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THE IMPLEMENTATION OF TECHNO-PEDAGOGY TEACHING APPROACH FOR INDONESIAN SECONDARY SCHOOL TEACHERS IN JAVANESE GAMELAN LEARNING

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ABSTRACT

Since its recognition as a World Intangible Cultural Heritage by UNESCO, it is pivotal to preserve Gamelan musical instruments by introducing them to the younger generation; one of which is through teaching such Indonesian traditional musical instruments at schools. However, in practice, Javanese Gamelan learning in schools is often neglected, among other things, due to the lack of teacher knowledge, limited facilities, and lack of support from the school. The purpose of this research is to explore the concept of techno-pedagogy as an alternative teaching approach that can be developed and applied by teachers in Javanese traditional Gamelan music classrooms at secondary schools in Indonesia; utilizing technology and information media to ease students' learning. This qualitative research was carried out by collecting data from interviews, document analysis, and review of previous literature related to the current purpose. Three participants (two experienced music teachers and one lecturer) were involved. The data obtained were then analyzed using qualitative coding techniques. The findings of this study demonstrate that the concept of techno-pedagogy provides teachers with the necessary abilities and resources to deliver Gamelan teaching in a more effective way and in accordance with the needs of today's students. By combining modern technology with a pedagogical approach, teachers can make the learning experience more engaging and accessible and allow students to explore Gamelan through interactive platforms such as M-Learning The results imply that teachers should adapt their teaching strategies to different learning situations to engage students effectively; particularly through the techno-pedagogy approach.

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1. INTRODUCTION

Indonesia is one of the countries that is rich in various forms of art and culture. One of the existing forms of cultural arts is the art of music which has occupied its own place as a recognized field in society. The embodiment of Indonesia's cultural values through the art of music is realized by the existence of traditional music. Traditional music is music that is used as an embodiment and cultural value in accordance with tradition Not only does traditional Indonesian music provide entertainment value, but it also serves as a window into the country's rich and varied cultural identity. Traditional music serves as a means of passing down from one generation to the next the historical, social, and spiritual aspects of society. According to Mazid et al. (2020), conserving traditional music is essential to maintaining the nation's cultural history.

Traditional music serves as a marker of a distinct and unique identity in the context of globalization, which is progressively undermining local identity. It also serves as a vehicle for bolstering a sense of patriotism. The importance of this traditional music requires us to ensure that the younger generation not only knows but also appreciates and master traditional music. One effective way to achieve this is to incorporate traditional music into the school curriculum. Formal education about traditional music in schools can arouse students' interest and increase their appreciation of local culture. It is hoped that through structured learning, this valuable cultural heritage can continue to live and develop in the hands of the next generation (Budiwirman et al., 2023).

In the curriculum of Indonesia's national education, the subject of Arts and Culture aims to have students have the ability to understand the importance of concepts and skills from Indonesia's arts and culture. The scope of the Cultural Arts subject includes aspects of Fine Arts, Music Arts, Dance Arts, and Theatre Arts. To understand the art of traditional Indonesia music, one of the learning materials for traditional Indonesia music is taught at the secondary school level. In this learning material, the basic competencies that are expected are so that students can recognize, understand the types and functions of traditional musical instruments, and be able to play them (Ananda & Hudaidah, 2021). The types of traditional musical instruments that are commonly studied in schools include Javanese Gamelan, Sundanese Gamelan, Angklung, and so on.

Indonesia should be proud because one of the types of traditional Indonesia musical instruments finally received recognition from UNESCO. On 15 December 2021, Gamelan was officially inscribed on the World Intangible Cultural Heritage list from the 12th Indonesia, which was confirmed at the 16th session of the UNESCO Intergovernmental Committee for the Safeguarding of the Intangible Cultural Heritage in Paris, France (https://www.kemdikbud.go.id). This indicates that the traditional Gamelan musical instrument needs to be preserved by introducing it to the next generation, one of which is by teaching it in schools.

Among the young generation today, Javanese Gamelan musical instruments are classified as unpopular and less in demand than other musical instruments. Because of this, not many people have the ability to play it. The process of player regeneration is also poor due to lack of interest, so this musical instrument tends to be abandoned over time. The rapid development of technology has made traditional musical instruments less and less in demand by the younger generation today (Indriani et al., 2024). Especially with the many cultural influences from abroad, the younger generation loves modern music more and does not know the types and ways to play traditional music and there are many other factors. Javanese Gamelan learning in schools has the potential to enrich students' musical and cultural experiences. However, in practice, Javanese Gamelan learning in schools is often ignored or does not receive enough attention.

