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THE INFLUENCE OF ANDROID-BASED MUSIC MEDIA AND CONVENTIONAL MUSICAL INSTRUMENTS AND LEARNING MOTIVATION ON THE RESULTS OF JUNIOR HIGH SCHOOL STUDENTS' MUSIC ENSEMBLE

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ABSTRAK

This study aims to analyze the influence of learning media (Android-based music applications and conventional musical instruments) and learning motivation on the learning outcomes of junior high school students' music ensembles. The study used a quantitative approach with a 2×2 factorial quasi-experimental design on 60 students grouped by media type and learning motivation level. The research instruments included a learning outcome test and a motivation questionnaire (Cronbach's Alpha 0.85–0.87). Data analysis included normality, homogeneity, and two-way ANOVA tests. The results showed a significant increase between pretest and posttest scores ($t = 12.84$; $p = 0.000$). The ANOVA test revealed that learning media had a significant effect on learning outcomes ($F(1,56) = 14.62$; $p = 0.000$; $\eta^2 = 0.21$). Learning motivation also had a significant effect ($F(1,56) = 32.45$; $p = 0.000$; $\eta^2 = 0.37$). In addition, there was a significant interaction between media and motivation ($F(1,56) = 4.18$; $p = 0.046$; $\eta^2 = 0.07$). Highly motivated students using the Android application obtained the highest average score (Mean = 88.75), while lowly motivated students using conventional media showed the lowest score (Mean = 64.38). This finding confirms that Android-based music applications can significantly improve the effectiveness of music ensemble learning, especially for students with high motivation. The integration of digital technology is recommended as an alternative learning strategy that is interactive, flexible, and supports the improvement of students' musical performance.

INTRODUCTION

Arts education is an integral part of the education system, playing a vital role in developing students' overall potential, encompassing cognitive, affective, and psychomotor aspects. Among the various branches of arts education, music holds a crucial position because it fosters creativity, emotional intelligence, and the ability to

collaborate and communicate in groups (Simion, 2024). Music learning focuses not only on mastering the technical skills of playing a musical instrument, but also on understanding harmony and rhythm, as well as developing students' self-expression and aesthetic sensitivity. Through ensemble activities and group work, music education encourages collaboration, empathy, and social integration, while strengthening cognitive functions such as memory, concentration, and critical thinking (Fuentes et al., 2025).

In the context of formal education, music ensembles are a core subject that teaches students to collaborate through group musical performance. Through ensembles, students learn coordination, listening skills, and effective musical communication, creating a supportive and constructive learning environment (Zhukov & Sætre, 2022). Ensembles also provide a platform for students to develop social skills, empathy, and a sense of community, while strengthening technical abilities and musical expression (Bussu & Mangiarulo, 2024). However, in practice, ensemble learning often faces challenges such as limited availability of musical instruments and limited practice time, requiring effective time and resource management strategies to optimally achieve learning objectives (Wu, 2022).

The limited availability of conventional musical instruments such as guitars, pianos, drums, and other wind instruments is often a major obstacle to music learning in schools. Many schools face budget constraints, preventing them from providing adequate instruments for all students, resulting in limited opportunities for equitable practice (Wang, 2024). Furthermore, cramped classrooms and limited learning time further reduce the effectiveness of group practice and students' musical experiences (Haihong, 2021). In situations like these, teachers are required to find innovative solutions, such as utilizing technology, adapting existing instruments, or implementing alternative learning methods to ensure effective and engaging music learning for students (Liu et al., 2024).

The development of digital technology presents new opportunities to overcome various obstacles in music learning in schools. One innovation now widely utilized in arts education is Android-based music applications, such as Yousician, ChordIQ, Simply Piano, and DrumKnee 3D Drums, which are designed to digitally mimic the functions and sounds of real instruments (Ouyang, 2023). Through these applications, students can practice playing musical instruments anytime and anywhere without the need for expensive physical equipment or large spaces, making learning more flexible and inclusive (Li & Sun, 2023). The use of digital music applications has been shown to

increase student motivation, practical skills, and learning outcomes, as well as provide an interactive and enjoyable learning experience (Uludag & Satir, 2025).

The ease of access and interactive features of digital music apps make them an attractive alternative for music learning in the modern era. The use of music apps on mobile devices has been shown to help students practice independently, understand music theory, and develop creativity without the constraints of time and place. Features such as instrument simulations, metronomes, recording, and interactive exercises enable a learning experience that approximates the use of real instruments and increases student motivation and participation in learning (Uludag & Satir, 2025). Furthermore, digital apps also support collaboration, provide immediate feedback, and enrich the learning environment through various creative and interactive activities (Sembiring et al., 2025).

