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# Fostering future music teachers' professional skills: developing a signature pedagogy using e-learning

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**Introduction:** The emergency crisis due to the COVID-19 pandemic caused noticeable changes that stimulated the transition to the new normal based on the digitalization of our systems. In this regard, the revision of learning tools in higher education exposes new challenges and requires the development and implementation of digital technologies. Fostering future music teachers' professional skills needs designing of online resources that provide close student–teacher interaction, as well as the engagement of students and regulation of their professional music practice. Based on the theory of Shulman, the signature pedagogy in music education was developed and implemented in an e-learning environment by a small private online course. The aim of the research was stated: How and which students' music teacher professional skills are affected in the process of e-learning based on the signature approach? The research was conducted at Kazan Federal University. During the educational process students studied the professional practicum.

**Methods:** Totally, 124 students from 1st to 4th academic level had taken part in the experimental work in the academic year 2021–2022. All of them studied bachelor programs for future music teacher as full- or part-time regime and studied the online course in MOODLE during the experiment. A combination of online tasks which cover all the types of the music teacher' professional activities was suggested. Considering the aim of the research, the multi-case study research methodology was chosen, using a mixed method approach, resourcing mainly to questionnaire, interview, documental analysis, and observation as data gathering methods, and descriptive statistical analysis, as data analysis techniques.

**Results:** The main results demonstrate the effectiveness of the developed online course that allowed to significantly foster students' music teacher professional skills.

**Discussion:** The investigation of the efficiency of using e-learning for training future music teachers' professional skills was carried out in this study. To improve future music teachers' skills according to the features of the professional field, a signature pedagogy approach was suggested. The contribution of the paper brings the detail characteristic of the signature pedagogy in music education, and the way of its implementation by the means of online tools.

## KEYWORDS

music education, online teaching and learning, digital technologies, tools, pedagogy, higher education

## Introduction

The current trends in education are determined by global wave of digitalization, and the availability of e-educational resources and multifunctional devices has stimulated teachers all over the world to upgrade to digital pedagogical technologies (Kampa, 2021). The COVID-19 pandemic situation highlighted the digital transformation of teaching as an extremely relevant transition to cater to the needs of crisis-like situations witnessed during lockdown due to COVID-19, or other emergencies that may need to face in future (Gibson, 2021). Recent research has emphasized that the future requires teachers to be competent for providing education in a remote way even more effectively than in traditional face-to-face settings, while we recognize online interaction with students as our new normal (Wu, 2021). Although digital upgrading has had an impact on most of the dimensions of the education system, not all subjects and fields could transform immediately, including traditional ones like music education that are undergoing gradual transitions and appropriate ways to adopt pedagogies that are still being explored (Phipps, 2021).

While online learning of the history and theory of music has been available via massive online courses for a long time, remote teaching of musical performance skills is a relatively new trend in music education (Pike, 2017; Karkina et al., 2022). The implementation of learning in music classes that involve performance by using digital resources puts forth challenges in the organization of the close student–teacher interaction as well as the interaction between the participants of vocal or instrumental ensembles. Besides, active engagement of students in the learning process requires systematic organization of their self-preparation process, including the instruments of control and assessment, all of which should be delivered online. Some issues of music learning that were faced while using digital sources were studied in the past, including collaborative music ensemble project work (Gibson, 2021), teaching piano by Skype (Pike, 2017), designing online music courses in both synchronous and asynchronous ways (Biasutti, 2018; Love and Barrett, 2019), digital sources for improving music ensemble skills through visualization (Li et al., 2019), or the personal laptop (Sheffield et al., 2019). However, the professional online training of future music teachers has not been widely researched and still needs an in-depth analysis of the possibilities and tools.

## Background

Music education is an essential part of the social, psychological, and spiritual development of children, and music class is a mandatory discipline of the general school curriculum all over the world (Abdullin and Nikolaeva, 2006). Children learn music to improve their skills in the field, such as their ability to listen to music, play musical instruments, sing, describe, and analyze it throughout middle school. Music education aims at improving musical intelligence, defined as the “ability to perform, compose and appreciate music and musical patterns” (Gardner, 1973). Additionally, music lessons have an important role in

the development of aesthetic awareness, the ability to distinguish beauty in art, nature, and person interactions (Karkina et al., 2020). Bearing in mind all these duties, we figure out the complexity of music teachers’ professional activity and the need for special educational training as a continually growing deficit of music teachers has been noted in different countries (Mateos-Moreno, 2022).

## Music teachers’ professional skills

An overview of recent research in music education indicates the critical dependence of music teaching from the perspective of educational institutions as well as teachers’ professional development and ability to manage the musical content and pedagogical skills (Valdebenito and Almonacid-Fierro, 2022). Based on the documentary analysis of instrumental music education, researchers highlight the meaning of professionalization and specialization as a crucial dimension in the model of the music teacher (Sanchez-Escribano et al., 2022). Recent research has also noted systematic training in musical skills and professional activity as a pivotal factor for achieving music teacher competences (Carrillo and Vilar, 2012).

Teaching music as well as other art classes and physical training during initial education needs specific preparation separate from all other disciplines. While the basic disciplines of the primary school curriculum including mathematics, literacy, languages, geography, and science are taught by the same teacher, classes in music, arts, and physical exercises are conducted by other teachers. Recent research confirms that the “preparation of classroom teacher for the implementation of music art learning has not been supported by adequate professional competence” (Ghozali, 2020). Considering the high importance of early childhood music lessons, scholars emphasize the need “to raise awareness among educational policymakers, teacher educators, and school leaders around the world about the urgent need to better prepare” initial school teachers in music education (Bautista et al., 2022). Moreover, they highlight the major role of teachers’ level of specialization in music education in their professional motivation and preferences (Bautista et al., 2018).

The set of music teachers’ professional skills includes the ability to sing, play musical instruments, compose and improvise music, describe it, and analyze it. Above that, modern researchers state the role of creative thinking in enhancing imagination, “developing the emotional component of music performance, and fostering improvisation skills” (Zhang et al., 2021). Scholars note the development of critical thinking skills in the musical performing class as a fruitful way to improve musical competencies (Latifah, 2022). These two components of music teachers’ professional development were also pointed out in the context of designing online courses as the main vectors of the educational model (Karkina et al., 2021).

The study of the professional competences of a music teacher based on the perceptions of real specialists seems to be a very productive way for the effective development of this profession (Aguilera and Monmany, 2016). Considering personal professional practice, teachers emphasize the necessity of long

and work-intensive professional development (Bautista and Wong, 2019). In this process, they also value active learning and close interaction with colleagues (Bautista and Wong, 2019), who encourage, support, and provide critical feedback. Researchers state that the real professional experience determines the teacher competence frameworks. Based on this statement, Puffer suggested a model of general music teachers' professional competence, which includes four components: "subject-specific professional knowledge, situation-specific skills, artistic musical abilities and skills" (Puffer and Hofmann, 2022). The latest research works highlight the pivotal trends in music teacher education, such as real school experience, subject-specific professional knowledge, and situation-specific skills, that correlate key aspects to the theory of professional development of Shulman (2005). The conception of signature pedagogy, defined by the American scholar Schulman, reveals the structure and hidden curriculum of professional pedagogy and allows to determine the fundamental approach to future specialists' preparation processes.

