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Development of SIMPONI (Interactive Pianica Simulator) as a Learning Media for Music Education in Junior High Schools

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Abstract
This study aims to develop SIMPONI (Interactive Pianica Simulator) as an innovative learning medium to enhance the effectiveness of music education, specifically piano instruction, at the junior high school level. The research was motivated by the limited availability of musical instruments in schools and the lack of interactive instructional media, which negatively affects students' learning motivation and instrumental performance skills. This research employed a Research and Development (R&D) approach using the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation. Product validation was conducted by material and media experts, resulting in an average feasibility score of 87.5%, categorized as highly feasible. Students' responses in small and large group trials reached an average score of 91% in the very good category, indicating that the media is highly practical. Learning effectiveness was demonstrated by an improvement in students' learning outcomes from an average pretest score of 58 to a posttest score of 84, yielding an N-Gain value of 0.62 in the moderate effectiveness category. The results showed that SIMPONI successfully improved students' learning autonomy, musical notation understanding, and piano playing skills through interactive practice. Furthermore, the media supports technology-based learning in line with the implementation of the Merdeka Curriculum. Therefore, SIMPONI is considered appropriate for use as an alternative learning media to overcome limitations in musical instruments and to promote adaptive, creative, and meaningful music learning in junior high schools.

Introduction

The rapid development of information and communication technology has reshaped educational practices, including music education. This transformation requires teachers to adopt digital-based strategies and media that support interactive and student-centered learning. In Indonesian junior high schools, the teaching of basic instruments such as the pianica remains hindered by limited facilities, conventional teaching methods, and low student engagement. Although the pianica is intended to develop foundational musical competencies—such as notation reading, rhythm recognition, and motor coordination—implementation in schools often falls short. Sunarni (2022) found that the shortage of instruments and restricted class time inhibit students' opportunities for individual practice, resulting in suboptimal psychomotor and cognitive outcomes.

A lack of pedagogical innovation further exacerbates these challenges. Many music teachers continue to rely on demonstration-based instruction without integrating digital media that accommodate students' varied readiness levels. Such practices contradict differentiated learning principles emphasized in the Independent Curriculum. As noted by Dawati (2023), uniform instructional delivery often leads lower-ability students to fall behind, reducing motivation and learning persistence. Local findings at SMPN 69 Jakarta illustrate this issue: with only 10–12 functional pianicas available for classes of 36 students, practice must be conducted in large groups, limiting teachers' ability to provide individualized guidance.

These obstacles indicate structural problems in music education management. Lestari (2023) observes that most Indonesian public schools lack systematic procurement and maintenance plans for musical instruments, as budgets prioritize core academic subjects. Additionally, a tendency among teachers to focus on theoretical instruction reduces opportunities for students to engage in meaningful musical experiences. According to Rexhepi (2024), music learning that prioritizes memorization over active exploration diminishes students' aesthetic appreciation and motivation.

Given these issues, there is a strong need for innovative learning media capable of addressing equipment shortages, enhancing engagement, and integrating digital pedagogy. Simulation-based media offer a promising alternative, allowing students to practice virtually without relying on physical instruments. SIMPONI (Simulator Pianika Interaktif) was developed in response to these needs. The application simulates pianica sounds and functions digitally, enabling individual practice and providing real-time feedback on pitch and rhythm. Prior studies demonstrate the efficacy of such technologies: Feng et al. (2023) reported that digital instrument simulations improve cognitive and psychomotor abilities, while Kim and Park (2022) found that interactive learning media increase students' motivation and confidence.

SIMPONI aligns with constructivist principles, which posit that learning occurs when students actively construct understanding through exploration and feedback (Piaget, 1976; Vygotsky, 1978). It also supports holistic competency development—cognitive, affective, and psychomotor—which scholars argue is central to effective music education (Elliott, 1995; Jorgensen, 2008). Furthermore, the platform is relevant to the learning characteristics of digital-native students who respond better to interactive and multimodal media (Prensky, 2011). Its development follows instructional design principles such as the ADDIE framework to ensure systematic and pedagogically coherent learning experiences (Branch, 2009).

