teaching. For the safety of learners, schools had to implement remote online teaching. Learners could study in a safe environment and participate in both synchronous live teaching and asynchronous learning through online platforms such as Xuexitong and Tencent Conference, effectively preventing delays in their learning progress. Consequently, this approach has certain advantages, particularly in the teaching of music theory courses (Li, 2020).

According to the research data in Table 8, 58% of teachers strongly agree that more ICT will be used in the classroom after the epidemic, and nearly half of teachers (48.6%) enjoy using ICT in class. While 41.7% of teachers believe that physical classrooms are more effective than online classes, 37.5% of teachers have a neutral view and are uncertain about effectiveness. In addition, 43.1% of teachers agreed that their school's infrastructure is capable of supporting online teaching.

Although distance teaching and in-person teaching share educational commonalities, they operate in different time and space contexts, requiring different procedures and competencies. One significant issue exposed by online teaching during the epidemic is that teachers lack adequate training for online teaching (Du, 2020). The results indicate that 38.89% of teachers have received technical training for online classes. The widespread adoption of online education has covered almost all subject areas from primary school to university, with music courses increasingly included in online offerings. The outbreak of the COVID-19 pandemic led to the suspension of in-person classes in almost all universities and colleges, forcing learners to take online lessons at home using computers, tablets, and mobile phones. The use of ICT technology will become an indispensable part of music teaching in the future, with more and more teachers expected to incorporate it into their music instruction.

Table 9. *The factors important to music teachers in using ICT during music lessons (%)*

Factors	Extremely important	Very important	Moderately important	Slightly important	Not at all important
Making music teaching easy	52.8	34.7	6.9	5.6	0
Facilitating learners' self-directed learning	40.3	27.8	22.2	9.7	0
Evoking learners' curiosity and excitement	52.8	26.4	12.4	5.6	2.8
Increasing the academic performance of learners	43.1	25.0	16.7	12.4	2.8
Promoting learner collaboration	51.4	25.0	15.3	6.9	1.4
Promoting the parents' collaboration	40.3	29.2	12.5	11.1	6.9
Promoting the development of musical skills	51.4	22.2	19.5	6.9	0
Encouraging learners to participate more in learning activities	56.9	20.9	12.5	9.7	0
Improving the atmosphere in the classroom	75.0	12.4	5.6	4.2	2.8
Increasing personal qualities (creativity, artistry, responsibility, etc.)	54.1	25.0	13.9	4.2	2.8
Increasing the use of modern music education techniques and music education methods	55.6	23.6	12.4	2.8	5.6

Computer music technology has the characteristics of efficient and convenient music teaching (Kimav & Aydin, 2020). More than half (52.8%) of music teachers believe that ICT makes music teaching easier, and 40.3% of teachers think that enabling learners to learn by themselves is a very important factor. There are many applications of ICT in their daily lives, so that learners can use ICT proficiently. And they can learn by themselves, and they will actively

learn music knowledge when learners are interested. Therefore, 52.8% of teachers believe that using ICT can arouse learners' curiosity and excitement. When learners are actively learning and interested in learning music, it is easier to improve learner outcomes. 43.1% of teachers believe that the use of ICT can improve learner performance is a very important factor. In traditional music classrooms, teachers mostly use the effective combination of books and whiteboards, that is, they let learners learn to sing songs based on books or write lyrics and staff on the blackboard. This teaching method not only wastes time but also fails to allow learners to appreciate music. The interesting part of music has hindered the development of music teaching to some extent (Huang et al., 2020). The use of ICT in music lessons can promote learner collaboration and promote the development of musical skills (51.4%). As far as the interaction with parents is concerned, due to the age of the learners, the interaction between learners and their parents during learning can increase (40.3%). The proficiency in ICT use will gradually no longer need the help of parents, so 6.9% of teachers believe that the interaction between parents and parents when using ICT in teaching is not important. More than half of teachers consider it very important to encourage learners to participate more in learning activities (56.9%) and increase personal qualities (creativity, artistry, responsibility, etc.) (54.1%). The use of ICT in music lessons also improves the atmosphere in the classroom (75,0%) and increases the use of modern music education techniques and music education methods (55.6%).

The use of ICT for teaching has become a trend in music education. The use of ICT in music education not only brings great convenience to music teaching but also allows learners to have more fun learning music. Various factors make ICT play a very important role in music education, so it is important to meet the requirements of the times, to continue learning and to improve teaching methods to make music teaching more effective.

4.2. Online course on music education resources to promote the development of music ICT

With the new crown pneumonia epidemic, online music education has forced most music teachers and learners to use this method for teaching and learning, but because this is a new type of education model, the point of view is that online music education provides material conditions for the large-scale dissemination of music knowledge, improves the impartiality of education, and promotes the interaction and collaboration among the participants of teaching activities (Zhang, Xi & Fu 2021). That online music education is a comprehensive music learning platform for

people with different music education backgrounds, using the internet as a communication medium (Bai 2016). Learners are free to choose the music courses they are interested in without the constraints of time and space. That learners' online music learning is conducive to promoting learners' understanding of their own learning; learners can choose courses that they are interested in or have expertise in and can also help learners to conduct secondary learning or even multiple learning (Li 2021). With self-directed learning, learners' subjective enthusiasm can be greatly enhanced. Zhang (2021) writes, that online music education can be divided into three types, B2C, O2O, and C2C. Having so many different media and music resources available for analysis, some music teachers have a hard time deciding which favourite pieces, or even favourite genres, they want to study. In some cases, diversity itself creates problems and learning opportunities (Schmidt-Jones, 2018). This is why music teachers should be more careful in selecting open resources and various information communication technologies.

Xiaoyezi Partner, Homework Club, and Ape Counseling *Xiaoyezi Partner, Homework Club, and Ape Counseling* are examples of B2C online music education software. These platforms offer various disciplines, but *Xiaoyezi Partner* is specifically designed for music learning. Unlike other subjects, online music education requires real-time interaction. *Xiaoyezi Partner* allows music teachers to engage directly with learners for teaching and practice, providing immediate correction of mistakes. In contrast, *Homework Club* and *Ape Counseling* primarily serve other types of learning. These platforms use pre-recorded videos and do not offer real-time interaction, though learners can review content repeatedly and leave messages on the platform.

For O2O (Online-to-Offline) models like MOOC and Classical Piano, these resources are beneficial for music teachers. They can use the extensive music teaching materials available on these platforms to enrich classroom activities and enhance teaching quality. The C2C (Customer-to-Customer) teaching model, used by platforms such as *Zoom, Tencent Meeting, DingTalk, and Teams*, was particularly relevant during the COVID-19 pandemic. This model shifts offline classrooms to an online environment, allowing teachers and learners to interact face-to-face in real time.

However, the C2C model differs from the B2C and O2O models in that it requires music teachers to manage multiple learners simultaneously. Teaching music to a large group online presents challenges in maintaining learner engagement and concentration. Teachers must adapt their skills and methods to effectively apply this online model, which tests their proficiency in both online education and music teaching techniques.

Table 10. The frequency of using online course software

Software	Responses (N)	Percent (%)	Percent of cases
<i>Ding Talk</i>	442	54.4	83.4
<i>Homework Club</i>	170	20.9	32.1
<i>Ape Counselling</i>	91	11.2	17.2
<i>Youdao Premium Course</i>	40	4.9	7.5
<i>Xiaoyezi Partner</i>	31	3.8	5.8
<i>Other</i>	39	4.8	7.4
Total	813	100	153.4

According to the research data presented in Table 10, the frequency of using online course software in this survey is as follows: N represents the number of responses, 813, and the percentage is calculated as 54.40% (442/813), while the percentage of cases refers to the percentage based on the sample size, which is 83.40% (442/530). The response frequency distribution reveals that primary school learners most frequently use *Ding Talk* and *Homework Club*, and *Xiaoyezi Partner* is used less frequently. According to the survey data, 54.4% of the learners chose to use *Ding Talk* as the online course software, indicating that this platform is the most popular among the primary school learners interviewed, while 20.9% of the learners used *Homework Club*, which was significantly less frequently used than *Ding Talk*, and the other platforms were relatively less frequently used, further suggesting that *Ding Talk* is widely used among primary school learners. The relatively low usage of the other platforms further indicates that *Ding Talk* is widely used among primary school learners. These data reflect the market distribution of different e-learning tools and can be used as a reference for subsequent research, policy making or instructional design.

Table 11. The results of the reliability analysis of the dimension of reasons for choosing online courses

Reason	Scale means if item deleted	Scale variance if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if item deleted	Cronbach's alpha
Convenience	16.60	22.728	0.463	0.269	0.593	0.659
Time freedom	16.72	24.593	0.313	0.185	0.637	
Repeatable learning	17.26	24.056	0.375	0.296	0.62	
More teaching resources	17.24	23.709	0.38	0.296	0.618	
More interesting music content	17.18	23.552	0.355	0.147	0.626	
Teacher recommendation	16.25	22.965	0.416	0.268	0.607	
Parents request	16.12	24.432	0.274	0.208	0.651	

From the results of the reliability analysis (see Table 11), the overall standardised reliability coefficient is 0.659 in terms of reasons for choosing online courses. As can be seen from the removed reliability coefficients, they are all less than the overall 0.659. Therefore, the reason for using an online course is that this question does not require adjustment.

Table 12. *The reasons for using online music education software (%)*

Reasons	Strongly important	Very important	Neutral	Important	Unimportant
Convenience	19.43	16.04	33.21	11.89	19.43
Time freedom	21.13	19.62	28.49	15.28	16.47
Repeatable learning	37.36	23.21	20.00	10.75	8.68
More teaching resources	38.49	22.45	17.55	11.32	10.19
More interesting music content	40.19	19.25	16.42	10.94	13.12
Teacher recommendation	13.58	17.74	21.7	17.74	29.25
Parents request	13.77	16.23	19.06	13.77	37.17

According to the research data in Table 12, there is a clear trend in the reasons why learners chose online music education software: 40.19% of learners said they chose to use online music learning software because it provided more interesting music content, which indicates that interest-driven is one of the main motives for learners to choose online learning platforms. 38.49% of learners believed that online music learning software provided more teaching resources was an important factor in their choice of the platform, which reflected the importance of resourcefulness in learners' decision-making. 37.17% of learners believed that parental requirements were the least important factor in their choice of online music education software, and 29.25% of learners believed that teachers' recommendations were not the most critical factor either.

These data indicate that learners no longer rely solely on their parent' and teachers' opinions when choosing online software, suggesting that they have become more autonomous and independent, and are paying more attention to their own learning interests and needs. This change reflects the transformation of learners' learning styles in the modern educational environment, i.e., learners are gradually shifting from an externally-driven mode of learning to an autonomous mode of learning, with an emphasis on personalisation, interest-orientation, and independent choice. In particular, they are more concerned about the interest of the teaching content and the richness of the teaching resources, and they show a concern for the direct learning effect and their personal needs. This phenomenon reflects the improvement of learners' ability to learn independently in

the modern educational environment and also reflects the advantages of online music education in terms of personalised learning and autonomy.

Table 13. *The reliability analysis of the frequency of online use of individual courses*

Course	Scale means if item deleted	Scale variance if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if item deleted	Cronbach's alpha
Chinese lesson	30.43	15.856	0.661	0.6	0.717	0.803
English	30.72	17.47	0.616	0.571	0.724	
Mathematics	30.78	17.604	0.591	0.446	0.73	
Science	29.45	22.475	0.58	0.406	0.747	
Fine Arts	29.52	22.908	0.463	0.428	0.758	
Music	29.84	22.372	0.332	0.209	0.773	
Sport	29.38	23.377	0.406	0.433	0.764	
Computer	29.38	23.926	0.372	0.449	0.769	

The results of the reliability analysis in Table 13 testify to the fact that for the frequency and reliability analysis of the online use of individual courses, the overall standardised reliability coefficient is 0.803. As can be seen from the removed reliability coefficients, they are all less than the overall 0.803. Therefore, the online use of this subject in individual courses does not require adjustment.

Table 14. *The online use of individual courses (%)*

Course	Four times a week	Three times a week	Twice a week	Once a week	Did not use
Chinese lesson	16.23	7.36	10.57	13.58	52.26
English	11.89	11.89	22.83	22.26	31.13
Mathematic	14.53	88.87	23.4	24.72	28.49
Science	0.94	0.57	2.64	13.02	82.83
Fine art	0.94	0.75	3.02	18.49	76.79
Music	0.75	3.96	16.79	13.77	64.72
Sport	1.51	0.38	2.83	3.58	91.7
Computer	0.94	0.57	1.13	8.87	88.49

According to the research data presented in Table 14, there is a significant difference in the frequency of learners in using online software for mathematics and music learning: 88.87% of the learners used online software to learn mathematics on a weekly basis, which suggests that online

learning in Mathematics is more prevalent among the learners and online educational resources are widely utilised. In contrast, 64.72% of learners do not use online software for music, which means that the use of online software for music is much lower than for maths. Only 16.79 per cent of learners used online software to learn music twice a week, and 13.77 per cent learnt music online once a week, indicating that online music learning was used less frequently.

These data suggest that most music teaching still takes place in traditional offline environments in schools and that the use of online software for music learning is more limited. This may be due to the fact that music education relies more on hands-on practice and teacher guidance, or that the content and interactive format of current online music education platforms are not yet able to fully meet the needs of learners. Therefore, while online learning in maths has achieved a high frequency of use, online learning in music remains more marginal.

Table 15. *The summary of the empirical research*

Reliability statistics		
Cronbach's alpha	Cronbach's alpha is based on standardized items	N of items
.746	.772	15

According to the research data in Table 15, the results of validity analysis show that the reliability of this questionnaire is good, with a standardised Cronbach's alpha value of 0.772, a coefficient which indicates that the questionnaire has a good internal consistency, and the reliability of the data is high. Generally, a Cronbach's alpha value greater than 0.7 indicates that the reliability of the questionnaire is within the acceptable range, which indicates that the questionnaire has a good correlation between the individual items and is able to effectively measure the topic under study.

In addition, the study used SPSS version 23 for data analysis and was tested using Exploratory Factor Analysis (EFA). This method helps to identify potential factor structures and ensures that the questionnaire entries can be reasonably grouped under different factors, thus further validating the validity of the questionnaire. Exploratory factor analysis helps to test whether the questionnaire accurately measures the intended constructs and dimensions by identifying factors common to the questionnaire items.

Table 16. *The KMO and Bartlett's Test*

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.775
Bartlett's Test of Sphericity	Approx. Chi-Square	2214.975
	df	105
	Sig.	.000

According to the results of exploratory factor analysis in Table 16, the KMO test coefficient is 0.775, which is located in the range of 0 to 1. It is usually considered that the data are suitable for factor analysis when the KMO value is greater than 0.7. The KMO value of 0.775 indicates that the sample data have good fitness for further factor analysis.

In addition, the significance of the Bartlett's test of sphericity is close to 0. This result indicates that the null hypothesis (i.e. there is no correlation between the variables) can be rejected. The significance of the Bartlett's test of sphericity is minimal, implying that there is sufficient correlation between the variables in the data to support factor analysis. Therefore, the combination of the KMO values and Bartlett's test results confirms that the questionnaire possesses good validity and that the data is suitable for exploratory factor analysis to further validate the structure and measurement validity of the questionnaire.

With the rapid development of information and communication technologies (ICT), online teaching has gradually become an important trend in music education. These technologies not only provide unprecedented convenience for music education, but also greatly enhance learners' interest and participation in music learning. Specifically, ICT provides the following advantages for music teaching: Enriched learning resources: Through the Internet, learners can access a variety of music learning materials anytime and anywhere, such as online courses, teaching videos, sheet music libraries, etc. This enables learners to choose their own learning content, increasing the flexibility and personalisation of learning. Enhanced interaction and participation: Online music education platforms are usually equipped with interactive features, such as real-time feedback, discussion forums and online answers, which enable learners to receive timely guidance during the learning process and enhance the sense of participation and interaction in learning. Facilitating cross-border teaching and learning: ICT enables teachers and learners to communicate and learn about music education across borders regardless of geographical constraints, especially for remote or resource-poor areas, ICT provides more opportunities for music education. Increased enjoyment and motivation: Through technologies such as multimedia and virtual reality, learners are able to learn music in more immersive environments, and gamification and interactive

learning methods enhance learners' motivation and enjoyment of learning. Adapting to the changes of the times and constantly improving teaching methods the development of ICT has led to changes in the field of music education, and it is important for teachers and educational organisations to keep up with the times and accept and adapt to the changes brought about by these technologies. Teachers need to continue to learn about new technological tools and platforms and incorporate them into their teaching practices in order to improve the effectiveness of their teaching and the learning experience of their learners. ICT will undoubtedly become an integral part of music education in the future. With the continuous innovation of technology, more teachers will more actively apply it in the teaching process, using big data, artificial intelligence and other technologies to further optimise the teaching content and methods, making music education more efficient and personalised. This not only provides learners with richer learning resources and experiences, but also provides teachers with more teaching support tools, pushing music education into a brand new era.

Based on the initial pre-survey questionnaire, a larger sample size was used for data collection to test the reliability and validity of the questionnaire, thereby ensuring that the survey data is more comprehensive and well-justified.

The results of this study provide an important basis for further research on teachers' online music education patterns. Through the survey of learners, the study not only understands the learning status of learners in using online music education but also reveals their learning patterns. Based on these data, music teachers can have a clearer picture of the actual situation of learners in using online music education resources, so as to optimise the teaching design and methods.

There are differences in learners' interest in and acceptance of online music education modes. Certain modes may be more in line with learners' learning habits and interests, while other modes may be less likely to motivate learners to learn. Therefore, understanding the preferences of different student groups for learning modes can help teachers design more targeted teaching programmes. Research has shown that learners have different learning needs and interests. Different types of learners should use different online music education modes to personalise their learning experience. Teachers can choose suitable online education platforms and teaching methods based on the factors affecting learners' choice of online learning software to ensure that each student can get the best learning results in the mode that suits him/her best. The richness of online music education resources provides teachers and learners with more learning options. Teachers can make full use of these educational tools to supplement classroom teaching according to the content of classroom teaching and the characteristics of online resources. For example, through the interactive learning, instant feedback, and video tutorials provided by online platforms,

teachers can help learners gain a deeper understanding of music theory and skills. Learners' interest in online music education is usually related to the interactive, fun and personalised nature of the learning model. Designing more engaging teaching modes can greatly increase student engagement and motivation to learn. The results of the study suggest that teachers should focus on incorporating interactive and fun elements into their teaching in order to increase learners' engagement and motivation in learning.

The research provides valuable data support and theoretical basis for music teachers' practice in online music education. Teachers can design diversified online education modes according to the actual situation and needs of their learners in order to fully utilise the advantages of online music education resources to help learners better master music knowledge and skills, as well as to enhance their interest and motivation in learning. In future teaching, the flexible use of online music education modes will be an important way to enhance the effectiveness of music teaching.

4.3. Analysing factors influencing the use of music teachers' ICT competencies in a changing context

The research analysis part of the formal questionnaire describes in detail the data collection and the basic profile of the respondents. Based on the feedback from the initial pre-survey questionnaire, the research team conducted the formal questionnaire by enlarging the sample size to improve the reliability and validity of the results. Specifically, 500 music teachers participated in the survey. 523 questionnaires were distributed and 500 were actually collected, which is a high recovery rate. Among the teachers who participated in the survey, 78% had a bachelor's degree and had received professional music study. This indicates that most of the teachers have certain professional knowledge and background and are able to conduct more professional music education. 56% of the teachers have a Grade 2 teaching qualification, which further indicates that the respondents have a high professional level, which is in line with the requirements of the survey and the reliability of the study. The distribution of teachers' years of teaching experience was relatively even, showing that teachers at different stages of experience participated in the survey. Specifically, 28 % of teachers had 1-3 years of teaching experience, 25% had 4-6 years of teaching experience, and 22% had 16-20 years of teaching experience. This distribution helps to ensure that the survey results reflect the perspectives and practical experiences of teachers of all ages. The gender distribution data shows that 15% of teachers are male and 85% are female, which is consistent with the general gender ratio of music teachers in China (about 2:8) and reflects the

dominance of female teachers in the field. Among the survey respondents, 66% of teachers came from fourth-tier cities and 29% from third-tier cities, indicating that teachers from third- and fourth-tier cities dominate the sample. As the geographical distribution of Chinese music teachers is more concentrated in these cities, this distribution feature helps to better reflect the situation of teachers in these areas. In terms of school type, 63% of teachers work in primary and secondary schools, while 23% teach in junior high schools. This means that music teachers in primary and secondary schools predominate, which is consistent with the overall structure of China's education system. The fact that 86% of the teachers interviewed in the survey belonged to the professional establishment suggests that the participants' titles and positions had been rigorously assessed and that they possessed more formal educational qualifications. Such data characteristics make the survey sample more in line with the needs of the study and ensure the representativeness and validity of the research participants.

4.3.1. Analysis of the current status of music teachers' competencies in the use of ICT

Through the description of these basic situation data, this research ensured the representativeness and diversity of the survey sample and provided a solid foundation for the subsequent data analysis. The participation of teachers with different academic qualifications, teaching ages, genders, geographic regions and school types enabled the findings to comprehensively reflect the diverse backgrounds of Chinese music teachers and their educational practices. In addition, the professional backgrounds and titles of the teachers also provide a guarantee of the reliability of the study results. The reliability and validity of the questionnaire assessing music teachers' competencies to use ICT in music teaching and learning in Appendix 1 was verified by analysing the reliability of the questionnaires of the interviewed teachers.

Table 17. The overall reliability coefficient

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.951	0.958	135

In terms of the overall reliability coefficient, the standardised Cronbach's alpha was 0.951, indicating that the questionnaire as a whole has a very high internal consistency. This indicates

that, based on the reliability analysis of the questionnaires of the interviewed teachers, the overall reliability of the questionnaire in Appendix 1 on the assessment of music teachers' competency in the use of ICT in music teaching is very high and the questionnaire is reliably designed to reflect the measurement objectives well.

Table18. *The KMO and Bartlett's Test*

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.934
Bartlett's Test of Sphericity	Approx. Chi-Square	44897.218
	df	6786
	Sig.	<.001

According to the results of exploratory factor analysis mentioned above, the KMO test coefficient is 0.934. The KMO test coefficient ranges from 0 to 1, and the closer the value is to 1, the better the validity of the questionnaire. In addition, the significance of Bartlett's test of sphericity is less than 0.01. Since the null hypothesis is rejected, this indicates that the questionnaire in Appendix 1 has good validity.

Table 19. *The current status of music teachers' competencies in using ICT*

Grade	Frequency	Percent (%)
Excellent	44	8.8
Good	188	37.6
Average	221	44.2
Fair	43	8.6
Poor	4	0.8

The research data show that music teachers' self-evaluation of their ICT competencies is characterised by the following: 37.6% of the teachers had a positive assessment of their ICT competencies, indicating that they were more confident in using ICT in their teaching. 44.2% of the teachers were uncertain about their level of ICT competency, which may reflect a lack of clarity about the extent to which they have mastered ICT technology or a lack of practical experience and confidence in its use. Less than 10% of teachers considered their ICT competencies to be weak, which suggests that at an overall level, music teachers generally have some ICT competencies. Although the majority of teachers had some ICT competency or perceived their competencies to be good, the 44.2 % uncertainty rate suggests that teachers may have doubts or low confidence in ICT application. This phenomenon suggests that schools or

education departments need to strengthen targeted ICT competency training and support to help teachers clarify their competency levels and further enhance their practical application competency.

Table 20. *The frequency of daily internet use by music teachers for professional and academic development*

Grade		Frequency	Percent (%)
Time spent daily on the internet for professional and academic development	1–2 hours	282	56.4
	3–4 hours	98	19.6
	5–6 hours	26	5.2
	More than 7 hours	94	18.8

According to the research data, the distribution of the time spent by music teachers on the Internet for professional and academic development is as follows: 56.4% of the music teachers spent a concentrated amount of 1-2 hours per day on professional and academic development, suggesting that this period of time may be their dominant study and work habit. 5.2% of the teachers spent a longer period of time on professionally related Internet activities, which may be related to the volume of workloads or personal learning needs. The 18.8% of teachers who used 7 hours, and more were online for long periods of time each day for professional and academic development, which may indicate a high reliance on information and resources or involve in-depth research, lesson planning, and other professional activities. The research data suggest that more than half of music teachers devote a moderate amount of time (1-2 hours) per day to professional and scholarly development, reflecting the importance of the Internet in teachers' daily preparation for teaching and updating their knowledge. In contrast, the 18.8% of high-frequency users may be due to higher pedagogical demands or greater reliance on ICT resources. These results suggest that in supporting music teachers' professional development, efficient and quality online resources and training platforms should be provided to enhance their learning efficiency and effectiveness.

Table 21. *The music teachers' use of ICT in the educational process*

Grade		Frequency	Percent (%)
Application of ICT in the education process	Always (More than 6 times a week)	120	24
	Often (4-5 times a week)	171	34.2
	Sometimes (2-3 times a week)	94	18.8
	Seldom (1 time a week)	104	20.8
	Never	11	2.2

According to the research data, the frequency distribution of music teachers' weekly use of ICT in teaching is as follows: 34.2% of the teachers used ICT 4-5 times per week and used ICT for teaching and learning frequently per week, showing that these teachers relied on ICT in the classroom to a high degree. Those who used ICT at least once a week, 20.8% of the teachers, used ICT less frequently per week, which may be limited by teaching demands, time schedules, or tool availability. 24% of the teachers relied highly on ICT in their teaching more than 6 times a week, which may be related to the nature of their courses or their familiarity with the technology. Those who do not use ICT, 2.2% of teachers, never use ICT in their teaching every week, which may be due to lack of equipment, lack of capacity or reservations about the pedagogical value of ICT.

Overall, ICT has been widely used by the majority of teachers in music teaching and more than half of them used it four or more times per week. However, there were still a small number of teachers who used it less frequently or did not use it, which may require schools to further enhance equipment support, strengthen ICT application training and optimise curriculum design to promote wider ICT adoption.

Table 22. Factors affecting the use of ICT in the music education (%)

Factors	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Lack of competencies	3.99	18.56	24.35	44.11	8.98
Lack of ICT tools in the schools	4	20	24	42.2	9.8
Insufficient funding	2.6	15	29.4	42.4	10.6
Lack of time to pursue innovations	3.6	18.4	22	44	12
Lack of time to use ICT during lessons	3.59	14.77	31.14	43.11	7.39
ICT tools do not meet expectations	3.39	12.97	30.14	45.71	7.78
Information search difficulties arising from information overload	3.39	14.37	30.14	44.11	7.89
Insufficient or unavailable ICT courses, training, and seminars	3.39	19.16	29.94	39.12	8.38

According to the research data analysis, the following factors influenced music teachers' use of ICT in teaching: nearly half of the teachers considered their own lack of ICT competency to be a significant barrier, a larger proportion of teachers believed that their schools lacked the necessary ICT equipment or tools to support them, limited financial investment imposed constraints on access to and use of ICT resources, and the busyness of teachers' daily work made it difficult for them to find time to focus on improving ICT competency. The limitation of lesson

time in the teaching programme is one of the hindrances to the use of ICT. Some teachers believe that the performance or functions of existing ICT tools do not meet the actual teaching needs, and the excessive amount of information makes it difficult for teachers to efficiently access the quality resources they need. Although the percentage was slightly lower, close to 40% of teachers felt that the lack of relevant training or workshops limited their ability to use ICT.

Overall, technical competency, availability of tools and resources, training opportunities, and time management are important influences on music teachers' use of ICT. These issues need to be progressively addressed through enhanced training, better infrastructure and more support.

Table 23. *The current status of ICT tools for music teachers in the educational process and professional development*

Category		Responses		Percent of cases (%)	
		N	Percent (%)		
Types of ICT tools used in the classroom	Computer	345	14.40	69.00	
	Smartphone	268	11.20	53.60	
	Multimedia	434	18.10	86.80	
	Microphone	207	8.60	41.40	
	Audio recorder	87	3.60	17.40	
	Acoustics	243	10.0	48.60	
	Tablet	64	2.70	12.80	
	Interactive whiteboard	323	13.50	64.60	
	Online conference software	46	1.90	9.20	
	Video recorder	41	1.70	8.20	
	Printer	58	2.40	11.60	
	Television (large screen)	38	1.60	7.60	
	Metronome	108	4.50	21.60	
	Music software	104	4.30	20.80	
	Others	31	1.30	6.20	
	Total		2397	100.00	479.40

The research data shows that music teachers use multimedia tools (86.8%) the most. This is the most commonly used ICT tool in the music teachers' classroom, which may include projectors, video playback equipment, etc., for enhancing teaching and learning. 69% use computers as an important teaching and management tool, computers are also widely used in preparing lessons, presenting courses or creating music, etc. More than half use interactive whiteboards which are intuitive and interactive in classroom teaching and are therefore chosen by most teachers, smartphones and audio devices nearly half, smartphones are convenient for instantly finding information or playing resources, and audio devices are used for playing music or other auditory aids to teaching and learning resources. 41.4% of teachers use microphones in the music classroom, especially in China, in scenarios where teachers are faced with a large number of

learners who need to amplify or record their voices.

These data indicate that multimedia and computers are central tools for music teachers to teach, reflecting the usefulness and convenience of these technologies in the music classroom. The use of other tools such as smartphones, audio devices and microphones are more diverse and dependent on specific pedagogical needs and environmental conditions. This also suggests that priority should be given to ensuring the usability and functionality of these core tools when advancing ICT applications.

Table 24. The current status of software used by music teachers for the preparation and implementation of lessons

Category		Responses		Percent of cases (%)
		N	Percent (%)	
Constructive tools used for planning and implementing lessons	<i>Word</i>	315	29.60	63.00
	<i>PowerPoint</i>	460	43.30	92.00
	<i>Excel</i>	187	17.60	37.40
	<i>MSPaint</i>	52	4.90	10.40
	<i>Other</i>	49	4.60	9.80
Total		1063	100.00	212.60

From the research data, it can be seen that music teachers' use of different software tools in the classroom is as follows: *PowerPoint*, which is the most commonly used software, 92% of the teachers are using *PowerPoint* in the classroom and may use it for creating lesson plans, displaying teaching content and giving presentations. 63% of the teachers are using *Word* and may use it for lesson plans, lesson preparation materials or classroom documentation 37.4% of teachers use *Excel*, mainly for data processing, performance analysis or organisation and documentation of teaching activities. Only 10.40% of teachers used *MS Paint*, probably because its functions are relatively basic, and Chinese music teachers are not good at using this software and have limited usage scenarios.

The research data show that *PowerPoint* is the core software tool for music teachers in the classroom, followed by *Word* and *Excel*, which are mainly used for content creation and teaching management. *MS Paint*, on the other hand, has a low usage rate, reflecting its weak applicability in music teaching. Schools can provide targeted training or introduce more software tools related to music teaching, such as audio editing software or interactive presentation tools, according to teachers' actual needs for software.

Table 25. The current status of communication software used by music teachers for lesson preparation and implementation

Category		Responses		Percent of cases (%)
		N	Percent (%)	
Communication tools used for planning and implementation of lessons	<i>WeChat</i>	466	40.10	93.20
	<i>QQ</i>	177	15.20	35.40
	<i>Tencent</i>	169	14.50	33.80
	<i>Dingtalk</i>	219	18.80	43.80
	<i>Email</i>	54	4.60	10.80
	Other	77	6.60	15.40
Total		1162	100.00	232.40

From the research data, it can be seen that Chinese music teachers choose to use the following communication tools when preparing for and conducting lessons: 93.2% of teachers tend to use *WeChat* for communication, which is the most important communication tool, probably because *WeChat* is convenient, fast and feature-rich, which is suitable for instant information sharing and interaction. 43.8% of teachers use *Dingtalk*, which suggests that it has certain user bases in certain schools or districts, probably because its functions are suitable for teaching management needs. Only 10.8% of teachers use *Email* for communication, which reflects that *Email* is less frequently used in the teaching and learning scenarios in China, probably due to its less interactive and instantaneous nature than instant messengers such as *WeChat*. The data show that *WeChat* is the preferred tool for music teachers to prepare lessons and communicate in teaching, reflecting the dominance of instant messaging tools in teaching and learning. The lower usage of *Email* may suggest the need for targeted promotion and training to use *Email* more effectively in suitable scenarios (e.g., formal notification or document delivery), and the common communication tools used by teachers can be further optimised to make their functions more relevant to teaching needs.

According to research data (see Table 26), music teachers' choices of ICT tools in lesson preparation and teaching were as follows: 60 % of music teachers chose acoustics as the most frequently used tool for playing music, audio demonstration or assisting in teaching, reflecting its central role in music teaching. About half chose digital piano, amplifier, music teaching preparation software, audio editing software and video editing software. The high percentage of use of these tools shows that they are in music teaching and lesson preparation. These tools were more functional, for example, digital piano for classroom performance, audio and video editing

software for producing teaching resources. In contrast, Edu Office was used by only 5% of the music teachers, which may be due to the fact that its functionality does not fully meet the needs of music teaching or the teachers' knowledge and usage of the tool is low.