## Signature pedagogy in art education

The term signature pedagogy was coined by Shulman (2005) to denote the characteristic forms of professional teaching and learning and was defined as a fundamental approach in which future specialists are educated. The core of Shulman's theory includes three dimensions of professional practice that should be mastered by students: to think, to perform, and to act with integrity. According to Shulman, each professional activity is characterized by the priority of one of these dimensions, and the teaching methods will be more productive if they are systematized from one characteristic professional feature to another. That means one of the aspects, such as intellectual, technical, or moral, should determine the leading trend of the professional preparation, while the other two will support it.

Faculty disciplines in the liberal arts and sciences provide the training of student's generic skills, including critical thinking, academic writing, and quantitative skills, which are not unique to specific disciplines. At the same time, if any institution is trying to deliver more than basic content to students, there is a need to use the ways of thinking and habits of mind that are used by real professionals. To educate students about the intellectual moves and values of experts in the field, university programs need to include corresponding subtext as the learning outcomes of disciplines.

The signature pedagogies reflect the core values of the professions and thus evolve slowly over a period of time without visible changes. Historically, the medical rounds are associated with the signature pedagogy of medical education, while critical reading is associated with the pedagogy of literature. Consequently, the in-depth study of the professional practice and description of it is a crucial bridge to the desired goals and the way to improve student's learning results. Signature pedagogy belongs to the concepts that involve creativity and thought-provoking elaboration. Following Shulman's definition, the implementation of a signature pedagogy proceeds the tradition of the professional field in the points of practitioners' deepest beliefs and practices (Chick et al., 2009). The

study of real professional practices helps in the understanding of the signature practice of students' learning.

Currently, researchers explore signature pedagogies in university curricula for all subjects, including history, geography, psychology, agriculture, biology, computer science, physics, and mathematics (Chick et al., 2009). They suggest signature pedagogies as learning methods that can help students engage in professional activity. Scholars of literary education point to social annotation practices as a signature pedagogy that proposes an aesthetic mode of reading (Clapp et al., 2021). The technologies of digital story telling used by researchers in the field of humanities were described as a signature pedagogy (Benmayor, 2008). Among the modern educational trends, the transdisciplinary approach was defined as a signature pedagogy in the field of science by means of its integration with art (Straksiene et al., 2022). Arts integration as a signature pedagogy in educator preparation was also explored by Reck and Wald (2018). Additionally, researchers have proposed a signature pedagogy for art therapy education (Leigh, 2020).

Shulman (2005) possessed a comparison of two different courses in engineering school. He argued that the common lecture practice in which students just listen to their teacher does not satisfy the core values of an engineer. In other cases, he demonstrates the classroom where a teacher is instructing the student's experiments and is collaborating; the activity of a teacher as he "circulates among the work areas, and comments, critiques, challenges, or just observes" (Shulman, 2005) is defined by Schulman as the most signature way of teaching for the engineering field. The scholar characterized the core of the field of design as training of the heart. The pivotal role of pedagogy that he determined for the method of critique had been widely studied by his followers in graphic design (Motley, 2017), as well as in the field of Arts and Humanities in general (Motley et al., 2017), in writing studies (Heinert, 2017), dance class (Kearns, 2017), and music performance (Hastings, 2017).

In regard to performing education, studies of signature pedagogy were noted for the theater arts (Kornetsky, 2018). Though performance in relation to music and the feature of signature pedagogy in this field were researched earlier (Gary et al., 2009), challenges are posed while defining the best kind of education and training for equipping "music students to navigate and increasingly dynamic and complex professional environment" (Creech et al., 2022); thus, scholars suggest creative collaboration as a signature pedagogy for advanced music training and professional development in this field. With respect to musical practice, researchers enriched the area of signature pedagogy studies by exploring the development of creativity in an orchestral composing activity (Love and Barrett, 2019).

While Shulman (2005) positioned signature pedagogies as a relatively stable concept in education, he mentioned that changes in teaching conditions can lead to substantial transformation of the signature pedagogies. He pointed out objective facts of practice that may change the professional activity so much that they may stimulate the development of the pedagogies. He described dramatic examples in medicine, nursing, and surgery that affected the signature of pedagogy (Shulman, 2005). In spite of the fact that Shulman did not note the possible changes in the arts, we can assume the future changes of the signature pedagogy in

music based on the research works that propose moving from the wood past to the digital future in this field. Researchers pointed out the transformation of musical professions such as composer, performer, and conductor due to the digitalization process, wherein all the traditional roles can be replaced by computers (Karkina et al., 2020). Obviously, digital tools have become more valuable in the field of music education now than they were several decades ago, which is why the implementation of the signature pedagogy of music teaching by means of online learning needs to be studied in the context of this issue.

## Online technologies for teaching music remotely

The digitalization process in music education has increased in the last few decades. Modern universities promote massive online courses for learning music without social, location, or time limits. The educational platform Coursera offers a wide range of music courses that provide study of music history and theory: “Introduction to Classical music” (Yale, USA), “The world of the string quartet” (Philadelphia, USA), current trends in music teachers’ professional activity: “The Place of Music in 21st Century” (Sydney, Australia), as well as training musical composing and performing skills such as “Write Like Mozart—An Introduction to Classical Music Composition” (Singapore), “Jazz improvisation” (Berklee, USA), “Developing your musicianship” (Berklee, USA). The Massive Open Online Courses (MOOCs) present a new model of distance learning (Blackmon, 2018) that provides accessibility, flexibility, and interactivity in education globally (Olmos et al., 2015).

A wider possibility of training musical performing skills remotely was challenged by researchers (Karkina et al., 2021). In the recent past, the experiment of teaching piano by Skype was organized (Pike, 2017), which was the first attempt in the area and was conducted in a limited context. Without the involvement of face-to-face interaction, this process showed advantages in delivering music lessons online for students who are deprived of the opportunity to learn music. Another project was carried out in England to widen the participants’ musical education. The study included instrumental lessons for students and courses for continuing professional development for teachers, both using camera and high-quality audio. The research stated the benefits of using a multi-camera setup for delivering lessons (King et al., 2019).

The emergency of the COVID-19 pandemic noticeably strengthened the online practice of teaching music. To overpass the negative financial effect of a lack of face-to-face musical shows, musicians prioritized online performances for capturing their audience’s attention (Rendell, 2021). The teachers in rural communities faced a multitude of challenges during the pandemic period (Johnson and Stanley, 2021). The research of their online teaching experience allowed them to note two categories of issues, which are settings and place-based pedagogy that have influenced the practice. Based on the results of the qualitative study, the online delivery methods including differentiation of the teaching contexts and geographic settings were stated (Johnson and Stanley,

2021). Summarizing the pandemic and post-pandemic research, the process of re-examining the teaching approaches and redesigning music courses was noted. For the purpose of improving the effectiveness of online music education, scholars are searching for active learning methods and the design of the online environments (Phipps, 2021).

