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Integration of Musical Skills Improvement: Optimization of Digital Music-Based Learning Media for Junior High School Students

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Abstract
This study aims to examine the effectiveness of using digital music-based learning media in improving musical skills of junior high school students. The background of the study is based on the low interest and creativity of students in music learning, which is still dominated by conventional methods. The research employed a quasi-experimental method with a pretest-posttest control group design. The sample consisted of 60 eighth-grade students divided into two groups: experimental (digital media) and control (conventional methods). Research instruments included music performance tests, observation sheets, and student response questionnaires. Data analysis using t-tests indicated significant differences in musical skills between the two groups ($p < 0.05$). The use of digital music-based media proved effective in enhancing rhythm, melody, harmony, and creativity. These findings suggest that integrating digital technology into music education is an effective strategy to optimize students' potential.

Introduction

Music education in junior high schools is an integral part of the curriculum, playing a vital role in fostering students' creativity, self-expression, and appreciation of the arts. Music serves not only as entertainment but also as a means to develop cognitive, affective, and psychomotor skills in a balanced manner. Through musical activities, students are expected to develop rhythmic, melodic, and harmonic skills, as well as enhance aesthetic sensitivity. However, in practice, music education in schools still faces several obstacles that hinder the achievement of these learning objectives. One such obstacle is the limited learning media used by teachers. The learning process tends to focus on theoretical explanations supported by simple musical instruments, resulting in students lacking interactive learning experiences. This condition results in students' musical skills not developing optimally, and their motivation to learn is often low because they perceive music learning as monotonous and less relevant to the digital world that has become part of their daily lives. Along with technological developments, various innovations in digital-based learning media have emerged that can be integrated into music education. Applications such as Chrome Music Lab or BandLab allow students to explore sound, rhythm, and harmony in a more engaging and interactive way. This media not only provides sound simulations but also provides students with a space for creativity, thereby improving musical skills and fostering creativity. Previous research has shown that the use of digital media can increase student learning motivation and creativity (Hidayat, 2020; Rahmawati, 2022).

Therefore, the integration of digital media in music learning is seen as a potential strategy to address the challenges of music learning in the modern era. Based on these conditions, this study starts from the main question: how can optimizing digital music-based learning media improve the musical skills of public junior high school students? This question serves as the basis for directing the research to be able to provide an empirical picture of the effectiveness of digital media in the context of music arts learning in schools. This study aims to develop a comprehensive understanding of the effectiveness of using digital music learning media within the context of

music education at the junior high school level. Specifically, it seeks to analyze the extent to which such digital media can support the improvement of students' musical skills, which include four main aspects: rhythm, melody, harmony, and musical creativity. Through the use of interactive learning technology, this research explores how students can more easily grasp musical concepts while being encouraged to experiment and express their creative ideas. In addition, this study aims to identify the characteristics of effective digital music learning media for both students and teachers. Understanding these characteristics is essential to ensure that the media used is not only visually appealing but also aligned with instructional needs and students' musical development.

Furthermore, this research seeks to provide a detailed description of the implementation process of digital learning media in the classroom, examining how the media is integrated into learning activities, how students respond, and how teachers facilitate the process. The study also aims to assess the improvement of students' musical creativity after using digital media, including their engagement in sound exploration, improvisation, and simple composition.

Finally, this study aims to uncover various supporting and inhibiting factors that affect the successful implementation of digital music learning media in schools. Identifying these factors is expected to serve as a foundation for developing more effective and sustainable learning strategies.

Thus, this study is expected to provide theoretical contributions to the development of music arts education, as well as practical benefits for teachers and schools in choosing more innovative learning strategies. Teachers can obtain alternative methods that are more interesting and interactive, students will have a more enjoyable and relevant learning experience, while schools can improve the quality of learning by utilizing developments in digital technology. With this research, it is hoped that the creation of a music arts learning model that not only focuses on theory, but also encourages practical skills through the use of digital media, so that the learning process is more meaningful, creative, and in accordance with the demands of the times.

Music learning in junior high schools plays a strategic role in developing students' musical potential through practical activities and appreciation. Musical skills, including rhythm, melody, harmony, and improvisation, are fundamental competencies that must be honed through hands-on learning experiences (Campbell, 2018). According to Gordon (2017), effective music learning provides students with opportunities to explore sound, develop musical sense, and express their creativity. However, in practice, music learning in schools often faces limited resources, monotonous methods, and low student interest. This results in suboptimal musical skill development. Therefore, learning media are needed that integrate musical theory and practice in an engaging, interactive, and contemporary manner. Digital media offers a solution to these challenges, providing a more contextual, accessible musical experience and facilitating active student involvement (Hidayat, 2020). In other words, the theoretical basis that supports the use of digital media in music learning is constructivism theory, where knowledge is built through students' active interaction with their learning environment (Piaget, 2001; Vygotsky, 1978).