The lack of support from schools, the restrictions of the facilities that are now in place, and the ignorance of teachers about the teaching of this instrument are some of the issues that have an impact on this. This is influenced, among other things, by the insufficient training of teachers, the scarcity of resources, and the absence of school assistance. Many teachers are confused about how to help students teach Gamelan musical instruments (Kurniawati et al., 2023). The main thing that is a problem is the absence of available equipment. As is known, traditional musical instruments require a lot of funds.

Despite various efforts to maintain Gamelan learning in schools, there remains a gap in the effectiveness of traditional teaching methods, particularly in engaging students with modern learning preferences. Previous research has largely focused on conventional pedagogical approaches without integrating digital tools that are increasingly relevant in contemporary education. Therefore, a techno-pedagogical approach is needed to bridge this gap, leveraging technology to create an interactive, flexible, and engaging learning environment. By incorporating M-Learning and digital applications, this approach not only addresses the limitations of conventional instruction but also aligns with students' digital literacy and learning habits.

The purpose of this research is to provide an alternative teaching process that can then be developed and applied conceptually by teachers in learning Javanese traditional Gamelan music in schools with a techno-pedagogical concept approach. The concept of learning by utilizing technology and information media is expected to make it easier for students to learn music. Teachers and students alike maximize the use of technology so that learning in the classroom becomes more interesting, more efficient, and effective. In addition, this research can also provide recommendations regarding the development strategy of Gamelan learning in schools so that the preservation of Javanese Gamelan culture can continue to be maintained for the next generation.

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1.1. Teacher Preparation in the Learning Process

A teacher must have the ability to carry out their duties and responsibilities well. A teacher should always improve their abilities by expanding their horizons of thought. Therefore, every ability to realize this must be based on the teacher's wishes. Because a teacher cannot let go of his responsibilities as a member of society, both small and household, as well as the general public. So, a teacher must be able to motivate himself to keep up with current technological developments so that they can provide a better education to their students. As a learning implementer, teachers must have a high and maximum work ethic in providing and guiding students in the learning process (Larlen, 2013).

Teacher preparation in the teaching and learning process is also needed in carrying out the learning and learning process at school. Teachers must deliver material in an interesting, creative, innovative, fun and accompanied by varied lesson methodologies. With good preparation, teachers will be active in learning activities, especially in achieving the success of the teaching and learning process. Teachers must have a diverse repertoire of effective practices to choose from, depending on various variables in the teaching-learning situation. Accomplished teachers focus on student success in high-stakes accountability measures and must navigate the complexities of teaching in today's diverse student population. One key aspect of this complexity is the need to differentiate instruction to meet the needs of all learners (Arends & Kilcher, 2010).

1.2. Javanese Gamelan

Gamelan is a traditional musical instrument that is often found in various regions in Indonesia, such as Java, Bali, Madura, and Lombok. The presence of traditional music as an alternative means of entertainment, is still widely favored by the public. Therefore, there are many types of traditional musical instruments used in performing arts, including one of them, namely the Javanese Gamelan musical instrument. The term Javanese Gamelan refers generally to Gamelan in Central Java (Chung, 2023).

The Gamelan ensemble typically consists of a variety of instruments, including metallophones, gongs, drums, and bamboo flutes. Each instrument has a unique timbre and plays a specific role in the ensemble, creating a rich and intricate tapestry of sound. The metallophones, known as Saron, Gender, and Slenthem, provide the melodic framework of the music, while the gongs, known as Kenong, Kempul, and Gong Ageng, provide rhythmic accents and punctuation. The drums, such as the Kendang, provide the driving pulse of the music, while the bamboo flutes add a haunting and ethereal quality to the ensemble's sound. Together, these instruments create a mesmerizing and hypnotic sonic landscape that is both ancient and timeless (Spiller & Clendinning, 2022).

The musicians in a Gamelan ensemble work together harmoniously by following their own conceptions of the inner melody while also listening to suggestions from other instruments that express it. They exhibit aspects of the song and some deviations from it, creating a collaborative and holistic performance. Since each instrument adds to the interpretation of the melody, cooperation is essential to bringing the inner melody to life. This inner melody can only be achieved when all of the ensemble's instruments perform together. The process involves searching for melodic formulas that fit the musical situation, with musicians altering, embellishing, and clarifying the piece until the inherent emotion emerges (Spiller & Clendinning, 2022).