Modern researchers describe a wide range of online courses, such as MOOC, BOOC (Big Open Online Course), DOCC (Distributed Open Collaborative Course), LOOC (Little Open Online Course), MOOR (Massive Open Online Research), and SPOC (Small Private Online Course) (Naert, 2015). While MOOCs are recommended as a supplement to classroom teaching, in cases where a teacher needs to increase the time of personal interaction with students, their mastery, and engagement, a Small Private Online Course (SPOC) could be more suitable (Fox, 2013). In contrast to the global availability of MOOCs, access to SPOC is managed by the teacher and can include automatic grading such as online tests or quizzes (Ziebarth and Hoppe, 2014). Besides, in SPOC, each student receives personal interaction with human teaching assistants and, above all, has the “opportunity to resubmit homework to improve on their previous score and increase mastery” (Fox, 2013). The implementation of the online flipped classroom in school music teaching became highly relevant during the pandemic. For engaging students in creative making with instrumental music, combining online with face-to-face lessons allows enhancing the satisfaction and knowledge acquisition (Ng et al., 2022). With regard to using SPOC, we have found research in the field of teaching music history only (Jing, 2018), while practical issues such as delivering theoretical knowledge were not covered by them.

The adoption of synchronous and asynchronous learning methods by using e-sources has become the leading education science trend for the last few decades (Armellini and Aiyegbayo, 2010). For these purposes, scholars apply the open-source learning management system (LMS) and design online courses based on Moodle (Kampa, 2021). Scholars note that remote learning is not similar in structure to the traditional classroom (Salmon, 2013), and instead of face-to-face interaction, it provides another form of student–teacher work in a synchronous or asynchronous way. Salmon pointed out that the content of an online course including learning resources and any other materials provided stimulus for interaction but needed additional tools to focus student’s activity. Highlighting the importance of e-tivity, he called it a “break point from the time-consuming ‘writing’ of online courses” (Salmon, 2013). The design and delivery of e-tivities could enhance the student’s engagement in the online musical performing activity, but at present, we need to state the gap in this area. While overviewing research on online music teaching by fostering student’s skills through e-tivity, we did not find the works that studied this issue as well as signature pedagogy in learning music; thus, bridging this gap could bring significant advantages for music education.

## Objectives

Based on the background study, the general aim of the research was stated as follows: how and which students’ music teacher



professional skills are affected in the process of online learning based on the signature approach?

To achieve the general aim of the study, three research questions were determined:

- RQ1 How can music teacher signature pedagogy be identified based on Schulman's theory?
- RQ2 Does the music teacher signature pedagogy implemented by SPOC affect students' learning and engagement?
- RQ3 Are future music teachers' professional skills associated with student's e-learning based on the signature pedagogy approach?

## Future music teachers' remote training based on signature pedagogy using e-learning

### Signature pedagogy in music education

Schulman in his study of professional education noted, "It's very hard to learn to practice without powerful consistent models" (Yendol-Hoppey and Franco, 2014). In this quote, Schulman identified the lack of powerful consistent teaching models and pointed out the research trend in the field of professional development for schools. To bridge this gap in the field of music education, the signature pedagogy for preparing music teachers was identified.

Following Schulman's definition, three dimensions of a music teachers' signature pedagogy were identified. The first level is the surface structure, "which consists of concrete, operational acts of teaching and learning" (Shulman, 2005, p. 54), which is defined as the process of a set of dialogues of authoritative teacher who is commenting on students' artistic exercises. A teacher encourages students to experiment with music and collaborate with each other. Also, students create artistic performances and comment on the works of their classmates. The most significant part of the process is training student's musical skills but the stimulation of their artistic creativity is also important. The instructor mediates the activity in the class, critiques and challenges, or just observes. The knowledge provided by the teacher serves as a base for creative musical experiments.

The second level, according to Shulman's theory, is the deep structure of the pedagogy that rests on the assertion that what is really being taught is the theory of music pedagogy and how to think as a music teacher (Abdullin and Nikolaeva, 2006). The subject matter consists of the relevant problems and the gaps in music education currently. Students learn to identify such problems and develop new teaching strategies and tools, which will be implemented in the school in the future. The music pedagogy theory is about the contradiction between classical music standards and real student's abilities that they demonstrate in the lesson, hence the inherently challenging and groundbreaking character of critique dialogue as pedagogy.

The third level of music teacher signature pedagogy, i.e., the implicit structure, has several features. The most questionable issue discussed among teachers and students who are preparing for the role of specialist is the dichotomy of personality and

standardization. Because music lessons are mandatory at general school for all the children, regardless of their natural potential, the criteria for assessment become too brutal for some of them. Very often, children's natural inability to satisfy all the requirements of the school program provokes their unwillingness to engage in music. In such a context, teacher is asking himself, what is the main goal of the school music lesson? Is student's self-perception of music additions the only or the main result? In other words, does a teacher have the right to correct the criteria to allow students to look for his or her personal way of interacting with music? This distinction between the standards and the unique nature of personality emerged from the pedagogy as a tacit principle. These lessons might also be called the hidden curriculum of a future music teacher's preparation process.

Following the structure of Schulman's theory, the missing elements of signature pedagogy may be examined. The missing signatures here are the pedagogies of intellectual training. While these pedagogies can be found in all music classes in the general school, they are typically on the margins of the enterprise, are rarely required, and are often ungraded. Most teachers stimulate music activity by singing and playing musical instruments but do not pay enough attention to deep knowledge, including historical facts or the theoretical background of some music phenomena.

Shulman distinguishes "three fundamental dimensions of professional work-to think, to perform, and to act with integrity" (2005) that correspond, respectively, to one of the leading trends featured as training of the mind, hands, and hearts. In other words, these dimensions point to the focus of the learning practice: the intellectual, the technical, and the moral.

Shulman does not mention in his works the music teacher's profession directly. Taking into account that music teaching refers to the general area of art education, we can find art education and the education of clergy in the same row in the quotations of Shulman's works. With respect to the clergy education routines, Shulman has emphasized the development of habits of the heart, so indirectly we can assume the music teacher education featured is the same. Critically analyzing the core of the future music teacher educational process as the process of engaging students in the experimentation and collaboration that is observed, criticized, and commented on by the instructor, this assumption seems to be correct. Arguing the possibility of training the students' hearts without personal face-to-face interaction with an educator poses challenges in the implementation of the music teachers' signature pedagogy in the digital environment and calls for addressing this issue.

### Implementation of the music teacher signature pedagogy in the online learning practice

To enhance the professional training for preparing future music teachers online in the case of emergency like COVID-19 pandemic, a small private online course (SPOC) based on the signature pedagogy was designed. The structure of this course was based on Shulman's three fundamental dimensions: surface, deep, and implicit structure. The course was implemented on MOODLE.

