Design, Development, and Evaluation of an Interactive Multimedia Resource for Teaching Kadazandusun Gong Music in Malaysia

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Abstract

In Malaysia, the Kadazandusun gong ensemble, locally known as *sompogogungan*, is a recognised form of indigenous musical heritage in the state of Sabah and has increasingly been introduced into formal and co-curricular school contexts, although its implementation is uneven. This study reports on the design and evaluation of an interactive multimedia instructional resource developed to support the teaching and learning of the Kadazandusun gong ensemble in educational settings. Guided by the ADDIE instructional design framework, the resource was structured through the organisation of core conceptual topics and performance-related content into clearly defined instructional units and learning outcomes. A mixed-methods approach was employed. Quantitative data were obtained through questionnaire-based evaluations conducted by specialists in music education and educational technology and analysed using descriptive statistics. Qualitative data were collected through semi-structured interviews with educators/trainers and students following implementation in a school ensemble context. The findings show high ratings for instructional design criteria, content components, and learning outcomes, while learning activities received more moderate evaluations, pointing to areas requiring further refinement. Overall, the results suggest that the multimedia resource is appropriate for instructional use when implemented alongside hands-on ensemble practice.

Keywords: gong ensemble, indigenous music, instructional design, interactive multimedia, music education

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Introduction

Kadazandusun gong music is widely recognised as an indigenous musical tradition of Sabah, a Malaysian state on the island of Borneo. The music is performed in a range of ceremonial and social settings, including weddings, *Kaamatan* (harvest festival), and other community events. It is typically realised through an ensemble known as *sompogogungan*, in which each gong contributes a distinct rhythmic and sonic role within the overall texture. A *sompogogungan* comprises six to seven gongs of varying sizes and pitches. The largest gong, the *tawag*, provides the underlying pulse, while the smaller gongs, including the *bandi*, articulate more complex rhythmic patterns that require close coordination among performers (Matusky & Tan, 2017).

Although the *sompogogungan* ensemble has traditionally been associated with community-based milieux, it has increasingly been presented in urban settings and formal cultural platforms. At the same time, changes in lifestyle and performance contexts have raised practical questions about continuity, transmission, and access. In response, local groups and organisations have undertaken various initiatives to introduce Kadazandusun gong music into formal education and to present it through cultural programmes and exhibitions (Loh, 2019). These developments position education as a key site for sustaining knowledge of the ensemble's structure, performance practices, and musical functions.

Formal music education contributes to the transmission of traditional music through organised learning contexts, documented resources, and established pedagogical practices. In school settings, traditional ensemble programmes provide students with practical musical experience and place local repertoires within recognised educational goals. Research on ensemble learning has shown its capacity to develop cultural awareness, social interaction, and collaborative skills (Campbell, 2004; Elliott & Silverman, 2015), as well as to encourage engagement with music as a socially situated practice that connects to students' own communities (Green, 2008). From this perspective, structured instruction offers a workable approach to maintaining traditional musical knowledge within contemporary education.

This study proceeds from the view that the teaching of heritage-related musical content in schools depends on the availability of carefully designed instructional resources. It is framed as an instructional design and evaluation study rather than a cultural or ethnographic investigation of gong music practices. The research documents and organises performance-related content associated with Kadazandusun gong music, as performed in the *sompogogungan* ensemble, for use in formal and co-curricular music education. Particular attention is given to the presentation of this content through interactive multimedia materials intended for structured classroom instruction.

Digital and multimedia tools make it possible to document performance elements and ensemble coordination through integrated audio-visual materials, with relevance for the development of practical musical skills (Hallam, 2010). At present, instructional content related to Kadazandusun gong music is unevenly documented and inconsistently incorporated into school curricula. By identifying key performance features, organising them into instructional units, and evaluating the

suitability of multimedia resources for classroom use, this study aims to strengthen the teaching of Kadazandusun gong music within contemporary school settings and in relation to established educational standards. The research objectives of this study are as follows:

1. To identify the primary performance elements of the *sompogogungan* for instructional purposes;
2. To organise *sompogogungan* performance content and instructional approaches into an interactive multimedia format for use in school-based music education;
3. To obtain evaluations from music education specialists on the design development of interactive multimedia teaching and learning resources for the *sompogogungan*; and
4. To gather feedback on the effectiveness and suitability of the interactive multimedia materials as instructional tools for incorporating the *sompogogungan* into formal and school settings.