Table 26. The current status of music technology tools used by music teachers for lesson preparation and implementation

Category		Responses		Percent of cases (%)
		N	Percent (%)	
Music technology tools used for planning and implementation of lessons	MIDI keyboard	106	6.20	21.20
	Digital piano	237	13.90	47.40
	Acoustics	300	17.60	60.00
	Stereo	49	2.90	9.80
	Amplifier	253	14.80	50.60
	Edu Office	25	1.50	5.00
	Music teaching preparation software	257	15.10	51.40
	Audio editing software	228	13.40	45.60
	Video editing software	214	12.60	42.80
Other	35	2.10	7.00	
Total		1704	100.00	340.80

The research data show that acoustics-related tools are the core support technology for music teachers in lesson preparation and teaching, followed by multi-functional digital tools such as digital piano, audio editing, software and video editing software, which can meet teachers' diverse needs in classroom presentation, content production and after-class resource development. The usage of Edu Office is low, and there may be a need to enhance its applicability through promotion and training, or to develop professional tools that are more relevant to music teaching.

Table 27. The current status of music technology tools used by music teachers in performance classes

Category		Responses		Percent of Cases (%)
		N	Percent (%)	
Music technology tools used for planning and implementation of lessons	<i>Cubase</i>	109	11.50	21.80
	<i>Sibelius</i>	90	9.50	18.00
	<i>ProTools</i>	45	4.70	9.00
	<i>LogicProX</i>	48	5.10	9.60
	<i>FruityLoopsStudio</i>	46	4.80	9.20
	<i>StudioOne</i>	58	6.10	11.60
	<i>SuperMusicEditor</i>	80	8.40	16.00
	<i>MusicProduction Workshop</i>	127	13.40	25.40
	<i>Audioextractor</i>	222	23.40	44.40
	Other	125	13.20	25.00
Total		950	100.00	190.00

According to the research data (Table 27), music teachers' use of music technology tools in planning performance and music technology courses is as follows: 44.4% of teachers use *Audioextractor*, which is the most commonly used music technology tool, probably because of its simplicity and ease of use, and its suitability for basic editing and pedagogical needs. *Music Production Workshop* is used by more than a quarter of the teachers, possibly for more integrated music production teaching scenarios. For *Cubase* and *Sibelius* there were nearly 20% of choices, which are more specialised tools used mainly for audio production and score arrangement, but with relatively low usage, possibly because of a steeper learning curve or features that are too complex for general teaching needs. In contrast, *Pro Tools*, *Logic Pro X*, *Fruity Loops Studio*, and *Studio One* were about 10%, and the even lower usage of these professional tools suggests that the majority of teachers rarely involve complex professional music production or arranging work in their teaching. The data reflects that music teachers prefer to use simple and easy-to-use editing software rather than high-end professional music technology tools. This may be related to the following reasons: teachers lack the skills to use specialised music technology tools. Specialised tools may appear to be too complex or a high investment of resources for general teaching and learning needs. Therefore, it is recommended that the education sector or schools should strengthen the training of music teachers in professional music technology tools and help them master professional tools such as *Cubase* and *Sibelius*, so as to enhance the technological depth and teaching quality of the music curriculum. In addition, teachers can be encouraged to choose appropriate tools in line with their teaching needs and gradually transition from basic tools to professional technology applications.

Table 28. Possibilities for the use of ICT in music education (%)

Possibility	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
It is useful	1.8	0.8	11.98	62.87	22.55
It is available	2.2	0.4	13.57	64.67	19.16
It is easy to use	2	0.4	12.38	64.47	20.76
I have more knowledge	1.8	0.6	10.18	65.07	22.36
I have support	2.2	1	21.56	56.69	18.56
It saves me time	1.4	2.2	14.57	63.27	18.56
It helps reach goals	0.8	0.6	11.58	65.07	21.96
It is required	1	6.59	30.34	45.91	16.17
It is inexpensive	1	7.98	36.13	40.72	14.17
It interests learners	1	0.8	13.77	61.68	22.75
It adjusts the classroom atmosphere	1	0.6	10.98	63.47	23.95

According to the research data in the 28 table, music teachers' agreement on the effectiveness of ICT communication in education is as follows: 62.87% agreed that ICT is highly useful in education and can improve teaching and learning. 64.67% of the teachers generally agreed that ICT resources are accessible in teaching and learning, which may indicate that equipment or technical support is more adequate. 64.47% of the teachers felt that ICT tools are easy to use, which may be related to the teachers' familiarity with the available technology and its intuitive nature. 65.07% of the teachers felt that ICT has helped them to broaden their knowledge, which may be due to the fact that ICT facilitates easy access to up-to-date educational resources and information. 56.69% of teachers reported that they received support in using ICT, which may involve resources, technical support or training in their schools. 63.27% of teachers generally perceived ICT tools to be more efficient and time-saving, which may be used for lesson planning, administration or student interaction. 65.07% of teachers perceived that ICT helped them to better achieve their teaching and learning goals, which may be through interaction, sharing of resources and personalised learning support. 45.91% of teachers believe that ICT is necessary in teaching and learning, reflecting that some teachers agree with its importance, but some may have reservations. 40.72% of teachers believe that ICT tools are less costly in education, which may be related to the affordability of the equipment or the school's resources. 61.68% of teachers believe that ICT can increase learners' interest in learning and help to improve classroom interaction and engagement. 63.47% of teachers believe that ICT can change the classroom climate, possibly by creating a more interactive and flexible learning environment. Overall, music teachers were generally positive about the role of ICT in education, especially in terms of its usefulness, usability, ease of use and knowledge support. Also, a certain percentage of teachers felt that ICT was necessary in teaching and could help to enhance learners' interest and classroom atmosphere. However, regarding the cost and necessity of ICT, some teachers may have reservations, suggesting that a balance of equipment investment, teacher training and school resources need to be considered when promoting ICT applications.

According to the research data in the 29 table, the distribution of barriers to non-use of ICT in the use of ICT by music teachers is as follows: 33.93% of the teachers are uncertain about the difficulty of ICT use, which may reflect confusion or lack of experience in the application of the technology. 38.72% of the teachers are uncertain about the cost of ICT tools, which may be related to the availability of resources in the school or the personal perception of the cost perception. 43.91% of the teachers clearly stated that ICT is valuable in teaching and learning, which shows

that they think ICT is helpful in teaching and learning. 35.53% of the teachers believe that ICT is feasible in teaching and learning, which shows their confidence in the application of the technology. 35.13% of the teachers are not sure whether ICT is a necessary tool in teaching and learning, which may be due to their traditional teaching methods or lack of adaptation to new technologies. 36.73% of the teachers were uncertain about the availability of policy support, which might be related to the implementation of policies in schools or education departments. 31.54% of the teachers did not think that the barrier to ICT adoption was not the lack of time, reflecting different understandings of time management. 45.2% of the teachers were uncertain about their own lack of competency in ICT, which it could be that they are not clear about the level of technology mastery or lack of adequate training.

Table 29. Barriers to the use of ICT in music education (%)

Barriers	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
It is too difficult	9.18	27.15	33.93	26.15	3,59
It is too expensive	7.19	24.15	38.72	25.15	4.79
It is not useful	14.37	43.91	27.15	12.38	2.2
It is not available	11.18	35.53	32.14	17.96	3.19
It is not required	10.18	30.34	35.13	20.96	3.39
I don't have support	8.58	30.94	36.73	20.16	3.59
There isn't enough time	9.18	31.54	29.54	26.35	3.39
I don't know enough	10.2	18.2	45.2	22	4.4

The research data suggests that the barriers music teachers face when using ICT are centred on uncertainty, particularly in relation to issues of difficulty, cost, policy support and their own competency. While the majority of teachers do not see ICT as useless or unusable in teaching, a high proportion still lack clear judgement when faced with the use of technology. To overcome these barriers, there is a need for more targeted training, clearer policy support, and help for teachers to improve their ICT application skills and self-confidence. At the same time, schools and educational organisations should do more in terms of technical support and equipment provision.

According to the research data in the 30 table, the current status of music teachers' ability to use information and communication technology (ICT) is as follows: 63.87% of the teachers have mastered the basic functions of computers, which shows that they have a certain degree of basic knowledge of computers. 42.91% of the teachers will take the initiative to try to repair the computers when there is a problem, which shows that they have a certain degree of coping ability to cope with technological problems. 57.49% of the teachers are able to independently install

professional software independently, which reflects their confidence and ability in technology operation. 38.92% of the teachers expressed uncertainty about whether they used computers to prepare lesson plans, which might be related to their teaching habits or the depth of technology application. 63.47% of the teachers were able to use computers to produce teaching aids, which shows that they have some computer application skills. 58.48% of the teachers used the Internet to look for teaching resources, reflecting their ability in information acquisition. which reflects their reliance on information access. 64.47% of teachers would prepare teaching notes via the Internet, showing the wide application of ICT in teaching preparation. 55.69% of teachers would use the Internet to look up exercises, which shows that they have applied ICT to assist teaching and learning in the classroom. 66.47% of teachers updated their teaching resources regularly, which shows that they are aware of the importance of timely access to the latest information. 66.27% of the teachers teach their learners how to use the Internet to search for information, showing that they are proactive in developing information literacy among their learners.

Table 30. Status of music teachers' use of ICT (%)

Statements	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
I know about computers and their functions	0.8	2.4	17.96	63.87	14.97
I repair my own computer	1	12.18	33.73	42.91	10.18
I install software on my own	0.8	6.39	21.76	57.49	13.57
I use the computer to prepare music lesson plans	3.39	22.75	38.92	28.74	6.19
I can create teaching aids using the computer	0.4	2.2	18.36	63.47	15.57
I search for teaching aids on the Internet	1.4	3.79	21.76	58.48	14.57
I prepare notes for my learners using the Internet	0.8	0.8	17.56	64.47	16.37
I find questions for my learners on the Internet	0.8	5.59	23.75	55.69	14.17
I always look for the latest information on the Internet	0.6	1.6	16.37	66.47	14.97
I teach my learners how to find information on the Internet	0.4	1	17.56	66.27	14.77

Most of the music teachers have developed strong competencies in the use of ICT, especially in using computers and the Internet to find teaching resources, prepare lesson plans and teaching notes. However, there were still a small number of teachers who were uncertain in applying technology, especially in using computers to prepare music lesson plans. To further enhance teachers' ICT application skills, it is recommended that relevant training and resource support be strengthened to help teachers become more comfortable with the use of technological tools in their teaching and learning process, and to enhance their level of technological application in their daily teaching.

Although most of the teachers have been able to use ICT tools in their daily teaching, there

is still a certain percentage of teachers who are uncertain in using computers to prepare music lesson plans and so on. This may be due to a more specific way of using ICT in music teaching or a lack of targeted pedagogical training. Some teachers may not have fully adapted to the use of new technologies or may not have fully realised the potential of ICT in curriculum design and teaching. Although teachers are technically competent, a not insignificant proportion of them still feel uncertain about how to apply ICT to their teaching. Therefore, further professional training and targeted support are important to enhance teachers' ICT competency, especially on how to effectively incorporate technological tools in music teaching and learning to improve classroom effectiveness and teaching quality.

On the whole, music teachers have developed some competency in the use of ICT, especially in the areas of Internet information collection, production of teaching aids and use of computers to prepare teaching content. However, some teachers are still uncertain in their practical application, especially in how to integrate ICT into the specific practice of music teaching. Therefore, the provision of more technical training and practical guidance on ICT application, especially for the specifics of music teaching, will help to further improve teachers' ICT application, as well as promote innovation and enhancement of education and teaching.

4.3.2. Analysis of the role of the music teacher in the changing paradigm of education

By describing the current status of these music teachers' perceptions of music education paradigms, this study ensured a representative and diverse survey sample, which provided a solid foundation for subsequent data analysis. The participation of teachers with different academic qualifications, years of teaching experience, genders, geographic locations and school types enabled the findings to adequately reflect the diverse backgrounds of music teachers and their educational practices. In addition, the teachers' professional backgrounds and titles ensured the reliability of the findings. The analysis of the results of the assessment questionnaire on 'Understanding the role of music teachers in the context of educational paradigm change' in Appendix 2 was validated by analysing the questionnaires of the interviewed teachers.

It can be clearly seen from the 31 table that the mean scores for the following dimensions are all significantly higher than 3 (neutral): music teachers' viewpoints on education (3.62), principles followed by music teachers in the educational process (4.08), music teachers' teaching methods and strategies in music lessons (3.81), cooperation of music teachers with learners in the educational process (3.77), music teachers' understanding in the process of music education (3.18),

music teachers' viewpoints in the educational process (3.64), music teachers' viewpoints in the classroom (4.15), and the roles played by music teachers in education (3.87).

Table 31. *The current status of music teachers' views on music education paradigms*

Music teachers' views	N	Mean±Std. Deviation	Test Value	T	P
Educational perspectives of music teachers	500	3.62±0.58	3.00	23.899	<.001
Principles followed by music teachers in the educational process	500	4.08±0.53	3.00	45.376	<.001
Teaching methods and strategies used by music teachers in music lessons	500	3.81±0.49	3.00	36.976	<.001
Co-operation of music teachers with learners in the process of music education	500	3.77±0.45	3.00	38.216	<.001
Music teachers' understanding of the music education process	500	3.18±0.68	3.00	5.763	<.001
Perspectives of music teachers in the educational process	500	3.64±0.52	3.00	27.407	<.001
Music teachers' perspectives in the classroom	500	4.15±0.50	3.00	51.843	<.001
The role of music teachers in education	500	3.87±0.47	3.00	41.88	<.001

Note: When using a five-point Likert scale, a score of 3 indicates neutrality. Therefore, the test value is 3

All these scores are above 3 and the p-values from the one-sample t-tests are all <0.05. This implies that music teachers in this research hold positive views on education, the principles followed in the educational process, teaching methods and strategies, cooperation with learners, understanding of music education, viewpoints in the educational process and classroom, and the roles they play in education.

Table 32. *Coherence of educational perspectives (%)*

Educational perspectives	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Schools teach the truth	0.4	1.2	8	55.6	34.8
Learning happens in the mind, not the body	1.4	12.4	9.2	51	26
Everyone learns or should learn equally	0	0.4	3.8	51	44.8
Learners are full of flaws, and schools correct them	5.2	22.6	17.4	38	16.8
Competition promotes learning	1	4	15.2	59.6	20.2
Schools rely on specialists for control	3.2	22.8	28.8	33.2	12
Knowledge is inherently fragmented	0.6	17.4	21.6	44.6	15.8
Some learners are clever; others are not	3.4	14.8	14.8	52	15
Learning happens in the classroom, not in the world	13.8	45.4	12.8	20	8
The learning outcomes aim to acquire as much knowledge as possible	4.6	26	17.6	38.4	13.4

According to the research data, regarding the unity of views on education, it is possible to summarise how different teachers agree on the philosophy of education and learning styles. 55.6%

agreed that teachers believe that the role of the school is to impart truth or basic knowledge, which shows that they agree on the central role of the education system in imparting subject knowledge and developing learners' thinking. 51% agreed that teachers believe that learning is an activity at the level of the mind, not just a physical or practical operations, reflecting the importance of theory and cognition in teaching and learning, and the same proportion believed that education should be fair and open to all learners, reflecting the importance attached to equality of opportunity in education. 38% of the teachers who agreed believed that one of the tasks of the school was to correct the deficiencies or defects of the pupils, reflecting a more corrective or error-correcting view of the function of schooling on the part of some of the teachers. 59.6% of the teachers believed that competition in learning plays a motivational role and helps to improve learners' motivation and performance. 33.2% of teachers believe that schools should be run by experts, indicating that some teachers have reservations about a centralised or expert-dominated model of educational management. 44.6% of teachers agree that knowledge is dispersed, which may imply that they embrace the idea of interdisciplinary or diverse bodies of knowledge. 52% of teachers believe that there are differences between learners in terms of their intelligence or learning abilities, implying an acceptance of individual differences. 45.4% of teachers disagreed that learning takes place exclusively in the classroom, suggesting that they recognise the value of learning outside the classroom, such as independent learning or extra-curricular activities. 38.4% of teachers believed that the goal of learning is to acquire as much knowledge as possible, which may reflect a traditional view of the transmission of knowledge. 38.4% of teachers believed that the goal of learning is to acquire as much knowledge as possible, which may reflect traditional views of knowledge transfer. The same, but also a significant percentage of teachers may prefer a more flexible and de-centred management model.

Overall, these data reflect the diversity of teachers' educational philosophies and approaches to learning. From an emphasis on knowledge transfer and competitive incentives to a focus on personalisation and equal learning opportunities, music teachers hold different views on educational goals, learning styles, and management models. In order to improve the quality of education, educational administrators should pay attention to teachers' diverse educational philosophies and promote personalised and equitable teaching, as well as balancing the transfer of knowledge with the needs of learners' differences. These views suggest that teachers need more training and support in their educational practices to cope with the rapidly changing educational environment.

According to the research data (Table 33), the principles followed by music teachers in the educational process are reflected in the following areas: 63.4 % of teachers believed that education

should be open to change, but at the same time look critically at the new, uphold universal ethical norms and national core values, and strive to realise common human values. This reflected teachers' acceptance of innovation while maintaining respect for traditions and core values in the face of educational reform. 67% of teachers believed that education should be concerned with the preservation of culture, and attach importance to cultural identity and historical continuity, showing their recognition of the important role of education in the transmission of culture. This also shows the importance of culture in education, especially in the arts subjects, where teachers may be more concerned with the transmission of cultural elements. 66.6% of teachers agreed that education should be based on democratic values, establish and respect democratic relationships, and be universal. This suggests that teachers consider democratic values to be a core component of education, which should not only impart knowledge but also foster a sense of social responsibility, equality and independent thinking.

Table 33. Principles for music teachers in the educational process (%)

Principles	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Education is open to change, but accepts what is new critically, maintains universal norms of morality and the core of nationality, and commits to common human values	0.2	1.6	8.2	63.4	26.6
Education commits itself to culture, takes care of its identity protection, and historical continuity	0.2	1	8.8	67	23
The values of democracy are understood, life is based on them, democratic relations are created and respected, and education is universally accessible	0	0.4	9.2	66.6	23.8

The principles followed by music teachers in the educational process emphasise cultural heritage, moral values, democratic concepts and critical acceptance of educational change. This suggests that teachers not only focus on updating and reforming the content of their teaching but also place great importance on the core values of the educational process, such as cultural preservation and the popularisation of democratic values. These principles provide guidance for educational practice and emphasise the responsibility of education in the changing times, while also reminding educators to respect the stability of traditions and values in their constant pursuit of innovation.

Based on the research data (Table 34), the views of music teachers on teaching methods and strategies can be summarised as follows: 69.8% of teachers preferred teaching through discovery and action methods, which emphasised learners' learning through exploration, experimentation

and hands-on practice, and fostered independent thinking and creativity. 59.8% of teachers considered verbal and aural reproduction methods to be effective teaching strategies, probably related to the characteristics of the subject of music, which often relies on aural learning and verbal expression. 69% of teachers favoured the use of cooperative learning methods, indicating that teachers believed that interaction and collaboration among learners had a positive effect on the enhancement of the learning process and outcomes. 33.4% of teachers believed that learning alone was not conducive to learners' development, emphasising the importance of teamwork and interaction in learners' learning.

Table 34. Teachers' methods and strategies for teaching music classes (%)

Teachers' teaching methods	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Discovery and action methods prevail	0.2	0.8	5.6	69.8	23.6
Oral and aural reproduction methods prevail	0.8	7.4	15.6	59.8	16.4
It is taught using various cooperative methods	0.2	0.4	6.2	69	24.2
Learned individually	5	33.4	23.2	29.4	9
Teaching is important	0.2	0.4	3.8	65.8	29.8
Learning is important	0	0.6	4.4	65.2	29.8
The methods are active and develop the ability to solve problems and take action	0.2	0.2	5	67.6	27
Mostly listening and reading	1.8	26.2	20.6	39.8	11.6
In the lesson, I try to create conditions for independent creative work and discovery based on the learner's experience	0.2	1	5.6	70.4	22.8
The use of my own words and examples prevails	1	8.4	18	56.8	15.8
My class is mostly textbook-based	3.6	28	19	38.4	11
In lessons, I rely on the social context as a significant learning environment	0	4	14	65	17
I can't imagine my music lesson without a computer	2	22	21.4	39.6	14.8
I adhere to the lesson plan	0.8	14	29	44.2	12

33.4% of teachers (Table 34) believed that learning alone was not conducive to learners' development, emphasising the importance of teamwork and interaction in learners' learning. 65.8% agreed that pedagogy was important, and 65.2% agreed that learning was important. Most teachers believed that pedagogy and learning itself are key factors in teaching success, highlighting the importance of effective teaching strategies. 67.6% agreed that the approach is proactive and develops problem-solving and action skills. Most teachers agreed that the teaching approach should be proactive and aim to develop learners' problem-solving and action skills. 39.8% of teachers considered listening and reading to be important learning styles in music teaching, suggesting that they still valued traditional 70.4% of teachers create conditions for learners to explore independently. 70.4% of teachers believe that teaching should provide learners with

opportunities for independent thinking and creativity and promote independent learning and discovery. 56% of teachers tend to use their own words and demonstrations in teaching, which indicates that teachers' personal experiences and styles still have an important role to play in the teaching process. 38.4% of teachers still rely on textbooks for teaching, despite the fact that modern music is still being taught. relied on textbooks for teaching, although modern educational philosophies promote more self-directed learning and creative approaches. 65% of teachers believed that the social environment played an important role in learning, possibly by incorporating elements of community, culture and real-life music to enhance learners' learning experiences. 39.6% of teachers believed that music lessons without computers were unimaginable, reflecting the technology in modern music education's importance. 44.2% of the teachers felt that teachers should be rigorous in their lesson plans, possibly indicating a focus on structured and organised lesson design in their teaching.

Music teachers adopted a variety of approaches and strategies in their teaching to support active learning, collaborative learning and personalised development of learners. Although there were still some traditional teaching methods that were retained, modern educational concepts such as encouraging learners' self-directed exploration, co-operative learning and the use of technology had been embraced by the majority of teachers. This diversity of teaching strategies reflects teachers' efforts in balancing innovation and tradition, personalised learning and structured teaching, with the aim of enhancing learners' overall competency and creativity.

Table 35. Music teachers working with learners in the educational process (%)

Cooperation channels	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Value relations prevail	1	17.6	23.6	45	12.8
Normative relations prevail	0.2	7.6	25.2	54	13
Didactics of interaction pedagogy prevails	0.2	0.4	9.4	70.4	19.6
The didactics of impact pedagogy prevail	0.4	4.6	26.4	53.8	14.8
Didactics of learning prevails	0.2	3.6	23	58	15.2
Learners' wishes and suggestions are landmarks for planning and improving my activities	0.2	1.6	11	68	19.2
The learner turns to me only when faced with an insurmountable problem	1.2	17	27	43	11.8
Together with the learners, we create the rules for living together and learning	0.2	4	13.8	64.8	18.8
Most popular in their classroom	0	2.8	35.2	47.4	14.6
I am happy to spend break time to help the learner	0.4	1.6	7	70	21
I take into account the wishes of the learners regarding the songs they want to learn	0	1	4.4	72	22.6
The interaction between me and the learner is based on dialogue, tolerance, respect, justice, demandingness, creativity	0	0.4	4.6	63.2	31.8

According to the research data (Table 35), the way music teachers work with learners in the educational process presents the following findings: 45% of teachers believe that value relationships dominate when working with learners, while 54% believe that normative relationships dominate. This indicates that teachers focus on both value and attitude development as well as normative behaviour and classroom management when working with learners. 70.4% believe that interactive pedagogy dominates when working with learners. This indicates that teachers tend to promote learners' participation and learning through interactive teaching and emphasise interactive communication between learners and teachers. 53.8% of the teachers believed that the influence pedagogy approach dominated when working with learners, showing that teachers were able to flexibly adjust their teaching strategies according to learners' feedback and needs during the teaching process. 58% of the teachers believed that the pedagogy approach should dominate when working with learners. This reflected those teachers still regarded the effectiveness and adaptability of pedagogical methods as a key factor in collaboration. 68% of the majority of teachers believed that learners' wishes and suggestions should be an important basis for planning and improving teaching and learning activities when working with learners. This suggests that teachers pay attention to learners' needs and feedback, respect learners' opinions, and try to optimise the content and methods of teaching based on these suggestions. 43% of the teachers believed that learners only turn to the teacher for help when they encountered intractable problems, which might imply that the teacher-student partnership was more about providing support when learners encountered difficulties than about sustained interactions throughout the learning process. 64.8% of the teachers in the counts believed that when working with learners, teachers and learners should work together to develop rules for living and learning. This indicates that teachers value cooperation and consensus with learners and believe that establishing norms together promotes a good learning atmosphere. 47.4% of teachers consider themselves to be the most popular in their classes and 70% are happy to use their break time to help learners. This suggests a more cordial relationship between teachers and learners and that teachers are willing to devote more time to helping learners, resulting in positive teacher-student interactions. 72% of the majority of the teachers believe that when working with learners, they should consider the learners' desires for the songs they are learning. This shows that teachers focus on selecting the content according to learners' interests and needs, thus enhancing learners' motivation and engagement. 63.2% of teachers agreed that the interaction between teachers and learners should be based on dialogue, tolerance, respect, fairness, demandingness, and creativity, which shows that teachers believe that good teacher-student relationships should be based on mutual respect

and trust, with an emphasis on fairness and creativity.

Music teachers demonstrated multidimensional interactions and flexible teaching strategies in their work with learners. They not only focused on the effectiveness of classroom management and teaching methods, but also actively listened to learners', respected their needs and suggestions, and committed to creating a positive learning environment through interaction and collaboration. This type of teaching style, which focuses on teacher-student interaction and respect for learners' opinions, can enhance learners' motivation to learn, improve classroom engagement, and help build a more harmonious teacher-student relationship.

Table 36. Perspectives on learners in the music education process (%)

Learners' views	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
The teacher knows everything, and the learners know nothing	14.4	52.4	11.8	16	5.4
The teacher is the subject of the learning process, and the learners are the objects	13.4	45	10.8	22.2	8.6
The teacher chooses and imposes his choice, and the learners obey	9.6	43.4	17.8	23	6.2
The teacher chooses the content of the programme, and the learners, who were not consulted, accept it	6.2	29.8	25.6	31.2	7.2
Assessment is used as a disciplinary tool	3	21	23.6	44.2	8.2
Learners are unable to self-assess	5.6	42	24.6	22.4	5.4
The teacher speaks, and the learners listen	4	25.2	24.4	38.3	8.2

52.4% of the teachers disagreed with the statement 'Teachers know everything and learners know nothing', indicating that most of the teachers believe that teaching is not a one-way transmission of knowledge, but an interactive and co-learning process. 45% of the teachers disagreed with the statement 'Teachers are the subject and learners are the object of the learning process', indicating that the teachers recognise the active role of learners in the learning process rather than passive recipients of knowledge. The fact that 45% of teachers disagreed that 'teachers are the main body of the learning process and learners are the objects' shows that teachers recognise the active role of learners in the learning process rather than being passive recipients of knowledge. 43.4% of teachers disagreed that 'teachers choose and impose their choices, and learners obey them', which shows that some teachers hope that learners can have a certain degree of initiative in choosing their own courses and focus on cultivating learners' participation in the process. This shows that some teachers want learners to have some initiative in curriculum choices and focus on developing learners' sense of participation and decision-making skills. However, 31.2% of teachers agreed with the statement 'Teachers choose the content of the curriculum and learners accept it without being consulted', indicating that some teachers are still accustomed to

teachers unilaterally deciding on the content of the curriculum, with limited opportunities for learners to participate in the design of the curriculum. 44.2% agreed with the statement ‘Assessment is used as a form of discipline’, and 44.2% agreed with the statement ‘Assessment is used as a form of discipline’. ‘Assessment is used as a disciplinary tool’, which indicates that some teachers regarded assessment as a means of disciplining learners’ behaviour or maintaining discipline in the classroom, not only a tool for measuring learning outcomes. 42% of teachers disagreed with ‘Learners are unable to conduct self-assessment’, which showed that teachers recognise learners’ ability to self-evaluate and support learners’ growth through reflection and evaluation of their own learning process. 38.3% of teachers agreed with the statement ‘Teachers talk and learners listen’, indicating that the traditional lecture mode of teaching is still prevalent to a certain extent, but the data also shows that many teachers are exploring more interactive and student-centred teaching modes. The data also shows that many teachers are exploring more interactive and student-centred teaching modes.

Music teachers demonstrate a tendency to integrate traditional and modern educational philosophies in the educational process. On the one hand, teachers are gradually recognising learners’ initiative and participation in learning and trying to break the traditional ‘teacher-led, student-subordinate’ model; on the other hand, there are still some teacher-centred practices in the actual teaching and learning process, such as the decision-making power of the curriculum content is mainly in the hands of the teachers. In the future, music education needs to further strengthen cooperation and interaction between teachers and learners, and to promote learners’ active participation in the design of the curriculum, the learning process and assessment, so as to achieve a more egalitarian, personalised and all-rounded model of education.

Table 37. Teachers' perspectives in the process of music education (%)

Teachers' views	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
A good teacher is based on the values of freedom and responsibility, love and compassion	0.2	1.8	4.6	63	30.4
The teacher formulates the tasks and requirements and the learners carry them out	2	18.2	18.8	47.4	13.6
The best teacher is an autocrat	18.2	49.2	9	17.4	6.2
A good teacher is strict, demanding, and does not change his opinion	11	48	11.6	22.2	7.2
A teacher who knows his worth and does not favour his learners will always be respected	0.2	3.6	11.8	59	25.4
A good teacher is an authority, he is like a helper, a guide in the learning process	0.6	3	9.8	62.2	24.4
A teacher is a creative personality, a human educator, not just a knowledge transferer	0.2	1.2	5.6	62.4	30.6
The teacher is the main source of information	1.6	24.8	22.6	38	13

The most important thing for a teacher in the educational process is the implementation of training programmes	0.6	11.8	18.4	53.4	15.8
The most important thing for the teacher in the educational process is the learners' concert activity.	0.4	9.4	13.4	60	16.8
The most important thing for a teacher in the educational process is the learner	0	1.6	10	67	21.4
The teacher is the transmitter of information, and the learner is responsible for his own learning	2.2	21.6	16	47.2	13

According to the research data, 30.4% of the teachers strongly agreed that a good teacher should have the values of freedom and responsibility, love and compassion, which shows that teachers generally agree that the core of education lies in the transmission of emotional and moral values, not only the transmission of knowledge. 47.4% of the teachers agreed with the principle that 'teachers set the tasks and requirements, and the learners carry them out,' which reflects that the traditional mode of task assignment still occupies a certain position in the educational philosophy of some teachers. 47.4% of teachers agreed that 'teachers set tasks and requirements and learners carry them out', reflecting the fact that the traditional mode of task allocation still occupies a certain position in the educational philosophy of some teachers. 49.2% of teachers disagreed with the statement that 'the best teacher is an autocrat', and 48% disagreed with the statement that 'a good teacher is strict, harsh and does not change his/her views'. This shows a general preference for democratisation and flexibility rather than authoritarianism and harshness. 59% of teachers agreed that 'a teacher who knows his/her own values and does not favour his/her pupils is respected', and 62.2% agreed that 'a good teacher is an authority but at the same time a helper and a guide'. 62.2% of teachers agreed that 'a good teacher is an authority, but at the same time a helper and a mentor'. These views indicate that teachers recognise the position of authority but are more concerned with the role of guidance in helping learners to grow. 62.4% of the teachers agreed that 'teachers are creative personalities, educators and not only transmitters of knowledge', emphasising that teachers are not only transmitting knowledge but are also role models for the development of learners' personalities. 38% of the teachers agreed that 'Teachers are the main source of information', indicating that although the role of information dissemination is still important, teachers are no longer the only source of information. 53.4 % of teachers agreed that 'the most important thing for teachers in the educational process is the implementation of training programmes', indicating that teachers The focus is on the implementation of the teaching programme. 60% of teachers agreed that 'the most important thing for teachers to do in the teaching process is the learners' concert activities', showing the importance of music performance practice. 67% of teachers agreed that "the most important thing in the education process is the

learners’, highlighting the importance of student-centred education. 47.2% of teachers believed that ‘teachers are the transmitters of information and learners are responsible for their own learning’, indicating that some teachers still preferred traditional teaching methods, but also recognised the autonomy and responsibility of learners in the learning process.

Music teachers’ educational philosophies are moving away from traditional models towards a modern, student-centred approach. Teachers generally recognise the importance of freedom, responsibility and love, and emphasise the practical, creative and personalised nature of teaching, but there is still some traditional influence in the allocation of tasks, the positioning of roles and the implementation of lesson plans. The future of music education should further promote the transformation of teachers’ roles, strengthen the support for learners’ independent learning, and at the same time balance the norms of teaching and learning with the need for individualised development, so as to achieve a more holistic educational goal.