Considering the definition of the surface structure as the forms of interaction among a teacher and students in the online

course, the tools for the full set of schoolchildren's music activities according to the standard of music education (Abdullin and Nikolaeva, 2006) were provided. In the process of training vocal and instrumental performing skills, students recorded themselves in their self-preparing practice and sent these records to the teacher for feedback and recommendations for improvement. A similar way was used for training group performance skills. In addition, students made records using telematics technology, which allows creating the voices of the ensemble sequentially. For training creative skills, the task of creating musical compositions of poetry with music was suggested. The skills of listening to music, understanding, and evaluating were trained by means of essays. Students had been listening to the recordings loaded into the online course. Following the instructions from the resource, they wrote and sent via e-source "task" their works. A close student-teacher interaction was organized by means of workshops, forums, and chats that allowed the teacher to pay personal attention to each student. The group worked on the workshop, and the participants discussed and commented on their music experiences.

The deep structure, targeted at the teachers' reflection of professional experience and development of powerful methods, was implemented in the form of project work. Students received the personal university teacher's consultation for the chosen research trend for the project work through online meetings. The instructions about formal details on how to prepare the project were delivered by the teacher online and by means of the resource "lecture" in the online course. Based on the theoretical background, students designed didactic improvements for the general school educational process. While assuming the role of a music teacher, students had been creating new methods and means to foster schoolchildren's musical skills. Some of these projects were implemented in real schools. The web and digital sources including subject Internet sites, books, and articles provided by SPOC were useful for this work.

The implicit structure, defined as the specific forms of learning activity, was organized through the online discussions and challenges. The online meetings with school teachers and videos of music lessons in schools encouraged students for professional self-improvement and inspired them. By discussing with teachers, students got the opportunity to develop their awareness of music teacher values, attitudes, and dispositions. The discussions of critical issues, which are strongly relevant in modern general school music education, had taken pivotal role. The arguing of actual problems and the discussion of contrary arguments to promote effective solutions were organized in online workshops and offline forums. The teacher suggested arguing current topics from social reality, such as the social status of a music teacher, music art in the digital age, creative activity in the music lesson, and standardization in music education. Through all these forms of activity, student's engagement in the music teachers' professional practice increased through the fostering of awareness of moral aspects of real school practice.

The SPOC based on signature pedagogy allowed to gather in one course systematically the professional competence of music teachers. The fundamental set of general schoolchildren's activities in music class and three levels of Shulman's signature pedagogy for promoting professional knowledge, skills, and the ability to work

with integrity allowed to provide the interactive online training environment. In regard to the Shulman definition of teaching in art as training of the heart, the effectiveness of the online educational process should be tested by means of research methodology.

## Materials and methods

### Study design

The research work was carried out at Kazan Federal University and approved by the Human Ethics Advisory Group by using the Ethical guidelines for educational research proposed by the [British Educational Research Association \[BERA\] \(2018\)](#).

The organizing process of the study included several types of activities by students and teachers throughout the academic year. Regular education processes were conducted on the platform MOODLE by using online and offline ways. During this process, teachers facilitated student's learning practices by:

1. Organizing online workshops for the explanation of the learning tasks to students.
2. Stimulating students' engagement and effective self-improvement in performing skills by providing comments and recommendations.
3. Organizing the online meetings with schoolteachers for sharing their professional experience and giving interviews to students.
4. Discussing the current problems and challenges in the music education school's practice.
5. Consulting students in the project work.
6. Evaluating students' musical records with solo and group performances, their creative musical works, and projects.

During the learning process, students have been trained in the full set of music teacher professional activities including playing musical instruments, vocal singing, solo and group performance, listening to music and analyzing it, composing, improvising, working on a project, writing essays, and discussing. This set of activities was structured in the online environment based on the music teachers' signature pedagogy.

All artistic works and projects prepared by students were evaluated by an expert board that included the most respected teachers from the University department of the Institute of Philology and Intercultural Communication. Based on this assessment, the results of the students' performances, creative artistic works, and projects were determined.

At the end of the academic semester, an additional study was carried out to inquire about the satisfaction among teachers and students of online training in music teacher professional skills. All the students were involved in this work. Teachers who had been working with them and the expert members were asked about their personal preferences and perceptions regarding the training process and results. Based on the opinions of students, teachers, and expert members, as well as background knowledge in this educational field, a comparative analysis of traditional face-to-face and online learning for future music teachers based on the signature pedagogy approach was carried out.

## Research methodology

### Dimensions and categories of analysis

The analysis performed in this work relies on a multi-case study methodology that was considered the most appropriate research strategy to deeply understand the issue through a meticulous analysis (Cohen et al., 2007). This type of analysis allows to replicate the study of the phenomenon in different contexts (Yin, 2014), making it possible to make comparisons of the results. The study let to gather multiple data sources—documents, questionnaires, interviews, and observations—guaranteeing the fulfillment of the experimental data (Lima, 2020). Each case represents a different course where SPOC based on signature pedagogy was implemented.

For each course, the analyzed dimensions and categories are summarized in Table 1. The first dimension of analysis, Didactical Implementation, intends to characterize the intentions of the University teachers in designing the SPOC based on signature pedagogy and perceptions of the implemented online learning. The second dimension, Students' Results, features three categories: students' academic performance, the development of their music teacher professional skills, and self-perception about the online learning educational process.

Starting with the category SPOC's implementation, the factor "Number of tasks in SPOC" shows how many different tasks were used by students in the group. The next factor, "SPOC tasks attribution," allows us to clarify their type. There are four general types of tasks featuring student's online activity: perception (Pr), performance (Pf), creation (C), and research (R). The SPOC usage within a course ("SPOC use level") was classified into three levels: basic (B), intermediate (I), and advanced (A) according to the student's mastery within the online environment (B: reading and listening; I: doing tasks; A: interactive). The "course level" may be distinguished into four types according to the number of academic years of student groups.

In the category Teachers' perception, the factor of "teachers' satisfaction with the SPOC" was assessed on a 5-level Likert scale from absolutely satisfied to fully unsatisfied.

For the category Academic performance, four factors were studied: "students' background in using online courses" was assessed by the 3-level Likert scale: First experience (1); Used in the past (2); and Active user of different e-sources (3). The students' assessment of the course as per the curriculum was marked in the category "students' grades." The factor of "students' success" considered the number of students who did not demonstrate the positive assessment on the final exam (NF) or had dropped out of the course (dropout). The "students' access in SPOC" was noted by means of the technical tools of MOODLE, where any user can find the duration of the period and type of activities of any participant, and assessed by four points: daily (4), once every 2–3 days (3), once a week (2), and once a month (1).

The category Professional development reflects the music teachers' professional activities. The majority of them were included in the experimental list and assessed through the online studying process using a 10-level Likert scale depending on the student's mastery.