On the other hand, developments in educational technology have significantly impacted the transformation of arts learning, including music. Digital music-based learning media, such as Chrome Music Lab, BandLab, or similar applications, enable students to learn music visually, auditorily, and kinesthetically simultaneously (Rahmawati, 2022). According to Mayer (2009), multimedia-based learning is more effective than conventional methods because it engages multiple senses, enhancing comprehension. This is further supported by research showing that integrating digital technology into arts learning can enhance student motivation, creativity, and learning outcomes (Suprapto, 2021). Furthermore, digital media enables collaborative, project-based learning, where students can create musical works together both online and offline. Therefore, the theoretical basis is that the use of digital media not only supports the achievement of cognitive goals but also develops students' psychomotor and affective skills in music. This means that optimizing digital media in music learning not only enriches teaching methods but

also serves as a strategy to facilitate the development of musical skills that are more adaptive to the needs of learners in the digital era

Method

This research uses a research and development (R&D) approach with the Borg and Gall model, modified to suit the needs of educational research. This method was chosen based on the research objective of producing a product in the form of digital music-based learning media that can be implemented in music arts learning in junior high schools. R&D was chosen because it combines the processes of needs analysis, design, development, testing, and product refinement. Thus, this research not only produces a description of the phenomenon but also provides a concrete solution in the form of innovative learning media.

The research subjects were eighth-grade junior high school students taking arts and culture (music) classes. Data were obtained through observation, teacher interviews, needs questionnaires, and product trials conducted in several stages. Data analysis was conducted using descriptive qualitative and quantitative methods. Qualitative data were used to describe student needs, teacher responses, and input, while quantitative data were obtained from expert validation tests and an assessment of the product's effectiveness in improving students' musical skills.

a. Research Framework

The main challenges faced in music learning in junior high schools are limited media, low student interest, and a lack of engaging and interactive musical experiences. To address these issues, this research developed digital music-based media designed to:

- Easy to use by students and teachers.
- Interactive and visual so it attracts students' attention.
- Encourage creativity in playing music, both individually and in groups.
- Relevant to the junior high school arts and culture curriculum.

The problem solving scheme can be explained as follows:

- Problem identification → music learning is less than optimal
- Needs analysis → teachers and students need innovative media.
- Digital media design → using digital music-based applications.
- Product development → creation of learning media prototypes.
- Validation and revision testing → involving material and media experts.
- Limited and field trials → on junior high school students.
- Implementation and evaluation → measuring the effectiveness of media in improving musical skills.

b. Problem Solving Approach

- **Preliminary study**

This is done by identifying problems in music learning in junior high schools, collecting needs data through observation and interviews, and analyzing the curriculum.

- **Initial product design**

Develop music-based digital media designs by paying attention to learning objectives, material content, and interactive features.

- **Digital media development**

Create a media prototype using a digital music application, then add instructions, practice examples, and evaluation features.

- **Product validation**

Products are validated by subject matter experts (music education) and media experts (educational technology) to ensure appropriateness of content, appearance, and function.

- **Product revision**

Improvements were made based on input from validators.

- **Limited trial**

The product was tested on a small group of junior high school students to determine responses, obstacles, and initial effectiveness.

- **Second revision**

Product improvements based on limited trial results.

- **Field trials**

The product was tested on a larger group to see its effectiveness in improving students' musical skills.

- **Final implementation**

The media is ready to be used more widely by teachers and students in music learning in junior high schools.

- **Evaluation of results**

The analysis was conducted to measure the improvement of students' musical skills, including aspects of rhythm, melody, creativity, and appreciation. Although this study used a Research and Development (R&D) approach, the product development process also involved the collection and analysis of quantitative data to assess the feasibility and effectiveness of digital music learning media. Therefore, the quantitative research procedures are described below.

1. Quantitative Research Instrument

a. Expert Validation Sheet

Used by subject matter experts (music education) and media experts (educational technology) to assess product quality. The instrument uses a 1–4 Likert scale with the following indicators:

- Material alignment with the curriculum
- Accuracy of musical concepts
- Clarity of display
- Media interactivity
- Ease of use
- Feature alignment with learning objectives

Each score will be calculated to determine the product's suitability.

b. Student Response Questionnaire

Using a 1–4 Likert scale, with the following aspects:

- Ease of use
- Appeal of display
- Clarity of instructions
- Learning motivation
- Musical engagement and experience

c. Music Skills Assessment Rubric

Used in product trials to assess the following skills:

- Rhythm
- Melody
- Harmony
- Musical creativity

Each aspect is scored 1–4 based on student performance.

