ISSN 2618-1568 Vol. 7, Issue 5: 73-79, DOI: 10.25236/FAR.2025.070511

Application of the TPACK Framework and IMMS Scale in Music Education: An Analysis of Learning Motivation Based on Field Teaching Experiments

Rui Ma[1,a,*]

[1]*Faculty of Performance, Beijing City University, Beijing, China*
[a]*marui@bcu.edu.cn*
**Corresponding author*

Abstract: *This study explores the application of the TPACK (Technological, Pedagogical, and Content Knowledge) framework in music education and uses the IMMS scale to measure students' learning motivation, evaluating its impact on students' motivation, academic performance, and learning satisfaction. The research found that integrating technological tools through the TPACK framework significantly enhances students' learning motivation and classroom engagement, especially in music creation and technology interaction, greatly stimulating students' enthusiasm and interest in learning. Additionally, the academic performance and learning satisfaction of the experimental group were higher than those of the control group, indicating that teaching methods under the TPACK framework are more interactive and innovative. However, the study also points out that teachers' ability to integrate technology and curriculum design are crucial for the successful application of the TPACK framework. Future efforts need to strengthen teacher training and technical support to optimize teaching effectiveness. In summary, the TPACK framework has significant advantages in music education, but realizing its full potential still requires overcoming challenges related to technology adaptability, instructional design, and teacher capability.*

Keywords: *TPACK Framework, IMMS Scale, Music Education, Technology Integration, Learning Motivation*

1. Introduction

As the world of information technology accelerates at an unprecedented pace, the field of music education is undergoing a transformative shift, increasingly adopting digital tools and integrating data-driven methodologies into its practices. The TPACK (Technological Pedagogical Content Knowledge) framework equips educators with essential strategies to help them achieve the integration of technology, pedagogy, and subject content in teaching [1]. Within the TPACK framework, educators not only need to master technology and subject content but also be able to apply appropriate teaching methods to organically combine the two, creating a teaching environment and methods suitable for student learning [2]. However, although the TPACK framework has been applied in research spanning various disciplines, empirical studies on its application in music education are relatively rare, especially in analyzing learning motivation and satisfaction.

This study is based on the TPACK framework and combines the IMMS scale to measure students' learning motivation, investigating the influence of the TPACK framework on students' learning motivation, academic achievement, and overall satisfaction in music education. The core issue of the study is how to enhance students' learning motivation through technology integration, thereby improving their learning outcomes and satisfaction.

2. Literature Review

2.1 Application and Theoretical Basis of the TPACK Framework

The TPACK (Technological Pedagogical Content Knowledge) framework was proposed by Mishra and Koehler, with a focus on the three-dimensional integration of technology, content, and pedagogy [3]. It holds that successful teaching requires not only content knowledge (CK) and pedagogical knowledge

ISSN 2618-1568 Vol. 7, Issue 5: 73-79, DOI: 10.25236/FAR.2025.070511

(PK) but also technological knowledge (TK), and the ability to combine them. With the widespread application of information technology in education, the TPACK framework offers a holistic approach to help teachers effectively utilize technological tools to support teaching.

In the realm of music education, the use of technology mainly includes tools such as audio editing software, music composition applications, and online learning platforms [4]. These tools not only empower students in developing their creative and performance abilities, but also enhance their understanding of music theory and foster a stronger enthusiasm for the subject [5]. Studies indicate that the use of digital technologies enhanced creative thinking and artistic expression among students. especially in interactive learning and personalized learning [6].

2.2 The Relationship between Learning Motivation and the TPACK Framework

Learning motivation, which is defined as students' enthusiasm and engagement in learning activities and plays a crucial role in learning outcomes. Learning motivation is conceptualized as comprising two primary dimensions: internal drive and external influence. When considering the driving forces behind student learning, intrinsic motivation is defined as the process of acquiring knowledge or skills not primarily due to external incentives but rather through personal curiosity, satisfaction, and intrinsic desire for growth. Conversely, extrinsic motivation arises from the influence of external rewards, such as grades, praise, or other tangible or intangible incentives, which act as catalysts for action.