1.3. Techno-pedagogy

Techno-pedagogy is the incorporation of technology into the educational process, combining pedagogical expertise with technological competence to improve academic outcomes. This approach requires the utilization of digital resources and tools, such as online classrooms, learning management systems (LMS), and interactive platforms such as Zoom, Google Classroom, to build more dynamic and efficient learning settings (Paschal et al., 2024). This goes beyond mere technological proficiency for personal use, including expertise in combining technology with subject matter to drive learning in the digital realm (Rajalakshmi, 2022). Proficiency in techno-pedagogy includes a deep understanding of content, pedagogy, and technology, empowering teachers to proficiently use these tools in their teaching methods (Jena, 2023).

The use of techno-pedagogy, despite its many advantages, faces various obstacles, especially in areas undergoing development where conventional pedagogical approaches continue to be influential as a result of inadequate preparedness and limited resources (Paschal et al., 2024). The ability of instructors to adjust to new pedagogical strategies and technical advancements, as well as their continued professional development, is another important factor in the success of techno-pedagogy. Some research indicates that there is a universal need to develop ICT competency in the classroom, even in the absence of any obvious differences in techno-pedagogical abilities between male and female instructors or between undergraduate and postgraduate teachers (Rajalakshmi, 2022). Therefore, in an increasingly digital environment, techno-pedagogy is crucial for modern educators to become proficient technology users, lifelong learners, and knowledge facilitators (Kumari & Rani, 2022).

By integrating technology into the teaching and learning process, a techno-pedagogical approach to education can improve students' overall learning outcomes. A more dynamic and captivating learning environment may be produced for students by teachers via the use of technology, including music applications, instructional films, and web resources. M-learning is one of the techno-pedagogical strategies that may be used, enabling students to study music on their own using electronic devices. M-Learning is a pedagogical approach that uses ICTs (information and communication technologies) to provide conveniently accessible learning materials from

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anywhere, at any time. It involves utilizing mobile e-learning devices, including laptops and cellphones, to access information and engage in interactive learning. M-learning enhances the educational process by offering engaging and accessible content, promoting interaction among users through various media such as voice, text, images, and videos. This model modernizes education, increases student engagement, and supports lifelong learning through the flexibility and convenience of mobile technology (Pea & Sharples, 2022).

Research has demonstrated that incorporating mobile technology into the educational process enhances student satisfaction, learning quality, and the connection between teachers and students. Mobile devices support both formal and informal learning by extending educational experiences outside of the classroom into everyday real-world contexts, such as homes, museums, and peer interactions (Pea & Sharples, 2022). M-learning provides many advantages that significantly improve the educational process. It encourages enhanced collaboration between teachers and students, offers practical feedback, and increases student engagement and engagement, essential for authentic learning and assessment (Hassan et al., 2024).

M-learning modernizes and streamlines the educational process, making it more thorough and relevant. This has a favorable effect on student satisfaction, attendance rates, and teacher-student engagement. In addition, m-learning fosters a more favorable classroom environment, aids in the retention of acquired knowledge, and improves overall academic achievement, as demonstrated by improved performance in assessments conducted through mobile apps (Chambi et al., 2023). These advantages collectively underscore that M-learning serves as a powerful instrument to enrich the teaching process, promote lifelong learning, and empower students to build personalized educational paths tailored to their professional responsibilities and requirements.

2. METHOD

This research is qualitative research that was carried out by finding out the problems in the learning process. The researcher collects data starting from interviews and analysis of documents related to the problems. This research involved several research informants who are practitioners and experts in the field of music learning in secondary schools. They are two music teachers who were actively involved and experienced in teaching Gamelan musical instruments in secondary schools, as well as one lecturer at one of the universities who is also actively involved in the preparation of textbooks for the Cultural Arts/Music subject Grade 10 in the national curriculum. The selection of informants was based on specific criteria, considering their expertise, teaching experience, and direct involvement in the development of Gamelan learning materials. The two teachers were chosen because they had extensive experience teaching Gamelan in secondary schools, while the lecturer was selected due to their contribution to curriculum development and textbook writing.

The interview was conducted in depth to explore the views and experiences of the resource persons related to the challenges and opportunities in learning Javanese Gamelan using technology. The interview process was semi-structured, allowing flexibility for follow-up questions based on the informants' responses. Each interview lasted approximately 60–90 minutes and was conducted via online platforms. After the data was collected through interviews, observations, and documents, the researchers conducted open coding to identify key themes related to the use of technology in Gamelan learning. Furthermore, the researcher conducts axial coding to connect these themes and delves deeper into how the concept of techno-pedagogy can be applied effectively in teacher preparation and the learning process. Finally, selective coding is carried out to formulate theories or recommendations that can be used in educational practice.

