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The effectiveness of SAPE: A technology-based interactive learning media for enhancing solfeggio ability of senior high school students

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Abstract:
This study addresses the challenge of deficient solfeggio proficiency amongst Year 11 students at SMAN 01 Jagoi Babang, a limitation that invariably leads to suboptimal musical performance, particularly for individuals with diminished pitch perception. The primary objective was to rigorously evaluate the efficacy of the SAPE (Senang Aktif Piano Efektif / Happy Active Piano Effective) interactive media in enhancing solfeggio capabilities within the music curriculum. Employing a quantitative approach, the research utilised a quasi-experimental, non-equivalent control-group design within a two-cycle Classroom Action Research framework. This methodology facilitated the precise measurement of proficiency trajectories through comparative analysis. The participant cohort comprised 36 students identified with pitch-perception difficulties via a diagnostic assessment, who were subsequently allocated to homogeneous experimental and control groups through purposive sampling. Data were systematically gathered via a pretest-posttest practical examination targeting sight-reading, ear training, and sight-singing, along with a Likert-scale questionnaire to capture affective responses. The findings demonstrate that the experimental group, utilising the SAPE intervention, achieved consistently superior improvements in solfeggio proficiency compared to the control group subjected to conventional pedagogical methods. Furthermore, SAPE functions as a highly efficacious multimodal instructional tool, fostering active engagement, augmenting self-confidence, and enabling independent, offline practice. Ultimately, this study substantiates that innovative interactive media, particularly when integrating local wisdom, serve as a critical determinant in the successful delivery of secondary school music education.

Keywords: interactive media; modified classroom; enhancing solfeggio ability

Introduction

National policy has formally emphasised the standardisation of arts education, as reflected in the Regulation of the Minister of Education and Culture Number 85 of 2013 concerning Minimum Service Standards in the Arts. Within this framework, music occupies a central position as a medium for cultivating students' creativity and expressive capacity. Despite its recognised importance, music instruction in schools continues to face persistent challenges, particularly those related to students' competence in performing musical instruments (Bedu et al., 2025). At a broader level, Indonesia's relatively low Human Development Index (HDI), which has been linked to limited global competencies among its human resources, highlights the need for educational efforts that foster greater awareness and engagement among learners (Hartono et al., 2022).

The arts foster an essential element in developing students' creativity and aesthetic sensitivity, supporting the holistic improvement of their global competence, as global competence requires creativity and collaborative abilities. Art, as a subject taught in schools, requires a concrete approach that can raise students' awareness and concern for the quality of learning. The expectation is that the quality of education in Indonesia will improve, with a positive impact on Indonesia's Human Development Index globally. Therefore, learning models integrated with technology are highly strategic for enhancing the quality of learning.

In the context of music education, one strategic response to this issue is to strengthen students' solfeggio skills. Solfeggio is a foundational aspect of music learning, as it underpins students' ability to read musical notation accurately, maintain proper intonation, and develop a comprehensive musical understanding. However, the musical abilities of senior high school students remain constrained, particularly in notation-reading accuracy and pitch reproduction, resulting in learning outcomes that frequently fall short of the minimum mastery standards. Musical ability, in this sense, reflects students' cognitive competence in recognising and expressing musical elements, including rhythm, melody, and harmony (Alhafiz & Andriyani, 2025).

An initial assessment of music learning outcomes among eleventh-grade students at SMA Negeri 1 Jagoi Babang reveals that students' musical competencies have not yet reached an optimal level. Overall, students' achievement scores remain below the Minimum Mastery Criterion *(Kriteria Ketuntasan Minimal/KKM)* of 72 as stipulated in the Cultural Arts curriculum. This condition points to underlying weaknesses in the music learning process, particularly in the development of core musical skills, which are further exacerbated by limitations in educational quality and instructional time. Moreover, as SMA Negeri 1 Jagoi Babang is located within a designated 3T (underdeveloped, frontier, and outermost) border area, instructional

practices in Grade XI continue to reflect restricted utilisation of educational technology, especially interactive and audiovisual music technologies. Music instruction is predominantly characterised by one-directional presentation media, leaving limited opportunities for software-assisted musical practice that could otherwise facilitate the holistic development of students' musical abilities.

