Enhancing Pre-service Teachers' Technological Pedagogical Content Knowledge Through Micro-lectures: A Case Study in a Music Pedagogy and Practice Course for Graduate Students

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ABSTRACT

The integration of information technology skills among teachers has been a topic of concern for researchers both domestically and internationally. The concept of Technological Pedagogical Content Knowledge (TPACK) has provided a theoretical framework for research in this area. This paper reports the results of a case study that investigated the impact of the "Music Pedagogy and Practice Course" on music education graduate students (i.e. pre-service music teachers). The course is based on the TPACK framework, aiming to enhance students' musical TPACK level and promote their gradual formation of a deep understanding of the interactive relationship between information technology, teaching methods, and subject content. Research has found that in the curriculum, pre-service music teachers demonstrate well-developed teaching content knowledge (PCK), motivating and encouraging students to think about music. Pre-service music teachers show significant differences in performance between the general musical TPACK and the specific musical (Kodaly, Orff, Dalcroze) TPACK. This study raised some important issues, namely, the effective strategies to promote TPACK for pre-service music teachers are to select educational technology application based on various types of music learning activities, to share TPACK knowledge in the network research community, and to carry out micro-lectures in real educational situations.

Keywords: *Micro-lectures, Pre-service teachers, TPACK, Qualitative analysis.*

1. INTRODUCTION

Technological Pedagogical Content Knowledge (TPACK) has garnered significant attention from researchers worldwide, as the integration of technology in education has become an essential component of teaching and learning in the 21st century.[1] TPACK is a theoretical framework used to study the interaction among technology, educational technology and educational knowledge in practical application.

2. THE CONCEPT OF TPACK

From a constructivist perspective, the development of TPACK involves several key elements, including identifying relevant knowledge domains (such as knowledge of content, pedagogy, technology), integrating these areas into a cohesive whole, and continually refining and adjusting this integrated knowledge based on changing environments and contexts.[2]

In the current environment, as music education is facing unprecedented challenges, it is particularly necessary to develop TPACK. Because music is a multi-dimensional and complex discipline, researchers must have an in-depth understanding of the connotation of music and the way of education, as well as the use of science and technology to assist education and learning.[3] Using the theory of constructivism to develop TPACK can make students master the basic knowledge and skills they need and make them effective and successful in education.

3. LITERATURE REVIEW

Mishra and Koehler[4] added the "technology" dimension to Shulman's PCK theory and proposed a TPACK model that integrates technology, subject content, and teaching methods to illustrate the subject teaching knowledge of teacher integrated technology. Subsequently, researchers began to pay attention to the subject teaching knowledge and ability structure of teacher integrated technology, and conducted extensive empirical research based on the TPACK theory, continuously testing and improving this theory.

The core of TPACK is to integrate a variety of knowledge areas so that teachers can teach skills to students.[5] However, what kind of concept is TPACK? It is a knowledge system that links teaching content, teaching methods and technology.[6] Shavelson et al provide an enlightening framework for the complete concept of TPACK.[7] They assume that the composition of knowledge consists of declarative knowledge (knowing), procedural knowledge (knowing how) and schema knowledge (knowing why), while strategic knowledge (knowing when, where and how to apply knowledge and strategies in a field, such as planning and solving problems, and monitoring progress in achieving goals).

Many related studies have been conducted on TPACK for music teachers.[8] Some studies suggest that combining learning and practice in the process of building TPACK with the development of instrumental skills can effectively enhance the quality of music education.[9] In addition, some studies indicate that teachers need to understand the characteristics of different knowledge domains in music and be able to adopt appropriate technological tools to support their teaching in the development of TPACK.[10] Furthermore, research has focused on assessing TPACK in music education, such as using methods like surveys, interviews, case analysis,[11] and so on.[12]

4. CURRICULUM DESIGN

The Music Pedagogy and Practice Course is a core course in the Master of Arts program for research graduate students in the field of music, particularly in music education. This course uses various teaching methods, such as lecturing, project-based learning, inspiring learning, and group discussions, to fully engage students. The main objectives of this course are to help students deeply understand the philosophical principles of music education, the basic development trends of music teaching methods, advanced educational concepts, and teaching methods that influenced world music education in the 20th century, and to master macro-level cognitive frameworks. The course also guides students to design music curriculum based on current standards and to learn systematic study of music education systems like Orff and Kodaly, using research-based learning to enhance their learning patterns and innovative thinking. Ultimately, this course aims to promote a comprehensive and incremental improvement in students' understanding and application of music teaching methods, from macro- to micro-level, from theory to practice, from merely "implementers" to global "designers," and to cultivate their localization thinking in music education materials and teaching methods based on China's national conditions, providing essential practical experience for future music education work.