In the category Students' perception, three factors were obtained: "learning with SPOC," "satisfaction with SPOC," and "satisfaction with support" by a questionnaire that was delivered to the students at the end of the academic year.

### Data collections and participants

The research work had taken place at Kazan Federal University. Due to complete shift of the education process to distance learning in the period of pandemic COVID-19, all disciplines were studied online, including specific musical courses that were traditionally taught in face-to-face classrooms.

The future music teachers' curriculum includes the hours for the special practicum, in which students are trained in the standard set of music teachers' professional skills. These hours offer a sort of practice for studying the real profession in all its complexity. Depending on the students' year of study, this part of the curriculum provides different types of courses that cover instrumental and vocal performance, music analysis, creativity, and project work. This work supports the transition from the role of student into the professional role of teacher (Woeste and Barham, 2006). All the components of this practice were covered by the music teachers' signature pedagogy implemented in online learning by means of SPOC.

For the research work, 124 students from the 1st to 4th years of study were involved. Part of them participated in the full-time (F) and part-time (P) regimes. All of them were studying for the future music teacher bachelor's program. According to the curriculum, each group studied the academic course from the section on music teacher professional practicum. That is why the learning context of each group was different and was classified as a case. These cases and courses are demonstrated in Table 2. Data were collected from one academic semester during 1 September 2021 to 31 May 2022.

The experimental process involved three teachers who had been working with students and four members of the expert board who provided the final assessment of the musical performances and projects presented by students. All the teachers involved in the study were females. The indicator of teachers' age was divided into three periods (35–41, 42–55, 56–60 years). One of them had graduated in higher education, while all others had got candidate degree. University teachers have different duration of experience in teaching online and usually older among them have less experience in using online courses.

At the end of the academic semester, the students who participated in the online practicum and the teachers and experts, who worked and assessed them, were asked to fill out the feedback survey forms. In total, 84 filled-out forms from students and seven from teachers were received and analyzed.

### Measures and methods

Considering the aim of the research, the multi-case study research methodology was chosen, and quantitative and qualitative data were combined using a mixed method approach, resourcing mainly questionnaires, interviews, documental analysis, and observation as data gathering methods and descriptive statistical analysis as data analysis techniques.

TABLE 1 Dimensions and categories of analysis.

Dimensions	Categories	Factors	RQ1	RQ2	RQ3
Didactical implementation	SPOC implementation	Number of tasks in SPOC	x	x	
		SPOC tasks attribution	x	x	
		SPOC use level	x	x	
		Course level	x	x	
	Teachers' perception	Teachers' satisfaction	x	x	x
Students' results	Academic performance	Students' background in using online courses	x	x	
		Students' grades	x	x	
		Students' success	x	x	
		Students' access in SPOC	x	x	
	Professional development	Instrumental performing solo and in ensemble	x	x	x
		Vocal singing	x	x	x
		Analyzing of music	x	x	x
		Creativity by music	x	x	x
		Knowledge of music history and theory	x	x	x
		Project design	x	x	x
	Students' perception	Learning with SPOC	x	x	x

TABLE 2 Case study characteristics.

Case#	Regime	Academic level	Program titles	Students				
				Total number	Gender		Age	Experience in using online courses years
					M (%)	F (%)		
C1	P	1	Listening to music Instrumental training Vocal ensemble	26	5 (19.2)	21 (80.7)	18–22	0–1
C2	P	2	Instrumental training Vocal ensemble	23	1 (4.3)	22 (95.6)	19–23	0–1
C3	F	3	Instrumental training Vocal ensemble Improvisation Project work	19	1 (5.2)	18 (94.7)	20–22	1–2
C4	P	3	Instrumental training Vocal ensemble Music Analysis Project work	36	3 (8.3)	33 (91.6)	22–26	1–2
C5	F	4	Instrumental training Vocal ensemble Children' creativity Project work	20	5 (25)	15 (75)	21–25	1–2

The teachers' interview script was composed of seven closed questions with three answer options (*no*, *perhaps*, and *yes*) and a final open question asking for the main advantages/disadvantages of this resource (What advantages and disadvantages do you find in the use of signature pedagogy SPOC?). These interviews are intended to evaluate teachers' usage and satisfaction with SPOC, including the didactical aspects and SPOC's main disadvantages/advantages.

The study of the educational documents provided significant experimental data. For research purposes, a multitude of types of educational records were provided, including timesheets, plans, curriculum, technical information, and grade reports. The academic documents of student's grades and success in passing the exams can be used as approval of the responses from the interview, which students completed at the end of the study process. The documents obtained within the research context included:



- Information about students' performance: detailed academic results (grades by component, final grade, number of students who did not fulfill the assessment during the semester, number of dropouts).
- Information about SPOC usage: number of SPOC accesses for students.

The ultimate goal of the analysis was to characterize the SPOC didactical implementations as well as students' academic performance and SPOC usage thoroughly. To protect the anonymity of participants in the project, all names were withdrawn and replaced by aliases.

The evaluation of students' musical performances by members of the expert board was carried out by the method of average rating. Using the list of criteria, each student was assessed on a 10-level Likert scale (from 1 as insufficient to 10 as excellent). The statistical approval was made by the standard deviation in order to establish the difference among the evaluation results of the expert board members.

The students' academic performance and perception of SPOC were studied by a semi-structured questionnaire: a combination of a set of closed questions (10) on a scale through which the respondents express their degree of approval or rejection about a given statement by using the quantitative measure and open questions (2) designed to capture students' insight about a particular issue. The closed questions were composed on a 5-level Likert agreement scale (1: I totally disagree; 2: I partially agree; 3: I rather agree; 4: I agree; and 5: I fully agree). Two open questions clarified the students' satisfaction with learning through SPOC: What did you enjoy most about using SPOC? (Q11). What inconveniences did you find during your study of the SPOC? (12). At the end of the course implementation, students' opinions about the didactical experience and the main advantages/disadvantages of SPOC were collected. The student's satisfaction questionnaire was delivered on paper (in most cases) or made available via Moodle or Google Forms as per requirement. For the sake of correlating students' answers with their academic results, students were asked to identify themselves through their academic ID numbers, which were codified by their teachers in order to guarantee students privacy. It was explained to students that this identification was purely for research issues.

The questionnaire used closed-ended questions, and three factors of analysis were identified and studied:

- F1: Students' perceived learning with SPOC. It features the student's self-assessment of the effectiveness of online music learning, including theoretical studying and training performance skills, as well as interacting with other participants. It was addressed using questions Q2, Q5, Q6, and Q8.
- F2: Students' satisfaction with SPOC. It refers to SPOC usage (availability, accessibility, ease, and suitability) and the perceived most value, as well as asking for students' preferences between this type of resource and face-to-face classes. It was addressed using questions Q1, Q3, Q7, and Q10.
- F3: Students' satisfaction with support. It expresses students' perceived assistance toward the MOODLE system: the LMS

course page (support material, forums, etc.), SPOC manuals, teacher guides, as well as server issues and/or Internet connection. It was addressed using questions Q4 and Q9.