2. Teknik Pengumpulan Data Kuantitatif

a. Validasi Ahli

Ahli materi dan ahli media diminta menilai produk menggunakan lembar validasi. Hasilnya berupa skor kelayakan.

b. Uji Coba Terbatas (Small Group Trial)

Dilakukan pada 10–15 siswa untuk memperoleh:

- Skor respon siswa
- Skor penilaian performa musikal setelah menggunakan media

c. Uji Coba Lapangan (Field Trial)

Dilakukan pada kelompok siswa yang lebih besar (25–35 siswa) untuk memperoleh:

- Skor pretest (kemampuan awal)
- Skor posttest (kemampuan setelah penggunaan media)
- Skor peningkatan (gain)

Results

Based on the research and development (R&D) stages, the resulting product is an interactive digital music learning medium designed to support the musical skills of public junior high school students. This medium integrates various digital application-based features, such as rhythm, melody, and harmony exercises, as well as simple instrument simulations. The results of this research can be summarized into several key points, namely:

1. Needs Analysis

Observations and interviews show that most music teachers still rely on conventional methods of lectures and hands-on practice with simple instruments. Students find learning less engaging due to limited resources and limited opportunities to explore musical creativity. A needs questionnaire distributed to students showed that 82% expressed a greater interest in learning music using interactive digital applications than conventional methods.

2. Product Design and Development

Based on this analysis, researchers designed a digital music-based media that is easy to use, accessible on computers and mobile devices, and features interactive visualizations. The initial product includes the following features:

- Rhythm Practice → students practice following beat patterns with animated visual displays.
- Melody Practice → students can compose simple notations using the drag and drop feature.
- Harmony Practice → students can combine several notes to produce chords.
- Digital Experiments → students can try virtual instruments such as piano, drums, digital guitar.

3. Expert Validation

The product was validated by media experts and material experts. The media expert validation score was categorized as "very appropriate" (89%), while the material expert validation score was categorized as "appropriate" (86%). This indicates that the developed media meets the needs of music arts learning in junior high schools.

4. Limited Trial and Field Trial

A limited trial was conducted on 15 eighth-grade students, while a field trial was conducted on 30 students. The results showed an improvement in students' musical skills, particularly in rhythm and creativity. Before using the media, the average musical skill score for students was 67.5, while after using the media, it increased to 82.3. Furthermore, 95% of students stated that learning music felt more enjoyable, interactive, and less boring.

5. Final Implementation

The revised product, based on student and teacher feedback, was then implemented into regular lessons. Teachers stated that this media helped them deliver the material, facilitated student skill evaluation, and increased active participation in class

Discussion

The results of this study indicate that digital music-based learning media can optimize the musical skills of junior high school students. This aligns with Mayer's (2009) theory on multimedia learning, which states that learning will be more effective if it involves multiple sensory channels, both visual and auditory. The developed interactive digital media successfully integrates both aspects, enabling students to learn music more comprehensively. Furthermore, this study supports Gordon's (2017) argument, which

emphasizes the importance of providing students with hands-on musical experiences. By using digital media, students not only learn music theory but also can directly try, experiment, and create simple works. This improves their psychomotor skills, particularly in aspects of rhythmic coordination, melodic mastery, and harmony understanding. The research findings also show that the use of digital technology can increase student motivation and engagement. This aligns with Suprapto's (2021) research, which shows that digital media encourages creativity and collaboration in arts learning. Students feel more confident expressing their musical ideas because digital media provides a space for exploration without fear of making mistakes. Furthermore, this study proves that musical skills can be improved not only through real instruments but also by utilizing virtual instruments. While real musical instruments remain important, digital instruments offer greater opportunities for independent practice, especially in schools with limited music facilities. This is relevant to the research findings of Rahmawati (2022), which found that digital media enhances students' creativity in creating simple musical compositions. Therefore, it can be concluded that the development of digital music learning media significantly contributes to improving the musical skills of junior high school students. This media serves not only as a teacher's aid but also as a more engaging means of exploration, creativity, and appreciation of music for students.