The IMMS Scale is a commonly utilized tool for assessing students' learning motivation, mainly focusing on four dimensions: attention, relevance, confidence, and satisfaction [7]. Through the IMMS scale, the state of students' learning motivation within a classroom setting can be quantified, thereby offering empirical data that supports the development of effective instructional strategies [8].

Guided by the principles of TPACK framework, the use of digital technologies can not only boost students' enthusiasm for learning and foster innovative thinking, but also increasing their drive to engage with academic material, especially in terms of the fluency of technology use and the relevance of teaching content. A body of academic studies indicates that when teaching content is combined with students' personal interests and real-world experiences, learning motivation is significantly improved.

2.3 Application Research of the TPACK Framework in Music Education

Although the TPACK framework has been widely applied across various academic fields, especially in mathematics, science, and language arts, research on its application in music education remains under explored. Research findings suggest that effective integration of technology helps students comprehend musical concepts and refine their technical proficiency [9]. For instance, students who utilize music composition software for creation can develop a deeper appreciation for the interplay between form and emotional nuance. However, most of these research endeavors emphasize the application of technological tools and lack a comprehensive evaluation of the impact of technology integration on students' learning motivation, learning satisfaction, and academic outcomes.

This research seeks to address this knowledge gap by exploring the integration of technology in music teaching within the TPACK framework and assessing students' learning motivation through the IMMS scale, comprehensively evaluating the influence of the TPACK framework on both students' academic outcomes and their overall satisfaction levels.

3. Experimental Design and Methods

3.1 Design of Experimental and Control Groups

In this research, we chose two groups of students from Class 1 and Class 2 of the 2023 Music Undergraduate program for a comparative experiment. The experimental group implemented a pedagogical strategy grounded in the TPACK framework, integrating music technology tools in teaching, such as music creation software, audio editing tools, etc.; the control group used traditional face-to-face teaching methods, predominantly through printed materials and lectures delivered by instructors. The research initiative spanned a period of two semesters, with 3 hours per week, totaling 30 weeks.

ISSN 2618-1568 Vol. 7, Issue 5: 73-79, DOI: 10.25236/FAR.2025.070511

3.2 Data Collection and Analysis Methods

In order to thoroughly evaluate the influence of the TPACK framework on students' learning motivation, this research employed the IMMS scale to assess students' learning motivation, combined with pre- and post-test academic performance, learning satisfaction interview, and classroom observation data for comprehensive analysis. The primary methods of data collection include: IMMS scale: used to measure students' learning motivation, including four dimensions: attention, relevance, confidence, and satisfaction; Academic performance: evaluated both the mid-term and final examination; Learning satisfaction: through in-depth interviewing students, uncover students' perceptions and experiences regarding the curriculum's relevance, pedagogical approaches, and the integration of digital resources.

4. Data Analysis

4.1 Analysis of Students' Learning Motivation

Table 1 shows that the comparison of scores between the experimental group and the control group on the four dimensions of the IMMS scale reflects the significant impact of the TPACK framework on students' learning motivation. Analysis of these four dimensions reveals that the experimental group outperforms the control group in all aspects, with the most notable difference occurring in the "Attention" dimension, which is 0.194 points higher. The next largest difference is in the "Relevance" dimension, with a gap of 0.174 points. The divergent outcomes can be attributed to the interactive nature of the technological tools and the dynamic feedback systems embedded within the teaching methodologies. Moreover, the differences in the "Satisfaction" and "Confidence" dimensions were 0.165 points and 0.164 points, respectively. Though the variations are not substantial. Indeed, the continued use of technological tools underscores their critical contribution to students' academic satisfaction and self-assurance in their learning journey. Below is a detailed description and analysis of the data for each dimension (with a maximum score of 5 points).