Figure 1. The main author with the Kampung Kinapulidan gong ensemble, Ranau. Photograph by Muhammad Solehudin Tukiman.

Literature Review

Digital teaching and learning technologies are widely used in contemporary education. As these technologies continue to develop, educational institutions have increasingly adopted them to enhance engagement, improve learning experiences, and prepare students for participation in a technology-dependent society. This literature review examines the role and significance of digital instructional technology in education, outlines key challenges, and considers its use in cultural heritage transmission and heritage-related learning contexts.

Instructional Digital Technology

Digital technology in education refers to the use of devices, software, tools, and related resources to support teaching and learning processes (Mohd. Nizam & Mahayuddin, 2019). These include learning management systems (LMS), interactive whiteboards, educational applications, virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) systems. The demand for more engaging, personalised, and accessible learning environments has driven the increasing adoption of educational technologies (Selwyn, 2022). Early efforts to digitise education began in the 1980s with the introduction of computers in schools (Bates, 2019). Subsequent developments, including the internet, mobile technologies, and cloud-based platforms, have reshaped the educational landscape, and digital technology now forms a core component of contemporary education rather than serving merely as a supplementary tool.

Apprehensions have nevertheless been raised regarding over-reliance on digital technologies in educational contexts and their actual contribution to learning outcomes. Further investigation is required to determine whether these tools genuinely support learning or function primarily as sources of entertainment. Hwang et al. (2020) examined the use of gamification in education and reported positive effects on student motivation and engagement. Their study found that the application of educational games in mathematics led to a 25% improvement in performance among more than 200 high school students when compared with conventional teaching approaches. One important advantage of digital technologies lies in their capacity to support individualised learning through adaptive instruction. Interactive multimedia tools allow for the monitoring of student performance and the modification of instructional materials to address individual learning needs. Kizilcec et al. (2021), in a study on technology use in higher education, reported that students who engaged with adaptive learning systems achieved higher academic results and expressed greater satisfaction with their learning experiences.

Platforms such as Google Classroom, Microsoft Teams, and Zoom are now commonly used for communication and collaboration between teachers and students in both physical and virtual learning environments. Martin and Ertzberger (2019) found that participation in collaborative online learning activities was associated with stronger performance in group-based tasks and improvements in critical thinking. More broadly, the integration of digital technologies into education contributes to the development of skills required in contemporary society, with Voogt and Roblin (2020) noting that students who develop these competencies through formal education are more likely to succeed in their careers.

Issues in Instructional Digital Technology

Despite its transformative potential, the use of instructional digital technology presents a range of pedagogical, social, and psychological challenges that may limit its effectiveness. One persistent issue relates to educational inequality. The digital divide extends beyond access to devices and stable Internet connections to include differences in digital literacy and the quality of technology use. Students from

economically disadvantaged backgrounds may lack appropriate devices, reliable connectivity, or suitable learning environments, resulting in what is often described as a "homework gap." Moreover, research shows that even when access is available, technology use varies across educational contexts. For instance, in under-funded schools, digital tools are often applied to basic skill reinforcement, whereas wealthier institutions tend to use them for higher-order learning such as creative and critical thinking. This disparity reflects a "second-level digital divide" in pedagogical practice, with implications for ongoing educational inequality (Reich & Ito, 2017).

The efficacy of digital tools is contingent upon how they are incorporated into instructional design. A recurring concern involves the disconnection between technology use and pedagogical objectives, whereby tools become the focus rather than the means of learning. Poorly designed multimedia resources may impose cognitive overload and impede comprehension and information processing. Additionally, constant digital notifications and the promotion of multitasking can disrupt sustained attention, which is essential for deeper learning. Clark (2023) writes that technology often amplifies existing teaching practices, that is, weak pedagogy may simply be transferred into digital formats without meaningful improvement. Prolonged screen exposure has also been associated with digital fatigue, sleep disruption, and reduced social interaction (Zuboff, 2019). These concerns point to the need for technology use to be guided by sound pedagogical principles that prioritise equity and learner well-being.

