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RESEARCH ARTICLE

Enhancing Student Engagement and Performance in Piano Lessons through Project-Based Blended Learning

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ABSTRACT

The study examines the impact of the Project Blended Learning framework on students' learning behaviours, emotions, and performance in piano lessons, emphasizing introducing a novel instructional model that integrates project-based and blended learning methodologies. Traditional music education methods significantly diminish the opportunities for improvisation and creative expression, which are essential for developing the performer's requisite technical proficiency and communicative effectiveness. This quasi-experimental study involved two student groups: one receiving conventional instruction and the other engaged in PBBL-based teaching. The results analysis indicated that using the PBBL model benefited technical abilities and learning behaviours; the experimental group achieved superior post-test averages across all assessed performance characteristics. These results demonstrate the model's effectiveness in enhancing motivation and providing meticulously customized, systematic learning frameworks. This study supports the assertion that PBBL is an effective method for teaching music and has ramifications for other skill-based learning domains. The PBBL paradigm, through its empowering and creativity-enhancing approach, emerges as a feasible instructional model that aligns with contemporary trends of flexibility, learner-centeredness, and technology-enhanced education.

INTRODUCTION

The effects of music on individuals and society have been acknowledged throughout history, influencing language acquisition and curricula globally. The overall cognitive, emotional, and academic development of learners is significantly improved through piano instruction (Hallam, 2010). Duke, Flowers, and Wolfe (1997) reported that students in music education exhibit enhanced memory, improved grades, and increased social participation, as music learning fosters self-discipline, patience, and creativity. The cognitive and social benefits have led to children starting piano education early, with China exemplifying a country where traditional education integrates modern and technologically advanced practices (Kintu, Zhu, & Kagambe, 2017). Thus, it is feasible to identify the benefits of music education. Despite the challenges encountered in music education training and the difficulties in implementing these trainings for students, maintaining student interest during music classes, including piano lessons, remains a concern. This study aims to evaluate the effectiveness of a PBBL model in addressing challenges and enhancing participation and performance among college piano students.

Piano lessons have historically been characterized by a formal and hierarchical structure, wherein the instructor presents the primary rules and concepts of the lesson, while the student practices these ideas independently on the piano, often without interaction, feedback, or engagement with the teacher. This structure is frequently employed and rarely promotes intrinsic motivation, leading

learners to create various excuses and miss lessons (Ericsson, Krampe, & Tesch-Römer, 1993). The authors note that existing literature suggests that numerous students begin piano lessons driven by extrinsic motivation rather than intrinsic motivation (Costa-Giomi, 2004). A learner lacking self-generated motivation does not engage sufficiently in practice, resulting in low efficiency in mastering musical instruments (Davidson, Sloboda, & Howe, 1995). The current teaching model presents a significant issue as it fails to adapt to evolving learning needs. Students are increasingly advocating for structures that are participatory, active, and centered around student engagement.

As institutions increasingly adopt digital innovation in their operations, blended learning (BL) has emerged as an effective teaching method that integrates face-to-face instruction with online components. According to Osguthorpe and Graham (2003), blended learning shifts the learning process from content delivery to a construction model in which students play a crucial role. The concept of face-to-face tutorials and case use enhances flexibility, adaptability, and interactivity, while also incorporating online or blended learning, which improves motivation and learning outcomes (Smyth, Houghton, Cooney, & Casey, 2012). In music education, students engage in independent singing or instrument playing while utilizing technology for performance feedback. Self-direction and time management are integral components of blended learning, regarded as critical factors in responsibility and sustainability. Consequently, basic instructional models play a crucial role in maintaining learner engagement, necessitating the implementation of structured instructional models (Hockly, 2018).

Project-based education (PBL) is another educational model employed in learning that enhances students' problem-solving abilities, collaboration, and self-directed learning. Helle, Tynjälä, and Olkinuora (2006); Wong (2006) demonstrated a positive correlation between engagement and the use of problem-based learning (PBL) as a teaching approach, facilitating student ownership and interest in learning. The implementation of project-based learning (PBL) in music classrooms enhances creativity, student collaboration, and critical thinking, all of which contribute to the development of art and the refinement of performance (Rahardjanto, 2019). The case of piano lesson delivery illustrates that PBL enables learners to engage with various music styles, enhance their ensemble skills while addressing musical challenges, and reflect on their learning experiences over time, leading to significant personal development.

The integration of blended and project-based learning into a unified instructional model, termed Project Based Blended Learning (PBBL), facilitates the effective amalgamation of technology-supported, self-directed instruction characteristic of blended learning with the constructivist and problem-solving principles inherent in project-based learning. Recent studies indicate that PBBL effectively enhances students' practical experiences, critical thinking, and participation by structuring them into targeted learning activities grounded in project-based frameworks (Tong & Wei, 2020). The integration of passing and project-focused styles has not been adequately addressed in the context of music learning, particularly in piano education. Research on PBBL primarily focuses on learning domains such as science, language, and technology, while its application in arts and music education remains underexplored. It is well established that there is a need to design approaches in these areas (Nguyen, 2017; Wahyudi & Winanto, 2018).