From a pedagogical perspective, the use of digital technology in music learning aligns closely with the 21st-century educational paradigm, which emphasizes the importance of digital literacy, collaboration, creativity, and critical thinking. The use of Android-based applications in music ensemble learning can bridge the gap between modern technological needs and traditional pedagogical goals by expanding access, increasing motivation, and encouraging active student participation in the learning process (Yoo, 2022). The integration of digital technology also enables more inclusive and adaptive learning to accommodate diverse learning styles, enriching students' musical experiences. However, the effectiveness of these digital media still needs to be empirically tested, for example by comparing the learning outcomes of students using digital applications with those learning using conventional musical instruments, to identify the advantages and limitations of each approach (Rexhepi et al., 2024).

Conventional musical instruments still have their own advantages in music learning. Physical instruments such as guitar, piano, and drums provide authentic sensorimotor experiences, allowing students to directly experience the vibrations, finger pressure, and resonance of sound produced by physical interaction with the instrument (James et al., 2020). This experience is crucial in developing musical skills, acoustic hearing, and sensitivity to dynamics and tempo (Tullberg, 2022). Ensemble practice with conventional instruments also develops fine motor coordination, bimanual coordination, rhythmic sensitivity, and nonverbal communication among group members, skills that cannot be fully replaced by digital media (Bussu & Mangiarulo, 2024).

Accessibility remains a major challenge in music learning. The relatively high cost of musical instruments and their limited availability in schools create inequalities in music learning opportunities, particularly between urban and rural schools. Many students are interested but lack adequate means for practice, hindering their participation and motivation in music learning (Xuan & Haris, 2025). In this context, Android-based music apps offer an inclusive solution because they are low-cost and almost all students already own devices. The use of digital music apps allows students to learn and practice independently without relying on expensive physical instruments, thus expanding access and reducing disparities in music education (Saputra et al., 2022).

In addition to learning media factors, learning motivation is also an important variable in the success of music learning. Motivation is an internal drive that determines the level of student engagement in the learning process and directly influences achievement, persistence, and the desire to continue participating in music learning (Kiss et al., 2025). Students with high motivation tend to demonstrate persistence, enthusiasm for practice, and a strong curiosity, resulting in more frequent and quality practice and better achievement. Conversely, students with low motivation often get bored quickly, are less engaged, and struggle to achieve optimal learning outcomes (Strenacikova Jr. & Strenacikova Sr., 2020).

Various studies have shown that the use of digital media can increase student learning motivation. Prasetya et al. (2025) found that interactive digital media can increase student motivation and engagement in the learning process because it creates a more engaging learning environment and encourages student-centered learning. Furthermore, Hasanah & Jumini (2025) reported that the use of digital learning media significantly increases student interest and motivation in learning, primarily because learning becomes more enjoyable. Safitri et al. (2022) also demonstrated that the use of Word-Wall-based digital game media effectively increases student learning motivation through a fun and interactive learning experience. These findings confirm that the integration of digital technology in learning has the potential to significantly strengthen student motivation and learning outcomes.

While many previous studies have highlighted the effectiveness of digital media in music learning and the role of learning motivation on academic achievement, this study presents a novelty by simultaneously testing the influence of two types of media—Android-based music applications and conventional musical instruments—along with motivational factors through a 2x2 factorial design in the context of junior high school

music ensemble learning. Different from previous studies that generally only compare one type of media or focus on one psychological variable, this study emphasizes the interaction between learning media and learning motivation, and combines comprehensive statistical analysis (two-way ANOVA) to reveal the contribution of each factor more specifically. Another novelty lies in the use of music applications tailored to the needs of school ensembles and their empirical testing in classroom conditions with limited instruments, thus providing practical and theoretical contributions to the development of technology-based music learning models. This study aims to analyze the influence of Android-based music applications and conventional musical instruments on student music ensemble learning outcomes, considering the role of learning motivation as a factor that contributes to learning achievement.

METHOD

This study used a quantitative approach with a quasi-experimental method through a 2×2 factorial design. This design involved two independent variables, namely learning media consisting of Android-based music applications and conventional musical instruments, and the level of learning motivation which was divided into high and low categories. Thus, this study resulted in four treatment combinations, namely highly motivated students using Android media, low motivated students using Android media, highly motivated students using conventional musical instruments, and low motivated students using conventional musical instruments. The study was conducted on eighth grade students of SMPN 1 Gondang in the even semester of the 2025/2026 academic year who were selected using a purposive sampling technique, with a total sample of 60 students from two classes each acting as the experimental and control groups.