While concerns regarding diminished expressiveness in digital music learning persist, simulation media are not intended to replace real instruments but to complement traditional instruction. By supporting basic skill acquisition outside class time, simulators enable more efficient in-person sessions focused on ensemble work and creative expression. Automated feedback systems also provide objective performance data, supporting modern assessment practices.

Overall, the primary challenge in pianica learning lies not only in the scarcity of instruments but in limited pedagogical innovation that integrates technology with students' learning needs. The development of SIMPONI is therefore positioned as both an academic and practical contribution: academically enriching the limited literature on technology-enhanced music learning in Indonesia, and practically offering a viable solution to improve learning outcomes, efficiency, and student engagement in junior high school music education.

Method

This study uses a research and development (*R&D*) approach with the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The ADDIE model was chosen because it is systematic, adaptive, and suitable for producing effective and measurable technology-based educational products. The use of this model allows the learning media development process to be structured sequentially, from identifying needs to assessing product effectiveness.

The product developed is a SIMPONI (Interactive Pianica Simulator) learning media created with the *JavaScript programming language* and *HTML5 markup language* which functions as a digital tool for music learning in junior high schools, especially in the material of playing the pianica musical instrument. The background to the development of this media departs from problems found in the field, namely the limited number of pianica musical instruments available in schools, the lack of variety of technology-based learning media, and low student engagement and motivation to learn. Therefore, interactive media is needed that can imitate the function of the pianica musical instrument virtually, is easily accessible, and is interesting for students. In the analysis stage, an identification of music learning needs at SMPN 69 Jakarta was carried out

through observations of teaching and learning activities, interviews with arts and culture teachers, and analysis of curriculum documents. The results of the analysis showed that most music learning activities still depend on direct demonstrations and limited use of musical instruments, which causes inequality in student opportunities to practice. This condition encourages the need for innovation in simulator-based digital learning media that can provide independent and interactive musical learning experiences.

The design phase was carried out by developing a conceptual design for the SIMPONI media. This process included designing the user interface, coding interactive content in the form of notation, keystrokes, and song practice, as well as integrating audio-visual elements to create a realistic learning experience. The design principles were based on Mayer's (2009) multimedia learning theory, which emphasizes the importance of integrating text, sound, and visuals to enhance comprehension.

The development phase involved producing an interactive web-based SIMPONI media prototype that allows students to virtually practice playing the pianica by pressing the note buttons, listening to the resulting sounds, and learning scales and simple songs. The developed media was then validated by two experts, Youke Netaneel as a material expert and Asep Ricky Subagya as a media expert, each assessing twenty feasibility indicators according to their respective areas of expertise.

The validation results were analyzed using quantitative descriptive statistics with the formula:

$$\boldsymbol{Nilai} = \frac{\boldsymbol{Skor\ Maksimum}}{\boldsymbol{Skor\ Maksimum}} \times \mathbf{100}$$

Researchers compiled validation instrument categories in the form of assessment sheets from material experts, media experts, and student response questionnaires using a four-level Likert scale with categories that can be seen in Table 1 below.

Table 1. Expert Questionnaire Scoring Criteria

Score	Evaluation
Very good	4
Good	3
Not good	2
Not good	1

Source: Sugiyono (2023)

Table 2. Expert Response Criteria

Percentage (%)	Eligibility Category
81% - 100%	Very Worth Using
61%–80%	Worth Using
41%–60%	Less Suitable for Use
< 40%	Not Suitable for Use

Source: Desy (in Lestari, 2023)

The implementation stage was carried out in two trial stages, namely a small group trial involving four seventh-grade students, and a large group trial involving sixteen seventh-grade students of SMPN 69 Jakarta. The purpose of the implementation was to measure students' responses to the media and the effectiveness of its use in the music learning process. The learning process was carried out in three sessions, namely a pretest (before using the media), learning using SIMPONI, and a posttest (after using the media). Student response questionnaires were given to assess aspects of ease, appearance, clarity of instructions, attractiveness, and usefulness of the media. The assessment scores used a Likert scale (1–4) with the criteria as shown in table 3 below.