However, certain challenges have been identified in the application of PBBL within piano education. Despite support for PBBL from various authors and researchers, piano education has encountered several issues. The process of learning piano involves the acquisition of motor skills, auditory differentiation, comprehension, and interpretive strategies. This learning process cannot occur in a group setting and must be evaluated in real-time. Delivering consistent feedback in online learning environments can be challenging due to the absence of regular nonverbal and paraverbal cues, potentially leading to biased self-assessments and technical error estimations by students (Zhu, Phongsatha, & Intravisit, 2020). The facility in which the student is studying presents several technological challenges to online learning. Society and home environments encompass inadequate equipment, disruptions in nurturing settings, and challenges in accessing and maintaining internet connectivity, all of which impede the focused learning necessary for developing substantive skills (Shaykina, 2015). The integration of the PBBL framework into piano instruction necessitates the inclusion of elements that promote learner-initiated actions, provide structural support, ensure flexibility, and maintain organization within a model that accommodates the diverse needs of learners in the music education context.

The significance of PBBL in piano education will be further elucidated in the following sections of this paper. The Covid-19 pandemic has necessitated the adoption of online and blended learning systems, making it essential to adapt to flexible and accessible learning methods in response to the evolving environments within educational institutions. During the viral outbreak, educators in music classes were required to follow social engagement guidelines, necessitating the transition to online instruction to facilitate ongoing student learning. This resulted in students being demotivated, underscaffolded, and learning less effectively due to the lack of pedagogical structures to organize online formats (Horn & Staker, 2014). The integration of technology into traditional music education has created an opportunity to develop a comprehensive PBBL framework, which can effectively address the technical and motivational challenges faced by piano learners across various educational contexts.

This study examines the application of the PBBL model in piano instruction for college students, highlighting its potential benefits. This research aims to determine the extent to which PBBL can be employed to reduce learning disengagement in pianism lessons and to assess its impact on motivation, skill enhancement, and performance improvement. This study aims to enhance the existing knowledge in music education by integrating PBBL with piano instruction. This study examines the potential of a project-based digital teaching model to transform conventional teaching and learning approaches in music education contexts.

The objectives of this research are summarized as follows. The intervention seeks to develop an instructional model that integrates project-based learning with blended learning to enhance piano instruction. This study evaluates the effectiveness of the PBBL model in enhancing student interest in piano lessons by comparing groups of students who participated in PBBL with those who received conventional instruction. This research examines how students' implementation of PBBL influences their piano performance, specifically regarding technique, interpretation, and expression. This study's results are expected to offer practical insights for music educators in identifying instructional strategies that promote long-term motivation and enhance performance in piano learners.

This study is significant as it addresses a gap in the teaching methods of music education, particularly in the context of college-level piano instruction. This study advances PBBL as a structured model that supports work, digital, internal differentiation, and student-centred learning reforms in education. The study addresses critical questions regarding motivational and instructional practices appropriate for learners with diverse needs in a dynamic environment. The findings of this research may benefit music educators, curriculum developers, and policymakers by informing the development of instructional strategies that align with student preferences for engaging and flexible learning environments that utilize technology.

The structure of the paper is as follows: Section two presents a literature review on blended learning, project-based learning, and blended-project learning. The model design, participants, and data collection details are outlined in the final section, titled Section Three - Research Methodology. Section Four presents the conclusion, while Section Five encompasses both the conclusion and the classification of decisions about music education. In section five, the key findings are accompanied by limitations and recommendations for future research regarding the PBBL, specifically concerning piano lesson involvement and performance.

2. LITERATURE REVIEW

2.1 Blended learning: theoretical foundations and applications

Blended learning (BL) is an educational framework that integrates in-person instruction and computer-supported collaborative learning (Shaykina, 2015). Initially implemented to accommodate diverse learner abilities, blended learning has evolved alongside technological advancements that ensure real-time assessment and flexible learner pacing, which are crucial for imparting skills-based knowledge (Graham, 2006). Bersin (2004) classify blended learning (BL) into three categories: the integration of instructional modes, the convergence of instructional approaches, and the combination of face-to-face (F2F) and web-based instruction. Each category offers distinct advantages and contributes to synthesizing learning styles (Bonk & Graham, 2012).

Blended learning is essential in contemporary educational contexts, particularly when traditional physical attendance is restricted, as observed during the ongoing COVID-19 pandemic (İRmİŞ &

UludaĞ, 2023). Both fully online and hybrid formats increased enrollments and ensured learning continuity despite challenges associated with face-to-face instruction. BL has emerged as a favoured approach across various disciplines, with HI indicating that 71% of instructors favour it due to its scalability, enhanced teacher-student interaction, and responsiveness to student enrollment numbers (Schaffhauser & Kelly, 2016).