The limitations observed in students' musical achievement stem from several interrelated factors, with the instructional use of educational technology emerging as a central concern. At SMA Negeri 1 Jagoi Babang, music learning still has not incorporated practice-oriented audiovisual technologies in a meaningful way. Instruction continues to rely primarily on one-directional presentation media, while opportunities for musical practice supported by interactive instructional software remain limited. This approach contrasts with findings in recent literature, which consistently demonstrate that multimodal interactive media enhance musical learning by engaging visual and auditory processing simultaneously, increasing student engagement, and accelerating the acquisition of fundamental skills such as solmisation and intonation.

The persistence of this instructional pattern reflects a broader national challenge in music education, where the integration of information and communication technology (ICT) into classroom practice remains insufficient. Comparable issues are also reported internationally, particularly regarding pitch perception and notation mastery among learners with auditory processing difficulties, including those affected by congenital amusia (tone-deafness), a condition rarely addressed in digital learning interventions. In the Indonesian context, music instruction at the senior high school level continues to emphasise passive delivery modes, with limited adoption of interactive tools such as virtual piano applications.

Further, Whiteford & Oxenham (2018) view congenital amusia as a permanent neurological disorder that disrupts pitch recognition and melodic pattern perception, with broader consequences for spectral analysis of sound. Aryandari (2024) attributes low levels of music literacy in Indonesia to restricted learning experiences, inadequate teacher qualifications, and limited digital support, factors that reinforce one-way instruction and reduce hands-on musical engagement

Optimising the teaching and learning of music arts at the research site includes using interactive media as one alternative strategy. In this study, the use of interactive media called SAPE, an acronym for *Senang Aktif Piano Efektif* (Joyful, Active, Piano, and Effective), is recommended. This concept is based on the philosophy of presenting a piano-playing application that not only provides enjoyable and active emotional engagement but is also effective in its implementation in the learning process. The use of technology, through relevant software, can contribute

to the music creation process and foster engaging, attractive music learning experiences (Kim, 2023)

The name SAPE, which refers to a traditional musical instrument from West Kalimantan, also symbolises the integration of local wisdom to enhance the quality of musical mastery in the region. This approach is intended to improve the effectiveness of music education, particularly in relation to solfeggio skills. Solfeggio skills include listening (ear training), reading musical notation (sight reading), and singing musical notation (sight singing).

The previous research, which is in line with this study (Hidayah et al., 2024; Hutagalung, 2021), highlights the interactive media in arts learning in schools to introduce musical instruments, strengthening 4C presenting music materials, increasing student activity and response and highlighting the comparison of the effectiveness of the solfeggio method (18,9%) and drill (14%) for the improvement of choir vocals. However, the three studies did not have a confirmation of musical ability based on tone perception, tone-deaf characteristics, did not use a digital piano as a base for solmisation and intonation exercises, were still general cognitive, did not evaluate specific and affective psychomotor Solfeggio skills and engagement, and did not test changes in musical ability based on tone production empirically through a comparative pretest-post-test. Causal evidence emptiness on the increase in interactive piano-based solfeggio capabilities. As for this research, testing as well as the application of interactive piano-based SAPE media with a focus on improving tone literacy, ear training and sight-singing for students who experience tone perception barriers, because it positions technology as a multimodal musical practice device based on piano instruments, providing offline practice scenarios that are the main characteristics of SAPE.

However, the study did not examine basic pitch literacy, such as solmisation and intonation; did not rely on a digital piano; did not use a comparative experimental–control design; did not target tone-deaf learners; and focused on university students rather than senior high school students who require structured solfeggio practice. Taken together, these limitations indicate a clear research gap in the absence of empirical evidence regarding the effects of offline, interactive piano-based music software on senior high school students' solfeggio ability. Therefore, this study aims to examine the effectiveness of the SAPE interactive medium in improving solfeggio skills in music learning at SMAN 01 Jagoi Babang.