Table 3. Student Response Score Criteria

Score	Evaluation
Very good	4
Good	3
Not good	2
Not good	1

Source: Sugiyono (2023)

The results of student responses to SIMPONI media were analyzed using the following percentages:

$$P(s) = \frac{S}{N} \times 100$$

Information:
P(s) = Percentage of results
Validity = Total score of answers
N = Maximum score

After the percentage is calculated, a quality score will be obtained from the media developed by the researcher, with the validity criteria for student responses which can be seen in table 4 below.

Table 4. Student Response Criteria

Criteria (%)	Validity Level
81% - 100%	Very good
61%–80%	Good
41%–60%	Not good
< 40%	Not good

In addition to the response questionnaire, the effectiveness of the media was also evaluated through the results of the pretest and posttest practical tests using a *pre-experimental one group pretest-posttest design*.

$$\mathbf{O_1 \times O_2}$$

O_1 represents the test results before using the media, while O_2 shows the test results after learning using the "SIMPONI" media.

To assess the level of feasibility, practicality, and effectiveness of the media. The feasibility analysis was obtained from the validation results of material experts and media experts, while practicality was obtained from student responses. To assess the effectiveness of the media on improving learning outcomes, a comparison of pretest and posttest scores was conducted using the N-Gain formula as follows:

$$\boldsymbol{N - Gain = \frac{Postest - Pretest}{Skor\ Maksimal - Pretest}}$$

Table 5. Interpretation criteria for N-Gain values

Gain Index	Criteria
> 0.7	Tall
0.3 – 0.7	Currently
< 0.3	Low

Source: Meltzer (in Mardiyah, 2022)

Table 6. Student Response Criteria

Index Gain	Criteria
< 40	Ineffective
40–55	Less Effective
56–75	Quite Effective
> 76	Effective

Source: Desy (in Lestari, 2023)

This analysis is combined with qualitative findings from observations and interviews, resulting in a comprehensive picture of the media's effectiveness from a pedagogical, psychological, and technological perspective. This triangulation approach ensures that the research results rely not solely on quantitative data but also consider the context and actual learning experiences of students. The validation process was conducted iteratively using the principle of formative evaluation: media was developed, tested, revised, and then retested until a product was suitable for use. All input from subject matter and media experts was analyzed qualitatively to address weaknesses in content, language, graphic design, and interactivity. Data validity was strengthened through expert judgment and field practicality testing. From a methodological perspective, the application of the ADDIE model in this study serves not only as a development framework but also as an evaluative approach that ensures each stage is logically and empirically linked to the expected learning outcomes. The combined use of qualitative and quantitative analysis allows researchers to assess media from various aspects, from design and content to its impact on learning outcomes.

Results and Discussion

The development of SIMPONI (Interactive Pianica Simulator) is an integral part of technology-based music learning innovation designed to address the limitations of practice tools at SMPN 69 Jakarta. This media was developed using *HTML5* and *JavaScript markup languages* with a very light file size of 16 *kilobyte*, so it can be accessed quickly and stably through various devices, both computers and gadgets. The main simulator file is installed at https://smpn69jkt.sch.id/simulatorpianika/simponi.html making it a learning media that is easily accessible to students without the need for additional installations. The selection of *HTML5* and *JavaScript* was based on considerations of efficiency, compatibility, and flexibility. *HTML5* provides a stable page structure and supports direct audio playback in the browser without external plug-ins, while JavaScript functions to regulate button interactivity, visual animation, and sound response from each virtual pianica key. The combination of the two produces a simulator that resembles a real instrument, where each button on the screen represents diatonic and chromatic notes as on a conventional pianica. When the user presses a button, the *JavaScript system* calls the frequency-adjusted *audio file, then displays a visual effect in the form of a color change or animated vibration to emphasize the interactive response.*