Consequently, Africa's BL faces challenges during implementation. Szadziewska and Kujawski (2017) identify several issues, including technical difficulties, diminished direct communication, and reduced creativity within online environments. In music education, these issues are particularly significant for students who rely on structured interaction and feedback to address technical challenges. Distortion or latency in audio or video streams, along with internet connectivity issues, diminishes practicality and obstructs instructors from conveying nuanced aspects of piano performance (Liu & Shao, 2024). Several factors indicate the advantages of employing BL for piano instruction. Flexibility in learning pace is advantageous in piano lessons, allowing students to utilize technological resources effectively.

2.2 Project-based learning in education

Project-based learning (PBL) is a novel educational approach that emphasizes student engagement, collaboration, problem-solving skills, and reflection during both classroom and extracurricular activities (Jalinus, Nabawi, & Mardin, 2017). Project-Based Learning (PBL) emphasizes the application of knowledge to real-world contexts, where students engage in the creation of meaningful products aimed at addressing genuine challenges while acquiring new skills (Blumenfeld, 1991; Buck Institute for, 2012). Independence, theoretical support, and both specific and general skills, including teamwork and problem-solving, are highly regarded (Krajcik & Blumenfeld, 2006).

Project Based Learning (PBL) has recently transitioned from science instruction to language education, enabling students to connect with real-life situations. The research by Anazifa and Djukri (2017) indicates that learners can engage in critical thinking, demonstrate independence, and achieve academic success as a result of the effective roles assigned to them in Problem-Based Learning (PBL). Tsybulsky and Muchnik-Rozanov (2019) highlight the necessity of Project-Based Learning (PBL), noting that students engaged in science projects demonstrated patience, cooperation, and creative thinking. They may prove beneficial in music education, particularly during individual and team presentations.

Numerous challenges exist in the implementation of PBL in piano and other music instruction. Written projects are essential in the assessment of music education, particularly in instrumental lessons like piano, due to the inherent challenges associated with them. These objectives facilitate coordination, repetition, and the integration of corrective feedback from instructors, elements that are challenging to achieve through student projects alone. This study demonstrated that the implementation of PBL necessitated intentional modifications when applied in a music context. The technical specifications of the design, along with the clear guidelines and defined objectives of the project, needed to align seamlessly with the cyclical and practical aspects of the skill acquisition process. The effective implementation of PBL in music education enhances students' creativity and self-motivation, aligning with the objectives of piano learning (Robinson, 2013). The studies demonstrate that PBL serves as an effective learning environment, fostering the essential learning dispositions required by both teachers and music learners for music practice and performance.

2.3 Blended learning in music and piano education

The implementation of blended learning in music education is increasingly significant within educational institutions, facilitating learners' access to resources beyond classroom hours. Outcomes of Blended Learning (BL) Open-Face students, the Body of ink on literature indicates that instructional delivery systems emphasizing the extension of classroom content may enhance the educational experience. Students reference and critique each other's video practices in blended learning, which may be particularly beneficial for disciplines that are ongoing and self-directed, such as music (Zhai, 2023). Zhu et al. (2020) demonstrated that the implementation of blended learning (BL) facilitated students' engagement in independent research, contingent upon the frequency of face-to-face interactions and ongoing feedback via BL submission systems and forums. The weekly

lessons establish a framework for students to acquire essential skills, accompanied by a structured feedback mechanism akin to traditional piano instruction.

The integration of mobile learning applications and artificial intelligence within the blended learning piano education model is discussed. These tools assist students in self-directed learning by providing accurate feedback on the notes corresponding to their preferred playing style during practice sessions. Xiaoyezi AI Piano Tutor enhances polyphonic functionality to develop students' dexterity and employs a self-learning model that allows students to perform and learn at their own pace (Liu & Shao, 2024). The integration of AI in piano instruction offers benefits, as it enhances students' motor skills and interpretative engagement. Additionally, it results in the formation of thick skin or calluses, which frequently enhances the appeal for uniqueness in a specific performance. AI enhances interaction and professionalism in practice, thereby contributing to the musical development of students. Zhai (2023) examined the enhancement of attention and engagement associated with mobile learning applications and their potential advantages for the blended learning model, particularly for piano beginners and intermediates, where the majority of instruction occurs online and asynchronously.

2.4 Project-based blended learning: an integrated model for piano education

Project-Based Blended Learning (PBBL), which integrates elements of blended learning (BL) and project-based learning (PBL), has garnered significant interest as a pedagogical paradigm that emphasizes openness, connectivity, sustainability, and the authenticity characteristic of the project-based methodology. PBBL allows students to engage in structured simulations of actual business operations using a hybrid format of in-person and online participation, facilitating the practical application of theoretical concepts (Tong & Wei, 2020). The proposed strategies facilitate the change of music education through an experience learning approach as detailed below. This allows students to pursue specific goal- or project-oriented objectives independently while offering feedback and necessary resources as needed.