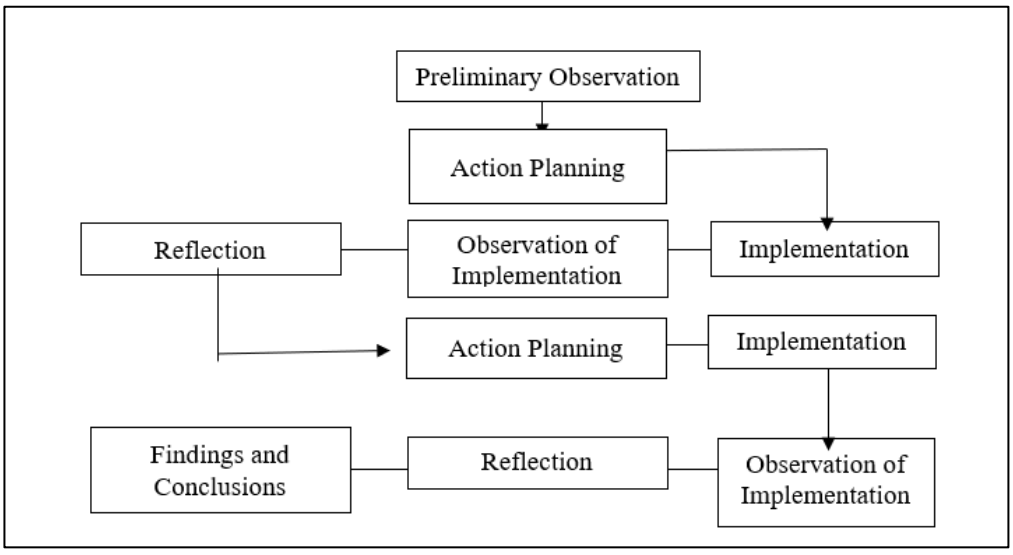
Method

This study adopted a quantitative, quasi-experimental design to examine the measurable effects of an instructional treatment on students' musical abilities. A quantitative approach was selected because the study aimed to objectively measure the effect of the SAPE learning media on improvements in pitch solmisation and vocal–auditory

intonation, rather than pursuing narrative or exploratory inquiry. The research employed a non-equivalent control group pretest–post-test design, which allowed for comparison of learning gains between an experimental group and a control group that were not randomly assigned. To mitigate threats related to group non-equivalence, both groups were balanced based on their pretest scores. The target population comprised all students at SMAN 01 Jagoi Babang, totaling 256 students. From this population, an accessible population of 95 eleventh-grade students from both science (IPA) and social science (IPS) streams was identified for experimental screening. The final sample consisted of 36 students who were identified as exhibiting tone-deaf or off-key tendencies and difficulties with reading musical notation, in accordance with the study's established inclusion criteria.

Purposive sampling was used because the target participants did not represent a general student population but rather a specific group requiring an intervention focused on pitch skills. After the participants were identified, the sample was divided evenly into an experimental group (18 students) and a control group (18 students). Group assignment was based on pretest score similarity to maintain comparability in baseline ability. Moreover, the study was carried out at SMAN 1 Jagoi Babang. It is a public senior high school located on Jalan Yamaker Sei Takert, Jagoi Village, Jagoi Babang Subdistrict, Bengkayang Regency, West Kalimantan Province. This place was chosen because it provided access to eleventh-grade students who were identified as tone-deaf and, therefore, required a targeted treatment, supported by supplementary learning media, to improve their solfeggio skills. The stages of the study were as follows:

Figure 1. Stages of the study



Problem Identification

At this stage, a preliminary observation was conducted to understand

the existing learning conditions. The identification process centred on eleventh-grade students at SMAN 01 Jagoi Babang, particularly their solfeggio abilities. This stage involved assessing whether students could be identified as 'tone-deaf' or 'pitch-impaired' and examining instructional needs related to integrating technology-based media into music education. The purpose of this stage was to establish a clear understanding of students' difficulties with solfeggio and the need for supportive instructional media. Planning

The planning phase was developed based on the results of the initial problem identification. This plan outlined a set of action strategies designed to improve, develop, or modify students' learning behaviours and musical skills in line with the intended objectives. The planning process was flexible and allowed adjustments in response to classroom conditions and emerging instructional needs.

Implementation

During the implementation phase, the researcher carried out the planned actions as outlined in the previously formulated plan. These actions were intended to improve and develop the learning conditions identified as problematic. In this study, the teacher facilitated solfeggio learning by employing interactive media during instruction, including activities such as reading musical notation and recognising pitch using the SAPE application during the learning process.

Observation

Observation functioned as the primary data collection method during the action phase. The researcher systematically recorded and evaluated students' responses and any changes resulting from the implemented actions, particularly in relation to learning behaviour and learning outcomes. In this context, students practised reading notation and performing solfeggio using the interactive media, either individually or in groups, while the teacher monitored the development of their solfeggio abilities throughout the learning activities.