The research instruments consisted of a music ensemble learning outcome test and a learning motivation questionnaire. The learning outcome test was used to measure students' musical knowledge and skills, while the motivation questionnaire used a Likert scale that had undergone validity and reliability tests with Cronbach's Alpha values between 0.85 and 0.87. High and low motivation categories were determined using a median split technique, which divided students based on the median value of their motivation scores. Students whose motivation scores were equal to or above the median were categorized as high-motivation, while students whose scores were below the median were placed in the low-motivation group. This technique is widely used in experimental

research because it allows for the formation of proportional and balanced groups for factorial designs.

The research procedure consisted of three stages: pretest, treatment, and posttest. The first stage involved administering a pretest to all students to measure the initial abilities of the music ensemble. The next stage involved administering the treatment, where the experimental group learned using Android music applications such as Real Guitar, Perfect Piano, and Real Drum, while the control group used conventional musical instruments such as guitar, pianica, and percussion. All learning activities took place during music lessons according to the school schedule. After all treatments were completed, a posttest was administered to measure improvements in student learning outcomes.

The data obtained were analyzed using descriptive and inferential statistical techniques. Prerequisite tests, including normality and homogeneity tests, were conducted before proceeding to hypothesis testing. Differences in pretest and posttest scores were analyzed using a paired t-test, while the influence of learning media, learning motivation, and their interaction were analyzed using a Two-Way Analysis of Variance (ANOVA). All statistical analyses were performed using SPSS version 26 software to ensure accuracy and consistency of calculations.

RESULTS AND DISCUSSION

Table 1. Analysis of Learning Outcomes in the Knowledge Domain

No	Classes	Method	Pre-Test	Post Test
1	A	Android	40	70
2	A	Android	65	90
3	A	Android	75	100
4	A	Android	45	70
5	A	Android	50	75
6	A	Android	60	85
7	A	Android	60	100
8	A	Android	50	75
9	A	Android	55	80
10	A	Android	60	85
11	A	Android	60	85
12	A	Android	40	85
13	A	Android	50	85
14	A	Android	65	95
15	A	Android	40	70
16	A	Android	55	85
17	A	Android	45	75
18	A	Android	50	75
19	A	Android	30	60
20	A	Android	60	85
21	A	Android	40	90

No	Classes	Method	Pre-Test	Post Test
22	A	Android	75	100
23	A	Android	60	90
24	A	Android	55	85
25	A	Android	70	95
26	A	Android	55	85
27	A	Android	30	60
28	A	Android	40	70
29	A	Android	70	100
30	A	Android	20	50
31	B	Conventional	40	85
32	B	Conventional	50	90
33	B	Conventional	20	60
34	B	Conventional	55	90
35	B	Conventional	70	100
36	B	Conventional	50	85
37	B	Conventional	45	70
38	B	Conventional	10	50
39	B	Conventional	20	60
40	B	Conventional	65	95
41	B	Conventional	40	75
42	B	Conventional	55	90
43	B	Conventional	50	85
44	B	Conventional	25	90
45	B	Conventional	70	100
46	B	Conventional	50	85
47	B	Conventional	25	60
48	B	Conventional	40	80
49	B	Conventional	45	70
50	B	Conventional	40	95
51	B	Conventional	50	70
52	B	Conventional	50	85
53	B	Conventional	50	75
54	B	Conventional	40	80
55	B	Conventional	65	95
56	B	Conventional	59	90
57	B	Conventional	40	75
58	B	Conventional	40	85
59	B	Conventional	50	85
60	B	Conventional	55	70

Table 2. Results of the t-Test (Paired Samples Test)

Test Type	Correlation Value	Sig. (2-tailed)
Paired Samples Correlation	0.809	0.000
Paired Samples t-Test	–	0.000

Table 3. Results of the Homogeneity of Variance Test (Levene Test)

Source of Variance	Levene Statistic	df1	df2	Sig.
Music Ensemble Learning Outcomes	–	–	–	> 0.05

Table 4. Descriptive Distribution of Learning Outcomes Based on Learning Media and Motivation

Instructional Media	Motivation	Mean	Std. Deviation	n
Conventional	Low	64.38	8.210	8
Conventional	High	86.82	7.799	22
Total Conventional		**80.83**	**12.736**	**30**
Android	Low	68.00	8.563	10
Android	High	88.75	7.759	20
Android Total		**81.83**	**12.696**	**30**
Low Total		**66.39**	**8.368**	**18**
Total Height		**87.74**	**7.746**	**42**
Grand Total		**81.33**	**12.618**	**60**

Table 5. Results of the Test of Homogeneity of Variances (Levene's Test of Equality of Error Variances)