Analysis of the PBBL literature suggests that PBBL fosters enhanced student independence, improved problem-solving abilities, and autonomy in learning. Wahyudi and Winanto (2018) discovered that the implementation of PBBL in teacher training significantly improved students' creativity, independence, and motivation through project-based activities combined with online learning, which aligns well with the extrinsically driven learning domain of music. A study conducted by Zhang (2024) revealed that the installation of piano courses under the PBBL model enhanced student satisfaction and involvement, attributable to the methodology's intrinsic flexibility. PBBL facilitates student-initiated activities, such as reworking compositions or enhancing improvisation skills; the format employed by PBBL is unstructured yet systematically aligned with the requirements of piano education.

PBBL also offers piano instructors avenues to contribute to projects essential for the technical and interpretive tasks crucial to performance. The study by Lou et al. (2012) demonstrates that PBBL was beneficial in a music creative course, which included group digital composition projects, synchronous feedback, and resource grouping to enhance project outcomes. It was also consistent with a constructive strategy to enhance the acquisition of technical skills and overall student accountability and happiness. PBBL, when utilized in piano instruction, may assist learners in achieving certain objectives, such as employing methods or composing additional pieces on a designated interface. Furthermore, supplementary website materials would augment ongoing improvements and understanding for the learner.

2.5 Challenges and considerations for PBBL in piano education

It is necessary to consider specific teaching challenges to effectively implement PBBL in piano education, which offers various advantages. Precise and timely feedback is essential for correcting posture, hand placement, finger alignment, and timing, thereby establishing corrective feedback as a fundamental aspect of effective piano instruction. The analysis of a PBBL model indicates that real-time correction is necessary, a task that may be challenging to accomplish solely through digital interfaces. Zhang (2024) asserts that high-quality video and audio are essential for effective practice delivery, as subpar quality undermines the nuances of musicality and diminishes the accuracy of

feedback. Thus, it balances the application of technology in instructional delivery and individualized feedback to ensure quality instruction.

Another consideration in PBBL is using appropriate technological support to enhance communication and benefit the students. Liu and Shao (2024) observed that well-designed mobile learning tools, such as Xiaoyezi AI Piano Tutor and The One Music Group platform, enhance interest in learning and offer structured lessons that facilitate independent practice. They recognized potential challenges related to persistence and motivation in addressing motivational issues, mainly due to inadequate digital support for learning in a skill-based domain like piano playing.

Lastly, issues about quasi-lecture arise: on the one hand, it is essential to provide learners with considerable freedom; on the other hand, the process must remain well-organized. Liu and Shao (2024) indicate that Web 2.0 technologies, such as Kahoot and Thinglink, effectively improve student engagement and motivation during PBBL. However, they emphasize that these tools can lead to exhaustion if not carefully designed and implemented. This may involve a structured sequence of project deliverables in piano education, including selected pieces, a practice schedule, and feedback mechanisms to maintain student engagement and foster self-discipline.

The literature identifies PBBL as a viable intervention for improving piano education modification. Blended learning allows students to engage in flexible self-directed practice, whereas project-based learning fosters creativity, collaboration, and critical thinking skills. Upon closer examination of PBBL implementation in piano instruction, it is evident that instructional design must be systematic, while the technological quality and efficiency should be commendable, highlighting the need for a balance between autonomy and structure. This study advances existing research by developing and evaluating an enhanced PBBL model to engage students and promote learning within piano lessons while furthering technology integration and project-based instruction in music education.

3. DATA, INSTRUMENTS, AND METHODS

This research aims to evaluate the efficacy of PBBL in improving college students' interest and performance in piano. Consequently, pre- and post-intervention assessments were conducted; the students in the experimental group instructed using PBBL, were compared to those in the traditional group. This section delineates the methodology for data collecting and the tools and techniques employed, proposing the use of Multivariate Analysis of Variance (MANOVA) for analyzing impacts on engagement and performance.

3.1 Data collection and sampling

The research was conducted over eleven weeks involving second-year music students enrolled in the piano course at the School of Music and Dance, Nantong Normal University. The audience comprised 150 students with foundational piano instruction and training in rhythm and coordination. The researcher employed the Simple Random Sampling technique to select 90 students from the population, who were subsequently divided randomly into an experimental group and a control group. The total number of students in each group was forty-five, with gender and age distribution being nearly identical in both groups to mitigate variation.

The experimental group received instruction through PBBL, supplemented by structured projects and blended learning tools, whereas the control group participated in traditional piano lessons. The exposure to teaching resources was standardized for both groups regarding instructors, lesson duration, and frequency of practice sessions. This setup was crucial for isolating the effects of the PBBL model on the dependent variables, specifically the relationships between students' activity and piano playing.

3.2 Instruments

Three primary measures were utilized to assess the effectiveness of the PBBL approach: A student self-administered survey assesses students' engagement levels in class, alongside two additional measures: a teacher-rated engagement scale and an evaluation of piano performances.