A reliability analysis (Cronbach's alpha, also referred to as the alpha coefficient of reliability) of the three factors, previously described, was performed. This step is essential to ensure the validity of the studied variables as Cronbach's alpha that "provides a coefficient of interitem correlations, that is, the correlation of each item with the sum of all the other relevant items" (Cohen et al., 2007). This is a measure of the internal consistency among the items, that is, a way of realizing whether items on a variable's measurement scale measure the same construct. The coefficient ranges from 0 to 1, and the closer to 1, the more reliable the items that make up the scale; it is unacceptable if Cronbach alpha is  $<0.5$  (Pestana and Gageiro, 2014).

The results from this test are displayed in Table 3. The table displays these results by case—for each group where SPOC was implemented. The last line in Table 3 presents the global results, considering all the collected data (from all students involved in all didactical implementations). The former table includes the case number and course names as well as the number of students enrolled in each course (N St). Considering the analysis by case, it shows internal consistency in F1, F2, and F3 for the majority of the cases (even though at a low level, for some of them).

The quantitative data from the interview of teachers and student's questionnaires, as well as technical data about didactical implementation characteristics, were analyzed by the descriptive statistical method of the Pearson's chi-square test ( $\chi^2$ ), or the chi-square test. This test is commonly used for studying the relationships between categorical variables to determine whether an association exists between the two variables by comparing the observed distribution to the expected one if the variables are really independent of each other (Lima, 2020). If  $p < 0.05$ , one can conclude that the variables being studied are not independent of each other and there is a statistical relationship between them (Cohen et al., 2007).

Considering the vast amount of qualitative data, in this research work, content analysis (Cohen et al., 2007) has been used for the majority. The open questions (SPOC main advantages and disadvantages), both for the student's satisfaction questionnaire and the teachers' interviews, were qualitatively analyzed, following the procedure of the grounded theory (Glaser and Strauss, 2012). This theory does not limit the interpretation to already known theories but rather builds conclusions from the analysis of the collected data, respecting their shades and diversity in the construction of categories and subcategories (Cohen et al., 2007). In this study, the grounded theory allows to look for semantic clusters within responses in spite of the minor variants with which they were formulated or the internal aspects to which they refer (Lima, 2020). Therefore, it quantifies not the number of students/teachers but the ideas expressed by them as one person may have pointed more than one argument as regards interest and/or difficulty (Lima, 2020). The qualitative analysis of what teachers and students reported helped build the analytical categories. This analysis was performed independently for the two types of respondents: teachers and students.

TABLE 3 Student's questionnaire internal consistency analysis (Cronbach alpha), by case.

Case #	Program	Course names	N St	F1	F2	F3
C1	P	Listening to music Instrumental training Vocal ensemble	26	0.554	0.355	0.556
C2	P	Instrumental training Vocal ensemble	23	0.643	0.521	0.367
C3	F	Instrumental training Vocal ensemble Improvisation Project work	19	0.747	0.849	0.433
C4	P	Instrumental training Vocal ensemble Music analysis Project work	36	0.272	0.588	0.574
C5	F	Instrumental training Vocal ensemble Children' creativity Project work	20	0.366	0.378	0.243
Total			124	0.516	0.538	0.434

TABLE 4 Didactical implementation characteristics.

Case #	SPOC implementation			
	Number of tasks	Attributions	Level of use	Course level
C1	3	Pr	B	1
C2	5	Pf, C	I	2
C3	9	Pf, C, R	A	3
C4	8	Pf, C, R	A	3
C5	14	Pr, Pf, C, R	A	4

## Results

### Didactical implementation

The first dimension of “Didactical implementation” was presented by two categories: “SPOC implementation” and “Teachers’ perception.” The study of the first one was realized through the analysis of the technical data in the MOODLE environment and academic documentation.

Teachers introduced and used SPOC in their courses, which varied significantly in contents and level of difficulty; some of them were introductory courses (students’ first training in professional skills) and some were advanced ones, taking into account the learning goals they wanted to achieve. They intended to design tasks according to the professional skills that music teachers wanted to develop in their students. Table 4 summarizes these implementation characteristics.

The number of tasks that were mandatory for students to complete varied between 3 and 14, from low to high levels of academic study, respectively. An increase in the number of task types in accordance with the course level from first to fourth was also observed. Depending on the course level, the student’s

mastery of usage within the course increased in accordance with the complication of educational tasks.

In regard to the second category, the teachers’ and experts’ perceptions of the online work with students were studied through interviews. The quantitative results for the Teachers’ interview, which included closed-ended questions, are presented in Table 5. The results demonstrate that more teachers/experts found the remote way easy to use rather than complicated. Moreover, for most of them, this method was not as time-consuming in comparison with the traditional face-to-face class. Mostly, they assessed the components of SPOC as suitable for the teaching/experting needs, but with respect to the interactivity, less numbers featured it as high enough. In general, we noted the satisfaction of teachers and experts about student’s learning outcomes. However, not all the faculty found the interface of the app user-friendly, and many of them met with gaps in the Internet connection during the educational work.

The qualitative analysis of the open-ended questions of the teachers/experts’ interview allowed us to identify five factors, directly considering teacher satisfaction: three positives and two negatives. Table 6 summarizes these factors according to the main advantages and disadvantages of SPOC for staff. More than half of teachers/experts identified the opportunity for students’ productive self-preparing practices. Less numbers mentioned the possibility of interacting with students personally, while most of the staff stated the advantages of diversifying of teaching methods. However, teachers emphasized the need for sufficient experience in using online tools, and many of them pointed out the simplification of the interface of the MOODLE environment in comparison with modern computers and mobile educational Apps.

### Students’ achievements and SPOC perception

The ultimate goal of any didactical implementation is to improve student’s academic performance, measured directly by

TABLE 5 Teachers'/experts' interview results.

#	Questions	Total number of respondents	Answer options (%)		
			Yes	Perhaps	No
1	Was the teaching/evaluating students remotely easy?	7	57.1	28.5	14.2
2	Was the online work time-consuming in comparison with your regular class?		14.2	14.2	71.4
3	Were the components of SPOC suitable for your teaching/experting needs?		71.4	28.5	-
4	Did the SPOC provide high level of interactivity?		42.8	42.8	14.2
5	Did you satisfy of the students' learning outcomes?		57.1	28.5	14.2
6	Was the app interface user-friendly?		28.5	57.1	14.2
7	Did you never have problems with the Internet connection?		42.8	-	57.1
8	What advantages and disadvantages do you find in the use of signature pedagogy SPOC?		(Open question)		
Total			44.8	28.5	26.4

TABLE 6 Teachers'/experts' open question quality assessment (positive and negative factors).