3. RESULTS AND DISCUSSION

The challenge of teaching traditional music, particularly Javanese Gamelan, in Indonesia's digital era requires an innovative approach to attract students' interest and appreciation. One potential solution is the techno-pedagogical approach, which integrates technology into teaching strategies to enhance both learning effectiveness and student outcomes. This approach is particularly relevant in addressing challenges such as limited resources, access, and time constraints that often hinder the implementation of Javanese Gamelan learning in schools. By utilizing technology, students can engage in self-directed learning while experiencing an interactive and immersive learning process.

Thanks to technology, content may be presented in a wider variety of ways. Examples include anytime, anywhere access to video courses, interactive simulations, and learning applications. Additionally, this approach can enhance students' learning experiences by promoting cooperation via digital platforms between educators, gamelan practitioners, and students. Therefore, the techno-pedagogical approach helps to maintain traditional music culture while simultaneously equipping students to deal with the demands of the digital age.

The role of teachers in preparing learning using techno-pedagogy is very crucial. Teachers must have competence in integrating technology into the Javanese Gamelan learning curriculum. This includes a deep understanding of relevant M-Learning software and applications, as well as the ability to create and edit effective tutorial videos. To ensure that technology is used to assist educational goals rather than merely as an extra tool, teachers must be able to construct learning techniques that integrate technical features with pedagogy. As such, training and professional development for teachers is an urgent need to ensure they are ready to adopt and implement techno-pedagogical approaches effectively.

In this study, the research data that has been analyzed based on in-depth studies from previous studies and from the results of interviews with resource persons, a strategy for using a techno-pedagogical approach whose function is to assist teachers in carrying out learning preparation steps that can be applied. There will be two methods of learning: face-to-face learning in the classroom and independent learning at home.

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Face-to-face Learning

In the face-to-face learning approach, the Virtual Gamelan application is introduced as a technological alternative to conventional Gamelan instruments. This Android-based application can be easily accessed via the Google Play Store, with several available options, such as Gatoel, e-Gamelan, Gamelan Balai, and Real Gamelan. However, rather than merely serving as a digital replacement for traditional instruments, the integration of virtual Gamelan applications requires a structured pedagogical framework to ensure that learning objectives are effectively met.

Previous research and product development studies have explored the potential of mobile applications in Javanese Gamelan education, primarily as a solution to accessibility challenges faced by schools with limited resources. These applications offer students the opportunity to experiment with Gamelan sounds, practice playing techniques, and reinforce theoretical knowledge without the constraints of physical instrument availability. However, the effectiveness of these applications depends on how they are incorporated into the learning process.

To maximize the benefits of Virtual Gamelan in classroom instruction, teachers must adopt a techno-pedagogical approach that balances digital interaction with traditional practice. This includes designing structured learning activities, setting clear learning goals, and facilitating hands-on experiences that bridge virtual and real-world Gamelan playing. Teachers play a critical role in guiding students to not only familiarize themselves with the digital interface but also develop an understanding of Gamelan's musical structure, playing techniques, and cultural significance. By integrating Virtual Gamelan as a complementary tool rather than a full substitute, this approach ensures that students gain both conceptual knowledge and practical skills, while also fostering greater appreciation for traditional music through modern digital engagement.

Independent Learning

In face-to-face learning, learning using virtual Gamelan in a mobile application still allows students to continue practicing together in a group even if they are not playing the original instrument. In addition, the experience of playing in this group helps students hone their coordination and communication skills, which are very important in Gamelan ensembles. However, when students need to learn independently, a different approach will be required.

To learn independently, video tutorials, which include detailed instructions on how to play the Gamelan instrument, are available for students to use. These video tutorials allow students to learn specific parts of Gamelan in more depth at their own pace. In addition, there is also a music minus one video that allows students to practice playing their own parts while listening to other ensemble parts. This method provides flexibility for students to improve their ability to play Gamelan independently.

The lesson videos and music minus one video may be added to the school's learning management system (LMS) platform, which students can view at any time using Google Classroom or Moodle. Teachers can guarantee equitable access to learning resources for every student by submitting course materials to the LMS. Moreover, by using an LMS, students may follow their learning in an ordered and structured way, repeat the provided information, and download videos to review.

Students can use these videos to practice independently at home, either at a predetermined time or when they feel comfortable. This flexibility is important in supporting different learning styles among students. With easy access to learning materials, students can not only deepen their understanding of Gamelan playing techniques, but also develop independence in learning. This will help students feel more confident when they return to practice with the group in the next session.

Teachers must prepare well in order for virtual Gamelan learning to function well. Teachers must have a deep understanding of the technology to be used, including how to record, edit, and upload tutorial videos as well as music minus one to the LMS platform. Additionally, teachers need to ensure that the videos are made clear and structured, so that students can easily follow every step given. This includes a detailed explanation of the techniques for playing the Gamelan, proper tempo setting, as well as practical examples that are relevant for different levels of students' abilities.