Table 38. Perspectives from a music teacher's classroom (%)

Music teachers' views	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
I recognise that there is more than one solution to a problem	0	0.8	5	67.8	26.4
During music lessons, I teach attentive listening to the opinion of others	0	0.2	5.4	68	26.4
During music lessons, I teach taking responsibility for one’s position	0.2	1.4	9.4	65	24
I encourage tolerance in the lessons	0	1.2	6.8	67	25
I encourage learners to participate in the process of refining and improving their position	0	2.8	7.4	66.4	23.4
I try to bring teaching during lessons closer to life outside the classroom	0.2	1.2	7.6	66.8	24.2
In the lessons, I encourage discussion, argument, and enjoyment of the presented and realised ideas	0	1.6	5.6	68.6	24.2
I aim to foster an attitude that encourages direct, and fruitful sharing of ideas	0	0.6	7	68	24.4

According to the research data, 67.8% of the teachers agreed that there is more than one way to solve a problem, showing that teachers focus on the cultivation of diversified thinking in the classroom, and encourage learners to explore multiple solutions with an open mind. 68% of the teachers teach learners to listen carefully to others in the classroom, and 65% of the teachers teach their learners to be responsible for their own positions. This shows that music teachers are not only concerned with the transfer of musical knowledge and skills, but also with the development of learners' communication skills and sense of responsibility. 67% of the teachers encourage tolerance in the classroom, and 66.4% of the teachers encourage learners to participate in the process of refining and improving their positions. This reflects teachers’ commitment to creating

an inclusive classroom atmosphere and helping learners to continuously improve through critical thinking and self-reflection. 66.8% of the teachers believed that in-class teaching should be made more relevant to life outside the classroom, indicating that music teachers are concerned about the practical application and real-life relevance of music education, and attempt to cultivate learners' ability to engage in social participation and real-life musical experiences through classroom teaching. 68.6% of the teachers believed that learners should be encouraged to discuss, argue, and present and realise ideas in the classroom; 68% of the teachers stressed the importance of fostering a direct and productive attitude towards the exchange of ideas. The data suggests that music teachers place a high value on interactive teaching and learning and want to promote student expression and depth of thought through discussion and argument. The classroom perspectives of the music teachers demonstrated an open, inclusive and student-centred teaching philosophy. They focus on fostering diverse thinking, communication skills, and a sense of responsibility, while working to integrate classroom instruction with real life to provide learners with a holistic educational experience. By emphasising discussion and the exchange of ideas, teachers strive to create an interactive and productive classroom environment. This teaching style not only enhances learners' musical literacy, but also develops their comprehensive abilities, such as critical thinking, teamwork and creativity, in line with modern education's demand for holistic development.

Table 39. *The role of the music teacher in the classroom (%)*

Role	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
An inculcator of values	4.4	18	13.8	49.4	14.4
A creator	0.6	4	11.2	61.4	22.8
A connoisseur	0	1	6	69.6	23.4
A friend	0.2	0.8	6.2	67.2	25.6
A psychologist	0.2	2	10	68	19.8
A manager	1	5.6	12.4	62	19
A counsellor	0.2	3	5.8	70.4	20.6
An inspirer	0	0.2	4.6	69.4	25.8
A controller	14.6	47.2	9.6	21.8	6.8
A partner	0.6	7	16.8	58.6	17
A planner	0.8	4.4	12.6	65.4	16.8
An executor	3	14.2	18.6	51.2	13
An educational innovator	0	0.6	5.8	68.2	25.4
An actor	1.6	9.4	13.6	58.8	16.6
A mediator	0	1	5.2	71.2	22.6
A negotiator	2.4	17	20.8	47.8	12
An organizer	0	0.6	5.6	71	22.8
An assistant	0.4	6.4	16.8	59	17.4
The main provider of knowledge	1.4	6.6	13.2	61.6	17.2

Teachers' diverse and complex roles in the classroom, as instillers of values (49.4%) and main providers of knowledge (61.6%), as well as inspirers (69.4%), creators (61.4%), and innovators in education (68.2%), etc., reflect the wide range of educational responsibilities that music teachers have in the classroom. The high percentage of agreement among friends (67.2%), psychologists (68%), and counsellors (70.4%) indicates that music teachers focus on building cordial interpersonal relationships with learners, paying attention to learners' emotional and mental health, and providing them with support and guidance. Teachers' manager (62%), planner (65.4%) and organiser (71%) roles reflect their planning and control of classroom order and activities, highlighting the importance of teachers' role in maintaining the flow of teaching and learning as well as achieving goals. The proportions of agreement on the roles of educational innovator (68.2%), creator (61.4%) and actor (58.8%) show that music teachers focus on creativity and expressiveness in the teaching and learning process, engaging learners and enhancing classroom interest through lively ways. The roles of partner (58.6%) and negotiator (47.8%) reflect that teachers focus more on the partnership with learners and achieve classroom goals through communication and negotiation. 47.2% of the teachers disagreed with the role of controller, which indicates that music teachers tend to respect learners' autonomy and independence rather than adopting a coercive approach to classroom management. This shows that music teachers tend to respect learners' autonomy and independence rather than adopting a coercive approach to classroom management.

The role of music teachers in the classroom is not only as a transmitter of knowledge, but also as an inspirer, friend and psychological supporter. They ensure order in the classroom through management and planning and stimulate learners' interest and potential in learning through innovation and creativity. The emphasis on interactive and co-operative teaching methods brings the music classroom closer to modern educational concepts, while taking into account the emotional and psychological well-being of learners. Such diverse roles not only reflect the uniqueness of music education but also provide strong support for learners' all-round development.

4.3.3. Difference-in-difference test

The variance test is used to study differences between various variables' dimensions through independent samples t-test, chi-square test, and one-way ANOVA. In this analysis, the chi-square test, independent samples t-test, and one-way ANOVA were primarily employed, depending on the data characteristics. The analysis was performed using SPSS Version 29.

Based on the results in the table above, it is evident that 94.3% of music teachers who spend 1-2 hours per day have good ICT competency. There is a significant difference compared to those

who spend more than 2 hours per day ($p < .001$)

Table 40. The findings of the analyses regarding the impact of the daily time invested by music teachers in academic and professional development on their ICT competency

Chi-Square Tests		ICT competency assessment (N)		ICT competency rate (%)	Value	Asymptotic significance (2-sided)
		Poor	Good			
Time spent on professional and academic development on the Internet	1–2 hours	16	266	94.30	45.595	<.001
	3-4	4	94	95.90		
	5-6	1	25	96.20		
	More than 7 hours	26	68	72.30		

This suggests that the amount of time spent on academic and professional activities each day is a contributing factor to the varying levels of ICT competency among music teachers. Additionally, the analysis of whether the frequency of ICT use in the classroom impacts music teachers' ICT competency is presented below.

Table 41. The impact of the frequency of music teachers' ICT uses in the classroom on their ICT competency

Chi-Square Tests		ICT competency assessment (N)		ICT competency rate (%)	Value	Asymptotic Significance (2-sided)
		Poor	Good			
Frequency of ICT application in	Always	4	116	96.7	76.689a	<.001
	Often	8	163	95.30		
	Sometimes	6	88	93.60		
The educational process	Seldom	21	83	79.80		
	Never	8	3	27.3		

The research data results in the table above clearly show that 96.7% of music teachers who always use ICT in the educational process demonstrate good ICT competency. This result shows a significant difference compared to other frequencies of ICT use ($p < .001$). It can be implied that the frequency with which music teachers apply ICT in their teaching significantly influences their level of ICT competency.

Table 42. The analysis of music teachers' ICT competency in relation to their classroom ICT usage types

Fisher-Freeman-Halton Exact Test		ICT competency assessment (N)		ICT competency rate (%)	Value	Asymptotic Significance (2-sided)
		Poor	Good			
ICT used in the classroom	Computer	23	322	93.33	31.817	<.001
	Smartphone	21	247	92.16		
	Multimedia	38	396	91.24		
	Microphone	12	195	94.20		
	Audio recorder	5	82	94.25		
	Acoustics	15	228	93.83		

Tablet	2	62	96.88
Interactive whiteboard	26	297	91.95
Online Conference Software	0	46	100.00
Video recorder	0	41	100.00
Printer	3	55	94.83
Television (large screen)	2	36	94.74
Metronome	2	106	98.15
Music Software	0	104	100.00
Others	5	26	83,87

Since the table contains zero values, the chi-square test cannot be applied. Instead, the Fisher-Freeman-Halton Exact Test was used. The results indicate that $p < 0.001$, and this suggests a significant correlation between the ICT tools used in the classroom by music teachers and their competency. All ICT tools listed in the table are correlated with the competency of ICT use in the music classroom.

Table 43. The analysis of presentation software used by music teachers in relation to their ICT competency

Chi-Square Tests		ICT competency assessment (N)		ICT competency rate (%)	Value	Asymptotic significance (2-sided)
		Poor	Good			
Constructive tools used in planning and implementing courses	<i>MSWord</i>	18	297	94.29	7.015	0.135
	<i>PowerPoint</i>	41	419	91.09		
	<i>Excel</i>	9	178	95.19		
	<i>MSPaint</i>	1	51	98.08		
	<i>Other</i>	4	45	91.84		

The research data show, that $P = 0.135 > 0.05$, so there is no significant difference between the ICT competency of the music teachers and the presentation software used in the preparation and implementation of the lesson.

Table 44. The analysis of communication software used by music teachers for lesson planning and teaching in relation to music teachers' ICT competency

Chi-Square Tests		ICT competency assessment (N)		ICT competency rate (%)	Value	Asymptotic significance (2-sided)
		Poor	Good			
Communication tools used in lesson planning and teaching	<i>Wechate</i>	41	425	91.20	14.710	0.012
	<i>QQ</i>	8	169	95.48		
	<i>Tencent</i>	4	165	97.63		
	<i>Dingtalk</i>	16	203	92.69		
	<i>Email</i>	1	53	98.15		
	<i>Other</i>	9	68	88.31		

The research results show, it is evident that $p = 0.012 < 0.05$ $p = 0.012 < 0.05$ $p = 0.012 < 0.05$.

This indicates a significant difference between teachers' ICT competency and the software used for lesson preparation and exchange. This suggests that music teachers who use the specified software for lesson preparation and exchange tend to have higher ICT competency.

Table 45. The analysis of the impact of music teachers and music technology tools used in the curriculum on their ICT competency

Fisher-Freeman-Halton Exact Test		ICT competency assessment(N)		ICT competency rate (%)	Value	Asymptotic Significance (2-sided)
		Poor	Good			
Music technology tools used to plan and deliver lessons	MIDI keyboard	3	103	97.17	8.909	0.423
	Digitalpiano	13	224	94.51		
	Acoustics	24	276	92.00		
	Stereo	1	48	97.96		
	Amplifier	17	236	93.28		
	EduOffice	0	25	100.00		
	Music Teaching Preparation Software	16	241	93.77		
	Audioediting software	15	213	93.42		
	Videoediting software	10	204	95.33		
	Other	4	31	88.57		

Since there are zeros in the table, the chi-square test cannot be used; therefore, the Fisher-Freeman-Halton Exact Test was applied. The results show that $p=0.423 > 0.05$, $p = 0.423 > 0.05$, $p=0.423 > 0.05$, indicating that there is no significant difference between the ICT competency of music teachers and the music technology tools used in lessons. This suggests that these tools do not significantly impact the ICT competency of music teachers.

Table 46. The analysis of ICT tools used by music teachers

Chi-Square Tests		ICT competency assessment (N)		ICT competency rate (%)	Value	Asymptotic Significance (2-sided)
		Poor	Good			
Music technology tools used for planning and implementation of lessons	<i>LogicProX</i>	5	43	89.58	20.999	0.013
	<i>FruityLoopsStudio</i>	4	42	91.30		
	<i>StudioOne</i>	2	56	96.55		
	<i>SuperMusicEditor</i>	2	78	97.50		
	<i>MusicProduction Workshop</i>	3	124	97.64		
	<i>Audioextractor</i>	16	206	92.79		
	Other	18	107	85.60		

From the research results in Table 46, it is clear that $P=0.013 < 0.05$, there is a significant

difference between the ICT competency of teachers and the music technology tools used in the performance class, which shows that the music teachers who use the above music technology tools in the performance class have a higher ICT competency.

4.3.4. Effect of demographic variables on ICT competencies

Music teachers' views on the music education paradigm, their perspectives on education, the principles followed in the educational process, teaching methods and strategies in music class, cooperation with learners in the music education process, understanding within the music education process, perspectives on the education process, viewpoints in the classroom, and the roles they play in education can all be influenced by individual factors. Therefore, this section examines how these dimensions are affected by different genders, academic qualifications, education levels, city classifications, school types, job titles, years of teaching experience, city class, school type, and the preparation of music teachers.

Influence of gender on music teachers' views on music education paradigms. Gender was used as a dichotomous variable to test whether there was any significant difference between male music teachers and female music teachers in each of the variables by conducting an independent sample t-test using SPSS 29.0.

Table 47. *The differences in the dimensions by gender*

Variant	Genders	N	Mean	Std. Deviation	T	Sig.
Educational perspectives of music teachers	Male	77	3.62	0.55	-0.097	0.461
	Female	423	3.62	0.59		
Principles followed by music teachers in the educational process	Male	77	4.10	0.51	0.416	0.339
	Female	423	4.07	0.54		
Teaching methods and strategies used by music teachers in music lessons	Male	77	3.83	0.43	0.498	0.309
	Female	423	3.80	0.50		
Co-operation of music teachers with learners in the process of music education	Male	77	3.73	0.42	-0.821	0.206
	Female	423	3.78	0.46		
Music teachers' understanding of the music education process	Male	77	3.15	0.68	-0.297	0.383
Perspectives of music teachers in the educational process	Female	423	3.18	0.68	0.08	0.468
	Male	77	3.64	0.48		
Music teachers' perspectives in the classroom	Female	423	3.64	0.53	-0.364	0.358
	Male	77	4.13	0.47		
The role of music teachers in education	Female	423	4.16	0.50	0.142	0.443
	Male	77	3.88	0.46		

According to the results of the independent samples t-test, there are no significant gender

differences in the music education paradigm across various dimensions. The significance level for the music teachers' educational perspectives is 0.461, which is greater than the standard threshold of 0.05, indicating that there are no notable differences between genders regarding their educational perspectives. The mean evaluations for both male and female music teachers are similar. Thus, there is no significant difference between genders in terms of their views on education, the principles followed in the educational process, teaching methods and strategies in music class, cooperation with learners in the music education process, understanding in the music education process, perspectives on education, perspectives in the classroom, and roles played in education.

Effect of educational qualifications on variables. Since educational qualifications involved more than three groups, a one-way ANOVA test was performed using SPSS 29.0 to determine if there were significant differences between music teachers with varying educational qualifications on individual variables. The results of this analysis are shown in Table 48.

Table 48. The differences in individual variables among music teachers with different educational qualifications

Scope	Associate's degree (N=57)	Bachelor (N=392)	Master (N=47)	Ph.D. (N=4)	F	Sig.
Educational perspectives of music teachers	3.70±0.62	3.62±0.58	3.53±0.54	3.55±0.17	0.77	0.51
Principles followed by music teachers in the educational process	4.17±0.49	4.08±0.54	3.98±0.54	3.81±0.31	1.47	0.22
Teaching methods and strategies used by music teachers in music lessons	3.79±0.45	3.82±0.51	3.75±0.40	4.00±0.25	0.50	0.68
Co-operation of music teachers with learners in the process of music education	3.81±0.44	3.76±0.46	3.29±0.45	3.80±0.11	0.18	0.91
Music teachers' understanding of the music education process	3.16±0.66	3.17±0.69	3.23±0.64	3.48±0.59	0.37	0.77
Perspectives of music teachers in the educational process	3.70±0.49	3.63±0.53	3.66±0.48	3.77±0.34	0.44	0.72
Music teachers' perspectives in the classroom	4.18±0.41	4.15±0.51	4.18±0.50	3.94±0.13	0.40	0.76
The role of music teachers in education	3.91±0.46	3.86±0.47	3.88±0.41	4.05±0.51	0.36	0.78

From the data results of the analysis in the above table, it is evident that there are no significant differences across all dimensions of the music education paradigm based on different

academic qualifications. All significance tests are greater than 0.05, indicating that the views of music teachers on the music education paradigm do not vary with academic qualifications. The mean values further illustrate that the average ratings of music teachers with different academic qualifications are similar. Similarly, there are no significant differences in terms of educational viewpoints, principles followed in the education process, teaching methods and strategies in music class, cooperation with learners in the music education process, understanding of the music education process, viewpoints in the education process, viewpoints in the classroom, and the roles played in education among music teachers with varying academic qualifications.

Table 49. *The effect of music teachers' qualification on the variables*

Scope	Senior instructor (N=18)	First-grade instructor (N=106)	Second-grade instructor (N=279)	Third-grade instructor (N=97)	F	Sig.
Educational perspectives of music teachers	3.66±0.48	3.71±0.61	3.64±0.58	3.48±0.56	2.831	0.038
Principles followed by music teachers in the educational process	4.19±0.44	4.17±0.55	4.06±0.55	3.99±0.47	2.354	0.071
Teaching methods and strategies used by music teachers in music lessons	3.8±0.48	3.83±0.52	3.83±0.51	3.71±0.39	1.694	0.167
Co-operation of music teachers with learners in the process of music education	3.85±0.41	3.83±0.48	3.78±0.47	3.68±0.34	2.13	0.096
Music teachers' understanding of the music education process	3.18±0.52	3.27±0.73	3.16±0.71	3.11±0.57	0.954	0.414
Perspectives of music teachers in the educational process	3.59±0.5	3.7±0.56	3.64±0.54	3.58±0.42	0.959	0.412
Music teachers' perspectives in the classroom	4.24±0.41	4.22±0.5	4.15±0.53	4.07±0.4	1.733	0.159
The role of music teachers in education	3.9±0.47	3.94±0.46	3.86±0.48	3.82±0.42	1.171	0.32

From the results of the above analyses, it can be seen that there is no significant difference in the principles followed by music teachers of different titles in the process of education, teaching methods and strategies in music lessons, cooperation with learners in the process of music education, understanding in the process of music education, viewpoints in the process of education, viewpoints in the classroom, and roles they play in education, with the Sig. values all being greater than 0.05. Music teachers with different compositions teachers differed significantly only in the

dimension of viewpoints in education, Sig.=0.038<0.05.

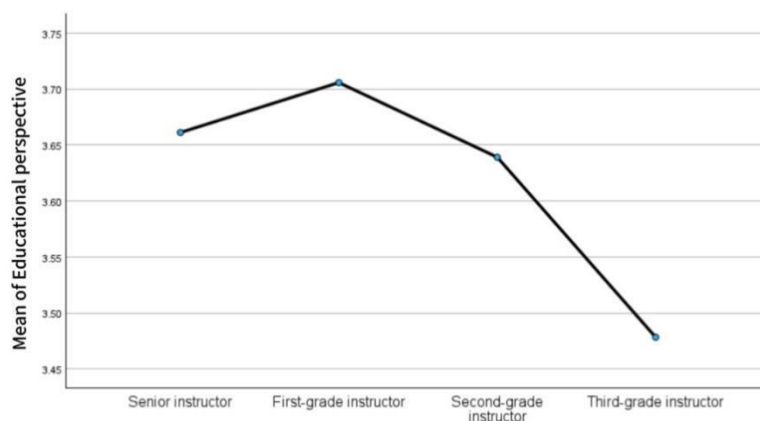


Figure 14. The effect of music teachers' qualification on the variables

It is necessary to analyse specifically which compositions of music teachers differed significantly in their viewpoints in education, and the results of Bonferroni's post-hoc multiple comparisons showed that the music teachers of the first level of the compositions differed significantly more than those of the third level of compositions in terms of their viewpoints in education. The details are shown in the table below.

Table 50. The effect of music teachers' teaching experience on the variables

Scope	1-3 years (N=141)	4-6 years (N=124)	7-9 years (N=54)	10-15 years (N=70)	16-20 years or more (N=111)	F	Sig.
Educational perspectives of music teachers	3.52±0.53	3.69±0.6	3.66±0.57	3.52±0.59	3.73±0.61	3.139	0.014
Principles followed by music teachers in the educational process	4.04±0.5	4.03±0.53	4.11±0.56	4.02±0.54	4.2±0.54	2.096	0.08
Teaching methods and strategies used by music teachers in music lessons	3.74±0.43	3.83±0.5	3.82±0.52	3.81±0.44	3.86±0.56	0.967	0.425
Co-operation of music teachers with learners in the process of music education	3.68±0.39	3.81±0.47	3.83±0.49	3.76±0.37	3.82±0.51	2.227	0.065
Music teachers' understanding of the music education process	3.12±0.58	3.22±0.73	3.22±0.72	3.05±0.7	3.26±0.71	1.502	0.2
Perspectives of music teachers in the educational process	3.58±0.45	3.67±0.55	3.66±0.53	3.59±0.5	3.7±0.58	1.287	0.274
Music teachers' perspectives in the classroom	4.09±0.43	4.1±0.54	4.26±0.53	4.19±0.51	4.22±0.5	2.246	0.063
The role of music teachers in education	3.81±0.41	3.88±0.49	3.93±0.47	3.86±0.46	3.92±0.5	1.075	0.368

From the results of the above analyses, it can be seen that there is no significant difference in the principles followed by music teachers of different teaching ages in the process of education, teaching methods and strategies in the music classroom, cooperation with learners in the process of music education, understanding of the music education process, viewpoints in the education process, viewpoints in the classroom, and the roles they play in education, with all significance values greater than 0.05. There is a significant difference only in the dimensions of educational views among music teachers with different teaching ages, with the significance values for these differences being greater than 0.05. Specifically, a significant difference was found in the dimension of viewpoints on education in the music classroom, with a significance value of 0.014, which is less than 0.05. Further analysis is required to determine which specific teaching ages show significant differences in their educational viewpoints. The results of multiple comparisons using the Bonferroni method indicated that music teachers with 1-2 years of experience had less significant differences in their educational viewpoints compared to those with 4-6 years and 16-20 years of experience. The details are shown in the table below.

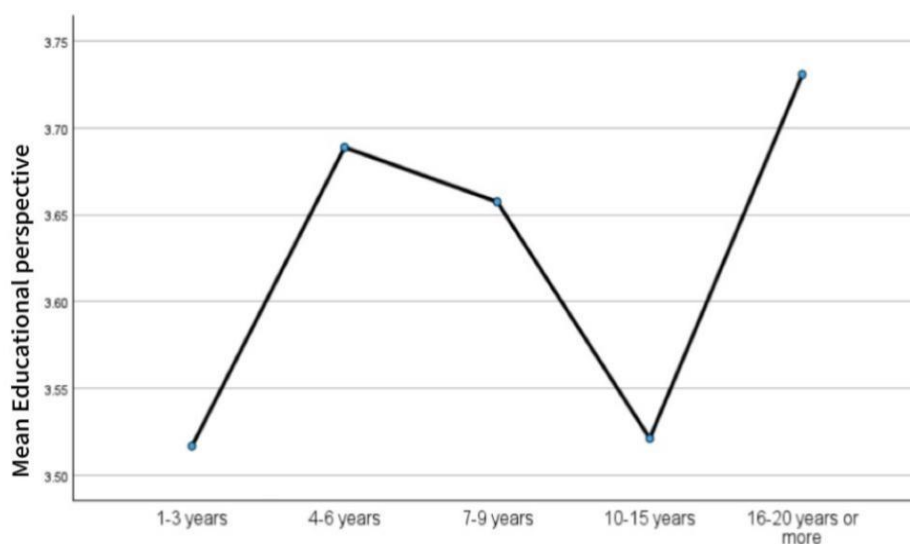


Figure 15. Effect of music teachers' teaching experience on the variables

We can assume that music teachers with 1-2 years of teaching experience do not significantly influence the principles followed in the educational process, teaching methods and strategies in music classes, cooperation with learners in the music education process, understanding of the music education process, viewpoints in the education process, viewpoints in the classroom, and roles in education, without being affected by differing educational viewpoints.

Table 51. The effect of city class on the variables

Scope	First-tier cities (N=3)	Second-tier cities (N=23)	Third-tier cities (N=145)	Fourth-tier cities (N=329)	F	Sig.
Educational perspectives of music teachers	3.6±0.2	3.58±0.44	3.62±0.63	3.63±0.57	0.061	0.98
Principles followed by music teachers in the educational process	3.92±0.38	4.01±0.41	4.07±0.57	4.09±0.53	0.286	0.835
Teaching methods and strategies used by music teachers in music lessons	4.02±0.25	3.75±0.47	3.82±0.54	3.81±0.47	0.313	0.816
Co-operation of music teachers with learners in the process of music education	3.93±0.07	3.71±0.41	3.77±0.5	3.77±0.43	0.275	0.843
Music teachers' understanding of the music education process	3.8±0.17	3.37±0.57	3.15±0.73	3.17±0.67	1.576	0.194
Perspectives of music teachers in the educational process	4.03±0.13	3.67±0.51	3.68±0.56	3.62±0.51	1.062	0.365
Music teachers' perspectives in the classroom	4±0	4.06±0.42	4.21±0.53	4.14±0.49	1.173	0.319
The role of music teachers in education	4.19±0.53	3.81±0.35	3.89±0.51	3.87±0.45	0.665	0.574

From the results of the analysis presented in the above table, it is evident that there is no significant difference between the different city classes in all dimensions of the music education paradigm, as the significance values are greater than 0.05. This indicates that there is no variation in the viewpoints on the music education paradigm among music teachers from different city classes. Based on the mean values, it can be observed that the average ratings of music teachers from various city classes are consistent. Therefore, music teachers' views on education, the principles followed in the educational process, teaching methods and strategies in music class, cooperation with learners in the music education process, understanding of the music education process, perspectives on the educational process, views in the classroom, and the roles played in education do not exhibit significant differences.

Table 52. *The effect of type of school on the variables*

Scope	Primary school (N=317)	Junior high school (N=115)	High school (N=35)	Vocational high school (N=33)	F	Sig.
Educational perspectives of music teachers	3.61±0.59	3.65±0.56	3.64±0.52	3.61±0.62	0.107	0.956
Principles followed by music teachers in the educational process	4.08±0.54	4.1±0.51	4.01±0.5	4.02±0.57	0.419	0.74
Teaching methods and strategies used by music teachers in music lessons	3.81±0.5	3.8±0.46	3.78±0.47	3.88±0.49	0.311	0.818
Co-operation of music teachers with learners in the process of music education	3.77±0.46	3.76±0.4	3.81±0.49	3.83±0.49	0.323	0.809
Music teachers' understanding of the music education process	3.13±0.69	3.18±0.63	3.35±0.73	3.41±0.7	2.589	0.052
Perspectives of music teachers in the educational process	3.63±0.53	3.61±0.47	3.66±0.53	3.74±0.57	0.567	0.637
Music teachers' perspectives in the classroom	4.17±0.5	4.14±0.47	4.1±0.47	4.12±0.57	0.3	0.825
The role of music teachers in education	3.88±0.47	3.84±0.45	3.86±0.43	3.93±0.49	0.43	0.732

From the results of the analysis presented in the above table, it can be seen that there are no significant differences in all dimensions of the music education paradigm among music teachers from different school types, as the significance values are greater than 0.05. This indicates that there is no variation in the viewpoints on the music education paradigm among music teachers from different school types. Based on the mean values, it can be observed that the average ratings of music teachers from various school types are consistent. Consequently, there are no significant differences in the academic qualifications of music teachers with respect to their viewpoints on education, the principles followed in the educational process, teaching methods and strategies in the music class, cooperation with learners in the music education process, understanding of the music education process, perspectives on the educational process, views in the classroom, and roles they play in education.

Table 53. *The effect of type of teacher staffing on the variables*

Scope	Staffing of public institution (N=431)	Personnel agency (N=19)	Labor dispatching (N=8)	Labor contract (N=42)	F	Sig.
Educational perspectives of music teachers	3.63±0.59	3.52±0.46	3.84±0.6	3.59±0.57	0.639	0.59
Principles followed by music teachers in the educational process	4.09±0.53	3.89±0.41	4.09±0.83	4.04±0.55	0.91	0.436
Teaching methods and strategies used by music teachers in music lessons	3.82±0.5	3.73±0.33	3.98±0.45	3.69±0.46	1.404	0.241
Co-operation of music teachers with learners in the process of music education	3.78±0.46	3.78±0.22	3.98±0.55	3.67±0.43	1.393	0.244
Music teachers' understanding of the music education process	3.19±0.69	3.05±0.61	3.7±0.8	3.03±0.58	2.484	0.06
Perspectives of music teachers in the educational process	3.64±0.53	3.52±0.39	4.01±0.61	3.6±0.45	1.8	0.146
Music teachers' perspectives in the classroom	4.15±0.5	4.2±0.43	4.19±0.52	4.13±0.53	0.098	0.961
The role of music teachers in education	3.87±0.47	3.9±0.43	4.03±0.54	3.82±0.43	0.51	0.676

From the results of the analysis presented in the above table, it can be seen that there are no significant differences in all dimensions of the music education paradigm among music teachers from different school types, as the significance values are greater than 0.05. This indicates that there is no variation in the viewpoints on the music education paradigm among music teachers from different school types. Based on the mean values, it can be observed that the average ratings of music teachers from various school types are consistent. Consequently, there are no significant differences in the academic qualifications of music teachers concerning their viewpoints on education, the principles followed in the educational process, teaching methods and strategies in the music class, cooperation with learners in the music education process, understanding of the music education process, perspectives on the educational process, views in the classroom, and roles they play in education.

4.3.4. Correlation analysis

A correlation test is a statistical analysis method used to assess whether there is a statistical correlation between two variables, and the strength and direction of that relationship. The questions answered are: are the two variables correlated between, for example, a music teacher's

view of education and the principles followed in the process of teaching in the music classroom? Is their relationship positive or negative? What is the strength of the relationship?

1. Correlation: refers to the degree of dependence between two variables, which may be positive, negative or uncorrelated.

- Positive correlation: one variable increases and the other increases.

- Negative correlation: as one variable increases, the other decreases.

- No correlation: one variable increases and the other decreases. No correlation: there is no significant relationship between the two variables.

2. Correlation coefficient: Used to quantify the correlation between two variables, ranging from -1 to +1.

- +1: perfect positive correlation.

- 0: no correlation.

- -1: Perfectly negative correlation.

The study was conducted using SPSS version 29, using the Pearson Correlation Coefficient, which is a linear correlation between continuous variables that are normally distributed. Used to measure the degree of linear correlation between two variables. To study the correlation between learners' learning methods and examination results. For example, the correlation coefficient between the educational views of music teachers and the principles followed in the For example, the correlation coefficient between the educational views of music teachers and the principles followed in the educational process in music classrooms is 0.473, which reflects a positive correlation. Similar positive correlations are observed between all other Similar positive correlations are observed between all other positive correlations are observed between all other variables

Satisfy normal distribution (Pearson's correlation needs to satisfy normal distribution). Through the correlation test, the study can provide a deeper understanding of the relationship between the variables and provide a basis for further analysis or decision making.

According to the results of the correlation analysis (Table 54), all the variables have a significant positive correlation at 99% level of significance, which indicates that there is a strong and mutually supportive relationship between the different variables in the field of music education.

Table 54. *The correlation analysis between dimensions*

Variant	Correlations	Education al perspectives of music teachers	Principles followed by music teachers in the educational process	Teaching methods and strategies used by music teachers in music lessons	Co-operation of music teachers with learners in the process of music education	Music teachers' understanding of the music education process	Perspectives of music teachers in the educational process	Music teachers' perspectives in the classroom	The role of music teachers in education
Educational Perspectives of Music Teachers	Pearson Correlation	1							
Principles followed by music teachers in the educational process	Pearson Correlation	.473**	1						
Teaching methods and strategies used by music teachers in music lessons	Pearson Correlation	.704**	.607**	1					
Co-operation of music teachers with learners in the process of music education	Pearson Correlation	.674**	.578**	.797**	1				
Music teachers' understanding of the music education process	Pearson Correlation	.562**	.154**	.496**	.530**	1			
Perspectives of music teachers in the educational process	Pearson Correlation	.635**	.444**	.692**	.717**	.687**	1		
Music teachers' perspectives in the classroom	Pearson Correlation	.407**	.617**	.532**	.580**	.141**	.485**	1	
The role of music teachers in education	Pearson Correlation	.554**	.533**	.644**	.691**	.443**	.657**	.655**	1

** Correlation is significant at the 0.01 level (2-tailed).

The following are the specific interpretations: all the correlation coefficients are greater than 0 indicating a positive relationship between the variables. A significance level of 99% ($p < 0.01$) implies that this correlation is highly reliable and virtually eliminates chance relationships due to randomness. The values of the correlation coefficients reflect the strength of the association between the variables. Although all coefficients are positive, the specific values are different, reflecting the possible differences in the strength of association between different variables. Educational Perspectives and Principles of Teaching in the Classroom (Correlation Coefficient = 0.473): there is a moderate positive correlation between Educational Perspectives and Principles of Teaching followed by teachers in the classroom. This suggests that music teachers' educational perspectives can influence their classroom behaviours to some extent, such as whether they are open to accepting new ideas and respecting learners' individuality. Other variables also showed positive correlations with each other, suggesting that different factors (e.g., teachers' pedagogical methods, classroom roles, and co-operative relationships with learners) complement each other in music education practices. For example, teacher roles and classroom perspectives may reflect the versatility of teachers in teaching and learning; partnerships and teaching strategies may emphasise the importance of teachers and learners participating in learning together. Positive correlations between variables indicate that all aspects of music education are a holistic system in

which teachers' educational philosophies, classroom practices, and teaching methods mutually reinforce each other to enhance the effectiveness of music teaching. By reinforcing factors with strong positive correlations (e.g., educational philosophy and teaching principles), teachers' improvement in other areas can be better promoted. For variables with weak but significant correlations, further research and measures can be taken in the future to enhance their links.