Educational Technologies in the Transmission of Cultural Heritage

Cultural heritage refers to practices, traditions, and other intangible forms of cultural expression transmitted across generations within communities. In the context of globalisation, concerns about continuity have drawn attention to the role of education in facilitating the transmission of, and sustained engagement with, culturally specific knowledge. Instructional technologies, including digital media, multimedia applications, and interactive platforms, are discussed in the literature as means of documenting and transmitting cultural knowledge. Developments such as virtual and augmented reality have further expanded possibilities for experiential and immersive engagement with musical traditions.

Previous studies note that instructional technologies enable the documentation and storage of musical knowledge that may not be represented in written form. Digital recording and multimedia presentation allow traditional performances to be systematically captured and organised for educational use. In this regard, traditional gong performances in Sabah may be digitally documented to maintain continuity within teaching and learning contexts. Multimedia resources also enable learners to engage with cultural materials through listening, viewing, and guided interaction within structured learning environments.

UNESCO (2019) emphasises the role of technological approaches in safeguarding cultural heritage, particularly in response to pressures arising from urbanisation, climate change, and conflict. Digital methods are described as ways of recording and maintaining cultural materials that may be at risk of loss, while

extending access to cultural knowledge beyond local settings. UNESCO further calls for collaboration between educators and cultural practitioners to ensure that technology use is contextually appropriate.

Fernández (2020) examines the use of educational technologies in the preservation and dissemination of cultural memory and notes their potential to enable reinterpretation of traditions in contemporary contexts. The study underlines the importance of involving community members in the design and implementation of digital initiatives to avoid misrepresentation and to maintain agency over the presentation of cultural practices. Similarly, Lee (2021) explores immersive technologies and interactive multimedia in cultural heritage education, particularly within participatory learning environments, and suggests that such approaches can enhance student engagement, especially among learners familiar with digital media.

Anderson and Smith (2020) describe a room-scale virtual reality simulation of an ancient city in which users navigated a physical space containing reconstructed architectural and historical elements. Participant interaction with the environment was studied in relation to its cultural features. The study found that virtual reality was associated with stronger perceptions of cultural value, a greater sense of connection to historical contexts, and higher levels of engagement in heritage learning activities.

García and López (2019) examine the use of digital storytelling to document and disseminate indigenous knowledge and practices. Working in collaboration with indigenous communities, they developed multimedia accounts of beliefs and historical experiences for use in an e-learning platform. Their findings suggest that digital storytelling facilitates the transmission of indigenous knowledge and gives communities control over how these accounts are presented within instructional contexts.

Chen et al. (2021) investigated a gamified approach to cultural heritage education using a smartphone application that engaged users through structured interaction with artefacts and events. The application was designed to encourage exploration and participation in an accessible format. Their results showed higher levels of engagement, clearer understanding of heritage-related content, and increased collaboration among users.

Overall, the literature indicates that digital instructional technologies are widely used in contemporary education and have shaped approaches to teaching and the transmission of cultural knowledge. Within cultural heritage education, tools such as virtual reality, digital storytelling, and gamified applications are discussed in relation to documentation, access, and learner engagement. Although much of this research addresses heritage in general terms, it provides a basis for examining the use of educational technologies in teaching traditional music in formal learning environments. Building on this work, this study focuses on instructional design for teaching Kadazandusun gong music through the *sompogogungan* ensemble in school contexts, with attention to the development and evaluation of multimedia learning materials.

Research Methodology

This study employs an instructional design and evaluation approach to examine the suitability of an interactive multimedia resource for teaching Kadazandusun gong music through the *sompogogungan* ensemble in formal education. It addresses pedagogical processes associated with ensemble-based gong music learning, which has traditionally been transmitted through informal, community-based practice, and considers how these processes can be addressed through structured multimedia materials in school settings. Performance-related insights from *sompogogungan* practitioners were systematically translated into instructional content.