In the course, the micro-lectures that guide students to design and optimize mainly include the following three types: problem-based micro-lecture design, case-based micro-lecture design, and situational micro-lecture design, highlighting the integration of technology and innovation, autonomy, and personalization. To achieve the goals of various activities and the overall curriculum objectives, one supportive strategy was introduced in the micro-lecture: "proposal refining," which is based on Janet L.Kolodner's "learning by design" approach.[13]

5. METHOD

The study was conducted at a Beijing-based university, where pre-service music teachers were enrolled in the course on "Teaching Methods and Practices in Music Education." The participants of the study were asked to design and develop a series of mini courses using available educational technologies. the course on "Teaching Methods and Practices in Music Education" encouraged students to use various teaching methods, such as lectures, inquiry based learning, task driven teaching, and group discussions. Multimedia tools, pianos, Orff instruments, and smart whiteboards with score will be used as teaching materials. The course emphasized the importance of students transitioning from being mere implementers to capable and comprehensive designers, as well as the importance of course design and implementation.

The data collection methods for this study involved multiple sources to gather information on

teachers' progress. Classroom logs were used to collect TPACK development from different teachers, while each teacher's teaching sequence plan integrated spreadsheet teaching to provide a preliminary view on the use of technology in music classrooms. All assignments during the summer course (resource cards, lesson plans for peer teaching practices) were collected and analyzed to evaluate teachers' progress in integrating music content and technological skills to develop their TPACK. Teachers also used spreadsheets to observe and interview before and after music teaching in their own classroom. Through qualitative data analysis methods, researchers recorded the discourse of the pre-service teachers during the implementation phase of the mini courses. The discourse was then coded and classified according to the TPACK framework.

6. DISCUSSION

Research has found that in the curriculum, teachers demonstrate well-developed teaching content knowledge (PCK), motivating and encouraging students to think about music.

On the one hand, pre-service music teachers have shown significant improvement in the TPACK approach to general music teaching. Throughout the entire process of designing and implementing mini courses, students' CK elements showed significant improvement in knowledge depth, while TCK, TPK, and PCK also showed significant improvement. This indicates that students can better integrate technology, content, and teaching methods, integrate technology into music curriculum design, develop effective teaching plans, systematically organize teaching activities, and strictly analyze and evaluate classroom teaching activities.

On the other hand, pre-service music teachers have not made significant improvements in specific music teaching methods (Kodaly, Orff, Dalcroze) TPACK, failing to effectively integrate technology, content, and teaching methods. Throughout the entire process of designing and implementing mini courses, students are relatively unfamiliar with the unique characteristics of Kodaly, Orff, and Dalcroze teaching methods. This to some extent affects teaching design and the effective organization of teaching activities.

At the end of the course, pre-service music teachers can describe and discuss how to integrate technology into music courses through micro lesson design, stimulate student engagement, and provide opportunities to expand questioning when considering hypotheses.

7. CONCLUSION

Based on the results of this study, it is recommended that pre-service music teachers not only participate more in specific music teaching methods (Kodaly, Orff, Dalcroze) learning activities, but also deepen their understanding of these three music education systems, teaching concepts, and the main content of each method; Consciously participate in learning activities that integrate technology, content, and teaching methods, and integrate technology into the design and implementation of music courses. These activities can include selecting appropriate educational technologies for specific teaching situations, participating in TPACK knowledge sharing networks, and participating in real-world teaching scenarios. These strategies will enhance the effectiveness of TPACK development for pre-service teachers and help better integrate technology into teaching practice.

Through extensive data collection and observation of teachers' teaching performance in their own classrooms, this study describes and discusses the progress of music education pre-service teachers in using technology to implement new knowledge and teaching plans. Of course, regarding what music education students (i.e. pre-service music teachers) should learn, how to teach music, and what preparations need to be made for using technology to teach music, it is a comprehensive system. The integration of musical TPACK in teaching is still in its early stages. As more and more technologies are available for teaching and learning music, and the connection between technology and teaching becomes increasingly close, the musical TPACK will gradually mature.

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