This analysis shows that the multidimensional variables of music education are closely related to each other, and the correlation analysis provides an important quantitative basis for understanding these relationships, as well as a guide for further improving the effectiveness and strategies of music education.

4.4. Analysis of interviews with music teachers regarding their perspectives on music education paradigms

Qualitative research methods and ethical codes used in the study. The research team used an open coding approach to analyse and interpret the data collected. The process of data analysis started from data collection, after transcription and structuring, the information was classified into systematic categories and subcategories, coded, categorised, described and interpreted to ensure that the data was analysed in a scientific and systematic manner.

Table 55. The music teachers' teaching styles

Category	Subcategory	Supporting statements
As a leader	Intellectual teaching style	"<...> Use reason to control the classroom teaching process, focusing on the music theory part and the explanation of music history".
As an empath	Emotional teaching Style	"<...> In music classes, video animations and instrument demonstrations will mobilise learners to emotionally connect with teachers by hosting classroom music activities <2>". "<...> resonate emotionally with music <2>".
	Natural teaching style	"<...> The classroom focuses on communication and cooperation with learners". "<...> By hosting classroom music events".
As a guide	Humorous teaching style	"<...> By hosting classroom music events <4>" "<...> Some humorous music stories increased the learners' interaction with me in class".
	Entertaining teaching	"<...> Under the premise that happy learning is student-centred, learners can learn music knowledge <6>". "<...> Learning is fun, and learners gain knowledge more easily through games and activities <2>".

During the interview phase, the study strictly adhered to the principles of research ethics. Participants gave their fully informed consent to participate in the study and signed an informed

consent form to ensure that the interviews were conducted voluntarily and that the participants were aware of the purpose and possible uses of the study. This code of research ethics reflects the respect and protection of participants' rights and interests.

The sample for this study was 15 school music teachers, and the qualitative analysis method was used to explore in depth issues related to the field of music education, providing rich practical support and theoretical underpinning for the findings.

From the interviews, the 15 music teachers were categorised into three different teaching styles: leader, empath, and guide (see Table 55). The leaders focused on intellectual teaching, using more ICT tools to teach the theoretical knowledge of music and some music history in the classroom. The empathic teachers were identified as those who taught in an emotional and natural way, using sound to help learners feel and understand music. The guide teachers employed a teaching style that focuses on humour and entertainment and incorporates games and activities in the classroom to engage learners and facilitate their learning.

Table 56. *The challenges in music teaching*

Category	Subcategory	Supporting statements
External challenge	Learners' parents	"<...> Parents have increasing requirements for teachers but do not pay attention to learners if they have requirements for teachers <2>".
	Insufficient teaching equipment	"<...> With the use of ICT in music lessons, but the school ICT equipment is not enough <3>".
	Schools attach importance to music education	"<...> The school does not pay as much attention to music as other subjects and does not pay as much attention to music teachers <5>".
Self-competency	Learner competencies	"<...> Learners' competencies to master ICT knowledge are uneven, their knowledge reserves are uneven, and they cannot use ICT to work together". "<...> Learners' music esthetical competencies are poor".
Self-competency	Teacher competencies	"<...> The music professional competencies of music teachers need continuous learning". "<...> Need to understand the psychological problems of learners, who are unable to adjust the classroom atmosphere according to the status of learners". "<...> It is also necessary to learn professional music software. Most of them are self-study by looking for teaching videos on the Internet and have not studied systematically <7>".

In the interviews, the music teachers identified the primary challenges they face that stem from external factors and the competencies required in the music classroom. The external challenges include issues related to learners' parents, insufficient teaching equipment, and the school's lack of emphasis on music education. Parents often have high expectations of music teachers but may not pay adequate attention to their learner's involvement in music. Additionally,

the limited availability of ICT equipment in schools hinders effective music teaching. Furthermore, schools generally place less importance on music education compared to other subjects, which translates to less support for music teachers.

In terms of competency-related challenges, teachers noted difficulties with both learner and teacher competencies. Learners' competencies in mastering ICT knowledge are inconsistent, with varying levels of understanding, making it difficult to ensure that all learners can effectively use ICT in music classes. Additionally, learners often lack strong music aesthetic skills. For teachers, there is a need for continuous professional development to enhance their music competencies, including understanding learners' psychological needs and adapting classroom atmospheres accordingly. Many teachers also reported that they had to self-teach professional music software, often relying on online videos without formal training, highlighting the need for systematic learning opportunities in this area.

Table 57. *The essential skills and competencies required for a music teacher*

Category	Subcategory	Supporting statements
Professional competencies	Musical instrument	"< ...> Instrumental music is the most direct tool for learners to feel music, and it is also the basic" "<...> Playing instrumental music in class can attract learners' attention more <3>"
	Sing	"< ...> Singing is a must-have skill for music teachers, making the classroom atmosphere more fun".
	Musicality	"< ...> A good sense of music can make learners feel the music more accurately, while a teacher with an average sense of music is only superficial, analysing music by simply dividing paragraphs and understanding the creative background, and has not really entered the music".
Teaching competencies	Innovation classroom	"< ...> Music teachers should have the competency to innovate classrooms, and should not follow the script, but should add innovative ideas".
	Organize music events	"< ...> To hold interesting music activities, whether in class or at school, music practice activities can greatly improve learners' sense of participation in music".
Competencies in educational psychology	Learner mental state	"< ...> Only by paying close attention to the psychological activities of the learners can the atmosphere of the music class be adjusted". "<...> Learners' psychological activities will affect the teaching effect and sometimes infect other learners in the class with positive or negative emotions".
	Teacher mental state	"< ...> The psychological problems of the teachers themselves also need to be taken seriously. Unexpected problems may occur at any time in the classroom, and stable emotions are needed to solve the problems".

The interviews showed that the respondents believe that there are three types of skills and competencies that music teachers should have, which are music professional skills, teaching

competency, and educational psychology. Musical instrument playing competency, singing competency and musicality represent the professional skills of music teachers. For musical instrument playing, whether it is piano, violin, clarinet, or Chinese traditional instruments, it is important to have the competency to play them in the classroom, while singing competency, like musical instrument playing, can bring a more direct musical environment to the learners in the classroom, and musicality represents the music teachers' quality of music, and having a good musicality can make it easier for teachers to choose appropriate teaching materials and music materials. Having a good sense of music makes it easier for teachers to choose appropriate teaching videos and music materials. The capacity to teach in the classroom means that according to the different contents of the curriculum, the classroom can be given innovative teaching and organising classroom activities also represents the music teacher's capacity, not to teach the same content in the same way, but to combine with some of the changes occurring in the classroom innovation, as well as in the classroom activities organised by the coordination of the capacity, so that each learner is more active in participating in and integrating into the activities. The study of educational psychology is mainly in the learners' psychology and teachers' own psychology, in the classroom at any time will happen unplanned things, how to make learners encounter problems in the classroom so that the right to seek help from the teacher so that the teacher understand the psychological changes in the learners, and then regulate the learners' emotions so that the classroom can continue to run smoothly, and teachers in the encounter of a variety of problems in a timely manner when you need to adjust their own psychological state is also part of the teacher's capacity. The teacher also needs to adjust his psychological state in time when encountering various problems is also part of the teacher's capacity.

Table 58. *The benefits of integrating ICT tools into the classroom*

Category	Subcategory	Supporting statements
To learners	Stimulate enthusiasm for learning	"< ...> Learners are more active and have efficient interactions and responses when teachers use ICT".
	Broaden horizons	"< ...> Learners can use rich music resources to appreciate music from different cultures and countries".
	Improve appreciation of music	"< ...> Watch different music styles, expose learners to more musical works, and improve".
To music teacher	Improve lesson preparation efficiency	"< ...> It is easy to find relevant materials that meet the preparation course and stay up-to-date with the latest music knowledge <3>".
	More music teaching resources	"< ...> There is a lot of music knowledge on the Internet, and you can find music knowledge and music songs for relevant courses to enrich classroom content".
	More diversified music teaching methods	"< ...> I will use ICT to experience different music modes, ICT makes it easier for me to change music modes, so I will continue to try different teaching styles <3>".

	Richer classroom	"< ...> Using ICT to communicate and interact with learners in the classroom will not make the course content boring, and learners will actively participate in the teaching interaction <2>".
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The music teachers interviewed are sure that the benefits of ICT in music lessons can be divided into benefits for learners and benefits for teachers, for learners, the use of ICT can make them have a more enthusiastic attitude to learning, and for learners nowadays, ICT happens in all corners of their lives, they are exposed to ICT all the time, they can broaden their horizons in the most familiar ways, so they can also learn to use ICT for self-learning to achieve higher music literacy. For teachers, the use of ICT improves the efficiency of teaching preparation, and the use of ICT tools allows them to find relevant materials, videos, and the latest music information in the classroom more quickly. It is also more convenient for music teachers to improve themselves, as they can search for better teaching methods, refer to good teaching cases, learn and integrate them into their own classrooms, as well as interact better with learners in the classroom, making it easier for learners to participate in various activities in the classroom and interact with the teacher.

Table 59. *The promotion of learners' motivation to learn music*

Category	Subcategory	Supporting statements
Music event	Choir competition	"< ...> Regularly hold chorus competitions according to different festivals, which can improve learners' sense of participation". "<...>Learners participating in the chorus competition will find the background of the song spontaneously, which is more effective than the teacher's lecture in class". "< ...> In the singing competition held in the school, learners have improved their love for music and will take the initiative to learn music knowledge outside of the classroom".
	Watching music movies	"< ...> Play music movies in class, improve music appreciation, and learn about different styles".
Social media	Music software	"< ...> The most commonly used is listening to music software to let learners find their favourite music to share". "<...> The learner union is happy to share their favourite music and can communicate and share with classmates".
	Video software	"< ...> Short video software is the most frequently used by learners, because it takes a long time to send music videos on video software, learners can see the latest music knowledge and songs faster".
Transform teaching method	Fusion innovation	"< ...> If you use one teaching method for a long time, the learners will feel bored, and they will even know what you are going to talk about in the next step. Only by integrating different styles will learners have a sense of freshness and interest to continue listening to the teacher".

Interviewees believe that organising music activities, social media and changing the mode of teaching can make learners love music more and make learners encouraged to learn music actively, learners' motivation to learn music in various music contests obviously increases, and they will

be more active in learning music knowledge, and playing music movies in the classroom will make learners love music more, and teachers will integrate music content into the classroom according to what is currently popular on social media, and learners will be more active in learning. Music as learning content, learners will also be more active in learning, teachers will also be based on the content of the current popular music into the classroom, innovative music learning methods. In extracurricular learning, especially in the popularity of social media, learners will take the initiative to use various social platforms to easily find the content they want to learn and are skilled in the use of a variety of music software, which is a more convenient way for learners to improve their independent learning and love of music.

Table 60. *The development of collaborative music education programmes: the perspective of teachers and administrators*

Category	Subcategory	Supporting statements
Exchange	Music sharing session	"< ...> Regular sharing and communication with music teachers will make me know more clearly that there are different solutions to the same problem, and teachers with more teaching experience will have more experience".
High-quality class viewing	Observation class	"< ...> Listening to an excellent music teacher's class will make me understand the teaching style of other teachers and the teaching methods and music activities that can be used for reference <3>".
Hosting an art event	Music contest	"< ...> Holding music activities will make all departments of learning cooperate, let the school pay more attention to music education, and add music education equipment".

For teachers themselves, improving collaboration with other teachers, administrators, and creating an integrated and comprehensive music education programme can be accomplished by using exchanges, observing classes, and hosting arts events. Teachers can learn from excellent and creative classroom content by visiting the classrooms of other excellent music teachers, visualising the atmosphere of other teachers' classrooms, and better share their feelings and learning experiences with other music teachers. And organising high-quality lesson observation can make their own state of the class by more music teachers to evaluate, get more opinions to improve the quality of teaching and teaching mode of teachers themselves, and in the after school organised a variety of art activities, can make teachers and school departments united, for the school's after-school life to enrich the learning content, so that the teachers have exchanges and collaborations.

Table 61. *The realisation of the ultimate goal of music education*

Category	Subcategory	Supporting statements
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To the learner	Esthetical education	< ...> Esthetical education is an education that learners must receive, which can improve learners' character".
	Music appreciation	"< ...> Learners need the competency to appreciate music, know how to appreciate music, express their feelings, and have different emotional experiences <3>".
	Improved life happiness	< ...> Learners should be able to use music to feel happiness in life and to use music to solve problems when there are no ways to solve them".
To the music teacher	Cultivation of learners' interest in music	"< ...> Focus on cultivating interest, and then gradually let learners become interested in music and stimulate their own initiative to learn actively <4>".
	Improving the music education system	< ...> Improving the music education system affects not only my learners, but also more learners, which is the most important". "<...> Because the times are changing, the music education system is also changing. This should be something that all music teachers should pay attention to and explore".
	Music education environment	< ...>A good music learning environment will make more people feel the charm of music and influence more people to learn music".

In the interviews, the music teachers' ultimate goals of music education were divided into the teachers' own ultimate goals of education and the ultimate goals of education for their learners. The ultimate goals for their learners are to improve their musical literacy and to make them love music, and they hope that their learners can be happier and more joyful in their lives through music, and for the music teachers, their ultimate goal of education is to cultivate their learners' love for music, improve the system of music education, and improve the environment of music education. The ultimate goal of music teachers is to cultivate learners' love of music, to improve the music education system and to improve the environment of music education. Teachers hope that music can bring more happiness to learners rather than burdening them, that they can find out more details of the music education system through their own continuous learning and exploring, and that they hope that the school and the society will pay more attention to music education and understand that music education is crucial to learners' development, and that they will pay more attention to music education. We hope that schools and society pay more attention to music education and understand that music education is crucial to the development of learners.

4.5. Case study of music teachers' use of ICT in the classroom in the context of changing educational paradigms

The model of teaching with teachers integrating information and communication technology (ICT) emphasises combining the advantages of ICT with classroom teaching and paying attention to learners' cognitive characteristics, learning needs and environmental features. The core of the

model lies in the use of ICT to enrich classroom content and optimise classroom structure through well-designed teaching and learning activities, thereby enhancing the effectiveness of teaching and learning. The reference record sheet can be viewed in Appendix 5.

The objective is to observe through video how teachers build an information-rich teaching environment when using ICT in the music classroom, and to achieve a revolution in the way the classroom is taught. This model not only emphasises the application of technology but also focuses on how technology serves learners' learning and development. Finally, the paragraph mentions that this ICT-based teaching model is further demonstrated through case studies, and specific applications are illustrated in the form of a table (Table 62) to provide guidance and reference for practice. This practice-based summary helps other teachers to learn from and replicate the teaching model. Conducting a case study through video viewing allows the researcher or learner to understand and analyse actual teaching and learning scenarios more intuitively, especially in educational research or pedagogical studies, where videos can provide a wealth of contextual information to help observe and analyse various aspects of the teaching and learning process. The following are the general steps for case study analysis through video viewing. Video content: choose instructional videos that are relevant to the research topic, especially practical examples that demonstrate the use of information and communication technologies (ICT) in teaching and learning. Case context: ensure that the teaching scenario in the video matches the target group (e.g. music teachers or learners), and that the teaching activity covers the key factors that you want to analyse, such as pedagogical approach, technological tools, learner engagement, etc. Watch the video: while watching the teaching video, pay attention to the main teaching activities, interactions, student responses and ICT tools used by the teacher. Record observations: record key information while watching the video, such as the teacher's pedagogical approach, use of technological tools, student engagement, achievement of teaching objectives, etc. Teaching objectives and content analysis: Analyse whether the teacher has clarified the teaching objectives and whether the teaching methods used are in line with the objectives. Observe how the teacher supports learners' learning process through ICT. Analyse learners' responses in the classroom, whether they are able to use ICT tools effectively to engage in learning, and whether learners' learning styles are innovative or personalised. Analyse the role of ICT tools in teaching and learning, whether it enhances learners' interest and engagement, and whether it improves the efficiency of teaching or the depth of content. Combining teaching theories: analyse the teaching methods and student behaviours in the video based on pre-set educational theories (e.g. constructivism, cooperative learning, etc.) and observe whether the teaching strategies are in line with these theories. Consider environmental and contextual factors: analyse how the classroom

environment (e.g. equipment conditions, time schedules) affects the application of ICT, and consider how these external factors interact with teacher and student behaviours.

Case analysis through video viewing not only helps learners gain practical experience, but also provides a dynamic and realistic classroom situation, which helps deepen the understanding of ICT application in teaching and learning and provides valuable reference for future teaching practice.

Table 62. Case observation records 1.

Content	Learn to sing the song "Jasmine Flower"	
Educational environment	Equipped with computers, audio, multimedia equipment and a music classroom with an electric piano.	
ICT Tools	Computers, multimedia, microphones, audio, electronic piano	
Classes taught to	The classes are for 22 learners aged 11-12 years old.	
Teaching process	Teachers' activities	Learners' activities
Introduction to teaching	The teacher starts the lesson by leading the learners to interact with the theme of the class by mimicking the sounds of a motorbike, as well as the movements, and the song Jasmine begins to play in the background, while the teacher claps her hands and legs to the beat.	Learners follow and imitate the teacher's movements to clarify the name of the song they are learning.
Clarifying the content of the song	The teacher uses video editing software to edit an a cappella music video that he or she has recorded of three instruments (electric piano, drums, and sand egg) and a hand beat to demonstrate the song in its entirety to the learners.	Learners can get a clear idea of what the song is about through the video shown by the teacher, as well as watch the teacher's rendition of the song using the instruments.
	After watching the video, the teacher started asking the learners questions Q1: "What's different about the teacher's singing form?" Q2: "How does the diatonic part feel" Therefore, the teacher introduces the song using formal teaching.	The learner answers. A1: "The teacher used a diatonic chorus" A2: "The diatonic sound is more colourful"
Skills teaching	1. The teacher plays a one-part accompaniment on an electric piano. Show the short score of the song and the lyrics on the multimedia screen. The teacher waits for the learners to finish singing, then uses the multimedia tools again to play the audio accompaniment to the song and sings the second part of the song while the learners sing the first part.	1. Learners sing the low voice part following the audio accompaniment for the second time. Learners sing Jasmine for the second time following the audio accompaniment.
	2. Questions to learners after the song ended: Q3: "At what point did I join the diatonic section".	2. Learners answer the questions: A3: "The diatonic added in the second measure"

	3. The teacher groups the learners, the 11 learners on the left are for one voice, the 11 learners on the right are for two voices, and the teacher conducts the learners in a two-voice chorus.	3. Learners sing the song "Jasmine Flower" in chorus after grouping.
	4. The teacher will use pictures to show different singing patterns of "Jasmine" and find a learner as a little helper to lead the group to learn the different singing patterns together.	4. Learners' chorus of "Jasmine Flower" in different singing modes
	5. The teacher demonstrates a picture of Colvin's gestures and plays the accompaniment on an electronic piano.	5. Learners follow the teacher's demonstration of Colvin's gestures to perform the movements and sing along with the accompaniment to the sketches.
	6. The teacher plays the accompaniment for the low voice singing part.	6. Learners sing along with the accompaniment for the higher voices.
	7. The teacher teaches the learners to use gestures to sing along with the song.	7. Learners learn and sing following the teacher's gestures.
	8. The teacher gets 1 learner to sing while the other 21 learners do not sing but only gesture.	8. 1 learner sings, and 21 learners make gestures.
	9. The teacher sings the high part of the song.	9. Learners sing "wu" and make hand signals to join the teacher in the chorus.
	10. The teacher concludes the teaching of the song. Teachers want learners to enrich the performance of "Jasmine Flower" by dividing learners into singing groups, instrumental groups and dance groups to choreograph the song "Jasmine Flower" on their own, with teachers helping in the process.	10. Learners form self-groups begin creating songs.
Learner showcase	The teacher listens to the learners' singing, guides, and gives direction at appropriate times.	Learners presented choreographed songs, with the singing group performing a two-part chorus, the instrumental group using the traditional Chinese instrument pipa for accompaniment and adding small percussion instruments such as wind chime beams, and the dance group dancing to the musical accompaniment.
Wrapping-up reflections, post-course work	The teacher guides the learners to summarise what has been taught in this lesson, which the teacher sets up at the end of the lesson in the WeChat group, and the teacher gives timely comments and guidance.	Videos of requirements and repertoire presentations posted by small groups of learners on <i>WeChat</i> at the request of the teacher. Improved interaction and communication with teachers and classmates, as well as parents through <i>WeChat</i> groups.

As can be seen in the process of teaching Jasmine, the teacher used ICT to enhance the role of social software such as *WeChat*, using *WeChat* groups and apps as platforms for assigning and uploading after-school homework. This effectively made *WeChat* groups or apps a central platform for these activities. In the classroom, teachers used multimedia technology to create courseware, incorporating pictures, audio, and other diverse visual media to present the innovative use of technology. This approach not only compensated for the limitations of traditional face-to-

face teaching but also transformed the conventional music class teaching model.


The use of ICT tools facilitated better interaction with learners, shifting their role from passive receivers of information to active participants in an environment of equality and mutual assistance. The teacher's design of classroom teaching centred around the learner. By using *WeChat*, teachers were able to foster a more significant partnership between the school, parents, and learners, which is essential for the learners' development. Information technology has been integrated into all aspects of the teaching process—before class, during class, and after class.

In preparing the presentations for the lessons, the teachers chose to make full use of video recording and editing techniques, as well as multimedia technologies, in the implementation of the lessons. The teachers used ICT, including video production software, to present learners with vivid animated sequences to help them easily understand the two-voice chorus, as well as the use of percussion and gestures. This approach enabled learners to better understand and master the effect of the two-voice chorus. Additionally, the teachers used multimedia technology with pictures, audio, and other elements to vividly convey the gesture movements of the song "Jasmine Flower," as well as the short score and different singing modes. In classroom teaching, teachers fully used the advantages of information technology to create an informative teaching session that increases the interest in learning and helps improve the overall effectiveness of classroom teaching.

The teacher used Colvin gestures in the classroom, along with rhythmic movements, as part of the basic tools and methods of teaching sight-singing in the Kodály pedagogy. These techniques help learners develop an appreciation for the sense of intervallic space and the tendency of pendant scales. The teacher also used gestures to ask questions, guiding the learners' learning in the classroom and encouraging them to practice. The teacher's role is that of a guide, and their professional skills are a reflection of their professionalism. ICT can effectively present the teacher's teaching style and, when used rationally, can enhance classroom instruction. By incorporating classroom recording, video, audio, microphones, projection, and multimedia hardware, along with teaching resources from websites, social media, PPT, and various apps, ICT can greatly improve the teaching quality of music teachers and the learning efficiency of learners.

Case observation 2. The observation table is based on the teacher's ICT integration teaching model, designed to be fully applied in classroom teaching. It focuses on the cognitive characteristics and learning needs of learners, as well as the environmental characteristics of the classroom, to design teaching activities. The goal is to fully employ the advantages of information technology to create an ICT-enhanced teaching and learning environment, as well as to transform the structure of classroom teaching and learning. The following will be a case study on the learning of musical instruments to describe the teaching model based on the use of ICT, as shown in Table

Table 63. Case observation 2

Content	Getting to know percussion instruments	
Educational environment	Music room with sound, multimedia equipment, electronic piano and cameras.	
ICT tools	Laptops, multimedia, electronic screens, stereos, webcams.	
Percussion instrument	 <p data-bbox="379 808 1390 875">Double horn, timbrel, bell with handle, African drums, Chinese drums, triangle, castanet, gong.</p>	
Classes are taught to	The classes are for 25 learners around 7-8 years old.	
Teaching process	Teachers' activities	Learners' activities
Introduction to teaching	<p data-bbox="363 1077 826 1205">The teacher starts the lesson by leading the learners out the door and lining them up, then plays music and leads them into the classroom while dancing.</p> <p data-bbox="363 1218 826 1563">The teacher's questions A1: "What is the most famous festival in China in winter?" A2: "What customs do we have in the Spring Festival?" A3: "Why do we set off firecrackers?" Teachers play the animated film "Little New Year Beast" and introduce the origin of the New Year Beast in the animated film.</p>	<p data-bbox="858 1077 1406 1173">Learners dance with the teacher in the classroom walking to their seats with music in the background.</p> <p data-bbox="858 1218 1406 1464">The learner answers: A1: "It's Chinese New Year." A2: "To put up the window stickers" "To set off firecrackers" A3: "To drive away the New Year's beasts" Learners watch the animated film with great interest.</p>
Skills teaching	<p data-bbox="363 1576 826 1899">1. After watching the animated film, the teacher suggested from the story that the "Translator" help the "Little Beast of the Year" communicate with humans, and the learners must learn the knowledge in the music class and finish the game to get the "Translator". The learners must learn the knowledge in the music class and get the "translator machine" after completing the game.</p> <p data-bbox="363 1906 826 1998">2. The teacher puts a short score on the screen and asks the learners to take out their triangles and play the rhythm of the</p>	<p data-bbox="858 1576 1406 1644">1. The learners watch the video and say that they will help "Little Beast" to get the "Translator".</p> <p data-bbox="858 1906 1406 1973">2. Learners take out their triangles and play the rhythm together according to the sketch.</p>

	song according to the score.	
	3. The second time, the teacher plays music for the learners to use the triangle again to make a rhythm.	3. Learners follow the accompaniment and again use the triangle to beat the rhythm.
	4. The teacher plays the second rhythm form and asks the learners to beat the rhythm with their hands.	4. Learners clap their hands to beat out the second rhythm form. Learners remove their double rattles to beat out the second rhythm form.
	5. The teacher asks the learners to take out their double-bellows to play the second rhythm form. The teacher plays the music and asks the learners to use the double-bellows again to play the rhythm.	5. The pupils follow the music and again use the double-bellows to beat out the rhythm.
	6. Teachers play music and take out the double-bellows to play the rhythm along with the music.	6. Learners and teacher work together to beat out a rhythm to the music using a double-barrel.
Getting to know percussion instruments	1. Teacher's question: A4: "Besides the triangles and doubles just used, what other percussion instruments do the learners know?" The teacher sets out, Chinese drums, African drums, tambourines, and gongs. Let the learners choose the instrument they know and introduce the instrument.	1. Learners choose instruments they know and go to the side of the instrument to introduce these percussion instruments to the rest of the class.
	2. There was no learner introduction to African drums, so the teacher played an animated video to start introducing learners to African drums and their uses.	2. Learners watch the video and listen to the teacher explain African drums.
	3. After playing the video, the teacher demonstrates the use of the African drum to the learners and have the learners squat down and tap the stool in place of the African drum.	3. Learners squat down and tap the stool to follow the teacher's tapping rhythm.
	4. The teacher chooses a learner to come forward and use the African drum to lead the other learners to beat the rhythm by tapping on the stool, while the teacher conducts from the sidelines.	4. One learner comes forward to lead while the other learners watch the teacher's direction and clap the rhythm together.
	5. The teacher plays the music and takes out the double-bellows for the learners to continue to follow the music and clap the big beat again.	5. Learners follow the music and play the rhythm again.
	6. The teacher lets the learner who is leading step down from the stage and then shows a video introducing the classification of the percussion instruments.	6. Learners watch a video to learn about the classification of percussion instruments.
Explaining the classification of	1. The video plays an introduction to percussion. The teacher takes pictures of the percussion instruments and puts them on the board	1. Learners watch the video and listen to the explanation of the classification of percussion instruments.

percussion instruments and play games	and classifies them according to the video.	
	2. The teacher displays a variety of percussion instrument pictures on the screen, then points to the pictures, and guides the learners in naming the types of percussion instruments together.	2. Learners look at the pictures pointed out by the teacher and name the types of each percussion instrument.
	3. The teacher opens the first game on the screen, which involves classifying the percussion instruments. Only the names of the percussion instruments are shown on the screen, and the learners on stage click on the screen to classify the various percussion instruments into categories.	3. Three learners sort into three types of percussion instruments and find the percussion instrument that belongs to their type. Go up to the electronic screen and click with your hand on the name of the instrument and drag and drop the name into the chosen category.
	4. After the learners have completed their selections, the teacher clicks directly on the screen, revealing the classifications made by the learners. The other learners then judge whether the classifications are correct.	4. Three learners return to their seats while other learners and the teacher watch the three learners' choices and judge whether they are correct.
	5. The teacher starts the second game, which involves finding the instruments with a membrane (cortical instruments)	5. Two learners go forward, the screen in front of them is divided into two left and right two, the left and right sides of the screen from the top of the drop with the name of the instrument balloon, the two learners stood at the station on the left and right, with a finger click on the screen that to choose their own screen belongs to the cortical musical instrument balloon, the game after 30 seconds after the game is over, the screen appeared in front of their respective scores.
	6. The teacher starts the third game by finding wooden instruments.	6. Two learners to come forward, the screen in front of them is divided into two left and right, the left and right sides of the screen from the top of the drop with the name of the instrument's balloon, the two learners stood at the station on the left and right, with a finger click on the screen to choose their own screen in front of the balloon belonging to a wooden instrument, the game is carried out 30 seconds after the end of the screen in front of them appeared respectively in their own scores.
	7. The teacher starts the fourth game by finding metallic instruments.	7. Two learners to the front, the screen in front of them is divided into two left and right, the left and right sides of the screen from the top of the drop with the name of the instrument balloon, two learners standing in the station on the left and right, with a finger click on the screen to choose their own screen in front of the balloon belonging to the metal musical instruments, the game is carried out 30 seconds after the end of the screen in front of them appeared in front of their respective scores.
	8. At the end of the game, the teacher played an animated film, which told the	8. Learners view the video and are happy that they have helped the 'Little Beast' celebrate the

	learners that they had been given a "translator", and that the "Little Beast" could communicate with human beings while wearing the translator.	New Year with human beings.
Learner showcase	The teacher displays on the screen the sheet music of the song "New Year" with the rhythms of the percussion instruments and asks the learners to group themselves into groups of different percussion instruments.	Learners begin to work in groups.
	The teacher enters the groups that the learners have been divided into and begins to give instructions.	In small groups, learners discuss the timing and sequence of their beats to the song "New Year's Day."
	At the end of the instruction, the teacher plays the song and asks the groups to clap.	Learners clap at the teacher's command.
	Finally, the teacher plays the full song and dismisses the class with the learners.	Learners clap a big beat along with the teacher and walk out of the classroom.

From the teaching process of "Knowing Percussion Instruments" can be seen, the teacher used ICT, the teacher in the classroom in the sub-use of multimedia technology to produce courseware, produced animated video, pictures, audio, interactive games, and other diversified, visual media to present the innovative use of technology to make up for the teaching of musical instruments, the existence of the singularity of the teaching of the traditional music class changed the mode of teaching. The use of ICT tools to create a better understanding of percussion instruments and percussion instruments to classify the group game and learner interaction, so that the teacher from a single leader role into an equal and mutually supportive role, the teacher of the classroom teaching design is centred on the learner as the centre. And through the classroom interactive games can improve the learners to strengthen the memory of classroom knowledge, as well as a strong interest in the content of the teaching, in the preparation of the content of the classroom display, the teacher chose to make full use of animation video production and editing production technology, multimedia technology in the implementation of the course. Teachers used animated video production software ICT to present learners with vivid animated stories to help quickly integrate into the role, with the help of the "little beast" to get the "translator" interactive story, so that learners have the role of substitution, so that the learners themselves have a self-learning experience. The learners have the experience of self-learning. They learnt more actively and cooperated with the teacher. Teachers also use the Orff teaching method of movement gestures, in a relaxed and pleasant environment, and learners spend the class time together. In classroom teaching, the advantages of information technology were fully employed to create a kind of informative teaching session, which strengthened learners' interest in learning and helped to improve the effectiveness of classroom teaching.

The teachers in this lesson used the Orff pedagogy, using musical instruments and polyphonic structures while teaching. The percussion instruments chosen for this approach are particularly well-suited for learners aged 7-8 years, as they do not require the complexity of fingering and impose no technical burden, making them easier to operate. These instruments are also effective in emphasising the characteristics of rhythm, which supports the development of a sense of rhythm in the learners. The ease of operation also facilitates cooperation among learners, encouraging them to work together. For example, in this lesson, the teacher divided the learners into groups according to different instruments and they ultimately performed a song together using these different instruments. This method not only improves learners' interest in music but also contributes to achieving high-quality teaching outcomes. Additionally, the accompanying music played by the teacher enriches the learners' performance, making it more harmonious and aesthetically pleasing.