In addition to the technical aspects, teachers also need to consider an effective pedagogical approach in creating the video material. The material must be designed in such a way as to be able to maintain students' interest and motivation in learning independently. Teachers need to anticipate possible challenges that students may face, such as difficulty understanding certain techniques without direct guidance, so videos should include a variety of examples, variations, and problem-solving strategies. By preparing the material comprehensively, teachers can create a more personalized and in-depth learning experience, even though it is done independently and virtually. In this activity, the learning process requires the active role of students and will indeed be the responsibility of the students themselves.

An explanation of the activity model that needs to be prepared by teachers in the learning process can be seen in Figure 1.

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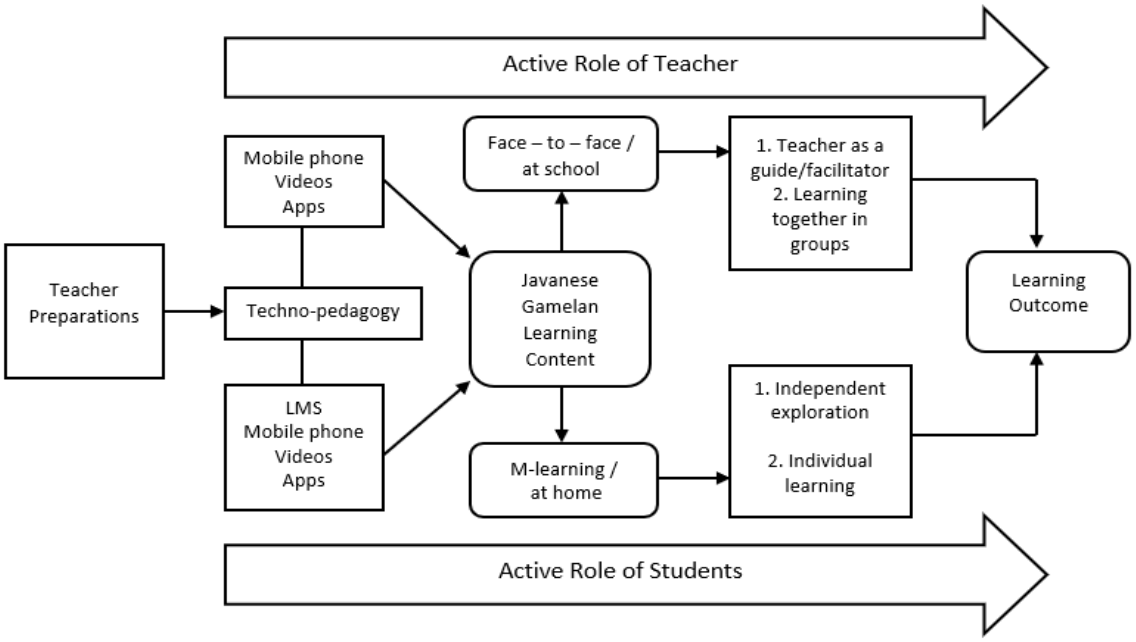

Fig. 1 – Model of Learning Javanese Gamelan using Techno-pedagogy Approach

Video Tutorial

In one of the learning process activities, teachers can prepare video tutorials that students can learn on their own. The process of creating a video with material taken from YouTube begins with determining the desired concept and theme. After that, the search for the relevant video is done through YouTube, making sure that the selected video has a Creative Commons license or permission that allows reuse. After finding a suitable video, the download is done using a safe and legal tool or website. It's important to pay attention to copyright and regulations regarding the use of content taken from YouTube to avoid violating the law.

Once the video material is downloaded, the next step is to insert it into an editing application, such as CapCut. CapCut is a video editing app available for mobile devices, known for its easy-to-use interface and comprehensive features. In CapCut, users can import videos, then start editing processes such as cutting, merging, or rearranging video clips. CapCut also provides a variety of tools for adding visual effects, text, stickers, and background music, which can help improve the quality of videos. Users can adjust the transitions between clips and add filters to give the video a certain feel.

The editing process ends with final detail adjustments such as adding sound, volume settings, and syncing the audio with the video. Once the video is finished editing, users can review the final result and make adjustments if needed. When everything is in place, the video is then exported from CapCut in the desired format and resolution. These final results are then ready to be uploaded to other platforms such as YouTube or social media, or to be kept as a personal archive. CapCut, with its creative features, allows for the creation of high-quality videos with ease, even for beginners.