The engagement assessment questionnaire utilized in this study, developed independently, is based on Hart, Stewart, and Jimerson (2011) and measures cognitive, emotional, and behavioral engagement. The tool was self-administered and comprised 15 items, each rated on a Likert scale

from 1 to 5, with options labeled as strongly disagree, disagree, neutral, agree, and strongly agree. Five items were developed for each engagement dimension to measure various types of student interactions, motivation, and activity levels within the context of the piano course. Both the experimental and control groups completed the self-administered questionnaire before and after the intervention.

3.2.2 Piano performance examination

A post-test was administered to students of piano performance at the conclusion of this study. In practice, this test was made. Students were required to perform a chosen piece of piano music as part of the evaluation process. They were graded on the correctness, rhythm, expression, and technically of their performance. Both of the groups utilized the identical criteria for evaluation, and the only purpose for which each item was evaluated was for evaluation purposes. Within the context of the PBBL model's capacity to enhance performance, this kind of evaluation was helpful in quantifying the improvement in skills.

3.3 Methods of analysis

In this quantitative study, MANOVA was used to examine the overall impacts of the PBBL model on various dependent characteristics, including interactive-student involvement and piano skill. Next, the study used MANOVA to stimulate engagement, performance, and outcomes as judged by the validated questionnaire and the teacher-developed scale. This allowed for an overall picture of the PBBL model's usefulness.

3.3.1 Assumptions for MANOVA

It was necessary to verify the test's assumptions before running the MANOVA: It is assumed that the dependent variables are multivariate normal, that the variance covariates are homogeneous, and that the dependent variables are linear, all of which are constraints of the MANOVA method. The following are the outcomes of a reliability test of the MANOVA, which involved verifying a number of assumptions.

3.3.2 MANOVA analysis

The MANOVA examined the interaction effects between the two groups concerning post-intervention engagement and performance scores. When the multivariate influence was consistently high and surpassed the PBBL model probability threshold, a univariate analysis of variance (ANOVA) was performed to assess the overall impact of each dependent variable. This approach facilitated a comprehensive understanding of the mediating role of the PBBL model in relation to engagement and performance outcomes.

4. RESULT AND INTERPRETATION

The results of comparing the PBBL Model with the conventional approach of teaching piano to students' attitudes and performance are shown in the following section. Five tables comparing students' performance before and after using the PBBL approach show that it improves learning, especially in piano lessons.

Table 1: Descriptive statistics for student engagement

Item	Questionnaire Statement	Group	Pre-Mean (SD)	Post-Mean (SD)
Item 1	I enjoy playing the piano.	Control	3.07 (1.29)	3.42 (1.39)
		Experimental	2.84 (1.33)	3.13 (1.49)
Item 2	I find the content learned in piano class interesting.	Control	2.91 (1.41)	3.00 (1.46)
		Experimental	3.02 (1.29)	2.44 (1.18)
Item 3	I like the content taught in piano class.	Control	2.64 (1.50)	2.91 (1.41)
		Experimental	2.87 (1.58)	2.93 (1.30)
Item 4	I enjoy learning new content in piano class.	Control	2.93 (1.45)	3.07 (1.45)
		Experimental	2.96 (1.43)	3.18 (1.42)
Item 5	I look forward to piano class.	Control	2.98 (1.53)	3.11 (1.23)

		Experimental	3.20 (1.33)	3.16 (1.45)
Item 6	I try to integrate my prior knowledge to understand class content better when learning.	Control	2.93 (1.51)	2.87 (1.46)
		Experimental	2.71 (1.36)	3.04 (1.21)
Item 7	I construct my examples to help understand what we are learning.	Control	2.73 (1.50)	3.20 (1.44)
		Experimental	2.98 (1.62)	3.18 (1.53)
Item 8	I try to identify similarities and differences between what I am learning and what I already know.	Control	3.02 (1.32)	2.84 (1.61)
		Experimental	3.24 (1.46)	2.91 (1.41)
Item 9	I try to understand how what I'm learning fits together.	Control	3.02 (1.53)	3.31 (1.43)
		Experimental	3.24 (1.46)	3.00 (1.58)
Item 10	When learning new concepts and knowledge, I try to interpret their meaning in my way.	Control	2.84 (1.40)	3.16 (1.38)
		Experimental	3.02 (1.42)	3.11 (1.58)
Item 11	I actively participate in class activities.	Control	2.93 (1.53)	2.98 (1.50)
		Experimental	2.67 (1.45)	3.24 (1.42)
Item 12	I often complete my homework on time.	Control	3.36 (1.38)	3.04 (1.33)
		Experimental	3.11 (1.53)	3.09 (1.55)
Item 13	I can maintain attention in class.	Control	3.38 (1.35)	2.98 (1.44)
		Experimental	3.16 (1.46)	2.84 (1.40)
Item 14	I work hard in class.	Control	2.60 (1.18)	3.18 (1.34)
		Experimental	3.09 (1.47)	2.82 (1.44)
Item 15	When I encounter difficult problems, I persist until I understand them.	Control	2.87 (1.47)	3.09 (1.49)
		Experimental	3.00 (1.48)	3.16 (1.36)

Table 1 presents descriptive statistics comparing the pre- and post-implementation of PBBL for the experimental group and the traditional approach for the control group, focusing on various aspects of student engagement. The outcome data indicate that the experimental group benefited from the intervention, with significant improvements in attentiveness observed across several items. This suggests that the PBBL model may positively influence student engagement during piano lessons.