Reflection

Reflection constituted the stage in which data and findings obtained during the implementation were analysed, evaluated, and interpreted. Through this process, the researcher reviewed the impact of the actions carried out to determine necessary adjustments and inform subsequent steps in the action research cycle.

Data analysis involves the procedures used to process and interpret collected data to uncover meaningful information as a foundation for decision-making in problem-solving. Collected survey data is processed through several phases, including editing, coding, data entry, and cleaning (Notoatmodjo, 2018). The data analysis was performed in a hierarchy following the purpose of hypothesis testing by the following sequence: Descriptive statistics to examine the score profile of each indicator, Comparative analysis of improvement in solfeggio ability

between the experimental and control groups based on gain scores, Paired-samples t-tests on affective questionnaire data across instructional cycles and Interpretation of affective–psychomotor relationship

By following the procedures above, the effectiveness of the learning media was assessed not only through students' practical performance scores, but also by examining the contribution of affective factors to the success of solfeggio practice. All performance tests were conducted individually and were validated using audio and video recordings. To ensure objectivity in psychomotor assessment, students' performances were independently evaluated by two raters through a double-rating procedure.

Finding and Discussion

Findings

This study was conducted at SMA Negeri 01 Jagoi Babang, a public senior high school in Bengkayang Regency, West Kalimantan Province. The location is chosen for its unique socio-cultural characteristics, including the SAPE traditional musical instrument, which serves as inspiration for developing the study's interactive media. Moreover, the pre-observation results showed that the music arts learning in the class faced some challenges, especially in students' Solfegio abilities. The total number of students in class XI at SMA Negeri 01 Jagoi Babang is 95, including 27 students in class XI IPA, 34 in class XI IPS 1, and 34 in class XI IPS 2. The study conducted singing practice with 95 students from July 16-18, 2025, as part of a pre-cycle process to identify students who are tone-deaf or have low solfeggio abilities.

Based on initial observations and diagnostic tests, 36 students were identified as having difficulty distinguishing tones (tone deaf) and reading musical notation. As a follow-up to this process, 36 students were determined as the research sample. Of the 36 students, the researcher divided them into two groups by considering the homogeneity of the initial test results, namely:

Table 1. Pre-Cycle Output

Class Classification	Number	Treatment
Experimental	18 students	Interactive Media
Control	18 students	Conventional Media

The number of participants was determined using a quasi-experimental, non-equivalent control-group design, allowing comparison between the experimental and control groups. The research employed observation, testing, and questionnaires. The following data demonstrates the Solfeggio ability results from cycle I of the experimental and control classes.

The Results of Solfeggio Ability for the Experimental Class in Cycle I

Table 2 shows the results of the Solfeggio ability tests for the experimental and control classes in Cycle I:

Table 2. Solfeggio Ability Tests for the Experimental and Control Classes in Cycle 1

Student Code	Indicator			Average	Category
	Sight Reading	Ear Training	Sight Singing		
Average of Experimental Class	67.89	69.50	61.67	66.35	Good
Average of Control Class	59.39	57.56	55.61	57.52	Fair

The experimental class using the SAPE interactive media achieved an average score of 66.35, categorised as good, compared to the control class's average score of 57.52, categorised as fair. This 8.83-point difference confirms the positive impact of media use since cycle I between the experimental class given interactive media and the control class given conventional media.

The Results of Solfeggio Ability for the Experimental Class in Cycle II

Table 3 shows the results of the Solfeggio ability in Cycle II for the experimental and control classes:

Table 3. Solfeggio Ability Tests for the Experimental and Control Classes in Cycle II

Student Code	Indicator			Average	Category
	Sight Reading	Ear Training	Sight Singing		
Average of Experimental Class	72.78	73.94	69.06	71.93	Good
Average of Control Class	62.11	60.17	60,50	60.93	Fair

The experimental class using the SAPE interactive media achieved an average score of 71.93, categorised as good, compared to the control class's average score of 60.93, categorised as fair. This 11-point difference confirms the positive impact of media use in cycle II, with the experimental class using interactive media and the control class using conventional media. Looking at each indicator, the experimental class achieved the highest score in ear-training (87) and the lowest in the same indicator (60). Meanwhile, the control class achieved the highest score of 72 in sight-reading, and the lowest in both sight-reading and aural reading, with a score of 50.