Music Minus One Videos

Music minus one is a term that refers to a music recording format in which a single piece of an instrument or vocal is removed, so that the musician or singer can play or sing along with the recording (Banoe, 2013). This idea was originally used by musicians who wanted to practice or perform with musical accompaniment without the need for the entire ensemble to be present. This concept is particularly useful in music learning, as it allows students or musicians to practice with virtual "playmates", whether in a soloist situation or in a group. Music Minus One is also often used in concert or performance rehearsals, as well as in music education to provide an ensemble playing experience without having to present other musicians.

In the process of this learning activity, teachers can prepare videos with *the concept of music minus one* to help students practice independently at home. The music *minus one* video created will be a supporting material, allowing students to play Gamelan virtually with the help of customized musical accompaniment, directly from their mobile devices.

The following is an example of a minus one accompanying video display that can be made by teachers by using a video editing application to help students in playing Gamelan instruments with a minus one concept, the concept of display planning can be seen in figure 2 and figure 3.

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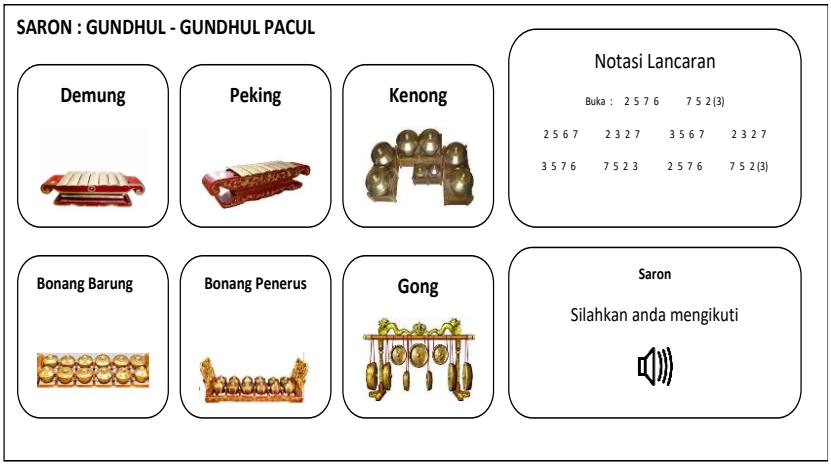

Fig. 2 – The Visual Concept of Music Minus One Video

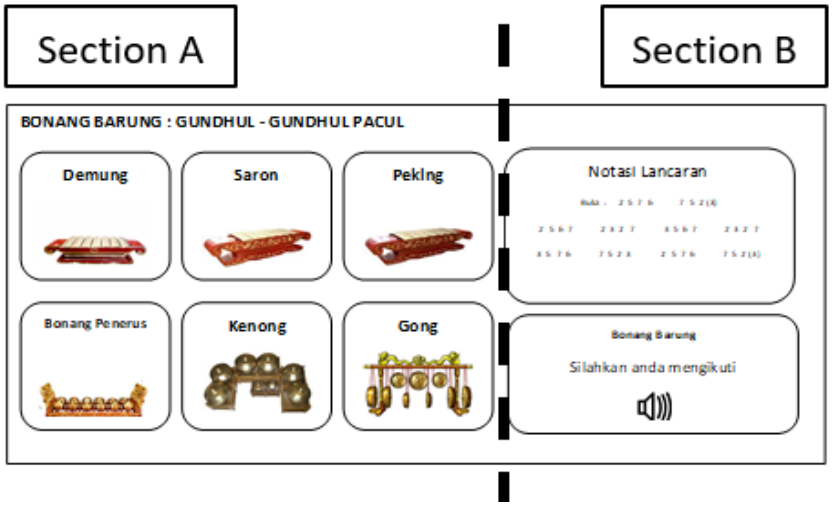

Fig. 3 – Section Separation of the Visual Concept of Music Minus One Video

The following is an example of video editing results that have been made to be used in playing along with Gamelan, as can be seen in figure 4.

Fig. 4 – Actual Music minus one Video

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In Figure 4 is the result of a music minus one video created by a teacher. The use of music minus one videos made by teachers to teach Gamelan, such as the song "Gundhul-gundhul Pacul", provides an interesting interactive experience for students. This video features images of Gamelan instruments such as saron, peking, bonang barung, kenong, and demung as well as musical notation. As if students were playing along with other musical instruments in a group, they could follow the music on the notation displayed. Students gain a better understanding of the role of each instrument in the composition of Gamelan individually and collectively thanks to the visual and sound display produced from each instrument.