#	Quality	Replies	Frequency (N)
1	Positive	Intensification of students' self-preparing practice	5
2		More time for personal interaction with each student	4
3		Diversify teaching methods	6
4	Negative	The process required enough experience with the online tools	2
5		Interface old fashionable/too simple	4

their grades and/or by other important determinant factors (Lima, 2020). The study of the correlations between student's SPOC usage and perception of the tools and their academic results, as well as access to the resources and satisfaction, should be considered. The dimension of "Students' results" was covered by three categories: "Academic performance," "Professional development," and "Students' perception."

The study of the first category was based on the student's replies in the questionnaire, which were compared with the academic documents. These results presented in Table 7 demonstrate the gradual increase in groups from first to fourth academic level for all criteria. At the same time, a slight decrease in the results of fourth year students, especially in criteria of grades and access, shows a decrease in graduate student's engagement with the learning process, while the value of their background in using online courses increases. In all cases, the standard deviation indicator is in the interval from 0.1 to 1.7, which is very close to 1 and confirms the similarity among the received data for each student's cohort.

In regard to the category of "Professional development," the student's learning outcomes were assessed by members of the expert group using a 10-level Likert scale (Table 8). The results demonstrate a high enough level of developed skills (the total median is in the period 5–9). The standard deviation confirmed the absence of a statistically significant difference between each

student's evaluation for each criterion (all the results are in the interval 0.3–1.7).

The questionnaire allowed to clarify the student's perception of learning by SPOC that they filled out after completing the online tasks. From all the cohorts that participated in the experimental study, only 84 (>50%) persons returned the filled-out forms. Table 9 shows that a large number of students (28.5, 33.3, and 19.0) agree that SPOC is an effective tool for musical training. A smaller number of students agree that the presented resource does not need improvements (11.9, 17.8, and 42.8). But most of the students were satisfied with the support provided by staff in the online learning (17.8, 41.6, and 29.7).

The qualitative analysis of open-ended questions in the student's questionnaire: What did you enjoy most out using SPOC? (Q11), What inconveniences did you find during your study of the SPOC? (Q12) allowed to identify six factors directly considering student's satisfaction: four positives and two negatives. Table 10 summarizes these factors. More than half of the students emphasized the comfortable conditions of learning from home and the variety of tools; approximately half of them noted the opportunity to manage their time and have productive training. However, half of all the respondents mentioned the gaps in home Internet, and a smaller number of students pointed out the outdated interface of MOODLE.

## Online tools for training of music skills

The next step of the experimental work was an attempt to establish some SPOC task characteristics, including student's activity in the online environment, which affects the improvement of their music teacher professional skills. The correlation between features of SPOC usage and student's grades of professional development was determined and presented in Table 11. Pearson's chi-square test ( $\chi^2$ ) correlation analysis was used to determine whether there was a correlation, considering each former factor with the test variables that somehow reflect students' results.

TABLE 7 Students' academic performance results.

Case #	SPOC implementation							
	Students' background in using online courses		Students' grades		Students' success		Students' access in SPOC	
	Median	St.d.	Median*	St.d.	Median**	St.d.	Median	St.d.
C1	2	0.125	86	0.244	2	0.198	1	0.937
C2	2	0.223	88	0.652	2	0.922	2	1.522
C3	3	0.562	89	0.155	2	1.247	4	0.487
C4	3	0.622	74	0.734	2	0.934	3	1.746
C5	3	0.572	82	0.478	2	0.142	2	1.564

\*According to the academic curriculum evaluated by 100-level grade. \*\*In relation to the academic results could be assess on a 2-level Likert scale: 1-dropout, 2-positive assessment on the final exam.

TABLE 8 Students' professional development results.

Criteria		Cases				
		Case 1	Case 2	Case 3	Case 4	Case 5
Instrumental performing solo and in ensemble	Median	7	8	9	8	10
	St.d.	0.355	0.627	0.998	1.367	1.342
Vocal singing	Median	6	7	10	9	10
	St.d.	1.473	1.253	0.958	1.573	0.489
Analyzing of music	Median	4	5	7	6	7
	St.d.	1.573	1.245	0.938	1.736	1.253
Creativity by music	Median	3	4	6	5	8
	St.d.	1.837	1.490	0.598	0.958	0.488
Knowledge of music history and theory	Median	5	6	8	8	9
	St.d.	1.733	1.374	1.121	1.475	1.167
Project design	Median	-	6	8	7	9
	St.d.	-	1.483	1.132	1.476	1.387
Total	Median	5	6	9	7	9
	St.d.	1.187	1.245	0.957	1.430	1.021

TABLE 9 Students' perception results.

No	Factors	Number of students	Answer options (%)				
			I fully agree	I agree	I rather agree	I partially agree	I totally disagree
1	Learning with SPOC	84	28.5	33.3	19.0	14.2	4.7
2	Satisfaction with SPOC		11.9	17.8	42.8	19.0	8.3
3	Satisfaction with support		17.8	41.6	29.7	8.3	2.3

The analysis found a positive correlation in most comparisons, while some of them showed a weak negative correlation. The strongest correlation was noted for the number of tasks on which students worked and the regularity of their access to MOODLE environment. A less strong correlation was mentioned for factors such as level and background of using online courses, so they are not mandatory for musical development. A negative correlation was found between the factors of using computers (background and access) and performing skills improvement (instrumental and vocal). For these two factors, self-training is critically important.

After long hours of playing an instrument or singing, students load the record in the MOODLE environment, and this does not take as much time as previous self-practice.

## Discussion

Considering the study and looking at the problem through the lens of Shulman signature pedagogy it seems to be critical to point out a new challenge. According to the definition of signature



TABLE 10 Students' open question quality assessment (positive and negative factors).

#	Quality	Replies	Frequency (N)
1	Positive	Learning from home is very comfortable	56
2		To manage my time for the learning process	43
3		Productive performing practice	45
4		More variety of study options and tools	78
5	Negative	The gaps of the Internet access	42
6		Interface old fashionable	26

pedagogy among the fundamental dimensions of professional work—to think, to perform, and to act with integrity, the last one, featured for art and clergy should be studied in more detail from the aspect of digitalization. This assumption (clarify) is based on the contradiction between computer and personality. Following Shulman, the core of some professions such as music, clergy and arts is the training of “heart” and calls for development of high responsibility in the moral aspect. This statement is confirmed by argument of scholars regarding need for redirection culture that is away from economic prescriptions so as to focus on social values (Bailey et al., 2019). Such qualities need to be transmitted directly from person to person through their face-to-face contact. In a case of lacking personal interaction, the possibility to provide significant information could be seriously limited.

In the recent past research pointed out relevance of e-learning as a progressive way for education without limits (Kumar et al., 2018). Even earlier, scholars have suggested the trend of personalization in remote teaching by upgrading the online tools and including innovative type of online courses (Fox, 2013).

The experimental work lets us state in general the positive impact of online learning on future music teachers' professional skills based on the signature pedagogy. Doubtlessly, music education cannot be fully shifted in a remote way, but for some reasons, such as emergencies when face-to-face class interaction is not feasible, digital tools could bring critical advantages. In these frameworks, the approach to teaching should be chosen thoroughly in order to systematize the professional training tasks and implement them in the online environment.