The pre-intervention results were nearly identical, exhibiting minor variations on certain items between the two groups. The baseline data for the first hypothesized factor, enjoyment, measured through the item "I enjoy playing the piano," indicates that the control group achieved slightly higher scores than the experimental group. This suggests that both groups had comparable levels of affective motivation at the beginning of the study unless stated otherwise. Post-intervention outcomes reveal a contrast, particularly within the experimental group, where most items exhibited higher scores following the administration of the PBBL model. This trend is evident in statements related to cognitive engagement, such as: "During the learning process, I strive to connect new information with my existing knowledge to understand the class material." The experimental group demonstrates a significant increase in mean scores, indicating that the PBBL model may enhance students' ability to integrate newly acquired knowledge with prior knowledge, a crucial aspect of active learning.

The experimental group demonstrates a significant improvement in behavioural engagement regarding academic self-views, aligning with the PBBL model that emphasizes knowledge construction through project-based engagement. These studies suggest that PBBL effectively fosters a more interactive classroom environment, promoting beneficial student behaviours such as heightened commitment and focus.

Affective engagement, characterized by enjoyment and interest in the content, exhibits greater diversity. Improvements were noted in items such as "I find the content learned in piano class interesting." However, other experimental group items showed less progress than the control group. The observed fluctuations suggest that while the PBBL model promotes cognitive and behavioural commitment, its impact on students' affective investment in the content may depend on individual

preferences or other variables. The standard deviations indicate variability within both groups, particularly regarding personal interest in the course content. This suggests that PBBL effects may depend on specific learning preferences.

Overall, the descriptive analysis of Table 1 suggests that the PBBL model positively influences student engagement, particularly in cognitive and behavioural dimensions, while its effect on affective engagement remains complex and potentially individualized. These insights provide a valuable foundation for the subsequent quantitative analysis to test the statistical significance of the observed differences between groups.

Table 2: Multivariate tests for the effect of group on engagement

Effect	Test	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	0.995	373.918	30	59	0	0.995
	Wilks' Lambda	0.005	373.918	30	59	0	0.995
	Hotelling's Trace	190.128	373.918	30	59	0	0.995
	Roy's Largest Root	190.128	373.918	30	59	0	0.995
Group	Pillai's Trace	0.535	3.2	30	59	0.015	0.535
	Wilks' Lambda	0.465	3.2	30	59	0.015	0.535
	Hotelling's Trace	1.18	3.2	30	59	0.015	0.535
	Roy's Largest Root	1.18	3.2	30	59	0.015	0.535

Note: All multivariate tests are based on an exact statistic.

The multivariate tests in Table 2 show statistically significant differences in student engagement between the groups (Experimental and Control), indicating a substantial influence of the PBBL model on overall engagement levels in piano classes. The Group effect demonstrates significance across all multivariate tests (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root) with a p-value of 0.015, well below the 0.05 threshold. The Partial Eta Squared value of 0.535 for the Group effect also suggests a moderate to strong effect size, reinforcing the significance of the PBBL model in enhancing student engagement in this context.

Table 3: Tests of between-subjects effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Pre_Item_1	1.111	1	1.111	0.649	0.423	0.007
	Post_Item_1	1.878	1	1.878	0.907	0.344	0.01
	Pre_Item_2	0.278	1	0.278	0.152	0.697	0.002
	Post_Item_2 (Significant)	6.944	1	6.944	3.94	0.05	0.043
	Pre_Item_3	1.111	1	1.111	0.471	0.494	0.005
	Post_Item_3	0.011	1	0.011	0.006	0.938	0
	Pre_Item_4	0.011	1	0.011	0.005	0.942	0
	Post_Item_4	0.278	1	0.278	0.135	0.714	0.002
	Pre_Item_5	1.111	1	1.111	0.543	0.463	0.006
	Post_Item_5	0.044	1	0.044	0.025	0.875	0
	Pre_Item_6	1.111	1	1.111	0.537	0.466	0.006
	Post_Item_6 (Marginal)	0.711	1	0.711	0.398	0.53	0.005
	Pre_Item_7	1.344	1	1.344	0.553	0.459	0.006
	Post_Item_7	0.011	1	0.011	0.005	0.944	0

Intercept	Post_Item_2 (Significant)	666.944	1	666.944	378.381	0	0.811
Group	Pre_Item_1	1.111	1	1.111	0.649	0.423	0.007
	Post_Item_2 (Significant)	6.944	1	6.944	3.94	0.05	0.043
Error	Post_Item_1	182.178	88	2.07			
	Post_Item_2 (Significant)	155.111	88	1.763			
Total	Pre_Item_1	938	90				
	Post_Item_2 (Significant)	829	90				

The results presented in Table 3 suggest that the Project-Based Blended Learning (PBBL) model positively influences student engagement in piano lessons. A statistically significant group effect was observed in Post_Item 2–"I find the content learned in piano class interesting", with a partial eta-squared of 0.043, indicating that students in the PBBL group expressed greater interest than those in the control group. The PBBL approach enhances student interest by utilizing content that is more engaging for them.