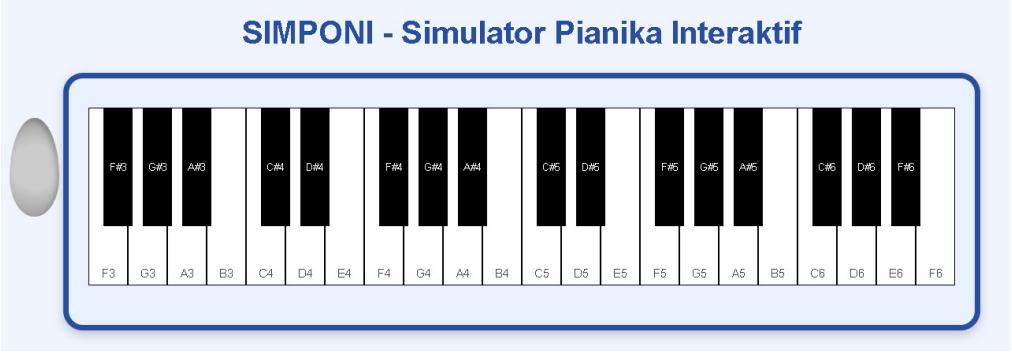

Figure 1. *Interactive Pianica Simulator (SIMPONI)*

This development approach also follows the principles of *user-centered design* , where the display and navigation are designed to be as simple as possible so that it can be used by seventh grade students, most of whom are new to digital music learning devices. The interface is made minimalist with a predominance of soft colors and intuitive icons, and is equipped with a user guide that appears when the simulator is first accessed. The use of *JavaScript* allows for an *event listener feature* that processes every user interaction in real-time, both through mouse clicks and screen touches (*touchscreen*), so that the simulator can be used across platforms on laboratory computers and students' personal mobile phones.

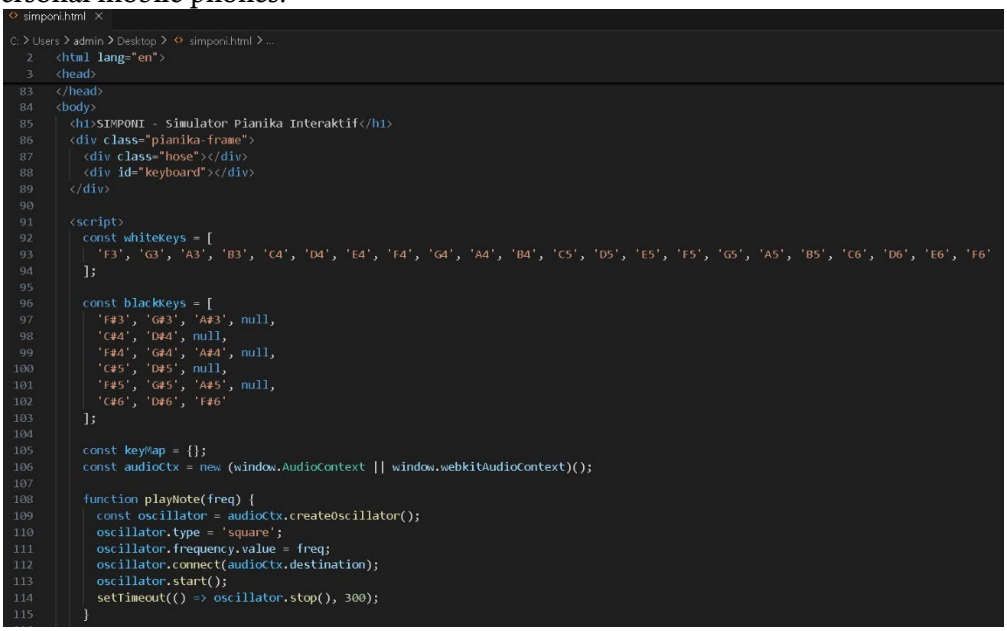

Figure 2. *SIMPONI code development process with HTML5 and Javascript*

Through this system, students not only hear sounds but also learn the relationship between notation symbols and note positions on the pianica. Each note mishit is met with distinct visual and audio feedback, helping students understand musical concepts in an exploratory manner. This process aligns with the theory of *learning by doing* and the principle of *constructivism,* which positions students as active participants in the learning process. Another advantage of SIMPONI is its ability to run online without relying on a high-speed internet connection. Its 4.16 KB file size makes page loading very fast, even on limited school networks. Usage data shows that this media is easily accessible in the school computer room and on students' personal devices, thus expanding learning access beyond formal class hours. Furthermore, SIMPONI's integration into the school's official website allows teachers to use it directly in teaching and learning activities without the need for additional devices, making it an efficient solution and a concrete representation of the implementation of digital learning in the field of music arts.