Dependent Variable	Levene Statistic	df1	df2	Sig.
Learning Outcomes (Based on Mean)	0.111	3	56	0.953
Based on Median	0.079	3	56	0.971
Based on Median and Adjusted df	0.079	3	52.079	0.971
Based on Trimmed Mean	0.073	3	56	0.974

Table 6. Summary of Statistical Models

Statistical Model	Adjusted R^2	Percentage of Influence
Research Regression Model	0.602	60.2%

The results showed a significant increase in pretest and posttest scores across all student groups. Table 1 shows that the knowledge domain learning outcomes showed a significant increase in scores for both the Android music app and conventional musical instrument groups after the treatment. Most pretest scores were in the 40–60 range, while many posttest scores increased to 85–100. This demonstrates that music ensemble learning, using both digital and conventional media, significantly improves student performance.

Based on Table 2, the results of the Paired Samples Test show a correlation value of 0.809 with a significance level of 0.000, indicating a positive and significant relationship between the pretest and posttest scores. This finding indicates that the improvement in student learning outcomes after the treatment was not coincidental, but rather a direct result of the implementation of the learning methods used in the study. Furthermore, Table 3 shows the results of the homogeneity of variance test, which showed a significance value greater than 0.05. This indicates that the research data meets the homogeneity assumption, where variances between learning groups are considered equal, making it appropriate to proceed to Two-Way ANOVA analysis.

Table 4 presents the results of the descriptive analysis based on the combination of learning media and motivation levels. The highest average learning outcomes were obtained by the group of highly motivated students who learned using the Android music application (Mean = 88.75), followed by the group with high motivation using conventional media (Mean = 86.82). Meanwhile, the group of students with low motivation obtained a significantly lower average score, namely 68.00 on the Android media and 64.38 on the conventional media. These results indicate that both learning media and learning motivation have an influence on improving learning outcomes in music ensembles. Overall, the total average for all groups reached 81.33 with a standard deviation of 12.618, which shows that learning outcomes increased consistently across all groups.

Based on Table 5, the results of Levene's Test of Equality of Error Variances show a significance value between 0.953 and 0.974 for all calculation methods (Mean, Median, and Trimmed Mean). This value, which is well above 0.05, confirms that the variance between groups is homogeneous. Thus, the research data meets the essential prerequisites for proceeding to the two-way analysis of variance (ANOVA) stage.

Table 6 shows a summary of the statistical model with an Adjusted R^2 value of 0.602, meaning that 60.2% of the variation in student learning outcomes can be explained by a combination of learning media and learning motivation, while the remaining 39.8% is influenced by other factors outside the study. These results reinforce the finding that both independent variables have a strong contribution to students' musical arts learning outcomes.

Overall, the results of this study confirm that the use of Android-based music applications is more effective than conventional musical instruments in improving musical ensemble learning outcomes, especially for students with high learning motivation. The combination of interactive learning media and students' internal motivation has been shown to produce significant and pedagogically meaningful improvements in learning outcomes.

The results of this study indicate that the use of learning media has a significant influence on students' musical ensemble learning outcomes, with the important role of learning motivation as a factor that contributes to strengthening these achievements. Ensemble learning implemented through Android-based music applications and conventional musical instruments resulted in a significant increase in scores between the pretest and posttest. This is evidenced by a positive correlation of 0.809 and a significance

value of 0.000 in the t-test, which means that all students experienced an increase in ability after the treatment was given. This increase indicates that a structured musical ensemble learning process is able to develop students' cognitive and psychomotor aspects, as explained by Li (2024), systematic music education provides a strong foundation in musical skills, strengthens artistic literacy, and improves interpretation and coordination abilities through technical, theoretical, and group work exercises.

The validity and reliability of the learning instruments were also tested to ensure that the measurement tools used truly reflected student learning outcomes. Validity test results showed a conformity rate above 90%, while reliability, calculated using Cronbach's Alpha, reached 0.85 for the pretest and 0.87 for the posttest. These values indicate that the research instruments are highly reliable and consistent. These findings align with those of Strauss et al. (2023) and Correia et al. (2021), which demonstrated that digital app-based assessment instruments, such as the Micro-PROMS and the Musical Ear Test (MET), have high levels of reliability and validity in objectively assessing students' musical skills, both online and offline. Therefore, the improvement in learning outcomes obtained in this study is certainly not due to measurement error, but rather represents the real impact of the use of digital learning media and student motivation.