A mixed-methods design was employed, combining qualitative and quantitative approaches in a sequential manner. The initial qualitative phase involved interviews with practitioners and a review of relevant literature to inform content development. This was followed by quantitative data collection to examine evaluators' judgements regarding the suitability of the instructional materials for school contexts. A final qualitative phase consisted of interviews with teachers, trainers, and students to examine usability and instructional relevance during classroom implementation.

In parallel with the research framework, the development of the interactive multimedia materials followed the ADDIE model, comprising Analysis, Design, Development, Implementation, and Evaluation. This model provided a systematic structure for material development and classroom application. During the analysis stage, information relating to the *sompogogungan* was compiled, including background context, instrumentation, playing techniques, musical structures, and performance practices. Ten performances and recordings from two Sabah-based ensembles (the Gong Sound of Borneo group and the Kampung Kinapulidan group from Ranau) were examined. These materials were organised to shape the design of multimedia learning resources suitable for educational use.

Based on this material, interactive multimedia resources were designed and produced for formal and co-curricular music education. Content and learning activities were sequenced through a structured approach to ensure clarity, coherence, and relevance to school-based teaching contexts. Prior to classroom use, the materials underwent a formative review by specialists in music education to ensure suitability and clarity of presentation. Revisions were made before they were introduced into the school setting.

The revised multimedia resources were implemented in a secondary school in Rompon, Tambunan that offers music education through both curricular and co-curricular activities. The site was selected for the availability of facilities, including dedicated music rooms and a gong ensemble comprising five gongs and a set of *kulintangan*. Students took part in a series of instructional sessions and ensemble-based training using the developed multimedia resources.

Quantitative data were obtained through questionnaires completed by specialists in instructional design and music education and analysed using the Statistical Package for the Social Sciences (SPSS) Version 12.0. Descriptive statistical procedures were applied to examine responses related to the design,

content, and technical features of the multimedia resources. Questionnaire items employed a Likert-scale format and were organised into three domains: a) interactive multimedia components; b) instructional framework; and c) technical specifications.

Qualitative data were collected through semi-structured interviews and classroom observations. Two music educators, who also served as ensemble trainers at the selected school, participated in interviews evaluating the developed teaching and learning materials following classroom use. Additional perspectives were obtained from eight students involved in gong ensemble training to document their experiences, skill development, and engagement across the instructional period. This qualitative component comprised 45-minute interview sessions and observations conducted over a three-month period.

Findings

Based on a review of requirements and sources across multiple units and subject areas, core topics were identified for inclusion in the interactive instructional design, covering key components of the *sompogogungan*. These topics were organised into related sub-topics, with learning outcomes defined for each to specify the intended knowledge and skills. Table 1 presents the relationship between topics, sub-topics, and their corresponding learning outcomes.

Table 1. *Topics, sub-topics, and learning outcomes*

Topics	Sub-topics	Learning Outcomes
Unit 1: Introduction	• History of the gong ensemble • Purpose and performance context of the gong ensemble • Ensemble musicians and their roles	• Trace the historical development of the gong ensemble • Describe the purpose and performance context of the gong ensemble • Identify the musicians and their roles within the gong ensemble
Unit 2: Instruments	• *Lapos-lapos* • *Mongoluton* • *Songkoluan* • *Dindihon* • *Ponohuri* • *Kulintangan*	• Identify the instruments used in the gong ensemble • Explain the roles of the instruments within the ensemble
Unit 3: Functions	• Uses of gongs in society and community • Suitability of the provided gong ensemble	• Explain the functions of gongs within society and the community • Assess the appropriateness of the provided gong ensemble
Unit 4: Construction	• Materials used in gong construction	• Identify the materials used in gong construction
Unit 5: Playing techniques	• *Pukulan naanahangon* • *Pukulan saasalakan* • *Pukulan hahambatan* • *Pukulan kuukulimpoon* • *Pukulan tootongan* • *Pukulan tatavag*	• Describe the performance styles and rhythmic patterns used in the gong ensemble • Apply appropriate playing techniques