Response to Interactive Media Utilisation

Students' responses to learning media are an effective aspect that directly influences the effectiveness of music learning, particularly in solfeggio skills, according to the Technology Acceptance Model and the

ARCS learning motivation model. The students' acceptance of technology is determined by two main factors: perceived usefulness and perceived ease of use. Therefore, in addition to measuring practical solfeggio skills, a systematic evaluation of students' perceptions of the SAPE interactive media was also conducted. The instrument used was a questionnaire based on a Likert scale of 1–5 on 10 indicators, covering two main dimensions: (1) Material Presentation, consisting of 6 indicators, which assess the quality of content, appearance, animation, sound, and language; and (2) Media Effectiveness consisting of 4 indicators, which assess practicality, repeatability, ease of learning, and motivation. Measurements were conducted after learning in Cycle I and Cycle II. The data were then analysed descriptively, supplemented with inferential analysis, and linked to the results of solfeggio practice.

Table 4. Results of Responses to the Utilisation of Interactive Media

Indicator	Sub Indicator	Average Cycle I	Cycle II	Difference (II-I)
Material Presentation	Suitability of video content to teaching material	3.72	4.06	0.34
	Attractive appearance	3.78	4.72	0.94
	Dancing animation presentation	3.67	4.11	0.44
	Clear sound	3.33	4.11	0.78
	Language presented is easy to understand	3.50	4.00	0.50
	Language presented is clear	3.56	4.17	0.61
Media Effectiveness	Practicality of Media	3.61	4.22	0.61
	Media can be used repeatedly	3.56	4.50	0.94
	Media facilitates learning	3.72	4.39	0.67
	Media can motivate learning	4.00	4.33	0.33
Overall Average		3.65	4.26	0.62

Overall, the average response increased from 3.65 in Cycle I to 4.26 in Cycle II. The largest increase was observed in the indicators of attractive appearance and media use, each by +0.94 points. This indicates that technical and design improvements in the SAPE media have a significant impact on student perceptions. Cross-analysis of solfeggio ability and motivation, based on the research results, showed that students who rated motivation to learn and ease of use highly also experienced significant increases in sight-singing scores. This aligns with the theory that affective factors (motivation, perceived usefulness) strengthen cognitive and psychomotor performance (Pintrich & Schunk, 2002). Thus, the success of the SAPE media in improving solfeggio ability is not only a technical matter but also the result of students' positive acceptance of the media. The results of the analysis of student responses indicate that the SAPE implementation received increasingly good acceptance from Cycle I to Cycle II. Technical improvements (clear sound, a more attractive appearance, offline access) and pedagogical improvements (group practice, reflective guidance) contributed to

improvements in student perceptions. This improvement was statistically significant and consistent with the results of the solfeggio practice test, strengthening evidence that the SAPE media innovation is holistically effective across cognitive, psychomotor, and affective aspects.

Discussion

In terms of media development, SAPE was designed as an interactive flipbook that combines short texts, musical notation, audio examples, and digital link-based quizzes. Proper integration not only creates dynamism but also functions as a pedagogical strategy, as audiovisual dynamics can be implemented using audiovisual displays (Huda & Pertiwi, 2018). The strength of SAPE lies in its role as a medium for active pitch literacy and ear training, while simultaneously presenting information. The implementation of these components is based on Paivio's dual coding theory, which emphasises the importance of processing information through visual and auditory channels simultaneously to strengthen understanding. Paivio emphasises that information is more effective when verbal and visual elements are combined. This integration strengthens memory information encoding, thereby enhancing learning comprehension. As shown in a study by Chumairoh & Fradana (2025), audiovisual media can enhance effective learning by increasing students' interest, concentration, and understanding. Thus, audiovisual media function as multimodal exercises that can enhance both theory-based and practice-based skills. The media created in the Canva application, refined by uploading it to the Heyzine platform, is complemented by offline versions in PDF packages and audio files for seamless access. This is supported by Canva's appeal as an interactive medium and its ability to improve students' critical thinking (Nurul Asri, 2019).