Table 1: IMMS Scale Scores Comparison

Dimension	Experimental Group	Control Group
Attention	3.723	3.529
Relevance	3.952	3.778
Confidence	3.459	3.295
Satisfaction	4.05	3.885

1) Attention

In the IMMS scale, the attention component primarily evaluates how students maintain focus during classroom activities. The score difference between the experimental and control groups in the "Attention" dimension is the largest. The experimental group’s average score is 3.723, while the control group’s score is 3.529, leading to a notable 0.194-point gap between the two groups.

The experimental group's superior performance in the "Attention" domain can be attributed to the effective application of technological tools as per the TPACK framework, which integrates pedagogical practices with technological knowledge.

After adopting the TPACK framework teaching method in the experimental group, students generally reported that using multimedia technology and interactive tools made the class content more engaging and visually appealing, thereby increasing the level of involvement and sustained focus during class sessions. As a result, students’ interest in the learning materials is heightened, leading to increased classroom participation.

2) Relevance

This dimension is evaluated by examining how students' academic interests align with the practical applications of the content, and whether these elements resonate with their personal experiences. The score difference in this dimension ranks second in magnitude. The experimental group’s average score is 3.952, while the control group’s score is 3.778, thereby creating a notable gap of approximately 0.174 points between the two groups.

The experimental group’s higher score in the "Relevance" dimension suggests that the incorporation of digital tools enhances the perceived relevance of the learning content. With the introduction of

ISSN 2618-1568 Vol. 7, Issue 5: 73-79, DOI: 10.25236/FAR.2025.070511

digital tools, students have developed a higher perception of the course's relevance, especially as digital music composition tools and online interactive platforms enable them to integrate what they learn in class with their personal creations. Consequently, this approach not only heightens their enthusiasm for the subject but also cultivates a stronger desire to engage with it on a deeper level.

3) Confidence

The confidence dimension primarily evaluates students' belief in their ability to successfully complete assigned tasks. In this particular dimension, the gap between the experimental and control groups is the most minimal. In the experimental cohort, participants achieved a score of 3.459, whereas the control group maintained a score of 3.295, resulting in a 0.164-point difference.

Students in the experimental group indicated that through in regular practice combined with real-time feedback, particularly after using digital tools, their confidence in their skills significantly increased. Digital tools can provide real-time feedback and actionable recommendations, which greatly enhance students' self-efficacy. While the use of technological tools aids the experimental group's learning, the introduction of new tools and technologies can also present challenges. Students need time to adjust to new tools and techniques. When students first encounter novel educational technologies or methods, they often require a period of adaptation to become proficient. During this transition phase, their initial confidence may experience a temporary dip as they navigate unfamiliar processes. And it may temporarily affect their confidence. As a result, the difference in confidence between the two groups remains relatively small, reflecting the time required for students to adapt to these new technologies. The prolonged period needed for students to fully integrate these emerging digital tools into their daily routines underscores the complexity of this transition.

4) Satisfaction

This dimension evaluates how students feel about their academic experience throughout the learning journey. The experimental group's score is 4.05, while the control group's score is 3.885, resulting in a 0.165-point difference. In this specific area, the experimental group achieved the highest score among all participants, and it stands out as the sole instance where the rating surpassed the threshold of 4 points.

The high satisfaction score for the experimental group indicates that students were more satisfied with the teaching method based on the TPACK framework. Students in the experimental group frequently reported that the use of technology made learning more pleasurable, particularly when using music creation tools to compose music, as they could see their progress and achievements, which heightened their motivation and overall learning satisfaction. While the control group also provided relatively high satisfaction scores, this could be attributed to their familiarity and comfort with traditional teaching methods, resulting in higher satisfaction within their accustomed learning environment.

To summarize, by analyzing the IMMS scale results from both experimental and control groups, our findings indicate that the experimental group scored significantly higher than the control group in all four dimensions, indicating that the TPACK framework can more effectively boost students' learning motivation.

4.2 Analysis of Academic Performance

Academic performance is a crucial benchmark for measuring students' learning outcomes. The data presented in the table 2 indicates a marked disparity in academic performance between the experimental and control groups, particularly in the final exam, where the experimental group's performance is notably stronger. This demonstrates the effectiveness of the TPACK framework in enhancing students' academic performance.