Unit 6: *Kulintangan*	• Characteristics of the *kulintangan* (instrument consisting of a horizontal row of small gongs, typically performed as part of a *sompogogungan* ensemble) • Playing techniques of *kulintangan*	• Identify the playing techniques and rhythmic patterns used in the *kulintangan* • Demonstrate appropriate techniques
Unit 7: Songs and musical score	• *"Sudun Hugu Divatto"* • *"Murut Tamigon"* • *"Rentak Gong Daerah Tambunan"* • *"Nogungan Kooduan Pangazau Magagong"* • *"Nogungan Pangazau"* • *"Nogungan Hungab"* • *"Nogungan Kolopis"* • *"(Kalimaran) Paluan Gong"* • *"Kalipasu"*	• Recognise compositions performed by the gong ensemble • Perform with appropriate technique
Unit 8: Additional information	Information on researchers/production	None

A systematic instructional design approach was employed to develop interactive multimedia learning materials for the gong music ensemble, in accordance with the prescribed subject content and learning outcomes within the formal education framework. Figures 2 to 4 present examples of the developed instructional materials.

Figure 2 shows the main menu, which outlines the principal topics and overall content. The topics include Introduction to the Gong Ensemble (*Pengenalan*), Functions (*Fungsi*), Instruments (*Peralatan*), Gong Making (*Pembuatan Gong*), *Kulintangan*, Playing Techniques (*Teknik Paluan*), and Songs and Music Scores (*Lagu & Skor*).

Figure 2. Example of the formulated instructional design

Figure 3 shows an example of information explaining the types of equipment used in a gong ensemble and the variety of gong types available. Apart from the textual explanation, related pictures are also displayed to facilitate students' understanding of the topic.

Figure 3. Example of the formulated instructional design

Figure 4 shows an example of a song and its notated score. In this display, students can view a video performance of the selected song and print the corresponding score.

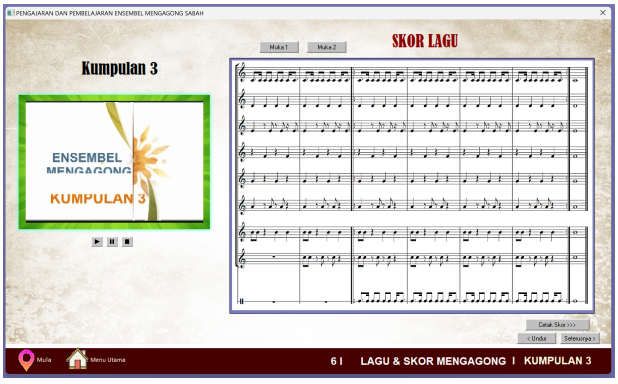

Figure 4. Example of the formulated instructional design

Table 2 presents survey results on the appropriateness of the interactive multimedia teaching and learning materials for *sompogogungan*, as evaluated by music education technology specialists. A rating of level 5 indicates high suitability, while level 1 denotes unsuitability. The mean score falls within the high category (4.0) and indicates that the materials correspond to students' learning outcomes, background, and capabilities.

Table 2. *Interactive instructional design criteria*

	Criteria	Level
2.1	Content is directly related to the objectives/learning outcomes	4
2.2	Provides all the content or learning experiences necessary to achieve the objectives/learning outcomes	4
2.3	In accordance with the characteristics (level of ability and maturity) and experience of the students	5
2.4	Relevant to the course requirements and target group	3
2.5	Broken down into small and continuous learning steps	3
2.6	Presented in a logical order	5
		Mean = 4.0

The mean content rating for the gong music ensemble teaching and learning materials is 4.2 (Table 3), which indicates a high level of appropriateness and that the content meets the teaching and learning objectives.

Table 3. *Content*

	Criteria	Level
3.1	Content review	3
3.2	Teaching and learning objectives	5
3.3	Instructions (text and symbols)	4
3.4	Provision of a synopsis	4
3.5	Statement of objectives is provided in a general and concise manner	5
		Mean = 4.2

The mean score for the evaluation of learning outcomes and objectives of the interactive multimedia teaching and learning design for the gong music ensemble is 3.83 (Table 4), signifying a high level of appropriateness.