Furthermore, Celik (2021)argues that digital applications integrated into learning have been shown to foster students' collaboration and creativity. During implementation, it is necessary to ensure students are in a comfortable, conducive environment and to incorporate interactive exercises, motivation and learning strategies are needed to enhance learning effectiveness (Hongsuchon et al., 2022).

At the observation stage, it is carried out systematically using student activity observation sheets, field notes, and audiovisual documentation to monitor the plan's implementation and identify technical and pedagogical obstacles. The data obtained served as the basis for reflection, an evaluative meeting between the researcher, teacher, and observer to review cycle results and formulate improvements for the next cycle. This reflection process demonstrates how SAPE implementation is not simply the use of digital media but also part of a continuous cycle of improving the quality of learning. SAPE media not only provides technical benefits in terms of access to materials but also pedagogically strengthens students' motivation, engagement, and confidence in

learning solfeggio. A study by Suriyanisa et al. (2024) emphasised the need to foster collaboration, active interaction, and student participation through a technology-integrated cooperative learning model. SAPE media, which integrates text, audio, visuals, and interactive exercises, is an effective instrument to be tested within this framework, due to its ability not only to present material innovatively but also to be flexibly adapted based on reflections between cycles. Solfeggio learning has tended to be traditional, with a classical approach and minimal technology integration. Auditory training is essential for listening to music and aims to improve rhythmic and pitch accuracy (Hutagalung, 2021). Changing times demand innovative approaches during learning (Ramadhan, Imran, et al., 2024). The implementation of SAPE fills this gap by presenting digital media rooted in the principles of music pedagogy while also embracing local wisdom, drawing inspiration from the Kalimantan SAPE instrument.

The Solfeggio Ability Cycle I

The Cycle I practical test was conducted after the implementation of the SAPE interactive media in the eighth meeting. This test aims to measure students' Solfeggio ability through three main indicators: sight-reading, ear-training, and sight-singing. The instrument used consisted of nine questions, three for each indicator. The assessment process was conducted individually, with each student being asked to read notation, imitate notes or rhythmic patterns, and sing simple melodies according to the given instructions. The assessment was conducted using a standard rubric with a score range of 0-100, which considers pitch accuracy, rhythmic accuracy, and fluency in reading and singing. The test results were then used to calculate a score for each student, an average score for each indicator, and an overall class score. The data are presented in two groups: the experimental class using SAPE media and the control class that continues to learn using conventional methods. The experimental class using SAPE interactive media achieved an average score of 66.35, in a good category, compared to the control class, which achieved 57.52, in a fair category. This difference of 8.83 points confirms the positive impact of media use in cycle I, as measured between the experimental class given interactive media and the control class given conventional media. Strategic aspects of learning are needed to address limitations across various dimensions as the quality of learning often falls short in these areas, such as the lack of pre-teaching approaches and the failure to meet the minimum passing criteria in the assessment.

Research findings at SMAN 1 Jagoi Babang indicate that, per indicator, the highest achievement of the experimental class was in the ear-training indicator, with a score of 84, and the lowest was in the sight-singing indicator, with a score of 45. At the same time, in the control class, the highest score was only 70 on the sight-reading indicator, and the lowest was also on the sight-reading indicator, with a score of 40. There were 3

students in the experimental class and 16 students who showed less than optimal results despite the specific learning media being implemented, indicating obstacles on both the technical and psychological sides, such as difficulty regulating intonation or a lack of confidence when singing. These findings indicate that solfeggio practice requires scaffolding support. The use of the offline version of SAPE, the integration of conventional media in the form of a piano, and the formation of small groups constitute corrective strategies. This relates to the complex cognitive-constructivist approach experienced by students, as described by Salsabila & Muqowim (2024). Of course, this finding is important because it becomes material for reflection for improvement in the next cycle, especially by adding additional audio exercises, using the offline version of SAPE in the experimental class and adding exercises with conventional media, namely piano, facilitated by the school in the control class, as well as the formation of small groups to increase self-confidence. Therefore, the solution is to train students to think more deeply by using engaging media (Gopinath & Santhi, 2021).

The Solfeggio ability in cycle II

After reflecting on Cycle I, learning in Cycle II focused on addressing the challenges that had emerged previously. Several strategies implemented included adding a variety of audio exercises, forming small groups to boost student confidence, and providing offline SAPE packages to address technical network challenges. Throughout the cycle, teachers utilised the intensive role of peer tutors for personal support and created a collaborative learning environment (Timonera et al., 2023). This indicates that heterogeneous group-based learning strategies provide affective interventions that reduce or even eliminate learning anxiety and address students' low self-confidence, thereby encouraging their engagement in solfeggio practice.