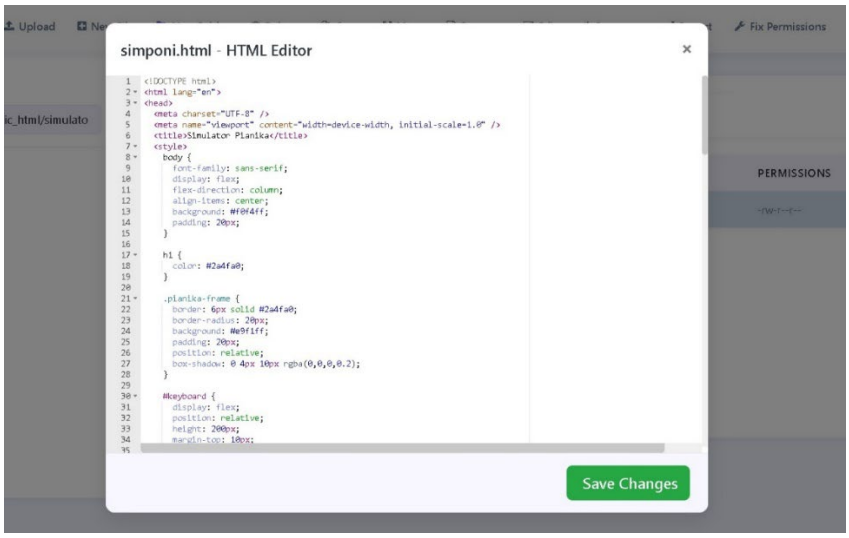

Figure 3. *SIMPONI upload process on the school website server*

The results of the research on the development of the SIMPONI (Interactive Pianica Simulator) learning media show significant achievements in terms of content validity, media quality, and the effectiveness of its use in improving the musical abilities of seventh-grade students at the junior high school level. This media was developed to address real-life problems in schools, particularly at SMP Negeri 69 Jakarta, where the learning process for melodic musical instruments such as the pianica faces constraints such as limited facilities and a variety of learning methods. In this context, SIMPONI is presented as a technology-based learning innovation designed to provide an interesting, efficient, and modern music learning experience. This media is the result of development based on the *ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model,* which emphasizes a balance between pedagogical needs and technological functions. In the analysis stage, researchers found that students had difficulty understanding notation, recognizing note positions, and coordinating fingers when playing the pianica. In addition, learning tends to be monotonous because it only relies on a limited number of physical tools. From the results of observations and interviews with music teachers, it was found that 1 set of pianicas was used alternately by several students, so that practice time was disproportionate to the number of students. This fact is the basis for the need for digital-based alternative media that can accommodate these limitations without reducing the quality of learning.

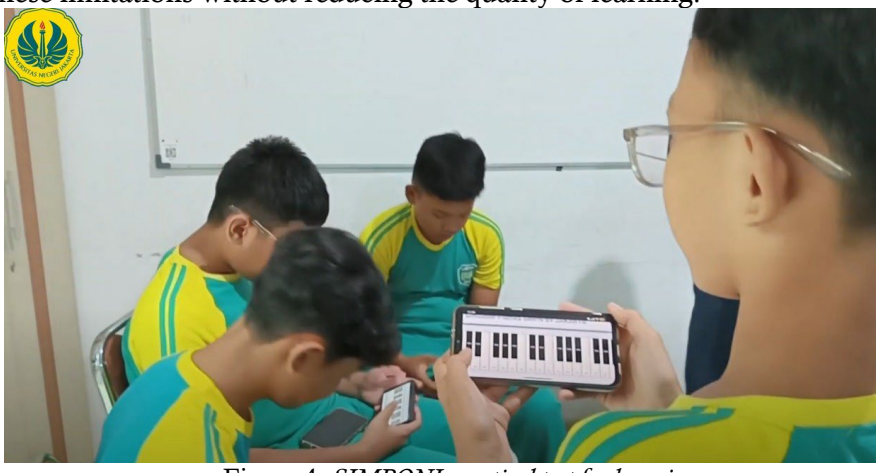

Figure 4. *SIMPONI practical test for learning*

SIMPONI was developed as an interactive simulator that allows students to play a virtual pianica with sounds and displays that resemble a real instrument. This media includes interactive features such as visualization of musical notation, step-by-step practice guides, and automatic feedback when students press the appropriate or incorrect notes. This approach is based on *Dewey's* theory *of learning by doing* and the principle of *Immediate Feedback* (*Mayer* , 2014), which states that

learning will be more meaningful if students actively interact and receive direct feedback from the system. Thus, SIMPONI is not just a digital tool, but a pedagogical tool that fosters learning autonomy and increases student engagement in the music learning process.