Table 4. *Learning outcomes/objectives of interactive instructional design*

	Criteria	Level
4.1	There are learning outcomes/instructional objectives for each unit.	5
4.2	Learning outcomes/objectives are written according to the learning hierarchy (from lower to higher levels).	3
4.3	Learning outcomes /objectives are written clearly and accurately.	5
4.4	Learning outcomes /objectives have appropriate verbs (measurable and observable).	4
4.5	Learning outcomes /objectives have cognitive, psychomotor, and affective domains.	2
4.6	Learning outcomes /objectives cover the entire content of the unit.	4
		Mean = 3.83

The learning activities received a score of 3.20 (Table 5), which indicates a moderate level of appropriateness according to the established indicators. The interactive multimedia materials were organised into a series of modules and key topics to support structured instruction. Through these materials, students were able to identify core concepts of the *sompogogungan*, recognise its compositions, distinguish playing techniques, and identify the instruments used.

Table 5. *Learning activities*

	Criteria	Level
5.1	Ability to attract students' attention and motivation	5
5.2	Use of varied methods and media to support instructional materials (e.g., discussions, simulations, video conferences, videos/YouTube)	2
5.3	Interaction between students and the learning materials	3
5.4	Interaction among students (face-to-face and/or online)	1
5.5	Sequencing of activities from lower-level to higher-level learning	4
5.6	Coverage of cognitive, psychomotor, and affective domains	3
5.7	Clarity of learning instructions	5
5.8	Provision of examples and learning guidelines	4
5.9	Inclusion of a recall formula for each unit	2
		Mean = 3.20

Discussion

The findings indicate that the developed interactive multimedia materials are generally suitable for classroom use, particularly in terms of structural design and correspondence with learning outcomes. Expert evaluations show strong ratings for organisation, content, and outcome clarity, while more moderate ratings for learning activities point to areas requiring further refinement to strengthen classroom application. These results thus suggest that the resource provides a sound pedagogical framework but requires additional support to maximise its effectiveness in school-based implementation.

The integration of traditional music ensembles, including gong ensemble performance, within educational institutions is commonly associated with benefits such as collaborative learning, coordinated performance skills, and broader musical understanding. Nevertheless, the sustained inclusion of ensemble-based music in formal education is often shaped by practical, institutional, and instructional constraints. These factors affect both students' access to meaningful ensemble engagement and teachers' capacity to deliver instruction in a consistent and structured manner. The findings of this study reflect these broader conditions, i.e., while multimedia resources can support instructional planning, their practical use is influenced by contextual factors beyond design alone.

Music education has long been part of the Malaysian school curriculum, with ensembles such as *caklempong*, *gamelan*, and *kompang* included in formal programmes. However, limitations in teacher preparation continue to affect instructional quality, particularly the shortage of educators with specialised ensemble training. Given the coordinated and practice-based nature of gong ensemble music, limited expertise in ensemble roles, rehearsal processes, and performance conventions may restrict the effective use of instructional materials, regardless of their design quality.

Many practising music teachers have received limited formal training in traditional ensembles or enter the profession following relatively brief preparation programmes. In the context of gong ensemble instruction, this presents particular challenges, as effective teaching requires familiarity with ensemble coordination, instrument hierarchy, and performance practice. The evaluation results indicate that the structured organisation of content and clearly sequenced instructional units can assist teachers in managing these demands, as reflected in the high ratings for instructional design criteria and learning outcomes (Tables 2 and 4). Yet the findings also confirm that instructional resources cannot replace pedagogical competence or performance expertise; trained music educators therefore are central to effective implementation.

Policy initiatives by the Malaysian Ministry of Education have sought to address teacher-related challenges by assigning music-trained educators to schools offering music programmes or demonstrating capacity in arts education. However, staffing constraints often require music teachers to teach additional subjects, and in some settings, music is treated as a non-core area. These conditions affect instructional continuity and limit opportunities for sustained engagement with specialised teaching materials. Institutional support therefore plays an important role in enabling trained educators to apply their disciplinary expertise effectively. Graduates from programmes such as those offered by the Faculty of Music and Performing Arts at Sultan Idris Education University (UPSI) enter schools with relevant musical training and are well positioned to make effective use of structured instructional resources such as those developed in this study.