Case observation 3. The observation table based on the teacher's ICT integration teaching model should be fully used to carry out classroom teaching, with careful consideration given to the cognitive characteristics of learners, their learning needs, and other environmental aspects of classroom teaching when designing teaching activities. It is important to fully take advantage of information technology to create an information-rich teaching environment and transform the structure of classroom teaching. The following is a description of the teaching model based on the use of ICT, illustrated through a case study of music appreciation, as presented in Table 64.

Table 64. Case observation 3

Topic content	Enjoy the song" Doll dances with Teddy bear"	
Educational environment	Music room with sound, multimedia equipment, electronic piano and learner computers.	
ICT tools	Microphone, sound, computer, microphone, electronic baton.	
Classes are taught to	The classes are for 30 learners around 8-9 years old.	
Teaching process	Teachers' activities	Learners' activities
Introduction to teaching	The teacher starts the lesson by playing music in the background to tell a story and shows a picture of a forest to introduce the song "Doll dances with Teddy bear" from the story. Invite the learners to join the "Ball" but only after they have completed the task will they receive an invitation.	Learners sit in their seats and listen to the teacher tell the story.
Clarifying the content	The teacher uses an electronic baton to tap on the on-screen video and explains the task to the learners, showing the short score of	Learners can listen to the full song through the video presented by the teacher.

of the song	the song and the lyrics.	
	The teacher plays through the song asking the following questions: A1: 'What is the mood of this song?' A2: "What characters appear in the lyrics? What are they doing?"	Learner Answers: A1: "happy" "lively" "pleasant" A2: "Dolls and bears, they're dancing" Learners listen to the teacher sing the song and dance to the accompaniment.
	The teacher plays the accompaniment and sings the song.	Learners listen to the teacher play the song and look for differences
	The teacher tells the learners that there are two places in the song that are different and plays an electric piano and sings the song with "La" for the learners to find the differences.	After listening to the teacher sing, learners answer the difference.
	The teacher selects the learners to sing about different places.	Learners sing about the differences.
	The teacher shows two three-step ladders, one from the bottom up and one in a bottom-up-bottom structure, with the words "DO-MI-SOL" and "DO-MI-DO" written on the screen. The teacher uses an electronic baton to click on the bears on the screen to move them up the different steps.	Learners sing the notes according to the position of the bear as directed by the teacher.
Skills teaching	1. The teacher shows the sketch on the screen and asks the learners: A3: "What does the "0" in the diagram mean?" The teacher plays an animated video explaining the role of the "rest".	1. Learner's answers: A3: "Rests" Learners watch an animated video to learn about "rests" and follow the video to do the actions.
	2. After playing the video, the teacher asks the learners to take out their tablets, connects the learners' tablets using a multimedia device, and asks the learners to select the correct answers on their tablets. The teacher also uses a player to play audio for learners to listen to and select the correct answer.	2. The learner's tablet shows the teacher's question and selects the answer on the tablet, then listens to the audio playing the melody to select the answer.
	3. Teachers can display directly on the computer the percentage of correct, incorrect, and unanswered answers, as well as explain the answers to the questions.	3. Learners listen to the explanation of the teacher's answer.
	4. The teacher plays the electric piano and leads the first part of the song.	4. Learners accompany the teacher and sing in two voices.
	5. The teacher plays the electric piano and leads the two-voice part of the song.	5. Learners sing the first part with the teacher's accompaniment.
	6. The teacher plays the accompaniment for the player and leads the learners in the movements.	6. Learners follow the accompaniment and imitate the teacher's movements while singing and doing movements.
	7. The teacher presents the second task on the screen, creating lyrics. And ask questions. A4: Who else would you like the doll to dance with besides the bear?	7. Learner's responses: A4: "puppy," "bird," "kitten"

	8. The teacher plays the electric piano and asks the learners to pick up their books and sing along with the lyrics of the song "Doll dances with Teddy bear".	8. Learners pick up their music books, sing along with the accompaniment played by the teacher and sing "bear" as "puppy" and "121" as " woof, woof, woof" to imitate the barking sound of a puppy.
	9. Teachers show their own song "Dancing Dolls and Ducklings" and display the song on the screen, accompanied by an electric piano.	9. Three pupils come forward and sing to the accompaniment of the teacher "Dancing Dolls and Ducklings".
Learner showcase	The teacher will have the learners turn on their learner tablets and work in groups of two to create the lyrics.	Learners work in pairs, with the learner on the left playing the backing track and the learner on the right recording and singing.
	Teachers provide guidance as learners create their own.	Learners create, ask teacher questions, record introductions, and then submit recorded audio.
	After all learners have submitted, the teacher displays the screen that shows the audio submitted by each learner and randomly plays and comments on the audio created by the learners.	Learners listen to a random audio played by the teacher.
	After presenting the learner-recorded audio, the teacher plays the song animation and does the dance moves, then ends the class.	Learners sing along and dismiss the class by mimicking the teacher's dance moves to the accompaniment.
Wrap-up reflections, post-course work	The teacher guided the learners to summarise the lesson, and the teacher used multimedia to connect the learners' tablets during the lesson, making the class more interactive and using the learners' imagination.	Learners use their imaginations to learn more independently and find joy in using the tablet.

As seen in the teaching process of "Dolls and Bears Dancing," the teacher effectively used ICT technology and tools in the classroom. By incorporating multimedia technology, the teacher designed courses, animated videos, pictures, audio, interactive games and employed learners' tablets, along with other diverse and visual media. This innovative use of technology in the music class addressed the limitations of traditional, singular music teaching methods and transformed the conventional approach to music education.

The integration of technology into music lessons was particularly innovative, compensating for the one-dimensional nature of traditional music teaching and altering the standard mode of music instruction. ICT tools were employed to create video animations to introduce the lesson, and pictures and audio were used to set the stage for the lesson's introduction. Computers were used to engage with learners' tablets during classroom interactions, making the class more participatory. A learner presentation at the end provided each student with the opportunity to showcase their own creations and to express themselves, shifting the teacher's role from the central figure at the podium to that of a guide, where learners and teachers interact as equal partners.

The design of classroom instruction was centred around the learners. By using learner tablets, teachers were able to more clearly understand the learners' progress, see the accuracy of their answers, adjust their teaching plans accordingly, and improve the quality of instruction. In preparing the content for the class presentation, the teacher made full use of animated video production and editing techniques, multimedia technology, and designed questions and student-created activities during curriculum implementation.

The teacher used ICT to create vivid animated stories, enabling learners to take on roles and actively participate in the "Dolls' Ball" story, making them more engaged in learning the classroom material and fostering cooperation with the teacher. In addition, the Orff teaching method was employed, incorporating movement gestures and dance in a relaxed and enjoyable environment, allowing the learners to spend the class time effectively. In general, the use of information technology greatly improved the learning experience and improved the effectiveness of classroom teaching.

In the course of teaching, it is essential to adapt our teaching plans and the use of ICT tools according to the age of the learners. In lower grades, the use of learner tablets may not achieve the desired classroom effect that the teacher aims for. However, as observed in the case where the learners are 8-9 years old, they already have the ability to operate their own tablets and follow the teacher's instructions. This is the only way to achieve high-quality teaching and learning outcomes.

In general, the use of ICT technology and tools by music teachers in the classroom is very common, regardless of the learners' age. The use of ICT tools in the classroom tends to produce better results; in the future, teachers will inevitably incorporate ICT into their teaching methods. The use of ICT improves the quality of teaching and the efficiency of learners' learning. Teachers are encouraged to use their creativity to personalise their teaching and move beyond the monotonous, formulaic, and patterned approaches of the past. Teaching is a collaborative creative activity between teachers and learners, and only by continually changing and innovating will teachers be able to cultivate learners with an innovative spirit.

In conclusion, the emergence of ICT has provided teachers with a more relaxed and flexible teaching environment than ever before. However, it has also placed higher demands on the teaching abilities of music teachers. In the future, teachers must continue to learn and develop these abilities to meet these new challenges.

DISCUSSION

As we advance further into the information age, the development of ICT competencies among music teachers has become a critical area of research, especially with the ongoing transformations in educational paradigms. For example, the competency structure of music teachers is considered a dynamic and scientific system that includes numerous indicators that are essential for future educators. This structure evolves through continuous practice and learning experiences (Zhang, 2002). The findings of the thesis indicate that 55.6% of music teachers now report an increase in the use of modern music education technology and methods. This suggests that the structure of teacher competency is evolving, particularly in terms of ICT technology, which improves through continuous use by teachers. The integration of new ICT plays an important role in learner education, making it obligatory for teachers to undergo professional training to meet the changing educational demands of the 21st century (Guillén-Gámez & Ramos, 2021). There is considerable evidence suggesting that ICT offers highly developed and widespread channels of expression, effectively removing barriers of distance, time, and space (Titus, 2020). The data analysed in this research concluded that music teachers are already competent in the use of ICT, especially in collecting information from the Internet, creating teaching materials and aids, and using computers to prepare teaching content. However, some teachers still have challenges in ICT practical application, especially in how to integrate ICT into the specific practice of music teaching and learning. Teachers can seek financial support from their school or the education department, apply for educational technology resources or equipment upgrades, and participate in educational technology projects provided by the government or NGOs. They can also participate in training courses, online seminars, and workshops to enhance their competency in using ICT. Additionally, educators can attend seminars on educational technology to seek advice and share experiences with their colleagues.

Schools can also provide regular technical support and assistance to teachers by setting up a technical support team or appointing a technology coordinator to help teachers solve technology problems in the classroom. Music teachers should evaluate and select appropriate ICT tools according to the teaching aims, learners' abilities, and the actual needs of the classroom. They can start with simple and easy-to-use tools and gradually transition to more sophisticated ones. The data analysis in this study also highlights that by using ICT, teachers can not only overcome these barriers, but also access a wider range of learning materials, which helps music teachers in organising data using big data techniques.

The TPACK model (Technology Pedagogical Content Knowledge) proposed by Mishra and Koehler (2006) has gained popularity, identifying three essential types of knowledge: content, pedagogical, and technological. These three aspects must interact and be balanced, as each influences the others, and this model is also applicable to music education (Gall, 2016). Implementing TPACK can help bridge the research gap in understanding and intentionally designing effective methods for training arts educators, particularly music teachers (Piotr, 2022). Although the concept of ICT competencies for music teachers has been somewhat vague, this dissertation refines it by integrating various research constructs. The ICT competencies of music teachers are divided mainly into six dimensions: pedagogical ICT competencies, continuous professional development competencies, music-specific competencies, information management ICT competencies, social ICT competencies, and technological ICT competencies. These dimensions offer a comprehensive evaluation of the ICT competencies of music teachers.

Measuring and evaluating the effectiveness of the integration of information and communication technology (ICT) in music education, as well as its limitations, is key to ensuring its effectiveness and enhancing the quality of teaching and learning. The question remains how to measure and evaluate the ways in which ICT competencies are integrated into teaching and learning practices. Based on the findings of this study, we conclude that quizzes, assignments, and classroom performance can be used to assess whether students better master music-related knowledge and skills with ICT support. Additionally, observing whether learners are more willing to explore creatively and engage in interactive learning activities (e.g., collaborative projects, online music composition) helps evaluate the effectiveness of ICT-supported learning environments.

The research explores the extent to which teachers can improve their efficiency in lesson planning, delivery, and classroom management by using ICT tools. It evaluates how teachers can transform their pedagogical strategies through the use of ICT applications, including audio editing software, virtual musical instruments, and collaborative online platforms, to create more varied and engaging teaching and learning experiences. The research also examines whether ICT tools contribute to a more dynamic and innovative classroom environment, while accounting for the possible effects of technological issues, such as equipment malfunctions and network disruptions, on teaching practices and student outcomes.

Particularly in the music classroom, ICT tools can enhance engagement and interactivity through virtual instruments, music production software, online courses, remote collaboration, virtual concerts in different locations, and more. Despite the many potentials of ICT in music education, there are some limitations, and many of the schools in the questionnaire survey may

lack sufficient technical equipment (e.g. computers, smart whiteboards, sound systems, etc.) to support the effective use of ICT. Schools are slow to update their technological equipment and software and may not be able to provide state-of-the-art tools, which affects the effectiveness of ICT. Some music teachers may be unfamiliar with the use of ICT tools and lack technical knowledge and operational skills, which makes it difficult for them to make full use of ICT to improve the quality of teaching and learning. If teachers do not receive systematic ICT training, they may be resistant to new technological tools and find it difficult to integrate them effectively into their teaching. Not all ICT tools can fully meet the needs of music teaching. Some tools may be too complex or are not specialised enough to support teaching activities such as music composition, performance, and music analysis well. Sometimes, traditional face-to-face teaching methods may be better suited to meet individualised and in-depth pedagogical needs than through ICT tools, especially in the learning of complex musical skills and artistic expression. Schools can also lack adequate technical support staff, which means technical problems not being resolved in a timely manner. This affects the quality of teaching and the learning experience of learners.

In music education, ICT integration can effectively enhance the quality of teaching and learning, stimulate learners' interest in learning, and broaden teaching methods. However, its successful implementation relies on a number of factors, including teachers' technological competency, teaching equipment and resources, learners' technological adaptability, and school support policies. To overcome limitations in ICT integration, schools and educational institutions must provide appropriate technical support, training resources, and ensure stable operation of equipment and networks, as well as maintain the organic integration of traditional teaching methods with ICT tools to maximise their teaching effectiveness.

In addition, despite increasing recognition of ICT competencies, there are still few studies exploring digital competencies within a musical context. Even less research has focused on the use of various technological devices by music teachers (e.g., laptops, projectors, tablets) and Web 2.0 tools (e.g., forums, wikis, Google+). According to the data collected in this study, a teacher's ability to use ICT effectively in lesson preparation and performance significantly influences their overall ICT competency. Music teachers, in particular, can enhance their ICT competency by using more specialised music technology tools. Waddell & Williamon (2019) found that, based on a sample of 338 music learners, attitudes toward technology use were generally positive, with the most commonly used devices in the classroom being smartphones and laptops, followed by tablets. Gorgoretti (2019), who studied the digital practices of 18 future music teachers, observed that today's educators frequently use multimedia devices and various music software in the classroom, along with smart whiteboards to enrich interactions. However, music-specific Web 2.0

tools such as sequencer programmes (e.g. *Garageband*, *Cubase*) are rarely used. Research also indicates that factors such as age can significantly impact ICT knowledge and its application (Guillén-Gámez et al., 2018; Noori, 2019).

Given the data derived from the study, to effectively integrate information and communication technologies (ICT) into music teaching practice, music teachers need to possess a series of key competencies, including the following:

1. Technology use competency and mastery of ICT tools: music teachers need to have the ability to use a wide range of ICT tools, such as audio editing software (e.g. Audacity, GarageBand), music production software (e.g. Sibelius, Finale), video editing software (e.g. iMovie, Adobe Premiere), as well as various educational platforms and online resources (e.g. Google Classroom, YouTube). Teachers should have the ability to operate multimedia equipment (e.g., smart whiteboards, projectors, audio equipment, etc.) in order to integrate these technological tools fluently in the classroom.
2. Technology integration skills: Instructional design and ICT integration: Music teachers should be able to design teaching and learning activities that make the best use of ICT according to the objectives of the teaching and learning objectives and the needs of the learners. This means having the ability to integrate ICT into the content, not just as an aid, but as a core component that enhances learners' learning experience. Innovative application of technology: Teachers need to be able to apply innovative ICT tools to design teaching programmes that are interactive and creative. For example, using music production software to allow learners to create music or using online platforms to allow learners to share and discuss their work.
3. Assessment and feedback skills: Assessment through ICT: Music teachers should be able to apply ICT tools for effective learning assessment. For example, using online tests, assignment submission platforms (e.g. Google Classroom, Edmodo) to collect learners' work and using these tools to give feedback. Using technology to provide feedback on student progress: Teachers should be able to use technology to record student progress, work and creative processes, analyse them effectively, and provide personalised feedback and guidance.
4. Digital Literacy and Information Retrieval Skills, Information Literacy: Music teachers have to be information literate and be able to efficiently search for relevant music resources, teaching and learning materials and professional development content online. For example, finding and sharing copyright-licensed musical works, and using online databases to access the latest research findings. Learning resource management skills: Teachers must be able to manage and organise a variety of digital learning resources, including audio files, video tutorials, online courses, and interactive materials, and apply them according to their teaching needs.
5. Problem-solving and technology adaptability, and the ability to solve technological faults: Technological problems are unavoidable in the teaching and learning process. Music teachers

should have the ability to quickly solve technical problems such as audio malfunctions and software crashes. Ability to adapt to technological change: As technology continues to evolve, teachers should remain sensitive to emerging technologies and learn about new technologies, tools, and teaching platforms in a timely manner to ensure that their teaching styles are up to date. 6. Communication and Collaboration Skills, Online Collaboration Skills: Teachers must be able to communicate and collaborate effectively online with learners and other teachers using ICT tools. For example, through social media platforms (e.g. WeChat Group, QQ Group) and online forums to share resources, discuss, and collaborate with learners. 7. Interdisciplinary Collaboration: Sometimes music teachers need to collaborate with teachers of other disciplines to extend the use of ICT to cross-disciplinary teaching and learning activities, which can lead to interactive learning between different disciplines. 8. Support for Learners, Personalised Learning Support: ICT can help teachers provide personalised learning experiences for learners. Teachers to provide personalised learning experiences for learners. Teachers must use ICT tools to provide appropriate learning support to learners according to their different needs, such as distributing differentiated learning materials through learning management systems and using educational applications for real-time feedback. Developing learners' digital skills: Teachers must also help learners develop their digital skills so that they can use ICT tools autonomously for learning, creativity, and expression. 9. Pedagogical innovation and flexibility, creativity and innovation: Teachers should be able to introduce innovative ICT applications into traditional music teaching. For example, using virtual instruments or online ensemble platforms to organise learners to work together remotely. Flexibility and adaptability: ICT-based teaching is different from traditional face-to-face teaching. Teachers must have the ability to adapt their teaching strategies to the changes and challenges brought about by technology. 10. Music teachers should have knowledge of relevant copyrights and be able to use and share music resources appropriately and legally, and to ensure that learners comply with copyright regulations in the process of creation and sharing. Concerned about cyber security issues, protecting learners' personal information and privacy, and ensuring the security of the teaching and learning environment in the use of ICT.

The current situation of music education has changed dramatically. For example, UNESCO (2020) reported that as of April 13, 2020, 194 countries had closed all schools to curb the spread of COVID-19, affecting over 1.5 billion learners. Since the outbreak, online music teaching has gradually become more prevalent in the process of education. The pandemic accelerated the integration of ICT in music education, with teachers increasingly adopting technology to improve their teaching practices. The effectiveness of ICT tools in teaching and learning music has been influenced by teachers' prior experience with technology and their creative approach to integrating

it into their teaching (Pozo et al., 2022). Observations from this research show that music teachers are creatively adapting to the use of ICT, such as incorporating smart whiteboards for music games, which offer learners a more engaging experience and facilitate music learning through play.

In the information age, music education paradigms must evolve to keep up with the times. In the latest educational paradigms, ICT plays an increasingly central role in music education, using information technology, multimedia tools, and computer programmes to motivate learners and improve their musical memory, creative thinking, and imagination. These tools also contribute to self-development, musical interpretation, and the cultivation of creative dialogue. ICT integration deepens both theoretical and practical knowledge, improves the quality of education, and fosters the development of musical competency (Gorbunova, 2019). The degree to which learners use ICT in music lessons is a direct indicator of whether these tools can effectively stimulate their learning potential. Dong & Linda (2018) argue that ICT can have a positive impact on learners' learning and development. Data show that teachers often serve as facilitators, observers, guides, and knowledge disseminators, but tend to focus more on explicit or low-interaction pedagogical approaches, rarely using mediated pedagogies to improve learners' use of ICT (Arthur, Bronwyn, Death, Dockett & Farmer, 2018).

The roles of music teachers vary, as demonstrated by interviews with 15 music teachers in the study, who were categorised into three different teaching styles: leader, empath, and guide. Teacher leaders, in particular, tend to emphasise intellectual teaching, using more ICT tools to convey theoretical knowledge and the history of music. Learners expect lessons to be enriched with various technological resources and presentation skills, rather than just verbal narration (Semra, 2021). In the classroom, music teachers use smart whiteboards to interact with learners, making it easier for them to view content. Panigrahi et al. (2020) states that the use of augmented reality apps in the curriculum significantly affects learners' emotional and cognitive engagement, facilitating their understanding of e-learning tools. Taiwanese researchers have shown that interactive technology in music education can stimulate emotional engagement and help learners focus on tasks (Sun & Hsieh, 2018). Therefore, when music teachers use ICT, it can effectively stimulate the learning potential of learners.

During music creation activities, teachers often allow learners to use tools such as tablets to record and arrange music in the classroom. This not only engages learners but also helps them continue to improve their ICT skills and independent learning abilities. Teacher confidence and self-efficacy in using ICT are closely linked to their digital competency levels and application skills (Hatlevik, 2017). Although ICT, music technology, and online learning have been integrated into music education for several years, many teachers still lack the guidance or skills needed to

manage these digital technologies effectively (Calderón-Garrido & Gustems-Carnicer, 2021). Music teachers have expressed a desire to improve their ICT skills and professional competencies through self-study, school, community involvement, and various learning exchange meetings. It is increasingly important for music teachers to understand how to integrate and engage with ICT through pedagogy and learning methodologies to improve their professional practice (Khan & Markauskaite, 2018).

As we adapt to the 'new normal', it is essential to further explore how teachers use ICT to inform teacher training and professional development (Merrick & Joseph, 2023). Research has shown that low self-efficacy can negatively affect the frequency of ICT use (Hammond et al., 2011). Laptops offer teachers various combinations of software (e.g., productivity, editing, notation) to create curriculum resources, edit tasks, and incorporate music technology into teaching and learning (Webster & Williams, 2018). As the data suggest, teachers need to choose the best software combinations for their content, which requires continuous learning and updates. Teachers often use multiple devices, software, and resources simultaneously, which requires the development of skills to integrate these technologies purposefully. However, teachers must also consider the issue of unequal access to devices, tools, and resources to ensure that all learners have equal opportunities to benefit from ICT learning (Drane et al., 2020; Wang, 2008). This highlights the urgent need to train music teachers in ICT competencies and provide them with more opportunities to learn these skills.

Traditionally, ICT competencies for music teachers have focused on technical skills such as operating software and hardware. However, with the shift towards a more learner-centred and inquiry-based pedagogical paradigm, music teachers' ICT competencies must expand to include pedagogical skills, for example, designing effective technology-enhanced learning activities, facilitating collaborative learning, and assessing learning outcomes (Kirschner & Selwyn, 2009). This paradigm shift also involves a change in the attitudes of teachers towards technology. Teachers must see technology as a tool that supports learning and creativity, not just as a means of delivering content. They must be willing to take risks, experiment with new technologies, and continually reflect on their practice (Ertmer & Ottenbreit-Leftwich, 2010). Furthermore, the shift in ICT competency for music teachers highlights the importance of continuous professional development. Teachers must continuously update their ICT competencies to keep up with new technologies, evolving educational paradigms, and changing needs of learners (Mishra & Koehler, 2006).

Overall, as Zhao, Pew, Shelton, and Byers (2002) states that the paradigm shift in music teachers' ICT competencies reflects the dynamic and evolving nature of music education. It

emphasises the need for teachers to adapt their practices to meet the changing needs of learners. The current status of music education paradigm in society is complex and multifaceted, shaped by technological advances, shifting cultural norms, and changes in educational policies.

In summary, the study reveals the content of music teachers' ICT competencies within the educational model, categorising them into six areas: pedagogical ICT competencies, continuous professional development competencies, music-specific competencies, information management ICT competencies, social ICT competencies, and technological ICT competencies. The use of ICT enables music teachers to provide learners with more knowledge and facilitate more equal communication in music lessons, leading to more active and focused learning, as well as increased learner autonomy in music education. Although there are limitations to the use of ICT depending on the age of the learners, this requires a change in the role of the music teacher. Music teachers must carefully adapt the lesson content using ICT to accommodate the age and cognitive differences of learners, ensuring that learners with varying levels of musical knowledge can learn effectively. The development of teachers' digital competencies becomes necessary, as it will help them better cope with the challenges posed by technology and encourage them to explore innovative teaching, learning, and assessment strategies and methodologies that lead to higher levels of learner engagement and productive learning experiences.

CONCLUSSIONS

1. ICT competency of music teachers are interpreted differently in the scientific literature. Some authors emphasise the importance of personal knowledge and competency, while others focus on the ability to apply acquired knowledge, skills and experience to practical activities. Other authors emphasise personal characteristics and values. Competency, as the main goal of education, consists of the integrated unity of a person's knowledge, abilities, skills and attitudes. In the education system, the level of competency indicates whether the learner has acquired the specific competency required for the occupation. Competencies required for a wider range of activities form a qualification that enables a person to work efficiently and with high quality in their respective occupation. The ICT competency of teachers is an integral part of their overall professional competency. Music teachers' ICT competencies are dynamic and change as technology advances; their integrative nature becomes apparent at different stages of technology adoption. Based on literature and theoretical analyses, the content and structure of ICT competencies for music teachers should include technical, pedagogical, social, information management, musical expertise and continuing professional development competencies. With these competencies, music teachers can effectively use technology to enhance music teaching and learning, provide learners with engaging and personalised music learning experiences, and prepare them for success in the music industry or further music education.

A paradigm is a framework of assumptions, ideas, values and behaviours that defines how an individual perceives reality and acts accordingly. Educational paradigms can be viewed as the guiding principles behind the methods of teaching and learning in an educational system, including curriculum, pedagogy, and assessment. Different educational paradigms reflect different beliefs and values about the purpose of education and the roles of teachers and learners in music education. The role of the music teacher can be complex and multidimensional, depending on the range of tasks assigned to the educator. Several models have been proposed to illustrate teacher roles, reflecting their multifaceted positions. These models show how teachers' roles evolve in ICT learning environments, where they become e-facilitators and instructors. In addition, online teachers are portrayed as process facilitators, advisors, assessors and other roles relevant to the digital age. The ICT Competency Model for Music Teachers in Changing Educational Paradigms reflects the dynamic and evolving nature of music education. Teachers are expected to have the technical skills, pedagogical knowledge, student-centred learning strategies, collaboration, critical thinking, problem-solving skills, and digital literacy competencies to use ICT tools effectively in the teaching and learning process. Professional development (e.g., in-

service activities), collaboration with other educators, and the use of online resources are valuable tools for music teachers to develop competencies and integrate ICT tools into the curriculum. Thus, changes in educational philosophy, musical concepts, and technological developments have shaped the concept of a paradigm shift in music education. These changes have been shown to have a long-term impact on the goals and objectives of music teaching and learning. Recent studies have confirmed the need for changes in the music education system, especially due to the increased use of technology.

2. Based on the results of the learner survey, an analysis of the respondents' answers revealed that more than two thirds of the learners used the C2C model for online music education, while only a few learners used the B2C model. Two-thirds of the learners considered that the most important factor in using online music learning software was which online music mode was more appealing as it would increase their interest in music learning. Survey data shows that almost all learners use online software three times a week, especially for subjects such as maths, and a quarter of learners use software for online music learning. Primary school learners preferred online learning software such as 'Nail' and 'Homework Club', which were mainly used for subjects, while online learning software such as 'Little Leaf Buddies' was mainly used for music learning and was used less frequently. The study shows that learners are more likely to use online learning software in music education than in other subjects. The study shows that learners use a variety of ICT tools and software in music education, but unfortunately the potential of information technology has not been fully utilised. By investigating the learning status and patterns of learners' use of online music education, music teachers can gain a better understanding of learners' use. In the classroom, learners are more interested in the mode of delivery, and different types of learners should use different modes of online music education to make the best use of available resources.

3. Based on the results of the survey of music teachers, an analysis of the respondents' replies shows that more than a third of music teachers consider their ICT skills to be very good, one in ten consider their ICT skills to be very good, and less than one in a hundred consider their ICT skills to be very poor. In addition, more than half of the teachers used the Internet daily for professional and academic development. More than a third of music teachers use ICT four to five times a week in the course of their teaching, two thirds choose multimedia and computers as ICT tools, and half choose smartphones and audio. Less than one-third of music teachers do not use PowerPoint in the classroom; more than two-thirds choose *WeChat* for communication during lesson planning and lessons, while less than one-third use email. Two-thirds of teachers choose audio as a music IT tool for lesson planning and classroom use. About half of the teachers also

use digital pianos, amplifiers, music teacher preparation software, audio editing software and video editing software. Nearly half of music teachers chose *Audioextractor* for planning performance lessons and music technology lessons, and nearly one-quarter chose *Music Production Workshop*. Nearly one-fifth chose *Cubase* and *Sibelius*, and only one in ten teachers used *Pro Tools*, *Logic Pro X*, *Fruity Loops Studio* and *Studio One*. It can be seen that music teachers do not often use specialised music technology tools, but rather use editing software more often, suggesting that there is a need to improve teachers' capacity to develop specialised music technology tools. According to the survey results, teachers use *WeChat*, *QQ*, *Tencent*, *Nail* and email software for lesson preparation and instruction, and *Cubase*, *Sibelius*, *Pro Tools*, *Logic Pro X*, *Fruity Loops Studio*, *Studio One*, *SuperMusicEditor* and *Music Production Workshop*. These music technology tools are associated with higher ICT competency. This suggests that the use of generic communication software and specialised music technology tools can improve music teachers' ICT competency. The results of the Music Teachers' Perceptions of Education survey showed that there was no significant difference between male and female music teachers' perceptions of education. There were also no significant differences in music teachers' perceptions of music education paradigms across educational backgrounds, nor were there significant differences in principles, teaching methods, strategies, or collaboration with learners across educational qualifications. However, music teachers with different levels of teaching experience viewed education differently. Music teachers with 1-2 years of teaching experience had less significant attitudes towards education compared to music teachers with 4-6 and 16-20+ years of teaching experience. This suggests that academic qualifications and teaching experience are factors that influence music teachers' views on education. Teachers with higher academic qualifications tended to identify more with the educational perspectives presented in the thesis, and teachers with more teaching experience also showed stronger identification with these educational perspectives.

4. Based on the qualitative research data, music teachers' teaching styles can be categorised into three main types: leadership, empathy and guidance. These styles reflect teachers' different strategies in classroom management and interaction with learners, which affect teaching effectiveness and learners' learning experience. Challenges faced by teachers during music teaching can be categorised into two types: external challenges and internal challenges. External challenges mainly stem from the relationship with learners' parents, for example, the importance parents place on music education, family support and other factors that may have a direct impact on learners' learning. Internal challenges, on the other hand, include a lack of competency on the part of teachers and learners themselves, such as teachers' deficiencies in the use of technology

or teaching methods, and learners' weaknesses in musical skills and interests. Information Communication Technology (ICT) tools are seen as an important means of addressing these challenges. Research has shown that the use of ICT tools in music education not only positively affects learners' musical experience but also stimulates learners' interest in music and broadens their horizons, while providing teachers with diverse teaching methods and strategies. These tools enhance pedagogical interaction, promote active student participation, and increase the effectiveness and interest of the classroom. For music teachers, the ultimate pedagogical goal is to stimulate learners' interest in music and to contribute to the improvement of the entire music education system and environment. In order to achieve this goal, teachers tend to carry out a variety of teaching and learning activities, such as exchange programmes, quality classroom observation and organisation of arts festivals, aiming to enhance learners' musical literacy and all-round development. In addition, effective communication and collaboration among teachers was considered a crucial step in improving music education programmes. By collaborating with colleagues, teachers are able to share their teaching experiences and optimise the content of their teaching, thus creating richer and more effective learning experiences for learners in the ever-changing educational environment.

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APPENDIXES

APPENDIX 1

Dear Music Teacher

This questionnaire is designed to assess the competencies of music teachers in using information and communication technology (ICT) in music lessons. Your responses will remain anonymous, ensuring that your privacy is protected. Please answer according to your actual situation. Thank you for your participation. Mark the correct answers with an "X" and provide your answers where necessary.

1. Teacher's educational background

Associate's degree Bachelor Master Ph.D.

2. Teacher's teaching experience

0-3 years 4-6 years 7-9 years 10-15 years 16-20 years or more

3. Teacher's gender

Male Female

4. The city where the teacher is located

First-tier cities Second-tier cities Third-tier cities Fourth-tier cities

5. Type of school

Primary school Junior high school High school Vocational high school

6. Employed unit

Music Institution School Community

7. Music teachers' ICT competency

7.1. Evaluate your current level of ICT competency.

Very good Good Average Insufficient Low

7.2. How many hours a day do you spend on the Internet for professional and academic development?

1-2 hours 3-4 hours 5-6 hours

Other

7.4. How often do you apply ICT in the education process?

All the time Very often (4-5 times a week) Often (2-3 times a week) Rarely (1-2 times a week) Never

7.5. Factors affecting the use of ICT in the music education. (Mark the answers that are right for you with an "X" sign)

Factors	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
a) Lack of competencies					
b) Lack of ICT tools in the schools					
c) Insufficient funding					
d) Lack of time to pursue innovations					

e) Lack of time to use ICT during lessons					
f) ICT tools do not meet expectations					
g) Information search difficulties arising from information overload					
h) Insufficient or unavailable ICT courses, training, and seminars					
i) The school encourages autonomy and teamwork to enhance ICT use among the teaching					
j) The school organises an ICT coordinator who can provide technical support for teaching					
Other.....					
...					