The expert validation results show that SIMPONI media has met high feasibility criteria. Validation was carried out by two experts, namely Youke Netaneel as a material expert and Asep Ricky Subagya as a media expert. Based on the assessment results using a Likert scale of 1–4 with 20 statement items, the material expert gave an average score of 91.25% which is included in the "Very Good" category, while the media expert gave a score of 83.75% also included in "Very Good". If averaged, the total validation score reached 87.5%, which indicates that this media is very suitable for use.

Table 7. Expert Validation Results

Validation Aspects	Validator	Percentage (%)	Category
Subject Matter Expert	Youke Netaneel	91.25%	Very Worthy
Media Expert	Asep Ricky Subagya	83.75%	Very Worthy
Average	–	**87.5%**	**Very Worthy**

Table 8. Expert Recommendation Results

Validator	Score	Category	Meaning and Recommendations
Material Expert (Y. Netaneel)	91.25	Very good	The material, indicators, and content of the pianica are very good; minor revisions to the clarity of instructions and the order of presentation.
Media Expert (AR Subagya)	83.75	Very good	Good presentation and interactivity; needs *UX refinement* and interface consistency for optimal learning experience.

In terms of content, material experts assessed that the music content contained in SIMPONI was in accordance with the learning outcomes of the Merdeka Curriculum, particularly in terms of introducing musical elements, practicing simple melodies, and strengthening expressive skills. However, several aspects received relatively low scores, namely in items R5, R10–R12, and R20, indicating the need for minor improvements. Expert recommendations included clarity of learning indicators, systematic presentation of materials, and the addition of more detailed user instructions so that students can learn independently without confusion. These notes became the basis for minor revisions that were immediately followed up in the final development stage. Meanwhile, the results of validation by media experts showed that in terms of appearance, navigation, interactivity, and functionality, SIMPONI met the principles of good instructional design. Aspects that received high scores were clarity of layout, color matching, and user-friendliness in navigating between menus. However, items that received a score of 3 (fairly good) included R2, R3, R5, R8, R9, R11–R13, R16–R17, and R20. These aspects relate to user experience, such as button response speed, interface color consistency, and visual element enhancements to make them more appealing. Based on these recommendations, researchers optimized the design by refining button animations, increasing color contrast, and adding an "interactive hint" feature to make it easier for new users to understand the function of each section. When linked to the media effectiveness criteria according to Desy in Lestari (2023), which states that an index above 76% is considered effective, the average validation result of 87.5% indicates that SIMPONI falls into the "Very Good" and "Effective" categories as an interactive learning medium. This means that both in terms of

substance and appearance, this medium meets the requirements for use in music learning in junior high schools.

After being declared suitable by experts, the media was tested on students to determine user responses and its effectiveness in improving learning outcomes. The trials were conducted in two stages: small groups (4 students) and large groups (16 students). In the small group trials, the assessment focused on the functionality and understandability of the instructions. Students were asked to try all the media features while completing a *Likert -based response questionnaire*. The results showed that the media obtained an average score of 88%, including the "Very Good" category. Students stated that the media was easy to use, had an attractive appearance, and provided a different learning experience from conventional learning. Some minor input was given regarding response speed and the addition of audio guides, which were then refined in the revised version.

In a large-group trial involving 16 seventh-grade students, the assessment focused on two aspects: user response and improved learning outcomes. Based on the results of the student response questionnaire, an average percentage of 91% was obtained, which falls into the "Very Good" category. Individual data showed relatively consistent variation, with the majority of students scoring between 80% and 100%.