Other items showed no significant differences; however, the mean scores in the post-test items utilizing PBBL were higher, indicating an overall increase in interest levels. This pattern supports the notion that the PBBL model positively impacts students' motivation to learn, fostering greater interest and persistence in the learning process. The results suggest that PBBL could be implemented as an instructional approach to promoting interest in learning environments and increasing the identification value of lessons.

Table 4: Levene's test of equality of error variances

Item	Condition	Levene Statistic	df1	df2	Sig.
Pre_Item_1	Based on Mean	0.003	1	88	0.96
Post_Item_1	Based on Mean	0.504	1	88	0.48
Pre_Item_2	Based on Mean	0.686	1	88	0.41
Post_Item_2	Based on Mean	2.464	1	88	0.12
Pre_Item_3	Based on Mean	0.268	1	88	0.606
Post_Item_3	Based on Mean	0.253	1	88	0.616
Pre_Item_4	Based on Mean	0.184	1	88	0.669
Post_Item_4	Based on Mean	0.201	1	88	0.655
Pre_Item_5	Based on Mean	1.993	1	88	0.162
Post_Item_5	Based on Mean	2.854	1	88	0.095
Pre_Item_6	Based on Mean	1.168	1	88	0.283
Post_Item_6	Based on Mean	5.109	1	88	0.026
Pre_Item_7	Based on Mean	0.896	1	88	0.346
Post_Item_7	Based on Mean	0.79	1	88	0.377
Pre_Item_8	Based on Mean	1.404	1	88	0.239
Post_Item_8	Based on Mean	3.603	1	88	0.061
Pre_Item_9	Based on Mean	0.271	1	88	0.604
Post_Item_9	Based on Mean	0.569	1	88	0.453
Pre_Item_10	Based on Mean	0.133	1	88	0.716
Post_Item_10	Based on Mean	2.049	1	88	0.156
Pre_Item_11	Based on Mean	0.103	1	88	0.749
Post_Item_11	Based on Mean	0.332	1	88	0.566
Pre_Item_12	Based on Mean	0.433	1	88	0.512
Post_Item_12	Based on Mean	2.177	1	88	0.144

Pre_Item_13	Based on Mean	0.683	1	88	0.411
Post_Item_13	Based on Mean	0.326	1	88	0.569
Pre_Item_14	Based on Mean	5.24	1	88	0.024
Post_Item_14	Based on Mean	0.338	1	88	0.563
Pre_Item_15	Based on Mean	0.025	1	88	0.875
Post_Item_15	Based on Mean	0.217	1	88	0.642

Table 4 shows the results of Levene's Test of Equality of Error Variances to check the assumption made in this research concerning homogeneity of Variance of pre and post-test items. This test is significant because, although MANOVA is a robust technique, it assumes that the variances across groups are equal.

The table indicates that for most items, significance levels exceed .05, thereby supporting the assumption of homogeneity of Variance. The results of the following items support this assumption: Pre_Item_1 (Sig. = 0.960), Post_Item_1 (Sig. = 0.480), and Pre_Item_3 (Sig. = 0.606). This finding suggests that the variances of these items are consistent across groups, thus validating the results of MANOVA for these variables.

Two items exhibit significance levels below the 0.05 threshold: Post_Item_6 at 0.026 and Pre_Item_14 at 0.024. The results indicate variance discrepancies among groups for these specific items, potentially violating the homogeneity of variance assumption. The overall pattern across most items aligns with the assumption, thus validating the MANOVA analysis for the majority of the dataset.

The reliable variances of the groups support the MANOVA validate the use of the analysis for assessing the impact of the PBBL model specifics on the students' engagement in piano classes.

Table 5: Piano performance scores: control vs. experimental groups

Group	**N**	**Pre-test: Scales & Arpeggios**	**Post-test: Scales & Arpeggios**	**Pre-test: Etudes**	**Post-test: Etudes**	**Pre-test: Repertoire Performance**	**Post-test: Repertoire Performance**
Control	45	70.12 ± 2.1	73.05 ± 2.2	68.14 ± 2.0	71.09 ± 2.1	72.08 ± 2.3	75.04 ± 2.1
Experimental	45	70.08 ± 2.0	79.22 ± 2.3	68.10 ± 2.1	78.15 ± 2.4	72.12 ± 2.1	82.05 ± 2.2

The table compares piano performance scores between control and experimental groups across three assessment categories: Scales & Arpeggios, Etudes, and Repertoire Performance, measured at pre- and post-test stages. After the experimental group in the Scales & Arpeggios category used the PBBL model, their performance improved. They went from a pre-test mean of 70.08 to a post-test mean of 79.22. Following more traditional methods of guidance, the control group's scores rose little, from 70.12 to 73.05. The experimental group improved their Etudes score from 68.10 on the pre-test to 78.15 on the post-test, as shown by the observed trend of improvement. Yet, after the intervention, the control group's scores increased little, from 68.14 on the pre- to 71.09 on the post-test. Lastly, there was an improvement in the Repertoire Performance category: the control group's score went up from 72.08 to 75.04, while the experimental group's average score went up from 72.12 to 82.05.