7.6. Which ICT do you used in your classroom?

- Computer
 Smartphone
 Multimedia
 Microphone
 Audio recorder
 Audio playback
Acoustics
 Tablet
 Interactive whiteboard
 Online Conference Software
 Video recorder
 Printer
 Television (large screen)
 Metronome
 Music Software
 Others

7.7. How often do you use ICT in music lessons?

ICT	Often	Sometimes	Never
Interactive whiteboard			
Multimedia			
Internet/Web Environment			
Television/Video			
Video recorder			
Audio recorder			
Smartphone			
Microphone			
Tablets			
Metronome			
Online conference software			
Music software			
Printed materials (journals, books)			
Other.....			

7.8. Which constructive tools do you use when planning and performing lessons

- MS Word
 PowerPoint
 Excel
 MS Paint
 Others.....

7.9. Which communicative tools do you use when planning and performing lessons

- WeChat
 QQ
 Tencent meeting
 Dingtalk
 E-mail
 Others.....

7. 10. Please indicate which music technology tools you use to plan and perform lessons

- MIDI Keyboard
 Digital piano
 Acoustics
 Stereo
 Amplifier
 EduOffice
 Music Teaching Preparation Software
 Audio editing software
 Video editing software
 Others

7.11. Please indicate which music technology programmes you use to plan and perform lessons

- Cubase Sibelius Pro Tools Logic Pro X Fruity Loops Studio Studio One
 Super Music Editor Music Production Workshop Audio extractor Others.....

7.12. Possibilities and barriers to using ICT in music education

Question	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
I use ICT because...					
...it is useful					
...it is available					
...it is easy to use					
...I have more knowledge					
...I have support					
...it saves me time					
...it helps reach goals					
...it is required					
...it interests learners					
...it adjusts the classroom atmosphere					
I don't use ICT because...					
...it is too difficult					
...it is too expensive					
...it is not useful					
...it is not available					
...it is not required					
...I don't have support					
...there isn't enough time					
...I don't know enough					

7.13. Do you agree with these statements?

Statements	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
I know about computers and their functions.					
I repair my own computer.					
I install software on my own.					
I can create a learning website.					
I use the computer to prepare music lesson plans.					
I can create teaching aids using the computer.					
I search for teaching aids on the Internet.					
I prepare notes for my learners using the Internet.					
I find questions for my learners on the Internet.					
I always look for the latest information on the Internet.					
I use the Internet in the computer lab with my learners.					
I teach my learners how to find information on the Internet.					
I use the Internet for personal purposes.					

7.14. Please indicate which social media tools you use to plan and perform lessons

.....
.....

7.15. Do you think using technology in music lessons improves lesson efficiency?

Yes (Please indicate the reasons).....

No (Please indicate the reasons).....

7.16. Do you think teacher roles have changed with the use of technology in music education?

Yes (Please indicate the reasons).....

No (Please indicate the reasons).....

7.17. When you evaluate the use of technology in music education, can you briefly describe current issues?.....

.....
.....

Thank you for your time and cooperation!

APPENDIX 2

Dear Music Teacher

This questionnaire is designed to understand the role of music teachers in the context of changing educational paradigms. Your responses will remain anonymous, ensuring that your privacy is protected. Please answer according to your actual situation. Thank you for your participation. Mark the correct answers with an "X" and provide your answers where necessary.

1. Please mark the answer options that best reflect your opinion with an "X".

Statements	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Schools teach the truth.					
Learning happens in the mind, not the body.					
Everyone learns or should learn equally.					
Learners are full of flaws, and schools correct them.					
Competition promotes learning.					
Schools rely on specialists for control.					
Knowledge is inherently fragmented.					
Some learners are clever; others are not.					
Learning happens in the classroom, not in the world.					
Learning outcomes aim to acquire as much knowledge as possible.					

2. What principles do you follow in the process of education?

Description of the principle	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
A learner is an incomparable value, capable of freely choosing and being responsible for his choice.					
Education is open to change, but accepts what is new critically, maintains universal norms of morality and the core of nationality, and commits to common human values.					
Education commits itself to culture, takes care of its identity protection and historical continuity.					
The values of democracy are understood, life is based on them, democratic relations are created and respected, education is universally accessible.					

3. Your teaching methods and strategies during music lessons

Methods and strategies	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Discovery and action methods prevail.					
Oral and aural reproduction methods prevail.					
It is taught using various cooperative methods.					
Learned individually.					
Teaching is important.					
Learning is important.					
The methods are active and develop the ability to solve problems and take action.					
Mostly listening and reading.					
In the lesson, I try to create conditions for independent creative work and discovery based on the learner's experience.					
The use of my own words and examples prevails.					
My class is mostly textbook-based.					
In lessons, I rely on the social context as a significant learning environment.					
I can't imagine my music lesson without a computer.					
I adhere to the lesson plan.					

A learner in the process of music education

4. Your collaboration with learners

Relations with learners	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Value relations prevail.					
Normative relations prevail.					
Didactics of interaction pedagogy prevails;					
The didactics of impact pedagogy prevail.					
Didactics of learning prevails.					
Learners' wishes and suggestions are landmarks for planning and improving my activities.					
The learner turns to me only when faced with an insurmountable problem.					
Together with the learners, we create the rules for living together and learning.					
The learner must always feel a little fear when dealing with me.					
I have my favourites in the class.					
I am happy to spend break time to help the learner.					
I take into account the wishes of the learners regarding the songs they want to learn.					
Learners rush out of the classroom					

immediately after the bell.					
The interaction between me and the learner is based on dialogue, tolerance, respect, justice, demandingness, creativity.					

5. Do you agree with these statements?

Statements	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
The teacher thinks for the learners.					
The teacher teaches, and the learners are taught.					
The teacher knows everything, and the learners know nothing.					
The teacher is the subject of the learning process, and the learners are the objects.					
The teacher acts, and the teacher's activity creates the illusion of action for the learners.					
The teacher chooses and imposes his choice, and the learners obey.					
The teacher chooses the content of the program, and the learners, who were not consulted, accept it.					
Assessment is used as a disciplinary tool.					
Learners are unable to self-assess.					
The teacher speaks, and the learners listen.					

6. Do you agree with these statements?

Statements	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
A good teacher is based on the values of freedom and responsibility, love and compassion.					
The teacher formulates the tasks and requirements, and the learners carry them out.					
The best teacher is an autocrat.					
A good teacher is strict, demanding, does not change his opinion.					
A teacher who knows his worth and does not favour his learners will always be respected.					
A good teacher is an authority, he is like a helper, a guide in the learning process.					
A teacher is a creative personality, a human educator, not just a knowledge transferer.					
The teacher is the main source of information.					
The most important thing for a teacher in the educational process is the implementation of training programmes.					
The most important thing for the teacher in the educational process is the learners' concert activity.					
The most important thing for a teacher in the educational process is the learner.					

The teacher is the transmitter of information, and the learner is responsible for his own learning.					
---	--	--	--	--	--

7. Do you agree with these statements?

Music teacher during the lesson	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
I recognize that there is more than one solution to a problem.					
In the music lessons, I teach attentive listening to the opinion of others.					
In the music lessons, I teach taking responsibility for one's position.					
I encourage tolerance in the lessons.					
I encourage learners to get involved in the process of refining and improving their position.					
I try to bring teaching during lessons closer to life outside the classroom.					
In the lessons, I encourage discussion, argument, and enjoyment of presented and realized ideas.					
I aim to foster an attitude that encourages direct, fruitful sharing of ideas.					

8. What roles do you think today's music teacher should play?

The roles of a music teacher	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
An inculcator of values					
A creator					
A connoisseur					
A friend					
A psychologist					
A manager					
A counsellor					
An inspirer					
A controller					
A partner					
A planner					
An executor					
An educational innovator					
An actor					
A mediator					
A negotiator					
An organizer					
An assistant					
The main provider of knowledge					

9. Do you spend time in your lessons to develop and improve critical thinking?

Absolutely NOT! Likely not Don't know Likely Definitely YES!

.....

10. If you could choose again, would you choose the teaching profession again?

Absolutely NOT! Like no Don't know Like Definitely YES!

11. Please indicate the biggest challenge as a music teacher.

.....

APPENDIX 3

QUESTIONNAIRE FOR LEARNERS

(Online course on music education resources to promote the development of music ICT education.)

Please feel free to fill out this form. We value your comments, which will help determine the virtual curriculum of music education resources and promote the possibility of music ICT education. Read the question and possible answer options, marking the correct answer.

1. What is your gender?

Girls Boys

2. How old are you?

9 10 11 12

3. How many music lessons do you have a week?

Once a week Twice a week Three times a week More than three times a week

4. What software will you use for online learning? (Multiple Choice)

Ding Talk Homework Club Ape Counseling Youdao Premium Courses

Xiaoyezi Partner Other

5. How much do you like the online resources in music class?

Perfect like Like very much

Like a little bit I don't like it

6. How often do you use the Internet to learn music knowledge in your spare time?

Once a week Twice a week Three times a week Don't learn

7. How did you learn about music online courses?

Teacher Recommendation Classmate Sharing Advertising

Parents' advice I don't know Other

8. Are your online music courses paid?

Paid Free

9. Why you choose online music courses? (Mark (V) only one answer in every line that matches your opinion).

Factor	Extremely important	Very important	Moderately important	Slightly important	Not at all important
9.1. Convenience,					
9.2. Time freedom,					
9.3. Repeatable learning					

9.4. More teaching resources					
9.5. More interesting music content					
9.6. Teacher recommendation					
9.7. Parents request					

10. If you encounter problems in music study, how will you choose to solve them? (Mark (V) only one answer in every line that matches your opinion)

Factor	Extremely important	Very important	Moderately important	Slightly important	Not at all important
10.1. Ask the teacher directly					
10.2. Check the information by yourself					
10.3. Ask the classmates to ask					
10.4. No solution					

11. How often do you use online learning for each subject? (Mark (V) only one answer in every line that matches your opinion)

Factor	Always	Often	Sometimes	Seldom	Never
11.1. Chinese Lesson					
11.2. English					
11.3. Mathematics					
11.4. Science					
11.5. Fine Arts					
11.6. Music					
11.7. Sports					
11.8. Computer					

APPENDIX 4

Interviews with Music Teachers

Dear music teacher: my name is Haoyue Sun and I am currently a third year Ph.D. student at the Faculty of Education, Vytautas Magnus University. I am currently working on a research project and I would like to invite you to participate in the study that aims to understanding the role of ICT competency in transforming the role of music teachers in the context of changing educational paradigms. The results of this study will help to elucidate how the emergence of ICT can help music teachers towards subsequent role transformation as well as enhancing ICT competencies, analysing learning data and providing feedback to learners based on the latter.

1. What is your academic qualification?
2. How long have you been teaching music?
3. How would you describe your teaching style?
4. What challenges do you face in teaching music today?
5. In your opinion, what are the most important skills and competencies for music teachers to teach effectively in today's classrooms?
6. How do you use ICT in your music classes?
7. How do you balance traditional approaches to music education with newer approaches that emphasise creativity and collaboration?
8. How do you assess learner learning in a student-centred classroom?
9. How do you foster a love and appreciation of music in your learners?
10. How do you adapt teaching methods and strategies to accommodate learners with different learning needs or backgrounds?
11. How do you incorporate cultural diversity and global perspectives into the music curriculum?
12. How do you collaborate with other teachers, administrators, and community members to create a comprehensive and integrated music education programmed?
13. What do you think is the ultimate goal of music education?
14. How do you think your approach to being a music teacher differs from your lesson patterns as a music teacher as a learner?
15. What do you think is the role of the music teacher in the classroom?
16. How should music teachers adapt their teaching style?
17. What do you think about the emergence of ICT? Is it favourable to teachers' classroom teaching?
18. What aspects of music teachers will be replaced by the emergence of ICT?

APPENDIX 5

Case study transcripts

Content		
Educational environment		
ICT Tools		
Classes taught to		
Teaching process	Teachers' activities	Learners' activities
Introduction to teaching		
Clarifying the content of the song		
Skills teaching		
Learner showcase		
Wrapping-up reflections, post-course work		

SANTRAUKA

IVADAS

Temos aktualumas. Informacinės ir ryšių technologijos (IKT) tampa vis labiau neatsiejama šiuolaikinės visuomenės kasdienio gyvenimo dalimi ir kelia ypatingus reikalavimus ne tik šiuolaikiniams besimokantiejiems, bet ir mokytojams. Nuotolinis, hibridinis, interaktyvus, prisitaikantis mokymasis ir įvairios mokymosi analizės - dar prieš metus tai atrodė kaip ateities vizija (Zhang, 2020). Šiandien tai realybė, kurioje gyvena visas pasaulis. Mokytojams ypač svarbios ne tik IKT žinios ir naudojimas, bet ir tai, kad IKT yra pagrindinis mokymo ir mokymosi proceso elementas. Nuo to, kaip mokytojai jas naudoja, priklauso, ir mokinių gebėjimai jomis naudosis klasėje, ar už jos ribų (Calderón-Garrido, 2021). Muzikoje, kaip ir kitose srityse, technologijų pažanga suteikia galimybę ieškoti naujų raiškos būdų. Muzikiniame ugdyme IKT atveria naujas galimybes: muziką ir garsą galima įrašyti, kurti, komponuoti, redaguoti ir groti įvairiais instrumentais, įvairiais garsais, muziką galima analizuoti, ieškoti naujos informacijos internete ir t. t. (Dorfman ir Roblyer, 2015; Minott, 2015). Taigi, muzikos mokymas/ mokymasis turi galimybę tyrinėti visiškai naujas muzikines erdves ir vietas. Šiuolaikinių muzikos mokytojų IKT kompetencijų ugdymas apima nuolatinį mokymosi ir tobulėjimo procesą. Jing (2016) atliktame tyrime teigia, kad muzikos mokytojai, dalyvaujantys kvalifikacijos tobulinimo programose, įgijo daugiau pasitikėjimo ir kompetencijų naudoti IKT mokymo praktikoje. Be to, ugdant muzikos mokytojų IKT kompetencijas, reikia noro prisitaikyti prie naujų ugdymo paradigmu. Todėl ši kaita reikalauja permąstyti santykius su besimokančiais, darbo metodikas ir priemones ir skatina mokytojus nuolat mokytis ir tobulėti. Tai reiškia, kad tradicinius muzikos ugdymo metodus, pavyzdžiui, mokytojo vadovaujamą, mokiniui paklūstantį mokymąsi, keičia į mokinį orientuotas požiūris, pabrėžiantis kūrybiškumą, bendradarbiavimą ir technologijų naudojimą (Weisheng, Hui, 2022). Muzikos mokytojai turėtų gebėti integruoti IKT į savo mokymo praktiką, kad palaikytų šias naujas paradigmas. Nepaisant galimos IKT naudos muzikiniame ugdymui, trūksta tyrimų apie kompetencijas, kurių reikia muzikos mokytojams, kad jie galėtų veiksmingai integruoti technologijas į ugdymo procesą. Taigi IKT vaidmuo ugdymo procese yra prieštaringas, o profesionalus IKT taikymas yra sudėtinga ir daug pastangų reikalaujanti veikla.

Klausas (2017) aptaria, kaip naujos technologijos, tokios kaip dirbtinis intelektas, robotika ir daiktų internetas, keičia mūsų gyvenimo ir darbo būdą. Harari (2018) teigia, kad išgyvename paradigmos pokytį, kai pasaulis tampa vis labiau automatizuotas, integruotas, sujungtas ir pagrįstas duomenimis, o šis pokytis turės toli siekiančių pasekmių visuomenei ir žmonėms. Keičiantis pasauliui, neišvengiamai keičiasi ir muzikinis ugdymas, todėl turite būti pasirengę

mokyti, gyventi ir dirbti nuolatinės transformacijos sąlygomis. Todėl galima teigti, kad reikia naujų muzikos mokytojų kompetencijų (Lasauskienė ir kt., 2015, Ghozali, 2020). Visi šie pokyčiai reikalauja atnaujinti ugdymo turinį ir diegti naujas kompetencijas, principus, požiūrius ir akcentus muzikinio ugdymo procese. Šiai problemai nagrinėti reikšmingi mokslininkų Elliott (1995), Regelski (1996), Ceruzzi (2000), Fullan, (2007), Keiler (2018) Bauer (2020), Hu (2021), Ahtola ir Juvonen (2023) teoriniai darbai ir įžvalgos.

Disertacijoje bus nagrinėjami iššūkiai ir galimybės, su kuriomis susiduria muzikos mokytojai, taikydami IKT savo ugdymo praktikoje. Būdai, kaip jie gali tobulinti savo IKT kompetencijas, kad pagerintų mokymo ir mokymosi rezultatus. Taip pat bus siekiama nustatyti veiksmingas strategijas, kaip pagerinti muzikos mokytojų IKT kompetencijų tobulinimą ir aprūpinti juos reikiama išteklių bei mokymais, kad jie sėkmingai veiktų naujoje švietimo paradigmoje.

Mokslinio tyrimo problema – trūksta mokslinių tyrimų, nagrinėjančių muzikos mokytojų kompetencijas, reikalingas veiksmingai taikant IKT į muzikinio ugdymo praktiką. Nepaisant galimos IKT priemonių taikymo muzikiniame ugdyme naudos, trūksta žinių apie specifines kompetencijas, kurias muzikos mokytojai turi išsiugdyti, kad galėtų veiksmingai integruoti IKT. Tyrime taip pat aptariami iššūkiai, su kuriais susiduria muzikos mokytojai integruodami IKT savo ugdymo praktikoje, nagrinėjama IKT taikymo muzikiniame ugdyme nauda ir apribojimai bei sparčiai besivystančių technologijų ir besikeičiančių ugdymo paradigmu įtaka muzikinio ugdymo atečiai. Šių svarstymų rezultatas – iškelti šie tyrimo srities klausimai:

1. Kokios kompetencijos reikalingos muzikos mokytojams, kad jie galėtų veiksmingai taikyti IKT mokymo praktikoje, ir kaip šias kompetencijas galima ugdyti?
2. Su kokiais iššūkiais susiduria muzikos mokytojai, taikydami IKT mokymo praktikoje, ir kaip šiuos iššūkius galima įveikti?
3. Kaip galima veiksmingai išmatuoti ir įvertinti IKT taikymą muzikiniame ugdyme ir kokia yra nauda ir apribojimai?
4. Kokią įtaką muzikiniame ugdyme ateityje turės sparti IKT plėtra ir besikeičiančios ugdymo paradigmos ir kaip muzikos mokytojai gali prisitaikyti prie šių pokyčių?

Tyrimo objektas – muzikos mokytojų IKT kompetencijos besikeičiančių ugdymo paradigmu kontekste.

Tyrimo tikslas – ištirti muzikos mokytojų IKT kompetencijas besikeičiančių ugdymo paradigmu kontekste.

Tyrimo uždaviniai:

1. Teoriškai pagrįsti muzikos mokytojų IKT kompetencijų ypatumus kintančių ugdymo paradigmu kontekste.

2. Ištirti mokinių požiūrį į muzikos mokytojų IKT taikymą.
3. Ištirti dabartinę muzikos mokytojų taikymo IKT būklę ir ją lemiančius veiksnius.
4. Muzikos mokytojo vaidmens kaitą besikeičiančių ugdymo paradigmu kontekste.

Metodologinis metodas grindžiama konstruktyvaus postmodernizmo idėjomis, leidžiančiomis analizuoti mokinių mokykloje gerovės tikrovę tiek racionalizuojant, tiek emociškai-refleksyviai ją suvokiant; rekonstrukcijos teorijos požiūriu, suteikiančiu galimybę interpretuoti mokinių gerovės raišką šiuolaikinio mokyklinio ugdymo pokyčių kontekste ir ieškoti praktinio, taikomojo refleksijos modelio; postpozityvizmo ir humanistinės psichologijos paradigmos susiformavusiomis raiškos kategorijomis: holistinis ugdymas, socialinis ir emocinis ugdymas, pozityvusis ugdymas.

Tyrimo metodai. Šioje disertacijoje tyrimo klausimams nagrinėti ir tyrimo tikslams pasiekti naudotas mišrių metodų tyrimo planas. Mišrus metodas leidžia rinkti ir analizuoti tiek kiekybinius, tiek kokybinius duomenis, o tai leidžia visapusiškiau suprasti tyrimo temą. Disertacijoje taikyti šie tyrimo metodai: mokslinės ir metodinės literatūros analizė, sintezė, interpretacija ir vertinimas, klausimynas mokiniams ir muzikos mokytojams, struktūruotas individualus interviu, muzikos pamokų stebėjimas, statistinė duomenų analizė, turinio analizė ir aprašomoji statistika.

Teorijos ir praktikos ryšys yra esminis aspektas ugdant muzikos mokytojų IKT kompetencijas. Teorija suteikia konceptualų pagrindą ir principus, kuriais vadovaujama naudojant IKT muzikos ugdyme, o praktika - kontekstą ir galimybes mokytojams pritaikyti ir tobulinti savo įgūdžius. Disertacijoje teorijos ir praktikos ryšys nagrinėjamas keliais aspektais: teoriniai IKT pagrindai muzikos ugdyme; muzikos ugdymo teorinės koncepcijos mokymo praktikoje ir iššūkiai bei galimybės, susijusios su atotrūkiu tarp teorijos ir praktikos mažinimu. Nagrinėjant teorinius IKT muzikiniame ugdyme pagrindus ir nagrinėjant praktinį taikymą, disertacija gali prisidėti prie geresnio supratimo, kaip padėti plėtoti prasmingą ir veiksmingą technologijų naudojimą muzikiniame ugdyme.

Disertacijos mokslinis naujumas ir teorinė reikšmė. Sukurtas inovatyvus teorinis muzikos mokytojo kompetencijų modelis, kuriame, remiantis literatūros analize, siūloma prielaida, kad muzikos mokytojo vaidmuo greičiausiai išliks suvaržytas egzistuojančių klasikinių ugdymo koncepcijų, kurios neatitinka šiuolaikinės ugdymo paradigmos, akcentuojančios pažangias ugdymo koncepcijas, skatinančias besimokančiųjų asmeninį augimą ir mokymąsi. Šis teiginys atspindi muzikos ugdymo srityje egzistuojančią įtampą: tarp tradicinės klasikinės ugdymo filosofijos muzikos mokytojo vaidmeniui keliamų apribojimų ir šiuolaikinės ugdymo paradigmos, akcentuojančios individualų besimokančiojo tobulėjimą ir savarankišką mokymąsi, reikalavimų. Šiuolaikinės ugdymo paradigmos bruožai: pasisakoma už orientaciją į besimokantįjį: dėmesys

sutelkiamas į besimokančiųjų interesus, galimybes ir individualius poreikius, jie skatinami imtis iniciatyvos tyrinėti ir išreikšti save mokymosi procese. Integracija ir įvairovė: dėmesys emocinei patirčiai, kultūrinei aplinkai ir socialinei reikšmei, suteikiant muzikos mokymuisi daugiau humanistinės vertės, o ne apsiribojant tik techninių įgūdžių mokymu. Į mokytoją orientuotas mokymas: tradicinėje muzikos mokymo sistemoje (pvz., fortepijono ir smuiko mokymas) mokytojas yra linkęs dominuoti, o mokymo programa parengta remiantis technikomis, repertuaru ir atlikimo standartais. Todėl ypač svarbu ugdyti muzikos mokytojų IKT kompetencijas kintančių švietimo paradigmu kontekste. Remdamiesi teorinėmis idėjomis, pasiūlytomis tokių autorių kaip (Martin, 2019; Zhao & Bryant, 2017; Gibson & Ifenthaler, 2017; Cao & Zhang, 2012; Zawilinski, 2009; Mishra & Koehler, 2006), novatoriškai parengėme muzikos mokytojų IKT kompetencijų modelį kintančios ugdymo paradigmos sąlygomis. Modelyje akcentuojamos šios kompetencijos: a) į mokinį orientuotas mokymasis; b) mokymasis bendradarbiaujant; c) skaitmeninis raštingumas; d) technologijų integracija; e) kritinis mąstymas ir problemų sprendimas; f) pedagoginės inovacijos; g) globalus sąmoningumas. Ir šios muzikos mokytojams reikalingos kompetencijos yra tos kryptys, į kurias reikia orientotis ateityje plėtojant muzikos mokytojų kompetencijas.

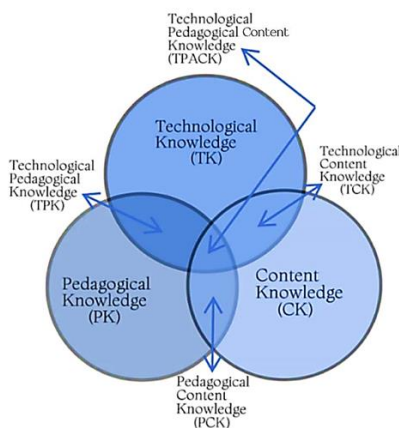
Praktinė tyrimo rezultatų reikšmė. Šioje disertacijoje kaip tyrimo ir analizės pavyzdys pateikiami Kinijos muzikos mokytojai. Tyrimo rezultatai rodo, kad mokytojų naudojimas IKT neišvengiamai plėtosis švietimo paradigmoje. Dėl šios priežasties siūlome muzikos mokytojų kompetencijų modelį, siekdami turėti aiškią mokymosi kryptį muzikos mokytojų IKT kompetencijų ugdymui ateityje. Faktorių tyrimo rezultatai atskleidžia IKT taikymo įtaką ir muzikos mokytojo IKT kompetencijų svarbą besikeičiančioje ugdymo paradigmoje. Kadangi tyrimo imtį sudarė tik kinų muzikos mokytojai ir mokiniai, nebuvo tarptautinių imties duomenų. Gauti rezultatai atveria galimybes toliau plėtoti išsamius muzikos mokytojų IKT kompetencijų tyrimus.

Bendra disertacijos apimtis - 185 puslapiai (be priedų), panaudota 15 paveikslų, 64 lentelės, 307 literatūros šaltiniai.

1. TEORINĖS DALIES APŽVALGA

Muzikos mokytojų IKT kompetencijos kaip profesinių kompetencijų sudedamoji dalis. Muzikos mokytojų kompetencijų struktūra – tai dinamiška mokslinė sistema, apimanti daugybę muzikos mokytojams būtinų kompetencijų ir yra dinamiška struktūrinė sistema, apimanti teoriją ir praktiką (Zhang, 2002). Shulmano, Mishros ir Koehlerio (2006) aprašyti pedagoginio turinio žinių (PCK) pagrindai paskatino sukurti naują konceptualią sistemą – technologinio pedagoginio

turinio žinias (TPACK), kuri integruoja technologijas, pedagogiką ir dalyko turinį. Informacinių technologijų ir dalyko programos kompetencijos integracija suteikia teorines gaires.



1 pav. TPACK sistema (pagal Mishra ir Koehler, 2006)

Būsimųjų mokytojų žinių struktūra neapsiriboja tradiciniu modeliu „dalyko žinios + pedagoginės žinios“, bet pabrėžia struktūrinės daugiasluksnio komplekso savybes (Gu, 2017). Falloon (2020) pasiūlė TDC teorinį modelį, kuris buvo adaptuotas remiantis TPACK teoriniu modeliu, pabrėžiant svarbų skaitmeninių technologijų vaidmenį mokytojų kompetencijoms, kaip parodyta 1 paveiksle.

XXI a. muzikos mokytojų ugdymas turėtų būti orientuotas į naują mokymo dizainą, komandos formavimą, naujų informacinių technologijų įgūdžių ugdymą, naujus kūrybiškumo ir inovacijų skatinimo būdus (Davidova, 2019). Tai rodo ir daugybė visame pasaulyje atliktų tyrimų, kuriuose įvardijama švietimo technologijų, daugiausia pagalbinių technologijų, svarba įtraukiosiose mokymo programose (Schwartz, 2015; Ghaleb, 2014; Oravec, 2020). Informacinių technologijų įsikišimas sukėlė esminių pokyčių švietimo ir profesinėje veikloje koncepcijų, metodų ir būdų požiūriu. Kartu atitinkamai pasikeitė ir visuomenės poreikiai besimokantiejiems, mokytojų tobulėjimo kryptys, socializacijos būdai ir priemonės (Xie, Chu, Qu ir Zhao, 2016). Daugelio autorių nuomone, mokytojo IKT kompetencijų struktūrą sieja bendri komponentai: dalykinis ir pedagoginis-psichologinis pasirengimas, vadovavimas ugdymo procesui, bendravimas ir bendradarbiavimas su ugdymo proceso dalyviais, profesinės kompetencijos tobulinimas. Todėl svarbu išskirti muzikos mokytojo IKT kompetencijų ypatumus, kurie yra aktualūs muzikos mokytojo ugdymui. Remiantis mokslininkų (Denis, & Tucker, 2021; Kirschner, & Selwyn, 2017; Mishra & Koehler, 2006; 2009; Xie, Chu, Qu & Zhao, 2016; Kelentri, Helland & Arstorp, 2017 ir kiti) teorinėmis idėjomis, muzikos mokytojo IKT kompetencijų turinį ir struktūrą būtų galima suskirstyti į kelias kategorijas: technologinės IKT kompetencijos,

pedagoginės IKT kompetencijos, socialinės IKT kompetencijos, informacijos valdymo IKT kompetencijos, specifinės muzikos kompetencijos, tęstinio profesinio tobulėjimo kompetencijos.

Muzikinio ugdymo paradigmos samprata ir dabartinės situacijos analizė. Negalima neįvertinti ugdymo, kaip pagrindinio žmogaus vystymosi aspekto, svarbos. Tačiau ugdymo metodai ir požiūriai gali labai skirtis priklausomai nuo pagrindinės ugdymo paradigmos. Terminą „paradigma“ įvedė amerikiečių fizikas Kuhnas (1957). Įvairiuose dalykuose paradigmos suprantamos skirtingai, taip pat skiriasi ir muzikinio ugdymo paradigmų samprata. Muzikos, kaip atskiros ugdymo formos, išraiška vyksta per muzikos meną ir turi savo unikalias formas. Ahtola ir Juvonen (2023) teigia, kad muzikinis ugdymas, nors ir nepriskiriamas tiksliesiems mokslams, gali lemti netikėtus empirinius atradimus. Šiuolaikinė muzikinio ugdymo paradigma apima globalias, marginalines, diferencijuotas, fenomenologines, interpretacines, ekologines, daugiakultūrinės ir daugiadalykines sankirtas (Guan, 2016). 2020 m. UNESCO paskelbė pareiškimą dėl švietimo vizijos iki 2050 m. Šiame pareiškime teigiama, kad esminis žmogaus eros ekologinės krizės sprendimas yra pakeisti gyvenimo pasaulyje būdą, pereinant nuo dominavimo prie simbiozės. Buvo pabrėžta, kad švietimas yra šio pokyčio pagrindas, kad ši istorinė misija būtų įvykdyta, švietimo paradigma turi būti apversta aukštyn kojomis - nuo antropocentrinės pedagogikos prie neantropocentrinės pedagogikos (Yang, 2022). Dauguma muzikos pedagogų vadovaujasi bihevioristine arba konstruktyvistine paradigma, kurios siūlo aprašomąsias mokymosi metodų teorijas, tačiau jos nėra universaliai pritaikomos visoms mokymosi situacijoms. Muzikinio ugdymo kontekste šios dvi paradigmos gerai papildo viena kitą ir leidžia aiškiai ir išsamiai paaiškinti muzikinio ugdymo ir mokymo proceso esmę, siekiant didesnio veiksmingumo ir efektyvumo (Å-zgul, 2015). Apibendrinant galima teigti, kad dabartinei muzikinio ugdymo paradigmai būdingi keli iššūkiai:

- *Globalios perspektyvos:* į muzikinį ugdymą diegiama globali perspektyva. Muzika pripažįstama kaip universali kalba, peržengianti šalies ribas. Tai taip pat paskatino pedagogus į mokymo programas įtraukti įvairias muzikos tradicijas iš daugelio pasaulio kraštų (Yang, 2020). Toks pasaulinis muzikos poveikis gilina besimokančiųjų supratimą apie muziką ir jos kultūrinę vertę.

- *Muzikos mokymo programos evoliucija:* pastaraisiais metais muzikos ugdymas patyrė daugybę pakeitimų (Vidulin, Plavšić, & Žauhar, 2020). Ugdymo tikslai, uždaviniai ir numatomi rezultatai – tai veiksniai, formuojantys šiuolaikinį muzikinį ugdymą.

- *Paradigmos įvairovė:* muzikos mokymas nebėra susijęs tik su vienu metodu. Jis nėra viena paradigma, bet apima daugybę paradigmų, pavyzdžiui, estetinę paradigmą ir praktinę paradigmą. Ši įvairovė nurodo skirtingas muzikinio ugdymo filosofines ir pedagogines orientacijas.