In Cycle II, a practice test was administered again at the end of the cycle, using the same instrument: nine questions (three for sight reading, three for ear training, and three for sight-singing). The test was administered individually, with audio recordings for verification, and double scoring by two assessors to ensure objectivity. The results showed a more significant improvement than in Cycle I in both the experimental and control classes, with the experimental class consistently outperforming. According to Tillander (2011), this improvement was driven by the utilisation of digital media, which enabled students to explore new ideas. The experimental class using SAPE interactive media achieved an average score of 71.93, categorised as good, compared to the control class's 60.93, categorised as fair. This 11-point difference confirms the positive impact of media use in cycle II, comparing the experimental class given interactive media with the control class given conventional media. When viewed per indicator, the highest achievement of the experimental class was in the ear-training indicator, with a score of 87,

and the lowest was in the same indicator with a score of 60, while the control class only achieved the highest score of 72 in the sight-reading indicator and the lowest was in both the sight-reading and ear-training indicators with a score of 50. As for its relation to pedagogical theory, this treatment includes implications of the Dual Coding theory (1971). This theory states that humans process information through the main channels of verbal and visual information (Pasira & Sukirman, 2024). Previously, in Cycle I in the experimental class, there were 3 students in the fair category and 15 in the good category. This increased in Cycle II, with 1 student in the very good category and 17 in the good category. Previously, in Cycle I in the control class, there were 2 students in the good category and 16 in the fair category. It increased in Cycle II, with 6 students in the fair category and 16 in the good category. This study aims to demonstrate the effectiveness of implementing interactive media in improving students' solfeggio skills. Interactive learning methods motivate students by leveraging adaptive technology (Suriyanisa et al., 2024).

Compared with cycle I results, the experimental class showed a significant increase in scores, from an average of 66.35 in cycle I to 71.93 in cycle II. There was an increase of 5.58. There was also an increase in each indicator with the specification of the sight-reading indicator from an average score of 67.89 to 72.28, an increase of 4.39, in the ear-training indicator from 69.50 to 73.94 an increase of 4.40 and the sight-singing indicator from 66.35 to 71.93 an increase of 5.58, indicating that additional strategies in the form of small group exercises and increasing the number of audio exercises were very effective in helping students overcome vocal barriers. However, with the intensive use of conventional media and the focus on solfeggio skills, the control class also showed an average increase, although not as significant as in the experimental class, namely from 57.52 in cycle I to 60.93 in cycle II, an increase of 3.41. According to Wijaya et al. (2019), the use of technology drives changes in the education sector. As interactive media, SAPE incorporates the Canva application and the Heyzine platform in the testing process, which form part of the stimulus aspect and generate responses and there was also an increase in each indicator, in the sight-reading indicator from an average value of 62.11 to 59.39 there was an increase of 2.72, in the ear-training indicator from 60.17 to 57.56 there was an increase of 4.40, and the sight-singing indicator from 66.35 to 60.50 there was an increase of 57.52. In other words, SAPE media has been proven superior in improving students' cognitive aspects and musical skills in Solfeggio material.

Response to Interactive Media Utilisation

Students' responses to learning media are affective factors that directly influence the effectiveness of music learning, particularly in solfeggio skills. According to the Technology Acceptance Model and the ARCS learning motivation model, the students' acceptance of technology is

determined by two main factors: perceived usefulness and perceived ease of use. Therefore, in this study, in addition to measuring practical solfeggio skills, a systematic evaluation of students' perceptions of SAPE interactive media was also conducted.