Table 9. Student Responses

Assessment Aspects	Percentage (%)	Category
Ease of Use	93	Very good
Understanding of Material	90	Very good
Visual Display	89	Good
Benefits for Learning Motivation	92	Very good
Average	**91**	**Very good**

In general, student responses showed that the media was well-received and stimulated interest in learning. An average response rate of 91% confirmed that SIMPONI was not only technically feasible but also affectively effective, as it fostered student motivation and engagement in music learning. Students reported feeling more confident and enthusiastic about learning notation and melodies because the media provided hands-on experience without the fear of making mistakes. The sound features and visual feedback provided by the media made the learning process more enjoyable, adaptive, and meaningful.

The effectiveness of SIMPONI media in improving students' musical abilities was also measured through pretest and posttest tests using the one group pretest–posttest design (O_1 X O_2) model. The pretest results showed that the average initial score of students was around 58, while after learning using SIMPONI media, the average posttest score increased to 84. This increase was calculated using the N-Gain formula, namely:

$$\boldsymbol{N - Gain = \frac{84 - 85}{100 - 58} = 0,62}$$

The calculation results show an N-Gain value of 0.62, which is included in the "Moderate" or "Quite Effective" category according to Desy's criteria (in Lestari, 2023). When converted into an effectiveness percentage, this value is in the range of 56–75%, indicating a significant improvement in learning outcomes after using SIMPONI media. Thus, this media has been proven to be able to improve students' abilities in understanding the concepts of tone, rhythm, and pianica playing skills digitally, which are then transferred to real-life practice.

From a qualitative analysis of student responses during the learning process, it can be concluded that interactivity is a key factor in the success of this media. Students feel free to experiment and learn independently without relying on teachers or physical tools. The intuitive user experience encourages students to try again and again until they achieve the desired results.

This demonstrates a constructive learning process, where students actively construct their knowledge through direct experience.

When linked to *Vygotsky's theory of social constructivism*, the interaction between media, students, and the learning environment creates an effective zone *of proximal development*. Media acts as a digital scaffold that guides students in gradually understanding musical concepts through easy-to-understand simulations. Thus, SIMPONI functions not only as a visual aid but also as a cognitive mediator that strengthens the connection between sensory experiences and abstract musical representations.

The results of this study align with the findings of Mulyono (2022), who stated that digital-based music learning media can increase interest and learning outcomes by providing a more interactive and enjoyable learning experience. Another study by Rahmadani (2023) also confirmed that the use of computer-based instrument simulators can accelerate the internalization of musical concepts in high school students. In this context, SIMPONI demonstrates that technology-based learning can be effectively adapted in arts education without diminishing aesthetic values and creative expression.

Overall data analysis shows that this media meets three important aspects in development evaluation, namely validity, practicality, and effectiveness. Validity is proven by the results of expert validation with an average of 87.5% which is in the "Very Good" category. Practicality is seen from the results of student responses of 85.78% which is also in the "Very Good" category. Meanwhile, effectiveness is reflected in the increase in pretest to posttest scores with an N-Gain value of 0.62 which indicates the effectiveness of learning using this media. These three indicators show consistency that SIMPONI is a feasible, practical, and effective media used in music learning in junior high schools.

Theoretically, these results also contribute to the development of technology-based music learning in Indonesia, particularly within the context of the Independent Curriculum, which emphasizes independent learning, creativity, and the use of digital media. In this curriculum, students are encouraged to develop their potential through exploratory activities. SIMPONI media aligns with these principles because it allows students to explore sound, rhythm, and melody independently and reflectively. Thus, this media supports a student-centered learning approach, where students become active subjects constructing their musical experiences. Furthermore, SIMPONI's success also demonstrates the importance of integrating art and technology in modern education. Music learning, which was previously synonymous with physical instruments, can now be conducted digitally without compromising its aesthetic and pedagogical value. This opens up opportunities for schools with limited facilities to continue providing quality music learning experiences. In the long term, media like SIMPONI have the potential to become a sustainable solution for equalizing access to arts education that adapts to technological advances.

Critically, it can be concluded that the success of SIMPONI's development lies not only in its numerical validation achievements or test results, but also in its ability to address contemporary pedagogical challenges. Music learning in the digital era demands an approach capable of bridging the analog and virtual worlds, between artistic practice and technological prowess. SIMPONI presents this synthesis through a contextual, interactive, and collaborative learning experience. Going forward, further development can be directed at integrating augmented reality or machine learning technology to provide more precise artificial intelligence-based feedback, making the media increasingly adaptive to the individual needs of learners.