This Gamelan music minus one video offers more than just an instrument-playing practice. With integrated visual and audio displays, students are invited to be actively involved in the learning process. They can follow the flow of the music through the visual guide of the notation while also hearing the harmony created by the entire Gamelan ensemble. Students not only learn to play their own parts but also learn to listen and adapt to playing the other instrument. This creates ensemble awareness and builds the collaborative skills that are essential in playing the Gamelan, where harmony between players is key to producing beautiful and harmonious music.

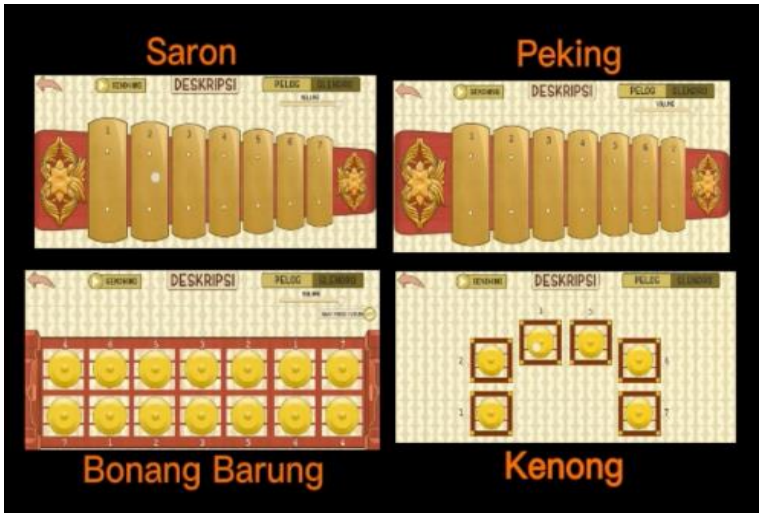

Fig. 5 Section A – Accompaniment Instrument Display

In this section A (figure 5), this accompaniment video serves as a companion in a Gamelan music minus one video, where each instrument is visually displayed along with the notation that must be played. When students play a song, for example "Gundhul-gundhul Pacul," they will be accompanied by sounds and images from other instruments seen on the screen. This display makes it easy for students to follow the flow of the music, recognize the role of each instrument in the ensemble, and familiarize themselves with the overall harmony.

When students play a certain instrument, such as a demung, they will hear the sound of other instruments such as the Bonang Barung, Kenong, Saron, and Peking which are played simultaneously according to the notation shown in the video. This visualization helps students not only to focus on their own instruments, but also to understand the context of the ensemble as a whole. This creates an experience that is as if students are playing music live in a group, even if they are learning independently or in more limited situations.

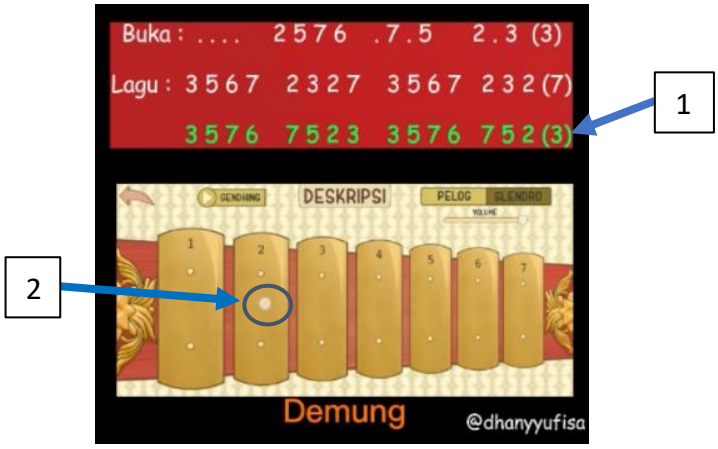

Fig. 5 Section B – Instrument Playing Guide Display

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Section B (Figure 6) is part of the Gamelan learning video which is divided into two main parts. The top, marked with number 1, indicates the notation of the notes to be played. These notations are arranged in a certain order according to the song being studied. The colors in those notes will change dynamically according to the tempo of the song, giving the player a visual clue as to when the notes should be played. This color change serves as an important guide to maintain order and harmony in the game, especially when practicing independently.

The bottom of the picture, marked with number 2 is a visualization of the Gamelan instrument being played, in this case of demung. Each demung bar is labelled with a number that corresponds to the notation at the top. When a particular note is played, a special sign or indicator will appear in the relevant bar, providing visual cobfirmation that the note is being hit. This helps students to better understand the relationship between number notation and the physical position of the instrument bar on the drum, thereby improving accuracy in playing.

These videoseffectively combine visual and audio guides to help students learn Gamelan more easily. With color-changing notation and indicators on the instrument bar, students can practice coordination between their sight and hearing. This approach also allows students to more quickly understand the structure of Gamelan music and develop instrument playing skills in an interactive and fun way, while maintaining harmony with the temo of the song being played.