Table 2: Academic Performance Comparison

Component	Experimental Group	Control Group
Mid-term Scores	81.2	78.7
Final Scores	83.5	80.9

1) Midterm Exam Score Analysis

Table 2 shows that the experimental group scored an average of 81.2 on the midterm exam, significantly higher than the control group's score of 78.7, with a difference of 2.5 points. The observed discrepancy indicates that the application of the TPACK framework contributes to improved

ISSN 2618-1568 Vol. 7, Issue 5: 73-79, DOI: 10.25236/FAR.2025.070511

performance in the midterm exam. When educators incorporate digital technologies into their teaching methods, the TPACK model facilitates a more profound understanding of both theoretical and practical aspects of music. Experimental group students likely benefited from using technological tools, such as music composition software, which allowed them to more intuitively apply the knowledge they had learned, resulting in better performance on the midterm exam.

2) Final Exam Score Analysis

The final exam is a critical indicator of students' overall academic performance. Table 2 shows that the experimental group's average score on the final exam was 83.5, significantly higher than the control group's score of 80.9, with a difference of 2.6 points. The score gap in the final exam is slightly larger than in the midterm, which may be due to the ongoing interactive learning and practical application supported by the TPACK framework throughout the semester. This sustained engagement enhanced the experimental group students' ability in music composition and their understanding of music theory. As the course progressed, the increasing use of digital tools strengthened students' grasp of the content, leading to more prominent performance in the final exam.

3) Main Influencing Factors Analysis

Through interviews with students, the study identified the following three main influencing factors:

Role of Technological Support: The TPACK model highlights the importance of digital tools like music composition software, which enable learners to bridge the gap between theoretical concepts and real-world applications in music education. This approach not only enhances students' enthusiasm for academic pursuits but also deepens their understanding and ability to apply the knowledge. The participants in the experimental group were able to receive real-time feedback during their learning process, allowing them to adjust their learning strategies promptly, which enabled them to perform better in exams.

Differences in Teaching Methods: The TPACK framework emphasizes instructional design and the integration of technology, with educators using diverse teaching methods and digital tools to foster more engaging classroom environments. This innovative teaching model likely encouraged greater student participation in learning, which improved their overall academic performance. In the final exam, students' comprehensive abilities were more fully demonstrated.

Students' Self-Efficacy: The experimental group students, when utilizing digital tools, could observe their learning progress and achievements in real-time, which enhanced their confidence and motivation. The excellent performance in the final exam may be related to this increased self-confidence, as students gradually built confidence in their academic journey, they also developed the capacity to adapt their knowledge effectively across various contexts.

In summary, from the perspective of grade distribution, it's evident that students in the experimental class outperformed their counterparts in the control group. The Analysis demonstrate that through the effective integration of technology, experimental group students were able to better understand music theory and apply it in their creative work, thus improving their academic performance.

4.3 Analysis of Learning Satisfaction

In the study conducted on student satisfaction, the participants in the experimental group reported a notably higher level of satisfaction compared to their counterparts in the control group. Participants emphasized that the pedagogical approaches aligned with the TPACK framework were more varied and engaging, and the digital tools used in class allowed students to more effectively absorb complex information, thereby enhancing their interest and self-directed learning enthusiasm.

Moreover, participants in the experimental group actively appreciated the assistance they received from teachers who employed technological resources, believing that these tools helped them grasp intricate musical concepts more effectively and developed personalized learning approaches. However, members of the control group indicated that traditional classroom teaching methods were relatively monotonous, lacking interactivity and innovation, leading to a more rigid and unengaging learning environment.

4.4 The Impact of the TPACK Framework on Learning Motivation and Learning Outcomes

By integrating the TPACK framework into music instruction, educators can not only boost students'

ISSN 2618-1568 Vol. 7, Issue 5: 73-79, DOI: 10.25236/FAR.2025.070511

intrinsic motivation but also effectively improve their academic performance and overall learning satisfaction. By leveraging digital tools, students can strengthen their mastery and application of knowledge via interactive learning environments, tailored educational approaches, and real-time feedback, thereby achieving enhanced academic outcomes.