The implementation of multimedia-based instructional materials is also influenced by the availability and reliability of technological infrastructure. Effective use of interactive resources depends on access to suitable devices, stable power supply, functional projection systems, and adequate audio equipment. Disruptions such as power outages, equipment malfunction, or limited sound reinforcement can reduce instructional effectiveness. In addition, small display screens may restrict visibility for larger groups and limit shared engagement with multimedia content.

Aside from technological considerations, access to physical resources is a key constraint. Many schools, particularly in Sabah, lack dedicated music rooms or sufficient gong sets to support ensemble practice, especially within co-curricular contexts. The absence of acoustically suitable rehearsal spaces further complicates ensemble preparation. Although the multimedia materials were rated as appropriate in terms of structure and content, their instructional value is most fully realised when students can engage in hands-on ensemble practice. These conditions correspond with the moderate ratings reported for learning activities and student interaction in Table 5.

The cost of acquiring complete gong sets of varying sizes presents an additional challenge. In most cases, students rely entirely on school-owned instruments for rehearsal and performance. As a result, the effectiveness of instructional resources is closely linked to a school's capacity to provide instruments and appropriate facilities. Without such support, effective integration of gong

ensemble instruction into formal education is likely unachievable, irrespective of instructional design quality.

This study addresses gaps in existing instructional resources by documenting, recording, and structuring gong ensemble performance content based on practitioner-informed assessment. Although the Ministry of Education has produced songbooks and classroom materials, coverage of gong ensemble music remains limited. At the primary level, available collections largely consist of educator-composed or international folk songs, with minimal representation of Sabah ensemble repertoire. The materials developed in this study respond to this curricular gap by providing structured content designed specifically for ensemble-based instruction.

Overall, the findings suggest that the effectiveness of interactive multimedia instruction for gong ensemble music depends not only on design quality but also on teacher expertise, institutional support, technological infrastructure, and access to physical resources. The developed materials provide a structured framework for organising content and preparing students for ensemble practice; however, their effective implementation requires coordination across instructional, institutional, and material domains.

Conclusion and Recommendations

Instructional aids play an important role in contemporary education, particularly in supporting the systematic teaching of music practices that require specialised skills, coordinated performance, and contextual understanding. In this study, an interactive multimedia instructional resource was developed to support the teaching and learning of *sompogogungan* music within formal and co-curricular educational settings. The resource integrates text, audio, video, and graphic elements, and its interactive design supports reciprocal engagement between learners and digital content. This approach allows musical knowledge to be accessed through multiple representational forms and enhances comprehension and participation (Mohd. Nizam & Zaharul Lailiddin, 2019). The resource is therefore intended to complement ensemble-based instruction rather than function as a stand-alone substitute.

A key challenge addressed in this study is the limited availability of structured teaching materials for *sompogogungan* music, which constrains both student exposure and teachers' capacity to integrate this repertoire into planned instruction. The developed materials respond to this need by organising content into clearly defined units covering ensemble background, instruments, functions, construction, playing techniques, selected repertoire, and contextual information, each linked to explicit learning outcomes. This structure supports curriculum planning and provides teachers with a clearer framework for sequencing instruction, monitoring progress, and linking activities to educational objectives.

Evaluation findings indicate that the instructional resource is generally suitable for educational use. Expert assessments show a high level of appropriateness in terms of instructional design and correspondence with learning outcomes, indicating that the overall structure and pedagogical intent are sound. At

the same time, the moderate ratings for learning activities point to areas requiring further refinement. These results underline the distinction between the adequacy of the instructional framework and the need to strengthen specific pedagogical supports that facilitate classroom application, particularly in school settings where time and teacher guidance may be limited.

Early and systematic exposure to ensemble-based music can broaden students' musical experience and support sustained engagement with coordinated performance practices. Interactive multimedia resources provide a practical means of presenting ensemble music in ways that are accessible, visually supported, and adaptable to different instructional settings, while remaining consistent with curricular expectations. In this study, the multimedia format allows students to observe playing techniques, listen to ensemble textures, and engage with structured content before or during rehearsal. This approach allows contact time to be used more efficiently and prepares students more effectively for hands-on learning.