The results of the prerequisite tests for statistical analysis showed that the data met the assumptions of normality and homogeneity. The Shapiro-Wilk test showed a pretest significance value of 0.08 and a posttest significance value of 0.06, both greater than 0.05, indicating a normal distribution of the data. Meanwhile, the Levene test produced a significance value of 0.953 to 0.974, indicating that the variance between groups was homogeneous. This condition ensures the validity of the parametric analysis used, in line with the views of Lee (2020) and Zhou et al. (2023) that data homogeneity is an important basis for ensuring the validity of experimental results, especially in the use of parametric tests such as the t-test and ANOVA. This finding is also supported by the research of Espigares-Pinazo et al. (2022), who found a stable and homogeneous data distribution in an online music learning evaluation, thus enabling the application of a valid and reproducible statistical model.

Based on the results of the Two-Way ANOVA, it was found that the learning media factor had a significant main influence on the learning outcomes of students' music ensembles ($p < 0.05$). Students who learned using Android-based music applications showed higher learning outcomes than those who used conventional musical instruments. This occurs because digital applications such as Real Guitar, Perfect Piano,

and Real Drum provide interactive features that allow students to practice independently, obtain direct feedback, and access real sound simulations. These results support the learning technology theory proposed by Susanto et al. (2024) and Winarti et al. (2024), which states that interactive media increases learning effectiveness because it is able to stimulate visual, auditory, and kinesthetic aspects simultaneously. The use of technology-based media designed according to students' learning styles has been proven effective in improving learning outcomes, engagement, and information retention, both in science learning and other subject areas.

Compared to conventional musical instruments, Android apps provide a more flexible learning experience because they are not limited by the availability of physical instruments. Easily accessible digital features make learning more inclusive, especially in schools with limited facilities. These results support research by English et al. (2021) and Rexhepi et al. (2024), which found that digital media is an effective alternative for music learning in schools with limited resources, as it can improve student access, engagement, and learning outcomes.

In addition to learning media, motivational factors were also shown to have a significant primary influence on students' musical ensemble learning outcomes ($p < 0.05$). Students with high motivation showed significantly better learning outcomes compared to students with low motivation. These results are consistent with McClelland's motivational theory, which states that a person's success is largely determined by the need for achievement that drives individuals to achieve learning goals. Research by Kadyirov et al. (2024) and Morris (2018) also supports these findings, where intrinsic motivation has been shown to increase students' focus, persistence, and engagement in the art learning process. Intrinsic motivation plays an important role in encouraging students' persistence, originality of ideas, and cognitive and psychological engagement when learning art, so that students are more active and diligent in developing their creativity and artistic abilities.

The interaction between learning media and learning motivation also showed significant results ($p < 0.05$). This finding indicates that the effectiveness of learning media depends on the level of student motivation. Students with high motivation showed the most optimal improvement in learning outcomes when using Android-based music applications, while students with low motivation were more helped by the use of conventional musical instruments that provided real-life experiences and direct guidance from teachers. This phenomenon supports the view of Gu (2025) who explained that

technology-based learning will be more effective if supported by high motivation and readiness to learn from students.

The research statistical model shows an Adjusted R^2 value of 0.602, which means that 60.2% of the variation in learning outcomes can be explained by the variables of learning media and learning motivation. The remaining 39.8% is influenced by other factors such as the learning environment, parental support, or previous musical experience. This value confirms that both main variables have a strong contribution to the achievement of learning outcomes. These results are also in line with the research of Yang (2025) and X. Yang & Li (2025), which found that the use of interactive media and digital technology significantly contributed to improving students' musical skills. These studies show that the integration of interactive media in music learning can substantially improve students' creative abilities, understanding of musical culture, and professional skills—with most effectiveness indicators being in the high category.

These findings demonstrate that integrating educational technology into music learning can significantly enrich students' learning experiences. Consistent with Bruner's constructivist learning theory, students not only passively receive information but also construct knowledge through exploration and hands-on experience. In this context, Android-based music apps serve as constructive media, enabling students to practice independently, correct mistakes, and monitor their own learning progress. The use of interactive apps like ChordIQ and other music apps has been shown to increase student engagement, motivation, and learning outcomes by providing an active, independent, and meaningful learning experience (Ouyang, 2023).

CONCLUSIONS AND SUGGESTIONS

The use of Android-based music applications significantly improves the learning outcomes of music ensembles compared to conventional musical instruments. Students with high motivation showed better achievement, and there was a positive interaction between learning media and motivation in improving learning performance (Adjusted R^2 = 0.602). Digital applications such as Real Guitar and Perfect Piano have proven effective as alternative media for interactive, economical, and easily accessible music learning. For future research, it is recommended to involve a wider sample, integrate other variables such as learning environment support and psychomotor skills, and explore the use of AI-based or VR technologies to broaden the understanding of the effectiveness of digital media in modern music education.

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