By leveraging the TPACK framework, educators can design more dynamic, flexible and interactive learning environments to encourage students to engage with subject matter more effectively and promote students' self-directed study through technological tools. Scientific studies indicate that the incorporation of digital tools into educational practices can overcome conventional teaching constraints, thereby enhancing learning outcomes, equipping students with a broader range of educational materials and diverse instructional strategies, thereby simultaneously improving the overall quality of their academic performance.

5. Conclusion

By examining the experimental group (TPACK-based instruction) and the control group (conventional teaching methods), the study concluded that the following key conclusions emerged:

1) Improvement in learning motivation: In the experimental group, students demonstrated notable enhancements in their motivation for learning, as evidenced by a substantial increase in all aspects of the IMMS scale, including attention, relevance, confidence, and overall satisfaction.

2) Improvement in academic performance: The students in the experimental group demonstrated notably higher performance on both midterm and final exams compared to their counterparts in the control group, indicating that the TPACK framework positively influenced students' academic performance by effectively leveraging technology in teaching processes.

3) Higher learning satisfaction: The students in the experimental group reported significantly greater satisfaction with their academic experiences compared to those in the control group, mainly reflected in classroom interaction and the use of digital tools.

In summary, the application of the TPACK framework in music education helps to improve students' learning motivation, academic performance, and learning satisfaction, providing teachers with both robust theoretical frameworks and actionable strategies for technology-integrated teaching.

6. Discussion

The application of the TPACK framework in music education has indeed boosted students' learning motivation, academic performance, and learning satisfaction. However, to realize its full potential, challenges such as technological adaptability, innovative teaching strategies, and teacher skill development must be addressed. In order to achieve this goal, educational institutions should offer enhanced professional development programs and robust technical assistance to educators, while making more comprehensive plans for teaching content design to ensure that the TPACK framework can be effectively implemented across various educational settings.

References

[1] Koehler M J, Mishra P, Cain W. What is technological pedagogical content (TPACK)?[J]. Journal of Education, vol. 193(3), pp. 13-19, 2013.
[2] Mishra P, Koehler M J. Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge.[J]. Teachers College Record, vol. 108, pp. 1017-1054, 2006.
[3] Koehler M J, Mishra P. What Happens When Teachers Design Educational Technology? The Development of Technological Pedagogical Content Knowledge[J]. Journal of Educational Computing Research, vol. 32(2), pp. 131-152, 2005.
[4] Bauer W I. The Acquisition of Musical Technological Pedagogical and Content Knowledge[J]. Journal of Music Teacher Education, vol. 22(2), pp. 51–64, 2013.
[5] Gall M. TPACK and music teacher education [M]. The Routledge companion to music, technology, and education. Routledge, pp. 329-342, 2017.
[6] Han J. Empowering Korean Preservice Music Teachers' Competency of Technological Pedagogical and Content Knowledge (TPACK): A Qualitative Study[J].Korean Music Education Society, 2023.DOI:10.30775/kmes.52.2.161.

ISSN 2618-1568 Vol. 7, Issue 5: 73-79, DOI: 10.25236/FAR.2025.070511

[7] Keller J M.Motivational design of instruction [J].Instructional Design Theories & Models An Overview of Their Current Status, 1983.DOI:http://dx.doi.org/.
[8] Ucar H, Kumtepe A T.Effects of the ARCS-V-based motivational strategies on online learners' academic performance, motivation, volition, and course interest[J].Journal of Computer Assisted Learning, 2020, 36(3).DOI:10.1111/jcal.12404.
[9] Ma R.Research on the development and measures of Music Education students in the information Age based on TPACK framework[J].Advances in Education, Humanities and Social Science Research, 2023.DOI:10.56028/aehssr.6.1.133.2023.