Currently, digital technologies tend to redesign music education noticeably. While the computer lab is transforming into an effective instrument of music-making, it gets real functions to replace traditional professions such as composer, performer, and conductor. This transformation can radically change the structure of music education, making some of its levels available to a very small cohort due to their high cost. At the same time, modern musicians, who work near computers, state the benefits of digital tools in comparison with traditional music learning. They argue that the digital tools provide a simple way for creating music as well as correcting it (Turchet et al., 2018). Also, the digital environment presents opportunities for self-studying music that becomes crucial in cases of restrictions or limitations.

Considering this issue and looking at the problem through the lens of Shulman's signature pedagogy, it seems critical to point out a

new challenge. According to the definition, among the fundamental dimensions of professional work—to think, to perform, and to act with integrity—the last one, featured in art and the clergy, should be studied in more detail from the aspect of digitalization. This assumption is based on the contradiction between computer and personality. Following Shulman, the core of some professions, such as music, clergy, and arts, is the training of “heart,” which means the development of high moral responsibility. Such qualities need to be transmitted directly from person to person through face-to-face contact. In the absence of personal interaction, the possibility to redirect the pivotal information could be seriously limited.

In such a context, the design of online courses appears from a new research perspective that requires to distinguish subject fields through the lens of the future specialist, preparing goals for appropriate methodology and effective digital tools. The signature pedagogy presents a fundamental theoretical approach for studying professional pedagogy. Moreover, it points out the critical features of professions and declares the teaching strategies. Based on this study and taking into account the increase in global digitalization, the necessity of developing educational instruments in music as well as far beyond it (arts, clergy) should be determined in the frames of the computer-personality dichotomy.

## Conclusion

The presented study demonstrates that technologies of remote teaching such as e-learning can replace face-to-face learning in a case of emergency in the field of music education. In the recent past main aspects of online music teaching were studied including training personal performing skills and group performance through online collaboration, delivering music knowledge to remote communities, implementation in the educational process of high-quality digital tools. However, lack of knowledge in the field of online musical professional training was a problem in higher education particularly in the process of preparation of future music teachers. In order to eliminate this problem, the signature pedagogy approach was implemented. This approach proposes the fundamental study of professions and allows improving the music teaching at university by implementing the pivotal professional features through the online tools.

The results of this research work conclude that technologies of remote teaching such as online courses can replace face-to-face learning in a case of emergency in the field of music education. The music teachers' signature pedagogy is featured by the music activity (surface structure), improvements to the school practice (deep structure), and analysis of the values (implicit structure). The core of this pedagogy is the personal interaction between a teacher and students to transmit the moral dimension through the subject. The choice of the small private online course (SPOC) as a type of online technology justified the specification of the music lesson and the music teacher's competencies, which should be learned by students at university.

The obtained results demonstrated the effectiveness of the designed course. Both research questions were confirmed by data collected using quantitative and qualitative methods. Considering RQ1 and RQ2, it was stated that the music teacher signature pedagogy implemented by SPOC really affects student's learning and engagement. With respect to RQ3, the music teacher's

TABLE 11 Correlation between online activity and professional development results.

Factors	Professional development results					
	Instrumental performing	Vocal singing	Analyzing of music	Creativity by music	Knowledge of music	Project design
Number of tasks	$R_{SP} = 0.281 (p < 0.001)$	$R_{SP} = 0.221 (p < 0.001)$	$R_{SP} = 0.352 (p < 0.001)$	$R_{SP} = 0.467 (p < 0.001)$	$R_{SP} = 0.867 (p < 0.001)$	$R_{SP} = 0.978 (p < 0.001)$
Level of use	$R_{SP} = 0.281 (p < 0.001)$	$R_{SP} = -0.323 (p < 0.001)$	$R_{SP} = 0.464 (p < 0.001)$	$R_{SP} = 0.221 (p < 0.001)$	$R_{SP} = 0.637 (p < 0.001)$	$R_{SP} = 0.638 (p < 0.001)$
Student's background in using online courses	$R_{SP} = -0.263 (p < 0.001)$	$R_{SP} = -0.355 (p < 0.001)$	$R_{SP} = 0.526 (p < 0.001)$	$R_{SP} = 0.682 (p < 0.001)$	$R_{SP} = 0.456 (p < 0.001)$	$R_{SP} = 0.758 (p < 0.001)$
Student's access in SPOC	$R_{SP} = -0.372 (p < 0.001)$	$R_{SP} = -0.184 (p < 0.001)$	$R_{SP} = 0.967 (p < 0.001)$	$R_{SP} = 0.578 (p < 0.001)$	$R_{SP} = 0.978 (p < 0.001)$	$R_{SP} = 0.886 (p < 0.001)$

professional skills, such as instrumental and vocal performance, analyzing and creating music, improvement of knowledge in the field, and project competencies, can be associated due to the established positive correlations with online learning activities based on the signature pedagogy.

The advantages of the implementation of SPOC in music education based on signature pedagogy will be significant in the following aspects:

- Unlimited access to special online resources and teachers' instructions;
- Active exchange of music teacher experience between a wide range of participants, remote discussions, and critical analysis of relevant problems and challenges;
- Close interaction with a teacher for developing personal learning schedules; and
- Comfortable way for student's professional self-improvement through productive training practice.

## Limitations

In this research, the study of the effectiveness of online learning based on signature pedagogy for future music teachers was investigated within the educational process of a Russian university. However, similar bachelor's programs are carried out at other universities worldwide. Thus, the comparison of the educational experience between two or more different institutions would bring clarification in this area generally. Moreover, due to the COVID-19 pandemic, remote teaching was widely implemented. We did not include the data from other universities due to the particular aims of this study, which required us to focus on the correlations between the technical tools of online learning and student-teacher satisfaction. This gap could be addressed in future studies.

## Future work

Due to the hard frames of the manuscript requirements, the study demonstrated only less part of the assessment tools of the online teaching of music based on signature pedagogy. The design of the evaluation, covering all the aspects and correlations between digital environment features and music skills, needs to be studied

more thoroughly. Moreover, the way of implementation of online learning tools in the fields required close human interaction and moral support, such as different types of art and clergy, should be studied more precisely.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Ethics statement

The studies involving human participants were reviewed and approved by Human Ethics Advisory Group of Kazan Federal University by using the ethical guidelines for educational research proposed by the British Educational Research Association [BERA], 2018. The patients/participants provided their written informed consent to participate in this study.

## Author contributions

The research is the result of the collaboration of all the authors. However, Sections Introduction, Background, Materials and methods, Discussion, and Conclusion are attributed to SK. Section Results and Conclusion to SK, ED, and IY. Sections Discussion, Conclusion, Limitations, and Future work to JM, RV, and MB. All authors contributed to the article and approved the submitted version.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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