Pedagogai paprastai įtraukia skirtingas paradigmas, kad pasiūlytų išsamų muzikinį ugdymą (Jing, 2015).

- *Personalizavimas ir į mokinį orientuotas mokymasis*: į mokinį orientuoti muzikinio ugdymo modeliai keičiasi į mokymosi bendradarbiaujant modelius. Mokymasis individualizuojamas pagal kiekvieną besimokantįjį, turintį skirtingus tikslus, interesus ir pageidaujamus mokymosi stilius. Technologijos leidžia įgyvendinti personalizuoto mokymosi idėją, atsižvelgiant į esamus ugdymo modelius, kurie numato didesnę besimokančiųjų atsakomybę ir įsipareigojimą (Siiri ir Antti, 2021).

- *Moksliniais tyrimais grindžiami pokyčiai*: šiuo metu muzikinio ugdymo reformose vis dažniau atsižvelgiama į mokslinių tyrimų rezultatus. Mokslininkai dėmesį skiria ne tik mokymo metodams, pažintinei raidai ir muzikinio ugdymo poveikiui įvairiems besimokančiųjų raidos aspektams (Siiri ir Antti, 2021). Moksliniais tyrimais grindžiamas požiūris pateikia įrodymų, kuriuos galima panaudoti keičiant mokymo programą ir mokymo praktiką.

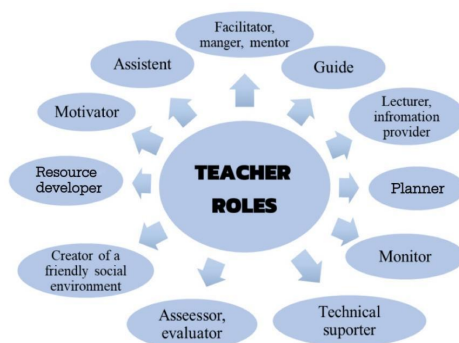
- *Perėjimas prie sociokultūrinės perspektyvos*: vis labiau suvokiama kultūrinės –socialinės perspektyvos svarba muzikinio ugdymo srityje. Šis požiūris pabrėžia kultūrinius ir socialinius muzikos kontekstus, pripažįstant muzikinių tradicijų ir patirčių įvairovę (Siiri ir Antti, 2023). Šiais laikais pedagogai dažniausiai taiko šį metodą, kad muzikinis ugdymas taptų įvairesnis ir atitiktų skirtingų kultūrinių ištakų besimokančiųjų poreikius.

- *Technologijų integravimas*: dabar yra neatsiejama muzikinio ugdymo dalis. Pasikeitė būdas, kaip besimokantieji mokomi ir mokosi muzikos pasitelkiant skaitmenines priemones, programinę įrangą ir internetinę žiniasklaidą (Xin, 2017). Integravus šias technologijas, muzikos mokymas gali būti pažangus, nes besimokantieji galės tyrinėti naujus muzikos kūrimo, rašymo ir mėgavimosi ja būdus. Tačiau neigiama pusė yra ta, kad kyla prieigos, skaitmeninio raštingumo ir užtikrinimo, kad technologijos gerai tarnautų muzikinio ugdymo tikslams, problemų (Wei, 2017).

Muzikos mokytojų vaidmuo besikeičiančių švietimo paradigmu kontekste. Dinamiškas technologijų vystymasis, gausūs informacijos šaltiniai ir galimybė naudotis žiniasklaidos priemonėmis – tai veiksniai, keičiantys mokinių ir mokytojų vaidmenis. Kaip teigia autoriai (Keiler, 2018) ir (Cook-Sather et al., 2020), mokytojai tolsta nuo žinių skleidėjo vaidmens, dabar besimokantieji į juos žiūri ne kaip į žinių saugyklas, bet kaip į ugdymo proceso koordinatorius ir pagalbininkus. Šis poslinkis sukuria sąlygas iš naujo tirti santykius su besimokančiais, verčiančias mokytojus įsitraukti į mokymąsi ir tobulėjimą. Viena vertus, kaip teigia Morris (2019), keičiasi besimokančiųjų vaidmuo, kurie iš paklusnių pagalbininkų ir žinių atkartotojų tampa savarankiškais ir smalsiais besimokančiais, tyrinėjančiais ir konstruojančiais savo tapatybę. Kartu su šiais pokyčiais stebima ugdymo turinio modernizacija, kai į mokymosi procesą

įtraukiamos naujos idėjos, požiūriai ir prioritetai. Vietoj klasikinio pasyvaus besimokančiųjų žinių įsisavinimo atsiranda aktyvus mokymasis (Yang, 2019). Kartu su švietimo naujovėmis muzikos mokytojai taip pat pakeitė savo požiūrį į didesnę įsitraukimą ir bendradarbiavimą (Merrick ir Joseph, 2023).

Mokytojo vaidmuo glaudžiai susijęs su įvairiomis jo atliekamomis užduotimis (Edmonson ir House, 2000). Geras pavyzdys yra Harden ir Crosby (2000) modelis, kuriame išskiriama 12 mokytojų vaidmenų. Šie vaidmenys apima šešias skirtingas užduočių rūšis, kurias gali atlikti mokytojai: įgyvendinti, imtis veiksmų, dalytis informacija, kurti išteklius, planuoti, vertinti ir kt. Įvairūs tyrėjai naudoja skirtingas metaforas mokytojų vaidmenims apibūdinti. Pavyzdžiui, Kaboody (2013) siūlo tokius vaidmenis, kaip iniciatorius, pagalbininkas, motyvatorius, mentorius, konsultantas ir psichologinis palaikytojas. Kitoks modelis, apimantis skirtingus etapus, yra Salmono (2013) penkių internetinio mokymosi etapų modelis, kuriame mokytojas vadinamas moderatoriumi ir instruktoriumi. Taip pat, Goodyear ir kiti (2001) internetinio mokytojo vaidmenis vertina kaip moderatoriaus, patarėjo, vertintojo, tyrėjo, turinio sudarytojo, dizainerio ir vadovo/administratoriaus. Podgorekas ir kiti (2019) pristato modelį (žr. 2 pav.), kuriame išskiriama 12 vaidmenų: 1) koordinatorius, vadybininkas, mentorius, 2) vadovas, 3) lektorius, informacijos teikėjas, 4) asistentas, 5) motyvatorius, 6) planuotojas, 7) stebėtojas, 8) techninis pagalbininkas, 9) vertintojas, 10) išteklių kūrėjas, 11) draugiškos socialinės aplinkos kūrėjas.

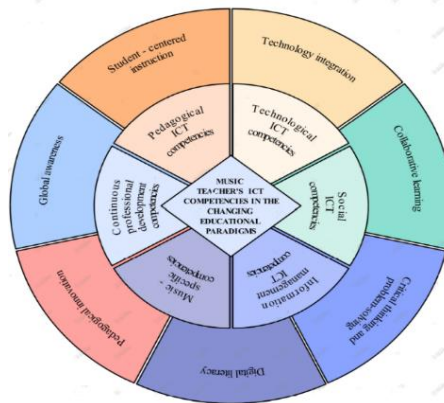


2 pav. Mokytojo vaidmenų modelis (pagal Podgoršek, Starčič ir Kacjan, 2019)

Mokytojų vaidmuo yra daugialypis ir įvairus, priklausomai nuo konkrečių užduočių ir situacijų. Šiems vaidmenims paaiškinti naudojami įvairūs modeliai, pabrėžiantys tokias veiklas kaip ugdymo proceso palengvinimas, informacijos teikimas ar vertinimas. IKT pakeitė mokytojų vaidmenį iš žinių teikėjų į pagalbininkus, koordinatorius, padėjėjus, palaikytojus ir t.t. Vaidmenys gali keistis ir vienoje klasėje, kai mokymas pereina iš vieno etapo į kitą. Šie vaidmenys byloja apie dinamišką mokymosi pobūdį ir būtinybę mokytojams judėti kartu su besikeičiančiomis švietimo paradigmomis ir technologijomis.

Muzikos mokytojų IKT kompetencijų modelis ugdymo paradigmu kontekste. Ieškant produktyvios muzikinio ugdymo paradigmos, nereikėtų pamiršti ankstesnių muzikinių tradicijų, iš praeities įgytas žinias galima panaudoti taikant naujus muzikinio ugdymo metodus (Ahtola ir Juvonen, 2023). IKT kompetencijų transformacija edukacinės paradigmos kontekste reiškia žinių, įgūdžių ir požiūrių pokyčius, kurių reikia muzikos mokytojams, kad jie galėtų veiksmingai integruoti technologijas į savo atlikimo praktiką besikeičiančių ugdymo paradigmu kontekste. Kaip teigia Christensenas, Johnsonas ir Hornas (2011), atsirandančios skaitmeninės technologijos griauja tradicinius švietimo modelius ir reikalauja, kad mokytojai ugdytųsi naujas kompetencijas, atitinkančias XXI a. besimokančiųjų poreikius ir lūkesčius. Tradiciškai IKT kompetencijos buvo orientuotos į techninius įgūdžius, tokius kaip operacinė programinė ir techninė įranga. Tačiau pereinant prie labiau į mokinį orientuoto ir tyrinėjimais grįsto mokymo paradigmu, muzikos mokytojų IKT kompetencija turėtų apimti ne tik techninius įgūdžius, bet ir pedagoginius įgūdžius, kurti veiksmingas technologijomis paremtas mokymosi veiklas, palengvinti mokymąsi bendradarbiaujant ir vertinant mokinių mokymosi rezultatus (Kirschner ir Selwyn, 2009). Muzikos mokytojų IKT kompetencijų kaita taip pat susijusi su mokytojų požiūriu į technologijas kaita. Mokytojai į technologijas turėtų žiūrėti kaip į mokymosi ir kūrybiškumo skatinimo priemonę, o ne tik kaip į priemonę turiniui perteikti. Jie turėtų būti pasirengę rizikuoti, eksperimentuoti su naujomis technologijomis ir nuolat apmąstyti savo veiklą (Ertmer ir Ottenbreit-Leftwich, 2010). Be to, muzikos mokytojo IKT kompetencijų kaita grindžiama nuolatinio profesinio tobulėjimo būtinybės pripažinimu. Mokytojai turės mokytis IKT visą gyvenimą, nes technologijos sensta, keičiasi ugdymo paradigma, o besimokančiųjų poreikiai tampa vis sudėtingesni (Mishra ir Koehler, 2006).

Šiandieninė muzikinio ugdymo struktūrinė paradigma yra sudėtinga ir daugiasluoksnė, veikiamą įvairių veiksnių, pavyzdžiui, technologinės pažangos, kintančių kultūrinių nuostatų ir nuolat besikeičiančios švietimo politikos. Dabartinę muzikinio ugdymo paradigmos būklę galima įvertinti nagrinėjant skirtingų muzikinio ugdymo paradigmu paskirtį, vertybes ir įsitikinimus, taip pat jų poveikį mokymui ir mokymuisi. Remiantis Martin (2019), Li ir Zhao (2018), Zhao ir Bryant (2017), Gibson ir Ifenthaler (2017), Cao ir Zhang (2012), Zawilinski (2009), Mishra ir Koehler (2006) ir kitų autorių pasiūlytomis teorinėmis idėjomis, buvo sukurtas Muzikos mokytojų IKT kompetencijų modelis besikeičiančiose ugdymo paradigmuose.



3 pav. Muzikos mokytojų IKT kompetencijų modelis besikeičiančiose švietimo paradigmos (sudaryta autorės)

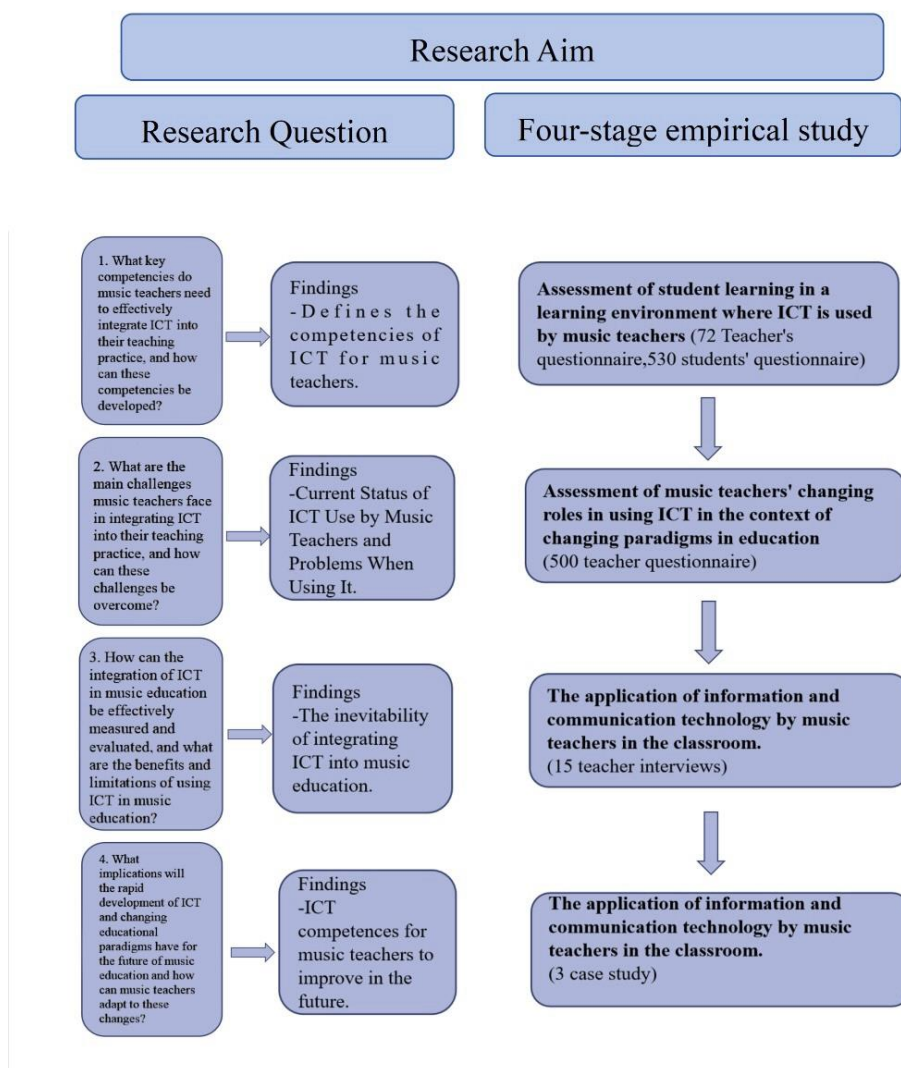
Kaip teigia Zhao, Pugh, Sheldon ir Byers (2002), mokytojų IKT kompetencijų modelis iliustruoja dinamišką ir besikeičiantį muzikos ugdymo pobūdį ir mokytojų poreikį koreguoti savo elgesį, kad jis atitiktų naujus besimokančiųjų ir visuomenės keliamus reikalavimus. Šis modelis akcentuoja į mokinį orientuoto mokymo, bendradarbiavimo, kritinės ir problemų sprendimo kompetencijos, skaitmeninio raštingumo, technologinės integracijos, pedagoginių inovacijų ir globalaus sąmoningumo svarbą muzikos mokytojams, nes mokymosi sistemos eina evoliucijos link. Inovatyvaus muzikos mokytojų IKT kompetencijų modelio taikymas praktikoje, atsižvelgiant į besikeičiančias švietimo paradigmas, padės muzikos mokytojams ugdyti kompetentingesnius mokinius, kurie bus pasirengę iššūkių kupinam technologijų pasauliui ir kurie jausis labiau įsitraukę ir mėgausis muzikiniu ugdymu.

2. TYRIMO METODIKA

Atsižvelgiant į šio tyrimo uždavinius, mišrus tyrimo metodas yra palankesnis siekiant išsamumo atsakant į pagrindinius klausimus. Siekiant užtikrinti tyrimo patikimumą ir pagrįstumą, šiame skyriuje išsamiai aptariama tyrimo metodika ir organizavimas, įskaitant tyrimo apibrėžtį, tyrimo etiką, duomenų rinkimo metodus, tyrimo imties patikimumą, pagrįstumą ir reprezentatyvumą.

Tyrimo planas ir organizavimas. Remiantis literatūros analize buvo sudaryta ši tyrimo sistema. Atsižvelgiant į tyrimo tikslą, tyrimo klausimus ir uždavinius, tyrime remiamasi mišrių metodų tyrimo metodika. Trečiąją disertacijos dalį sudaro keturi skyriai. Pirmoje dalyje kiekybiniais metodais patikrintas klausimyno patikimumas, jį išbandant su muzikos mokytojais ir mokiniais, renkant duomenis ir analizuojant rezultatus. Antroje dalyje buvo taikomi kiekybiniai metodai tyrimo duomenims rinkti naudojant adaptuotą klausimyną, kuris buvo oficialiai pateiktas muzikos mokytojams pradinėse, vidurinėse, aukštesniosiose ir profesinėse vidurinėse mokyklose. Klausimyne naudota Likerto skalė, jame buvo klausimų su vienu ir keliais atsakymų variantais.

Trečiojoje tyrimo dalyje taikytas kokybinis tyrimo metodas, konkrečiai - pusiau struktūruotas interviu su pradinųjų, vidurinių ir aukštųjų mokyklų muzikos mokytojais. Šioje empirinio tyrimo dalyje taip pat buvo atlikta tyrimo duomenų analizė ir tolesnis kokybinis tyrimas su atrinktais muzikos mokytojais atliekant pusiau struktūruotus interviu. Ketvirtoji dalis apėmė stebėjimo metodus, kuriais buvo stebimas trijų skirtingų tipų muzikos pamokų turinys, aprašomi stebėjimai ir nustatomi mokymo metodai ir modeliai, kuriuos taiko muzikos mokytojai įvairiose aplinkose ir skirtingo mokymo turinio pamokose. Tyrimo eigos schema (žr. 4 pav.).



4 pav. Tyrimo plano schema

Remiantis pirmiau minėta tyrimo sistema, disertacijoje buvo naudojami klausimynai, interviu ir stebėjimai siekiant surinkti duomenis, kad būtų galima suprasti dabartinę muzikos mokytojų IKT naudojimo pamokose situaciją, išanalizuoti IKT naudojimo iššūkius ir ištirti jų požiūrį į besikeičiančią muzikinio ugdymo paradigmą.

Duomenų rinkimas ir apdorojimas. Kadangi popierines anketas lengva pamesti, o elektroninės anketos gali užkirsti kelią šiai problemai, šioje disertacijoje apklausai atlikti

pirmausia naudota internetinė anketų pildymo programinė įranga „Questionnaire Star“. Siekdamas užtikrinti klausimyno pagrįstumą ir mokslinį validumą, tyrėjas įžangoje paaiškino jo turinį ir tikslą bei informavo respondentus, kad jų atsakymai liks anonimiški, taip skatindamas sąžiningus atsakymus. Visus klausimus užpildė patys muzikos mokytojai. Taip pat buvo gautas mokyklų ir apklausoje dalyvavusių 530, 9-12 metų amžiaus mokinių tėvų sutikimas. Duomenų apdorojimo metu buvo taikomi šie negaliojančių klausimynų pašalinimo principai: (1) atmesti klausimynus, kurių užpildymo laikas yra trumpesnis nei 300 sekundžių, remiantis atsakymo laiku, užfiksuotu pirminiuose duomenyse, ir (2) atmesti klausimynus su akivaizdžiais dėšningumais. Po pirminio apdorojimo duomenys buvo analizuojami naudojant *SPSS 29 versiją*. Penkiolika muzikos mokytojų buvo apklausti ir transkribuoti naudojant interviu telefonu, kokybinio tyrimo pagalba gauti tyrimo duomenys buvo analizuojami ir interpretuojami taikant atviro sąvokų kodavimo metodiką. Kokybinė duomenų analizė prasidėjo nuo duomenų rinkimo, užrašymo (transkripcijos) ir sisteminimo. Duomenys buvo koduojami taip, klasifikuojami, aprašomi ir interpretuojami. Grupuojant informaciją į susistemintas informacijos kategorijas ir subkategorijas (Bitinas, Rupšienė, Žydzžiūnaitė, 2008). Pateikta lentelės forma. Visi duomenys buvo susisteminti ir pagrįsti apibrėžiant kategorijas, priskiriant subkategorijas ir pagrindžiant atsakymus respondentų teiginiais. Kokybiniuose tyrimuose ypač svarbu gerbti tyrimo dalyvius: buvo stengiamasi kuo mažiau jiems trukdyti ir teisingai perteikti jų išsakytas mintis (Creswell, 2014).

3. TYRIMO REZULTATAI

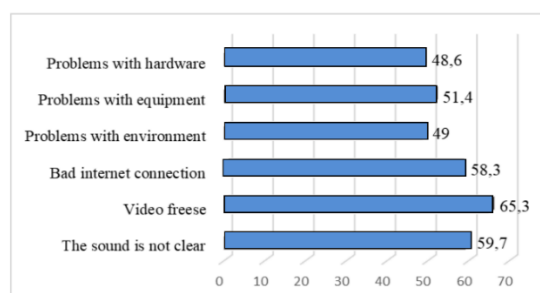
Dabartinė muzikos mokytojų IKT naudojimo kompetencijų būklė. Aprašant šiuos pagrindinius situacijos duomenis, šiuo tyrimu buvo užtikrintas apklausos imties reprezentatyvumas ir įvairovė bei suteiktas tvirtas pagrindas tolesnei tyrimo duomenų analizei. Tai, kad apklausoje dalyvavo skirtingos akademinės kvalifikacijos, pedagoginio amžiaus, lyties, geografinių regionų ir mokyklų tipų muzikos mokytojai, leido tyrimo rezultatams visapusiškai atspindėti duomenis, o mokytojų profesinė patirtis ir titulai taip pat garantavo tyrimo rezultatų patikimumą.

1 lentelė. Dabartinė muzikos mokytojų IKT naudojimo kompetencija

Grade	Frequency	Percent (%)
Excellent	44	8.8
Good	188	37.6
Average	221	44.2
Fair	43	8.6
Poor	4	0.8

Muzikos mokytojų IKT kompetencijos vertinimas rodo, kad 37,6% sutinka, jog jų IKT kompetencija yra labai gera, 44,2% nėra tikri dėl savo IKT lygio, o mažiau nei 10% muzikos mokytojų nemano, kad jų IKT kompetencija yra gera.

Tyrimo duomenys parodė (žr. 5 pav.), kad daugiau nei pusė muzikos mokytojų mano, jog sunkumų naudojant IKT muzikos pamokose kyla, kai vaizdo įrašas užstringa (65,3 %), nėra aiškaus garso (59,7%), blogas interneto ryšys (58,3 %), problemos su įranga (51,4 %).



Pastaba: kai kurie respondentai pažymėjo kelis variantus.
5 pav. Sunkumai naudojant IKT muzikos pamokose (%)

Daugumos muzikos mokytojų klasėje naudojamos IKT priemonės (2 lentelė) yra daugialypė terpė ir kompiuteriai – atitinkamai 86,8% ir 69%. Daugiau nei pusė muzikos mokytojų klasėje naudoja interaktyvias lentas, beveik pusė muzikos mokytojų taip pat renkasi išmaniuosius telefonus ir garso įrašus klasėje, taip pat 41,4% muzikos mokytojų naudoja mikrofonus.

2 lentelė. Dabartinė muzikos mokytojams skirtų IKT priemonių padėtis ugdymo procese

Category	Responses		Percent of cases (%)	
	N	Percent (%)		
Types of ICT tools used in the classroom	Computer	345	14.40	69.00
	Smartphone	268	11.20	53.60
	Multimedia	434	18.10	86.80
	Microphone	207	8.60	41.40
	Audio recorder	87	3.60	17.40
	Acoustics	243	10.0	48.60
	Tablet	64	2.70	12.80
	Interactive whiteboard	323	13.50	64.60
	Online conference software	46	1.90	9.20
	Video recorder	41	1.70	8.20
	Printer	58	2.40	11.60
	Television (large screen)	38	1.60	7.60
	Metronome	108	4.50	21.60
	Music software	104	4.30	20.80
Others	31	1.30	6.20	
Total		2397	100.00	479.40

Muzikos mokytojai yra įgiję tam tikrą IKT naudojimo kompetenciją, ypač interneto informacijos rinkimo, mokymo priemonių kūrimo ir kompiuterių naudojimo mokymo turiniui

rengti srityse. Tačiau kai kurie mokytojai vis dar nėra tikri dėl praktinio jų taikymo, ypač dėl to, kaip integruoti IKT į konkrečią muzikinio ugdymo veiklą. Todėl daugiau techninių mokymų ir praktinių rekomendacijų dėl IKT taikymo, ypač atsižvelgiant į muzikos mokymo specifiką, padės dar labiau pagerinti mokytojų IKT taikymą, taip pat skatins naujoves ir tobulins ugdymą.

Muzikos mokytojo vaidmuo besikeičiančioje ugdymo paradigmoje. Aprašant muzikos mokytojų dabartinę muzikinio ugdymo paradigmų suvokimo būklę, šis tyrimas užtikrino reprezentatyvią ir įvairialypę apklausos imtį, kuri tapo tvirtu pagrindu tolesnei duomenų analizei. Tai, kad tyrime dalyvavo skirtingą akademinę kvalifikaciją, pedagoginio darbo stažą, lytį, geografinę padėtį ir mokyklų tipus turintys mokytojai, leido tyrimo išvadose tinkamai atspindėti įvairių muzikos mokytojų patirtį ir jų ugdymo praktiką.

3 lentelė. Muzikos mokytojų požiūris į muzikinio ugdymo paradigmas

Music teachers' views	N	Mean±Std. Deviation	Test Value	T	P
Educational perspectives of music teachers	500	3.62±0.58	3.00	23.899	<.001
Principles followed by music teachers in the educational process	500	4.08±0.53	3.00	45.376	<.001
Teaching methods and strategies used by music teachers in music lessons	500	3.81±0.49	3.00	36.976	<.001
Co-operation of music teachers with learners in the process of music education	500	3.77±0.45	3.00	38.216	<.001
Music teachers' understanding of the music education process	500	3.18±0.68	3.00	5.763	<.001
Perspectives of music teachers in the educational process	500	3.64±0.52	3.00	27.407	<.001
Music teachers' perspectives in the classroom	500	4.15±0.50	3.00	51.843	<.001
The role of music teachers in education	500	3.87±0.47	3.00	41.88	<.001

Pastaba: naudojant penkių balų Likerto skalę, 3 balai reiškia neutralumą. Todėl testo reikšmė yra 3

Visi šie duomenys yra didesni nei 3, o p vertės, gautos atlikus vienos imties t-testus, yra <0,05. Tai reiškia, kad šiame tyrime dalyvavę muzikos mokytojai teigiamai vertina muzikinį ugdymą, principus, kurių laikomasi ugdymo procese, mokymo metodus ir strategijas, bendradarbiavimą su mokiniais, muzikinio ugdymo supratimą, požiūrį į ugdymo procesą ir klasę bei vaidmenis, kuriuos jie atlieka ugdymo procese.

4 lentelė. Muzikos mokytojų ugdymo principai taikomi mokymo procese (%)

Principles	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Education is open to change, but accepts what is new critically, maintains universal norms of morality and the core of nationality, and commits to common human values	0.2	1.6	8.2	63.4	26.6
Education commits itself to culture, takes care of its identity protection, and historical continuity	0.2	1	8.8	67	23
The values of democracy are understood, life is based on them, democratic relations are created and respected, and education is universally accessible	0	0.4	9.2	66.6	23.8

Principai (4 lentelė), kuriais muzikos mokytojai vadovaujami ugdymo procese, pabrėžia kultūros paveldą, moralines vertybes, demokratines koncepcijas ir kritišką švietimo pokyčių priėmimą. Tai rodo, kad mokytojai ne tik skiria daug dėmesio mokymo turinio atnaujinimui ir reformavimui, bet ir teikia didelę reikšmę pagrindinėms ugdymo proceso vertybėms, tokioms kaip kultūros išsaugojimas ir demokratiškos vertybių populiarinimas. Šie principai suteikia gaires ugdymo praktikai ir pabrėžia švietimo atsakomybę kintančiais laikais, kartu primena pedagogams, kad nuolat siekdami naujovių jie turi gerbti tradicijų ir vertybių stabilumą.

5 lentelė. Muzikos mokytojai, dirbantys su mokiniais ugdymo procese (%)

Cooperation channels	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Value relations prevail	1	17.6	23.6	45	12.8
Normative relations prevail	0.2	7.6	25.2	54	13
Didactics of interaction pedagogy prevails	0.2	0.4	9.4	70.4	19.6
The didactics of impact pedagogy prevail	0.4	4.6	26.4	53.8	14.8
Didactics of learning prevails	0.2	3.6	23	58	15.2
Learners' wishes and suggestions are landmarks for planning and improving my activities	0.2	1.6	11	68	19.2
The learner turns to me only when faced with an insurmountable problem	1.2	17	27	43	11.8
Together with the learners, we create the rules for living together and learning	0.2	4	13.8	64.8	18.8
Most popular in their classroom	0	2.8	35.2	47.4	14.6
I am happy to spend break time to help the learner	0.4	1.6	7	70	21
I take into account the wishes of the learners regarding the songs they want to learn	0	1	4.4	72	22.6
The interaction between me and the learner is based on dialogue, tolerance, respect, justice, demandingness, creativity	0	0.4	4.6	63.2	31.8

Muzikos mokytojai, dirbdami su mokiniais, demonstravo įvairiapusę sąveiką ir lanksčias mokymo strategijas. Jie ne tik sutelkė dėmesį į klasės valdymo ir mokymo metodų veiksmingumą, bet ir aktyviai klausėsi besimokančiųjų, paisė jų poreikių ir pasiūlymų, o sąveikaudami ir bendradarbiaudami stengėsi kurti teigiamą mokymosi aplinką. Toks mokymo stilius, kai daugiausia dėmesio skiriama mokytojo ir mokinio sąveikai ir pagarbai mokinių nuomonei, gali padidinti mokinių motyvaciją mokytis, pagerinti įsitraukimą klasėje ir padėti sukurti darnesnius mokytojo ir mokinio santykius.

Muzikos mokytojo vaidmuo klasėje yra ne tik pagalbininkas, bet ir įkvėpėjas, draugas ir psichologinis palaikytojas. Vadovaudami ir planuodami jie užtikrina tvarką klasėje, o diegdami naujoves ir kūrybiškumą skatina mokinių susidomėjimą ir mokymosi motyvaciją. Dėmesys interaktyviems ir bendradarbiavimo mokymo metodams priartina muzikos klasę prie šiuolaikinių ugdymo koncepcijų, kartu atsižvelgiant į mokinių emocinę ir psichologinę gerovę. Tokie įvairūs vaidmenys ne tik atspindi muzikinio ugdymo unikalumą, bet ir yra stipri parama visapusiškam besimokančiųjų tobulėjimui.

IKT kompetencijos, kurias muzikos mokytojai turėtų tobulinti ateityje. Iš 6 lentelėje pateiktų tyrimo rezultatų matyti, kad $P=0,012 < 0,05$ yra reikšmingas skirtumas tarp mokytojų IKT kompetencijos ir pamokų rengimui ir keitimuisi naudojamos programinės įrangos, o tai įrodo, kad muzikos mokytojai, kurie pamokų rengimui ir keitimuisi naudos minėtą programinę įrangą, turi aukštesnę IKT kompetenciją.

6 lentelė. Muzikos mokytojų naudojamos komunikacinės programinės įrangos, skirtos pamokų planavimui ir mokymui, analizė atsižvelgiant į muzikos mokytojų IKT kompetencijas

Chi-Square Tests		ICT competence assessment (N)		ICT competence rate (%)	Value	Asymptotic significance (2-sided)
		Poor	Good			
Communication tools used in lesson planning and teaching	<i>WeChat</i>	41	425	91.20	14.710	0.012
	<i>QQ</i>	8	169	95.48		
	<i>Tencent</i>	4	165	97.63		
	<i>Dingtalk</i>	16	203	92.69		
	<i>Email</i>	1	53	98.15		
	Other	9	68	88.31		

Iš tyrimo duomenų matyti, kad $p=0,013 < 0,05$, yra reikšmingas skirtumas tarp mokytojų IKT kompetencijos ir muzikos technologijų priemonių naudojamų atlikimo kategorijoje, o tai įrodo, kad muzikos mokytojai, kurie naudos minėtas muzikos technologijų priemones atlikimo kategorijoje, turi aukštesnę IKT kompetenciją.