Overall, the results of this discussion show that SIMPONI is a learning media innovation that is feasible, interesting, and effective to be applied in music learning in junior high schools. With a high level of validity (87.5%), very positive student responses (85.78%), and a significant increase in learning outcomes (N-Gain 0.62), this media has been proven to be a strategic alternative in learning melodic musical instruments in schools, especially in the context of limited physical equipment and the need for technology-based learning media that are relevant to today's digital education era.

Conclusions

The development of SIMPONI (Interactive Pianica Simulator) effectively addresses key challenges in junior high school music learning, particularly limited instrument availability and insufficient individual practice. Expert validation scores (83.75% media; 91.25% material) and high student responses (91%) indicate that SIMPONI is feasible, engaging, and pedagogically appropriate. Learning outcomes also improved significantly, with an N-Gain of 0.62, showing the media's effectiveness in enhancing students' basic musical skills.

This study is limited by its small sample size, single-school implementation, and the absence of collaborative and expressive skill assessments. Future development should integrate AI-based feedback, expanded learning content, and collaborative features, supported by teacher training for optimal classroom use. Overall, SIMPONI provides a practical and innovative digital solution for strengthening music learning in the context of the Independent Curriculum.

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References

Bell, J. D., Bartley, D. M., Lorenzen, K., & Loneragan, N. R. (2006). Restocking and stock enhancement of coastal fisheries: Potential, problems and progress. *Fisheries Research, 80*(1), 1–8.

Branch, R. M. (2009). Instructional design: The ADDIE approach. Springer.

Dawati, N. (2023). The influence of various music learning methods on junior high school students' learning interests. Indonesian Journal of Music Arts Education, 5(2), 101–109.

Elliott, D. J. (1995). Music matters: A new philosophy of music education. Oxford University Press.

Feng, Y., Liu, X., & Zhang, H. (2023). Application of virtual reality in music education: A systematic review. International Journal of Music Education Technology, 12(1), 45–57. https://doi.org/10.1177/20414356221149763

Jorgensen, E.R. (2008). The art of teaching music. Indiana University Press.

Karochmah, D. N., Nugraha, R. G., & Syahid, A. A. (2024). Pengembangan media "Rahayuning Bawana" untuk meningkatkan kemampuan motorik peserta didik dalam pembelajaran seni tari. Ideguru: Jurnal Karya Ilmiah Guru, 9(2), [halaman artikel bila tersedia]. https://doi.org/10.51169/ideguru.v9i2.1044

Kim, S., & Park, J. (2022). Interactive music learning using digital simulation media in secondary schools. Journal of Digital Education and Skills, 14(3), 210–225. https://doi.org/10.1080/00220272.2022.1987652

Lestari, W. (2023). Evaluation of interactive learning media in arts and culture subjects. Journal of Educational Innovation, 11(1), 34–42.

Mardiyah, N. (2022). The use of N-Gain in the analysis of learning outcome improvement. Journal of Educational Evaluation, 6(2), 56–64.

Mayer, R.E. (2009). Multimedia learning (2nd ed.). Cambridge University Press.

McKenney, S., & Reeves, T. C. (2012). Conducting educational design research. Routledge.

Ministry of Education, Culture, Research, and Technology. (2022). Independent Curriculum for liberating education. Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia.

Mulyono, H. (2022). The influence of digital learning media on secondary school music learning. Indonesian Journal of Music Education, 8(1), 22–31.

Piaget, J. (1976). The grasp of consciousness: Action and concept in the young child. Harvard University Press.

Prensky, M. (2011). Teaching digital natives: Partnering for real learning. Corwin Press.
Rahmadani, S. (2023). Implementation of a musical instrument simulator to improve the musical skills of junior high school students. Journal of Arts and Music Education, 4(2), 87–95.
Rexhepi, I. (2024). Music education challenges in digital era schools. International Journal of Arts Education, 9(2), 15–27.
Sugiyono. (2023). Quantitative, qualitative, and R&D research methods (3rd ed.). Alfabeta.
Sunarni, T. (2022). Analysis of melodic musical instrument learning in junior high schools. Journal of Art Studies, 10(2), 77–85.
Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.

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