The bottom of the picture, marked with number 2, is a visualization of the Gamelan instrument being played, in this case a demung. Each demung bar is labeled with a number that corresponds to the notation at the top. When a particular note is played, a special sign or indicator will appear in the relevant bar, providing visual confirmation that the note is being hit. This helps students to better understand the relationship between number notation and the physical position of the instrument bar on the drum, thereby improving accuracy in playing.

These videos effectively combine visual and audio guides to help students learn Gamelan more easily. With color-changing notation and indicators on the instrument bar, students can practice coordination between their sight and hearing. This approach also allows students to more quickly understand the structure of Gamelan music and develop instrument playing skills in an interactive and fun way, while maintaining harmony with the tempo of the song being played.

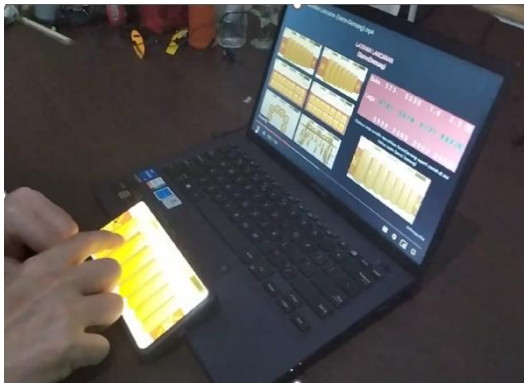

Fig. 7 – Implementation of Learning at Home

In the learning process shown in figure 7, the music minus one video that has been prepared by the teacher and has been distributed to students through the LMS, can be played on a laptop or computer, by displaying the gamelan instrument guide visually and audio. Students can play a simulation of a gamelan instrument on a smartphone that functions as a digital instrument, while a video played on a laptop displays musical notation and other instruments that seem to accompany the student's play. This method facilitates self-paced learning where students can follow the musical accompaniment live, providing a play experience that resembles a group practice situation even if it is done individually.

By using Music Minus One, it allows students to play gamelan with complete accompaniment without having to present an entire physical ensemble. With instrument simulations on smartphones, students can actively practice while listening to the accompaniment parts that have been recorded, reinforcing their understanding of the role of each instrument in the gamelan. This techno-pedagogical approach not only makes learning more interesting and interactive, but also helps to overcome barriers to access to traditional musical instruments, especially in the context of distance or independent learning. In this way, technology supports the preservation and appreciation of traditional music, integrating the beauty of gamelan culture with the ease of digital access.

With this music minus one video, students can feel a more practical and in-depth learning experience, as if they are in a joint exercise. This allows them to learn independently at home while still feeling together in the Gamelan ensemble. The use of technology like this also supports a techno-pedagogical approach to traditional music learning, where students can improve their Gamelan playing skills while maintaining their interest and appreciation for the cultural heritage of traditional Indonesia music. This multimedia integration also helps facilitate access to Gamelan learning in the midst of the challenges of the all-digital era, without having to reduce the essence and traditional values inherent in Gamelan music.

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4. CONCLUSION

The application of the concept of techno-pedagogy in Javanese Gamelan learning has great potential to improve the teaching and appreciation of traditional music among secondary school students. By combining modern technology with a pedagogical approach, teachers can make the learning experience more engaging and accessible and allow students to explore Gamelan through interactive platforms such as M-Learning. This approach not only helps students learn better about traditional music, but it also helps them learn more. The concept of the techno-pedagogical learning approach for Javanese Gamelan learning in schools has important implications for the development of the Cultural Arts (music) curriculum in schools. The flexibility offered in this learning design allows learning activities to be more interesting which is expected to pave the way to enrich traditional music culture in today's era. Integrating technology in traditional music education has the potential to be applied to other traditional music genres, broadening its impact beyond Gamelan learning. Openness to technological knowledge also has the potential to be applied to the learning of other traditional music genres. With tailored methods and media, this approach can make a significant contribution to efforts aimed at introducing and preserving traditional music for future generations. Additionally, it provides valuable opportunities for teachers to develop their skills and leverage digital media and technology to enhance their teaching methods.

Teachers need to adapt their teaching strategies to accommodate different learning styles and abilities to attract students' interest in learning. Previous studies also indicated that the use of applications and digital media in art education and music helped students to understand music concepts more quickly and in depth (Gorgoretti, 2019). Thus, the approach through applications and video music minus one in Java Gamelan learning not only strengthens existing learning methods but also enriches student experience in interacting with traditional music in a more modern and relevant way.

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