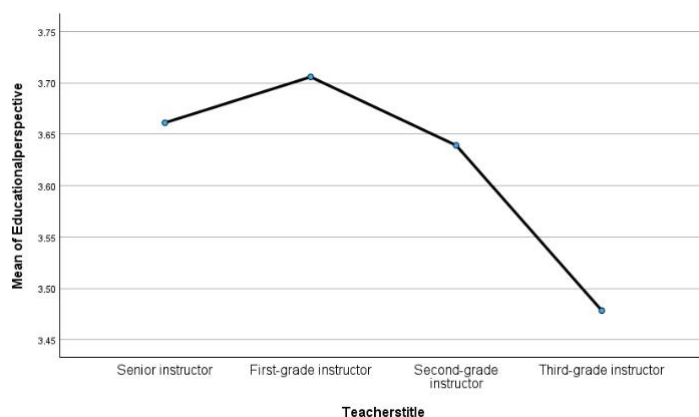
7 lentelė. Muzikos mokytojų naudojamų IKT priemonių analizė

Chi-Square Tests		ICT competence assessment (N)		ICT competence rate (%)	Value	Asymptotic Significance (2-sided)
		Poor	Good			
Music technology tools used for planning and implementation of lessons	<i>LogicProX</i>	5	43	89.58	20.999	0.013
	<i>FruityLoopsStudio</i>	4	42	91.30		
	<i>StudioOne</i>	2	56	96.55		
	<i>SuperMusicEditor</i>	2	78	97.50		
	<i>MusicProduction Workshop</i>	3	124	97.64		
	<i>Audioextractor</i>	16	206	92.79		
	Other	18	107	85.60		

Šių dviejų tyrimų rezultatai rodo, kad veiksniai, darantys įtaką muzikos mokytojų IKT kompetencijai, yra mokytojų naudojimas programine įranga ruošiant ir keičiantis pamokomis bei naudojimas muzikos technologijų priemonėmis, ir kad mokytojai turėtų stiprinti komunikacinės programinės įrangos naudojimą bei naudojimąsi muzikos technologijų priemonėmis, t. y. veiksniais, kurie, muzikos mokytojų nuomone, daro įtaką IKT kompetencijai.

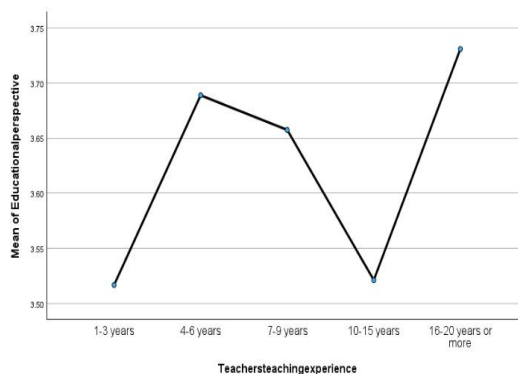
Tyrimų duomenys rodo (6 pav.), kad mokytojų mokymo metodams įtakos neturi reikšmingų skirtumų tarp principų, kuriais vadovaujasi skirtingų kategorijų muzikos mokytojai ugdymo procese, mokymo metodų ir strategijų muzikos pamokose, bendradarbiavimo su mokiniais muzikos ugdymo procese, supratimo muzikos ugdymo procese, požiūrio į ugdymo procesą, požiūrio į klasę ir vaidmenų, kuriuos jie atlieka ugdymo procese, Sig. reikšmės yra didesnės nei

0. 05. Skirtingų kategorijų muzikos mokytojai reikšmingai skyrėsi tik požiūrių ugdymo procese dimensijoje, Sig.=0,038<0,05.



6 pav. Muzikos mokytojo pareigų poveikis kintamiesiems

Konkrečiau išanalizavus, kokios darbo patirties muzikos mokytojai reikšmingai skyrėsi savo požiūriais ugdymo procese, o Bonferroni post-hoc daugkartinio palyginimo rezultatai parodė, kad pirmojo lygio sudėčių muzikos mokytojai reikšmingai labiau skyrėsi nei trečiojo lygio sudėčių muzikos mokytojai savo požiūriais ugdymo procese. Išsamesnė informacija pateikiama toliau esančioje lentelėje.



7 pav. Muzikos mokytojo pedagoginio darbo patirties poveikis kintamiesiems

Tyrimo duomenys rodo, kad skirtingos pedagoginės patirties muzikos mokytojų ugdymo proceso principai, mokymo metodai ir strategijos muzikos pamokoje, bendradarbiavimas su mokiniais muzikos ugdymo procese, supratimas muzikos ugdymo procese, požiūris į ugdymo procesą, požiūris į klasę ir vaidmenys ugdymo procese reikšmingai nesiskiria, Sig. reikšmės yra didesnės nei 0,05. Tik skirtingo pedagoginio amžiaus muzikos mokytojų požiūrio į ugdymą dimensijos reikšmingai skiriasi, Sig. reikšmės yra didesnės nei 0,05. testo reikšmės visos didesnės nei 0,05. Reikšmingai skiriasi tik požiūrių į ugdymą dimensijos muzikos klasėse, Sig.=0,014<0,05. Reikia konkrečiai išanalizuoti, kokio amžiaus muzikos mokytojų požiūriai į ugdymą reikšmingai skiriasi, daugkartinių palyginimų rezultatai Bonferroni metu parodė, kad 1-2 metų patirtį turinčių

muzikos mokytojų požiūriai į ugdymą reikšmingai skiriasi mažiau nei 4-6 metų ir 16-20 metų ir vyresnių muzikos mokytojų.

Koreliacinė analizė. Remiantis koreliacinės analizės rezultatais, visi kintamieji turi reikšmingą teigiamą koreliaciją 99% reikšmingumo lygmeniu, o tai rodo, kad tarp skirtingų kintamųjų muzikos ugdymo srityje egzistuoja stiprus ir vienas kitą palaikantis ryšys.

8 lentelė. Matmenų koreliacijos analizė

Variant	Correlations	Educational perspectives of music teachers	Principles followed by music teachers in the educational process	Teaching methods and strategies used by music teachers in music lessons	Co-operation of music teachers with learners in the process of music education	Music teachers' understanding of the music education process	Perspectives of music teachers in the educational process	Music teachers' perspectives in the classroom	The role of music teachers in education
Educational perspectives of music teachers	Pearson Correlation	1							
Principles followed by music teachers in the educational process	Pearson Correlation	.473**	1						
Teaching methods and strategies used by music teachers in music lessons	Pearson Correlation	.704**	.607**	1					
Co-operation of music teachers with learners in the process of music education	Pearson Correlation	.674**	.578**	.797**	1				
Music teachers' understanding of the music education process	Pearson Correlation	.562**	.154**	.496**	.530**	1			
Perspectives of music teachers in the educational process	Pearson Correlation	.635**	.444**	.692**	.717**	.687**	1		
Music teachers' perspectives in the classroom	Pearson Correlation	.407**	.617**	.532**	.580**	.141**	.485**	1	
The role of music teachers in education	Pearson Correlation	.554**	.533**	.644**	.691**	.443**	.657**	.655**	1

** Correlation is significant at the 0.01 level (2-tailed).

Ši analizė rodo, kad įvairiapusiai muzikinio ugdymo kintamieji yra glaudžiai susiję tarpusavyje, o koreliacijos analizė suteikia svarbų kiekybinį pagrindą šiems ryšiams suprasti, taip pat padeda toliau tobulinti muzikinio ugdymo veiksmingumą ir strategijas.

Muzikos mokytojų požiūris į muzikos ugdymo paradigmas. Remiantis interviu rezultatais, 15 muzikos mokytojų buvo suskirstyti į tris skirtingus mokymo stilius: lyderio, empatijos ir vadovo (žr. 9 lentelę). Lyderiai daugiausia dėmesio skyrė intelektualiam mokymui, klasėje naudodami daugiau IKT priemonių teorinėms muzikos žinioms ir kai kuriems muzikos istorijos dalykams dėstyti. Empatiškai mokytojai buvo įvardyti kaip tie, kurie mokė emocionaliai ir natūraliai, naudodami garsą, kad padėtų mokiniams pajusti ir suprasti muziką. Vadovaujantys mokytojai taikė mokymo stilių, kuriame daugiausia dėmesio skiriama humorui ir pramogai, o į pamokas įtraukė žaidimus ir veiklą, kad sudomintų besimokančiuosius ir palengvintų jų mokymąsi

9 lentelė. Muzikos mokytojų mokymo stiliai

Category	Subcategory	Supporting statements
As a leader	Intellectual teaching style	"<...> Use reason to control the classroom teaching process, focusing on the music theory part and the explanation of music history".
As an empath	Emotional teaching Style	"<...> In music classes, video animations and instrument demonstrations will mobilise learners to emotionally connect with teachers by hosting classroom music activities <2>". "<...> resonate emotionally with music <2>".
	Natural teaching style	"<...> The classroom focuses on communication and cooperation with learners". "<...> By hosting classroom music events".
As a guide	Humorous teaching style	"<...> By hosting classroom music events <4>" "<...> Some humorous music stories increased the learners' interaction with me in class".
	Entertaining teaching	"<...> Under the premise that happy learning is student-centred, learners can learn music knowledge <6>". "<...> Learning is fun, and learners gain knowledge more easily through games and activities <2>".

Kalbant apie su kompetencija susijusius sunkumus, mokytojai pastebėjo, kad kyla sunkumų tiek dėl besimokančiųjų, tiek dėl mokytojų kompetencijos. Besimokančiųjų kompetencijos įsisavinti IKT žinias yra nenuoseklios, jų supratimo lygis skiriasi, todėl sunku užtikrinti, kad visi mokiniai galėtų veiksmingai naudotis IKT muzikos pamokose. Be to, mokiniams dažnai trūksta tvirtų muzikos estetikos įgūdžių. Mokytojams reikia nuolat tobulinti profesinę kvalifikaciją, kad jie galėtų tobulinti savo muzikos kompetencijas, įskaitant besimokančiųjų psichologinių poreikių supratimą ir atitinkamą klasės atmosferos pritaikymą. Daugelis mokytojų taip pat nurodė, kad jiems teko savarankiškai mokytis profesionalios muzikos programinės įrangos, dažnai pasikliaujant internetiniais vaizdo įrašais be formalių mokymų, o tai rodo, kad šioje srityje reikia sistemingo mokymosi galimybių.

Interviu metu muzikos mokytojų galutiniai muzikinio ugdymo tikslai buvo suskirstyti į pačių mokytojų galutinius ugdymo tikslus ir jų mokinių galutinius ugdymo tikslus. Galutiniai jų mokinių ugdymo tikslai yra tobulinti jų muzikinį raštingumą ir siekti, kad jie pamiltų muziką, taip pat jie tikisi, kad j mokiniai per muziką taps laimingesni ir džiaugsmingesni gyvenime, o muzikos mokytojų galutiniai ugdymo tikslai yra ugdyti mokinių meilę muzikai, tobulinti muzikinio ugdymo sistemą ir gerinti muzikinio ugdymo aplinką.

10 lentelė. Galutinio muzikinio ugdymo tikslo įgyvendinimas

Category	Subcategory	Supporting statements
To the learner	Esthetical education	< ...> Esthetical education is an education that learners must receive, which can improve learners' character".
	Music appreciation	"< ...> Learners need the competency to appreciate music, know how to appreciate music, express their feelings, and have different emotional experiences <3>".
	Improved life happiness	< ...> Learners should be able to use music to feel happiness in life and to use music to solve problems when there are no ways to solve them".
To the music teacher	Cultivation of learners' interest in music	"< ...> Focus on cultivating interest, and then gradually let learners become interested in music and stimulate their own initiative to learn actively <4>".
	Improving the music education system	< ...> Improving the music education system affects not only my learners, but also more learners, which is the most important". "<...> Because the times are changing, the music education system is also changing. This should be something that all music teachers should pay attention to and explore".
	Music education environment	< ...>A good music learning environment will make more people feel the charm of music and influence more people to learn music".

Svarbiausias muzikos mokytojų tikslas - ugdyti besimokančiųjų meilę muzikai, tobulinti muzikinio ugdymo sistemą ir gerinti muzikinio ugdymo aplinką. Mokytojai tikisi, kad muzika mokiniams suteiks daugiau laimės, o ne užkraus jiems našta, kad jie patys nuolat mokydami tyrinėdami išsiaiškina daugiau muzikos ugdymo sistemos detalių, tikisi, kad mokykla ir visuomenė skirs daugiau dėmesio muzikiniam ugdymui, supras, kad muzikinis ugdymas yra labai svarbus mokinių tobulėjimui, ir skirs daugiau dėmesio muzikiniam ugdymui. Galima tikėtis, kad mokykla ir visuomenė skirs daugiau dėmesio muzikiniam ugdymui ir supras, kad muzikinis ugdymas yra labai svarbus besimokančiųjų tobulėjimui.

DISKUSIJA

Toliau žengiant į informacinį amžių, muzikos mokytojų IKT kompetencijų ugdymas tapo itin svarbia mokslinių tyrimų sritimi, ypač atsižvelgiant į vykstančius švietimo paradigmos pokyčius. Muzikos mokytojų kompetencijų struktūra laikoma dinamiška ir mokslškai pagrįsta sistema, apimančia daugybę būsimiems pedagogams svarbių rodiklių. Ši struktūra evoliucionuoja per nuolatinę praktiką ir mokymosi patirtį (Zhang, 2002). Disertacijos rezultatai rodo, kad šiuo metu 55,6 proc. muzikos mokytojų nurodo, kad šiuolaikinių muzikos ugdymo technologijų yra daugiau naudojama, o tai įrodo, kad mokytojų kompetencijų struktūra keičiasi. Naujų IKT integracija atlieka svarbų vaidmenį mokinių ugdyme, todėl mokytojams privalu kelti kvalifikaciją, kad jie atitiktų besikeičiančius XXI a. ugdymo reikalavimus (Guillén-Gámez ir Ramos, 2021). Yra nemažai įrodymų, kad IKT siūlo labai išvystytus ir plačiai paplitusius saviraiškos kanalus, kurie veiksmingai pašalina atstumo, laiko ir erdvės kliūtis (Titus, 2020). Remiantis šiame tyrime išanalizuotais duomenimis, galima daryti išvadą, kad muzikos mokytojai jau turi kompetencijos

naudotis IKT, ypač rinkti informaciją iš interneto, rengti mokymo priemonės ir naudotis kompiuteriais mokymo turiniui rengti. Tačiau kai kurie mokytojai vis dar susiduria su praktinio taikymo iššūkiais, ypač kaip integruoti IKT į konkrečią muzikos mokymo ir mokymosi praktiką. Šiame tyrime atlikta duomenų analizė taip pat rodo, kad naudodamiesi IKT mokytojai gali ne tik įveikti šias kliūtis, bet ir gauti prieigą prie įvairesnės mokomosios medžiagos, o tai padeda muzikos mokytojams organizuoti įvairesnius metodus.

Mishra ir Koehler (2006) pasiūlytas TPACK (Technology Pedagogical Content Knowledge) modelis, kuriame išskiriami trys pagrindiniai žinių tipai: turinio, pedagoginės ir technologinės žinios. Šie trys aspektai turi sąveikauti ir būti subalansuoti, nes kiekvienas iš jų daro įtaką kitiems, ir šis modelis taip pat taikytinas muzikiniam ugdymui (Gall, 2016). TPACK diegimas gali padėti užpildyti mokslinių tyrimų spragą siekiant suprasti ir tikslingai kurti veiksmingus meno pedagogų, ypač muzikos mokytojų, rengimo metodus (Piotr, 2022). Nors muzikos mokytojų IKT kompetencijų samprata buvo šiek tiek miglota, šiame straipsnyje ji tikslinama integruojant įvairius mokslinių tyrimų konstruktus. Muzikos mokytojų IKT kompetencijos iš esmės skirstomos į šešias dimensijas: pedagoginės IKT kompetencijos, nuolatinio profesinio tobulėjimo kompetencijos, muzikos specifinio ugdymo kompetencijos, informacijos valdymo IKT kompetencijos, socialinės IKT kompetencijos ir technologinės IKT kompetencijos. Šios dimensijos leidžia visapusiškai įvertinti muzikos mokytojų IKT kompetencijas. Be to, nepaisant didėjančio IKT kompetencijų pripažinimo, vis dar yra nedaug tyrimų, kuriuose skaitmeninės kompetencijos būtų nagrinėjamos muzikos kontekste. Dar mažiau tyrimų skirta muzikos mokytojų naudojimuisi įvairiais technologiniais prietaisais (pvz., nešiojamaisiais kompiuteriais, projektoriais, planšetiniais kompiuteriais) ir žiniatinklio 2.0 priemonėmis (pvz., forumais, vikis, Google+). Remiantis šiame tyrime surinktais duomenimis, mokytojo gebėjimas efektyviai naudoti IKT rengiantis pamokai ir ją atliekant daro didelę įtaką jo bendrai IKT kompetencijai. Muzikos mokytojai ypač gali padidinti savo IKT kompetenciją naudodamiesi labiau specializuotomis muzikos technologijų priemonėmis. Waddell & Williamon (2019), remdamiesi 338 muzikos besimokančiųjų imtimi, nustatė, kad požiūris į technologijų naudojimą iš esmės buvo teigiamas, o dažniausiai klasėje naudojami įrenginiai buvo išmanieji telefonai ir nešiojamieji kompiuteriai, po to - planšetiniai kompiuteriai. Gorgoretti (2019), tyręs 18 būsimųjų muzikos mokytojų skaitmeninę praktiką, pastebėjo, kad šiuolaikiniai pedagogai klasėje dažnai naudoja daugialypės terpės įrenginius ir įvairią muzikos programinę įrangą, taip pat išmaniąsias lentas, kurios praturtina sąveiką. Tačiau konkrečiai muzikai skirtos Web 2.0 priemonės, tokios kaip sekvencerių programos (pvz., Garageband, Cubase), naudojamos retai. Be to, tyrimai rodo, kad

tokie veiksniai, kaip amžius, gali turėti didelės įtakos IKT žinioms ir jų taikymui (Guillén-Gámez et al., 2018; Noori, 2019).

Muzikos mokytojų vaidmenys yra skirtingi, kaip parodė interviu duomenys su 15 tyrime dalyvavusiais muzikos mokytojais. Juos suskirstyti galima į tris mokymo stilius: lyderio, empatijos ir vadovo. Mokytojai lyderiai ypač linkę akcentuoti intelektualųjį mokymą, teorinėms žinioms ir muzikos istorijai perteikti naudoja daugiau IKT priemonių. Besimokantieji tikisi, kad pamokos bus praturtintos įvairiomis technologinėmis priemonėmis ir pristatymo įgūdžiais, o ne tik žodiniu pasakojimu (Semra, 2021). Muzikos mokytojai pamokose bendravimui su besimokančiais naudoja išmaniąsias lentas, kurios palengvina turinio peržiūrą. Panigrahi ir kiti (2020) teigia, kad interaktyvių programėlių naudojimas mokymo procese daro didelę įtaką besimokančiųjų emociniam ir kognityviniam įsitraukimui, palengvina jų e. mokymosi priemonių supratimą. Taivano tyrėjai įrodė, kad interaktyviosios technologijos muzikos mokyme gali skatinti emocinį įsitraukimą ir padėti besimokantiesiems sutelkti dėmesį į užduotis (Sun ir Hsieh, 2018). Todėl, kai muzikos mokytojai naudoja IKT, jos gali veiksmingai plėsti besimokančiųjų mokymosi galimybes.

Nors IKT, muzikos technologijos ir mokymasis internetu jau kelerius metus integruojami į muzikinį ugdymą, daugeliui mokytojų vis dar trūksta rekomendacijų ar įgūdžių, reikalingų veiksmingai valdyti šias skaitmenines technologijas (Calderón-Garrido ir Gustems-Carnicer, 2021). Muzikos mokytojai išreiškė norą tobulinti savo IKT įgūdžius ir profesines kompetencijas savišvietos, mokyklos, bendruomenės dalyvavimo ir įvairių mokymosi mainų susitikimų metu. Muzikos mokytojams tampa vis svarbiau suprasti, kaip integruoti IKT ir įsitraukti į jas pasitelkiant pedagogiką ir mokymosi metodikas, kad galėtų tobulinti savo profesinę praktiką (Khan & Markauskaitė, 2018). Prisitaikant prie naujos paradigmos būtina toliau tirti, kaip mokytojai naudoja IKT, kad būtų galima informuoti apie mokytojų rengimą ir profesinį tobulėjimą (Merrick ir Joseph, 2023). Tyrimai parodė, kad žemas saviveiksmingumas gali turėti neigiamos įtakos IKT naudojimo dažnumui (Hammond et al., 2011). Nešiojamieji kompiuteriai siūlo mokytojams įvairių programinės įrangos derinių (pvz. redagavimo, notacijos), kad jie galėtų kurti mokymo programos išteklius, redaguoti užduotis ir įtraukti muzikos technologijas į mokymą ir mokymąsi (Webster & Williams, 2018).

Daugiausiai muzikos mokytojų IKT kompetencija orientuota į techninius įgūdžius. Tačiau pereinant prie labiau į besimokantįjį orientuotos ir tyrinėjimais grindžiamos pedagoginės paradigmos, muzikos mokytojų IKT kompetencija turi būti išplėsta ir apimti pedagoginius įgūdžius, pavyzdžiui, veiksmingos technologijomis paremtos mokymosi veiklos projektavimą, mokymosi bendradarbiaujant palengvinimą ir mokymosi rezultatų vertinimą (Kirschner ir Selwyn,

2009). Šis paradigmos pokytis taip pat susijęs su mokytojų požiūriu į technologijas pokyčiu. Mokytojai turėtų žiūrėti į technologijas kaip į mokymąsi ir kūrybiškumą skatinančią priemonę, o ne tik kaip į turinio perteikimo priemonę. Jie turėtų būti pasirengę rizikuoti, eksperimentuoti su naujomis technologijomis ir nuolat apmąstyti savo patirtį (Ertmer ir Ottenbreit-Leftwich, 2010). Be to, pasikeitusi muzikos mokytojų IKT kompetencija išryškina nuolatinio profesinio tobulėjimo svarbą. Mokytojai turėtų nuolat atnaujinti savo IKT kompetencijas, kad neatsilikėtų nuo naujų technologijų, besikeičiančių ugdymo paradigmu ir besikeičiančių besimokančiųjų poreikių (Mishra ir Koehler, 2006).

Apskritai, kaip teigia Zhao, Pew, Shelton ir Byers (2002), muzikos mokytojų IKT kompetencijų paradigmos pokyčiai atspindi dinamišką ir besikeičiantį muzikinio ugdymo pobūdį. Ji pabrėžia būtinybę mokytojams pritaikyti savo patirtį prie kintančių besimokančiųjų poreikių. Dabartinė visuomenės muzikinio ugdymo paradigmos būklė yra sudėtinga ir daugialypė, jai įtakos turi technologinė pažanga, kintanti kultūrinė aplinka ir švietimo politikos pokyčiai.

IŠVADOS

1. Muzikos mokytojų IKT kompetencijos mokslinėje literatūroje interpretuojamos skirtingai. Vieni autoriai pabrėžia asmeninių žinių ir kompetencijų svarbą, kiti akcentuoja gebėjimą įgytas žinias, įgūdžius ir patirtį taikyti praktinėje veikloje. Kiti autoriai pabrėžia asmenines savybes ir vertybes. Kompetenciją, kaip pagrindinį ugdymo tikslą, sudaro integruota asmens žinių, gebėjimų, įgūdžių ir nuostatų vienovė. Muzikos mokytojų IKT kompetencijos yra dinamiškos ir keičiasi tobulėjant technologijoms; jų integracinis pobūdis išryškėja skirtingais technologijų diegimo etapais. Remiantis literatūros ir teorine analize, muzikos mokytojų IKT kompetencijų turinį ir struktūrą turėtų sudaryti techninės, pedagoginės, socialinės, informacijos valdymo, muzikinės kompetencijos ir tęstinio profesinio tobulėjimo kompetencijos.

Paradigma – tai prielaidų, idėjų, vertybių ir elgsenos sistema, kuri apibrėžia, kaip asmuo suvokia tikrovę ir atitinkamai elgiasi. Švietimo paradigmos gali būti laikomos pagrindiniais principais, kuriais grindžiami mokymo ir mokymosi metodai švietimo sistemoje, įskaitant mokymo programą, pedagogiką ir vertinimą. Skirtingos ugdymo paradigmos atspindi skirtingus įsitikinimus ir vertybes apie ugdymo tikslą ir mokytojų bei besimokančiųjų vaidmenis muzikiniame ugdyme. Muzikos mokytojo vaidmuo gali būti sudėtingas ir daugialypis, priklausomai nuo pedagogui priskirtų užduočių spektro. Mokytojų vaidmenims iliustruoti buvo pasiūlyta keletas modelių, atspindinčių daugialypę jų poziciją. Šie modeliai rodo, kaip mokytojų vaidmenys keičiasi IKT mokymosi aplinkoje, kur jie tampa e. pagalbininkais ir instruktoriais. Be to, internetiniai mokytojai vaizduojami kaip proceso koordinatoriai, patarėjai, padėjėjai ir kiti

skaitmeniniam amžiui aktualūs vaidmenys. Muzikos mokytojų IKT kompetencijų modelis kintančiose švietimo paradigmosse atspindi dinamišką ir besikeičiantį muzikos mokymo pobūdį. Taigi, ugdymo filosofijos, muzikos koncepcijų ir technologijų raidos pokyčiai suformavo muzikinio ugdymo paradigmos kaitos sampratą. Įrodyta, kad šie pokyčiai daro ilgalaikį poveikį muzikos mokymo ir mokymosi tikslams ir uždaviniams. Naujausi tyrimai patvirtino, kad muzikinio ugdymo sistemoje būtini pokyčiai, ypač dėl to, kad vis dažniau naudojamos technologijos.

2. Remiantis mokinių apklausos rezultatais, respondentų atsakymų analizė parodė, kad daugiau nei du trečdaliai besimokančiųjų naudojo C2C modelį muzikos mokymuisi internetu ir tik keletas besimokančiųjų naudojo B2C modelį. Du trečdaliai besimokančiųjų manė, kad svarbiausias veiksnys naudojant internetinę muzikos mokymosi programinę įrangą buvo tai, kuris internetinis muzikos mokymosi būdas yra patrauklesnis, nes tai padidintų jų susidomėjimą muzikos mokymuisi. Apklausos duomenys rodo, kad beveik visi besimokantieji naudojami internetine programine įranga tris kartus per savaitę, ypač tokiems dalykams kaip matematika, o ketvirtadalis besimokančiųjų naudojami internetine muzikos mokymosi programine įranga. Pradinių klasių mokiniai pirmenybę teikė internetinei mokymosi programinei įrangai, tokiai kaip *Nail* ir *Homework Club*, kurios daugiausia buvo naudojama dalykams mokytis, o internetinė mokymosi programinė įranga, tokia kaip *Little Leaf Buddies*, daugiausia buvo naudojama muzikos mokymuisi ir buvo naudojama rečiau. Tyrimas rodo, kad besimokantieji dažniau naudojami internetine mokymosi programine įranga muzikos mokymuisi nei kitų dalykų mokymuisi. Tyrimas rodo, kad besimokantieji muzikos ugdyme naudoja įvairias IKT priemones ir programinę įrangą, tačiau, deja, potencialas nėra visiškai išnaudojamas.

3. Remiantis muzikos mokytojų apklausos rezultatais, respondentų atsakymų analizė rodo, kad daugiau nei trečdalis muzikos mokytojų mano, jog jų IKT įgūdžiai yra labai geri, kas dešimtas mano, kad jų IKT įgūdžiai yra geri, o mažiau nei kas šimtas mano, kad jų IKT įgūdžiai yra labai prasti. Be to, daugiau nei pusė mokytojų kasdien naudojami internetu profesiniam ir akademiniam tobulėjimui. Daugiau nei trečdalis muzikos mokytojų savo pedagoginėje veikloje IKT naudoja 4-5 kartus per savaitę, du trečdaliai kaip IKT priemones renkasi multimediją ir kompiuterius, o pusė – išmaniuosius telefonus ir garso įrašus. Mažiau nei trečdalis muzikos mokytojų pamokose nenaudoja *PowerPoint* programos; daugiau nei du trečdaliai bendravimui per pamokų planavimą ir pamokas renkasi *WeChat*, mažiau nei trečdalis - elektroninį paštą. Du trečdaliai mokytojų kaip muzikos IT priemonę pamokų planavimui ir pamokų metu renkasi garso įrašus. Maždaug pusė mokytojų taip pat naudoja skaitmeninius pianinus, stiprintuvus, muzikos mokytojų rengimo programinę įrangą, garso redagavimo programinę įrangą ir vaizdo redagavimo programinę įrangą.

Beveik pusė muzikos mokytojų pasirinko *Audioextractor* atlikimo pamokoms ir muzikos technologijų pamokoms planuoti, beveik ketvirtadalis – *Music Production Workshop*, beveik penktadalis – *Cubase* ir *Sibelius* ir tik kas dešimtas mokytojas naudojo *Pro Tools*, *Logic Pro X*, *Fruity Loops Studio* ir *Studio One*. Matyti, kad muzikos mokytojai nedažnai naudoja specializuotas muzikos technologijų priemones, o dažniau naudojasi redagavimo programine įranga, o tai rodo, kad reikia tobulinti mokytojų gebėjimus kurti specializuotas muzikos technologijų priemones. Remiantis apklausos rezultatais, mokytojai pamokoms rengti ir mokyti naudoja *WeChat*, *QQ*, *Tencent*, *Nail* ir el. pašto programinę įrangą, o pamokoms rengti ir mokyti – *Cubase*, *Sibelius*, *Pro Tools*, *Logic Pro X*, *Fruity Loops Studio*, *Studio One*, *SuperMusicEditor* ir *Music Production Workshop*. Šie muzikos technologijų įrankiai siejami su aukštesnėmis IKT kompetencijomis. Tai rodo, kad bendrosios komunikacinės programinės įrangos ir specializuotų muzikos technologijų priemonių naudojimas gali pagerinti muzikos mokytojų IKT kompetenciją. Muzikos mokytojų kompetencijų suvokimo tyrimo rezultatai parodė, kad tarp muzikos mokytojų vyrų ir moterų nėra reikšmingo skirtumo. Nebuvo nustatyta reikšmingo skirtumo tarp muzikos mokytojų muzikinio ugdymo paradigmu suvokimo, taip pat jų ugdymo principų, mokymo metodų, strategių ar bendradarbiavimo su besimokančiais atsižvelgiant į jų išsilavinimą. Tačiau skirtingą pedagoginio darbo patirtį turintys muzikos mokytojai skirtingai vertina muzikinio ugdymo procesą. Muzikos mokytoji, turintys 1-2 metų pedagoginio darbo stažą, požiūris į muzikinį ugdymą buvo mažiau reikšmingas, palyginti su muzikos mokytojais, turinčiais 4-6 ir 16-20 ir daugiau metų pedagoginį darbo stažą. Tai rodo, kad akademinė kvalifikacija ir pedagoginė patirtis yra veiksniai, darantys įtaką muzikos mokytojų požiūriui į muzikinį ugdymą. Aukštesnę akademinę kvalifikaciją turintys mokytojai buvo linkę labiau tapatintis su disertacijoje pateiktomis ugdymo perspektyvomis, o didesnę pedagoginio darbo patirtį turintys mokytojai taip pat labiau tapatinosi su šiomis ugdymo perspektyvomis.

4. Remiantis kokybinio tyrimo duomenimis, muzikos mokytojų mokymo stilius galima suskirstyti į tris pagrindinius tipus: lyderystės, empatijos ir vadovavimo. Šie stiliai atspindi skirtingas mokytojų klasės valdymo ir bendravimo su mokiniais strategijas, kurios turi įtakos mokymo veiksmingumui ir mokinių mokymosi patirčiai. Iššūkius, su kuriais mokytojai susiduria mokydami muzikos, galima suskirstyti į du tipus: išoriniai iššūkiai ir vidiniai iššūkiai. Išoriniai iššūkiai daugiausia kyla dėl santykių su besimokančiųjų tėvais, pavyzdžiui, dėl to, kokią svarbą tėvai teikia muzikiniam ugdymui, šeimos paramos ir kitų veiksnių, kurie gali turėti tiesioginės įtakos mokinių mokymuisi. Kita vertus, vidiniai iššūkiai apima mokytojų ir pačių besimokančiųjų kompetencijos stoką, pavyzdžiui, mokytojų technologijų ar mokymo metodų naudojimo trūkumus, o mokinių muzikinių įgūdžių ir pomėgių trūkumus. IKT priemonės laikomos svarbia priemone

šiems iššūkiams spręsti. Tyrimai parodė, kad IKT priemonių taikymas muzikiniame ugdyme ne tik teigiamai veikia besimokančiųjų muzikinę patirtį, bet ir skatina mokinių susidomėjimą muzika, plečia jų akiratį, o mokytojams suteikia įvairių mokymo metodų ir strategijų. Šios priemonės stiprina pedagoginę sąveiką, skatina aktyvų mokinių dalyvavimą, didina pamokos efektyvumą ir motyvaciją. Muzikos mokytojams svarbiausias pedagoginis tikslas – skatinti mokinių susidomėjimą muzika ir prisidėti prie visos muzikinio ugdymo sistemos ir aplinkos tobulinimo. Siekiant šio tikslo, mokytojai dažnai vykdo įvairias mokymo ir mokymosi veiklas, tokias kaip mainų programos, kokybiškas pamokų stebėjimas ir meno festivalių organizavimas. Be to, veiksmingas mokytojų bendravimas ir bendradarbiavimas laikomas esminiu žingsniu tobulinant muzikinio ugdymo programas.

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Moksliniai straipsniai disertacijos tema:

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