This indicates that technical and design improvements in SAPE media have a significant impact on student perceptions. According to Ibraimkulov et al. (2022), implementing inclusive education by integrating social life. Students who perceive learning as relevant to their social lives tend to be more confident, more willing to engage in vocal expression, and more consistent in practice, thereby directly improving intonation accuracy and rhythmic precision in sight singing. A cross-analysis of solfeggio ability and motivation based on the research results showed that students who rated learning motivation and ease of use highly also experienced significant increases in sight-singing scores—learning motivation and the ease of using the interactive SAPE media act as mediators that engage students in the learning process. This aligns with the theory that affective factors (motivation, perceived usefulness) strengthen cognitive and psychomotor performance (Chumairoh & Fradana, 2025). Thus, the success of SAPE media in improving solfeggio ability is not only a technical aspect, but also the impact of students' positive acceptance of the media. The results of the analysis of student responses indicate that SAPE implementation received increasingly good acceptance from Cycle I to Cycle II. Technical improvements (clear sound, more attractive displays, offline access) and pedagogical improvements (group exercises, reflective guidance) contributed to improving student perception. This improvement was statistically significant and consistent with the results of the solfeggio practice test, further strengthening evidence that the SAPE media innovation is holistically effective across cognitive, psychomotor, and affective domains. A consistent pattern of improvement in students' solfeggio abilities was observed in both the experimental and control classes, with greater gains in the experimental class using SAPE interactive media. Questionnaire data showed that students' perceptions of SAPE media increased significantly from an average of 3.65 in cycle I to 4.26 in cycle II.

SAPE media serves not only as a technical aid but also as a pedagogical tool, creating a more meaningful learning experience. The improvement in solfeggio ability in the experimental class is inseparable from the use of SAPE interactive media, which was designed to integrate visual and auditory aspects. During the learning process, it is important to relate prior and important knowledge to students, then integrate it with interactive media (Bao & Koenig, 2019; Mills, 2016; Shen et al., 2017). The improvement in solfeggio in the experimental class indicates that SAPE functions as an audiovisual learning aid and as a means of building a cognitive bridge between students' initial musical knowledge and the

much more complex demands of solfeggio. In the sight-reading indicator, students more easily understand musical symbols because the media presents notation with interactive animation and accompanying audio. In line with what was conveyed, the media facilitates understanding. This facilitates easier understanding of complex concepts. With a synchronous combination, students can more effectively connect symbolic representations with auditory experiences.

For the ear training indicator, the SAPE me-ia provides a repeatable audio feature that enables students to practice pitch perception independently. Improvements made in cycle II, such as providing offline audio files, have been shown to improve students' assessments of the clear sound indicator and the reusability of the media. This aligns with the findings of Yadav & Zeghidour (2022), who stated that repeated audio playback has implications for independent learning. For the sight-singing indicator, students' success in singing notation more accurately in cycle II is closely related to the affective dimension, as demonstrated through questionnaire responses. Many students stated that SAPE media motivated their learning (the mean increased from 4.00 to 4.33). This supports the ARCS motivation theory Keller, 2006, specifically the Attention (attractive appearance) and Confidence (ease of use and repeatability) components. The findings of their study (Ramadhan, Thoharudin, et al., 2024) also demonstrate the potential for integrating interactive media to address subject learning challenges and effectively develop engaging and meaningful learning experiences across various disciplines. With a more attractive appearance and clearer sound, students felt more confident singing during the lesson, even those who were initially shy or had difficulty imitating notes. The perceived usefulness dimension was reflected in the increase in the score for the indicator of ease of learning, while the perceived ease of use was seen in the indicator of media practicality. Both directly contributed to increased student motivation, which then impacted the results of solfeggio practice.

The use of interactive SAPE media has limitations when teachers do not provide offline access in schools, including in 3T regions, due to limited internet connectivity or network availability. In addition, appropriate learning strategies are required to ensure that students actively provide feedback when using the interactive SAPE media, so the user experience can be continuously improved.

Conclusion

The implementation of SAPE not only broadened instructional variation in music education but also increased students' active engagement, making it responsive to the demands of ICT-based learning and the integration of local wisdom. The use of SAPE interactive media led to a clear increase in students' solfeggio skills, particularly in sight-reading, ear-training, and sight-singing. These trends show that learning

using SAPE facilitated greater growth in musical talent than the conventional strategy used in the control class. Students' responses to the use of SAPE also increased exponentially, with the mean rising from 3.65 in Cycle I to 4.26 in Cycle II. This positive response is associated with increased learning motivation, which in turn supported stronger outcomes in solfeggio practice. Despite the results, the current study was limited to one school; thus, implementing SAPE media in other school contexts or at the higher education level would extend the current findings to confirm its effectiveness in a more diverse context. All in all, this study underscores the importance of integrating technology and local wisdom in musical art learning.

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