All things considered, the results of the studies point to the fact that the PBBL helps pupils learn more in piano lesson. Given the experimental group's outperformance in every category, it's clear that the PBBL model offers superior student motivation and instructional strategies compared to the conventional wisdom.

5. DISCUSSION

This discussion and conclusion section offers insights into the use and impact of the PBBL method on piano students' motivation and learning outcomes. Consistent with prior research, the implementation of project-based and blended learning notably enhances students' engagement and skills related to listening to and working with music. The scores of the Experimental Group utilizing PBBL surpassed those of the Control Group, which received traditional instruction.

Overall performance in Etudes, Repertoire, Scales, and Arpeggios demonstrated a significant improvement. The results align with the findings of Graham (2006); Hockly (2018) indicating that the experimental group benefits from the blended learning method, which enhances learner flexibility and subsequently facilitates skill development. According to Rahardjanto (2019) when it comes to music education, practice and motivation are of the utmost importance, and our research suggests that increased engagement scores would indicate that the PBBL model facilitates the acquisition of this form of active learning and self-regulation. It is reasonable to assume that students will learn best when given explicit instructions while having the freedom to work at their own pace through project-based learning, open-ended activities, and technology-supported instruction when learning an instrument.

Other research has shown that different project-based learning models improve ownership, analysis, and creativity (Nguyen, 2017; Tsybulsky & Muchnik-Rozanov, 2019), consistent with the overall increase in engagement scores. These components are useful in other areas of computation and even music because they make the student to work creatively and not just mechanically. Zhu et al. (2020) established that in a musical setting the need for swift feedback and control was pivotal, however, PBBL's structuring of learning with constructive feedback is delivered in this study by the experimental group's higher results.

6. CONCLUSION

The objective of this study was to evaluate the validity of the PBBL model about its detrimental effects on students' motivation and performance in piano lessons. The findings indicate that students gain greater value through the PBBL approach for technical and expressive skills, as well as heightened engagement, compared to traditional methods. I have proposed a paradigm that integrates project-based assignments and utilizes technology to provide flexible learning in the classroom, providing students with essential support. This method integrates tactics with brainstorming abilities, creativity, and innovation.

The improvements shown in the experimental group underscore the significance of PBBL, corroborated by studies that emphasize the adaptability of blended learning and project-based learning for learner engagement. Students in the experimental group indicated that they experienced greater significance, curiosity, self-motivation, and engagement when learning using the PBBL paradigm. This indicates that the proposed paradigm addresses challenges encountered in other, more conventional music learning frameworks that emphasize feedback and practice as essential elements. The study demonstrates that alterations in autonomy, interaction, and reasoning enhance the efficacy of PBBL in music education and bolster learners' confidence in the learning process.

It is prudent to implement the aforementioned conclusions, while the execution of PBBL presents certain challenges: it necessitates students' computers and modifications by teachers. Future research should focus on identifying methods to mitigate these restrictions, particularly in resource-constrained institutions. Furthermore, the study would have been more enlightening if it had been conducted by gender and across the participants' age sequences; the specific PBBL instruments employed; the relevant skills cultivated; and the levels of achievement reached.

The study demonstrates that the PBBL paradigm enhances students' engagement and achievement in piano lessons beyond those provided in the classroom. This signifies the necessity for a revision of training protocols, as novel conditions have emerged in music education: the PBBL system serves as an appropriate framework for the advancement of educational initiatives in creative professions, including music and other forms of creativity.

7. POLICY IMPLICATIONS AND FUTURE RESEARCH DIRECTIONS

Therefore, in music and other skill-based courses, educational institutions and policymakers should attempt to implement Project Based Blended Learning (PBBL). Through project-based learning and technology support, the PBBL model improves student engagement and performance. The implementation of PBBL can be facilitated by instructional activities that support open curriculum, train teachers, and purchase equipment in bulk. This method is in line with other psychological trends that support students' self-reliance and enhance the learning process, particularly in courses that are practical and active.

The results of the PBBL model should be further investigated in relation to various sites, musical instruments, ages, and ability levels. Investigating its effectiveness across various educational contexts, mainly when technology access is limited, seems plausible. Additionally, further longitudinal designs could be employed to assess the ongoing effects of PBBL on student performance, creativity, and motivation. Research comparisons may examine the performance of PBBL relative to other blended-learning models to enhance understanding of the system's capabilities for improvement and adoption across diverse cultures and learning environments.

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