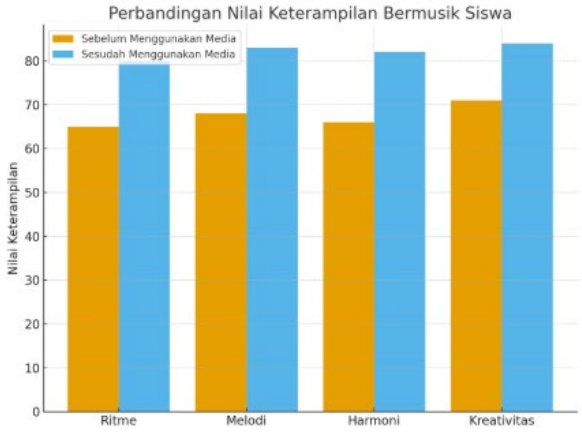

Figure 1. Comparison Diagram

The numerical data presented in the tables and diagrams in the *Results and Discussion* section were derived from a series of data collection procedures conducted during the trial phase of the digital music learning media. The data were collected through two types of assessments, namely a **pretest** and a **posttest**, as well as performance evaluations using a scoring rubric developed specifically for this study. Before the media was implemented, the researcher administered a **pretest** to measure students' initial musical abilities in four skill areas: rhythm, melody, harmony, and creativity. The pretest was carried out through simple musical performance tasks, such as following beat patterns, playing short melodic phrases, combining several notes to form harmony, and creating short improvisations or compositions. These performances were assessed using a **1–4 scoring rubric**, which was later converted into a scale of 0–100. The scores obtained from this stage formed the baseline (*before using media*) data presented in the tables. Following this, students participated in learning activities using the developed digital music media. During these sessions, they practiced using features such as rhythm exercises, melodic exploration, harmony-building tasks, and experimentation with virtual instruments. After the learning process was completed, a **posttest** was administered using the same types of musical tasks as the pretest, and the same scoring rubric was used to maintain

consistency. The results of this assessment became the *after using media* data. In addition to performance tests, data were also collected through **small-group trials and field trials**, each involving different numbers of students. The small-group trial included 10–15 students and produced preliminary data regarding student responses and musical performance after using the media. The field trial involved 25–35 students and generated pretest scores, posttest scores, and *gain scores*, calculated from the difference between initial and final scores. These data were then analyzed to determine the percentage increase in each aspect of musical ability. Thus, all numerical data presented in the tables and diagrams were obtained through direct measurement using structured musical performance tasks administered before and after the use of the digital media. The data reflect actual changes in students' musical skills as a result of the intervention. Furthermore, the data were collected systematically, objectively, and using expert-validated instruments, ensuring their scientific credibility and reliability.

Data is calculated using:

1. Average Score

For example:

Average before = 67.5

Average after = 82.3

2. Gain Score

Difference between posttest and pretest

3. Percentage Increase

$$\text{Increase } \% = \frac{\text{Posttest} - \text{Pretest}}{\text{Pretest}} \times 100$$

Example:

Melody

$$\frac{83 - 68}{68} \times 100 = 22.06\%$$

The results are listed in Table 2.

From the graph, it is clear that there was an improvement in all aspects (rhythm, melody, harmony, creativity) after the media was used.

Table 1. Results of the Digital Music Learning Media Trial

Skills Aspect	**Before Using Media**	**After Using Media**
Rhythm	65.0	80.0
Melody	68.0	83.0
Harmony	66.0	82.0
Creativity	71.0	84.0
Average	**67.5**	**82.3**

Explanation: The table above shows a significant increase in every aspect of students' musical skills after using digital music learning media. The largest increase occurred in the creativity aspect (from 71.0 to 84.0), followed by the melody aspect (from 68.0 to 83.0). Overall, the average student skill increased from 67.5 (sufficient category) to 82.3 (good category).

Table 2. Statistical Analysis of the Results of the Digital Music Learning Media Trial

Skills Aspect	Before	After	Gain Score	% Increase
Rhythm	65	80	+15	23.08%
Melody	68	83	+15	22.06%
Harmony	66	82	+16	24.24%
Creativity	71	84	+13	18.31%
Average	**67.5**	**82.3**	**+14.8**	**21.93%**

Explanation:

- All aspects of musical skills have experienced significant improvement.
- The biggest increase occurred in the Harmony aspect (24.24%), indicating that digital media really helps students understand the combination of notes and chords.
- The Creativity aspect also increased quite significantly (18.31%), although relatively smaller than other aspects, this shows that students find it easier to improvise after being facilitated by digital media.

Overall, the average student skill increased by +14.8 points or around 21.93% after using digital music learning media

Conclusions

Based on the results of the research and discussions that have been carried out, several conclusions can be drawn as follows:

a. Interactive digital music learning media has proven effective in improving the musical skills of public junior high school students. Trial results showed an increase in average scores from 67.5 (fair) to 82.3 (good), representing a 21.93% increase. This indicates that the developed media significantly optimizes music learning.
b. The use of digital media makes music learning more engaging, interactive, and enjoyable. Students can practice rhythm, melody, harmony, and create independently and collaboratively using virtual instruments. Ninety-five percent of students responded positively, stating that learning with digital media was more engaging than conventional methods.
c. Teachers are assisted in the learning process because this media simplifies material delivery, offers a variety of teaching methods, and supports the implementation of a project-based curriculum. This media is also relevant to the principles of constructivism, TPACK, and the Independent Curriculum, which emphasize exploration, creativity, and the use of technology.

This research shows that the integration of digital technology in arts learning, particularly music, not only improves students' cognitive and psychomotor aspects but also motivates them affectively to be more confident in expressing musical ideas. Thus, digital music media can be a real solution to overcome the limitations of conventional music resources in schools.

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