Based on the evaluation results, several recommendations are proposed. Learning activities may be strengthened through the inclusion of more varied instructional strategies, such as guided demonstrations, scaffolded practice tasks, and clearly sequenced activity progressions. Student interaction may be enhanced by incorporating planned peer-learning components and ensemble-based routines that promote collaborative learning and coordinated performance. In addition, each unit should include explicit recall and revision elements, such as concise summaries, review questions, or practice checklists, to support retention and continuity between sessions.

The findings also emphasise that the instructional value of the multimedia resource is closely tied to the availability of appropriate facilities, instruments, and instructor expertise. The materials are most effective when used in conjunction with ensemble practice in settings equipped with adequate gong sets and suitable learning spaces. Accordingly, the resource should be understood as structured instructional guidance for educators rather than a substitute for performance knowledge, ensemble leadership, or physical resources. Its role is to assist teachers in organising content, clarifying learning objectives, and preparing students for practical engagement.

In summary, this study presents an initial instructional design model and evaluation evidence for the teaching of *sompogogungan* music in formal school contexts. The developed multimedia resource demonstrates pedagogical promise, particularly in its instructional organisation and correspondence with learning outcomes. With further refinement of learning activities, the resource may better support consistent and effective classroom and co-curricular use. As an early effort to formalise instructional materials for gong ensemble education, this study offers a practical foundation for the continued development of resources that address instructional needs in contemporary music education.

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References

Anderson, J., & Smith, R. (2020). Virtual reality and cultural heritage preservation: A case study of an ancient city. *Journal of Educational Technology & Society, 23*(4), 45–58.

Bates, A. W. (2019). *Teaching in a digital age: Guidelines for designing teaching and learning* (2nd ed.). Tony Bates Associates Ltd.

Campbell, P. S. (2004). *Teaching music globally: Experiencing music, expressing culture*. Oxford University Press.

Chen, L., Wang, Y., & Zhang, H. (2021). Gamification in cultural heritage education: A mobile game approach. *Computers & Education, 162*, 104080.

Clark, R. E. (2023). *Learning from media: Arguments, analysis, and evidence* (2nd ed.). Information Age Publishing.

Elliott, D. J., & Silverman, M. (2015). *Music matters: A philosophy of music education*. Oxford University Press.

Fernández, M. (2020). Empowering communities through digital tools: The role of instructional technology in cultural heritage preservation. *International Journal of Heritage Studies, 26*(3), 287–301.

García, P., & López, M. (2019). Digital storytelling and indigenous knowledge: A collaborative approach to cultural heritage preservation. *Journal of Interactive Media in Education, 2019*(2), 1–12.

Green, L. (2008). *Music, informal learning, and the school: A new classroom pedagogy*. Ashgate Publishing.

Hallam, S. (2010). The power of music: Its impact on the intellectual, social, and personal development of children and young people. *International Journal of Music Education, 28*(3), 269–289.

Hwang, G.-J., Chiu, L.-Y., & Chen, C.-H. (2020). A contextual game-based learning approach to improving students' inquiry-based learning performance in social studies courses. *Computers & Education, 144*, 103710.

Kizilcec, R. F., Bailenson, J. N., & Gomez, C. J. (2021). The effects of immersive virtual reality on learning outcomes in higher education: A meta-analysis. *Journal of Educational Psychology, 113*(5), 899–921.

Lee, J. (2021). Immersive technologies in cultural heritage education: Opportunities and challenges. *Educational Technology Research and Development, 69*(2), 523–546.

Loh, F. (2019). Indigenous cultural revival in Sabah: The role of music and dance. *Journal of Southeast Asian Studies, 50*(2), 245–263.

Martin, F., & Ertzberger, J. (2019). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education, 68*, 76–85.

Matusky, P., & Tan, S. B. (2017). *The music of Malaysia: The classical, folk, and syncretic traditions*. Routledge.

Mohd. Nizam Nasrifan, & Mahayuddin Abdul Rahim. (2019). Developing and evaluating a digital interactive method book for teaching and learning recorder based on Malaysian folksongs. *International Journal of Innovation, Creativity and Change 6* (2), 132–147.

Mohd. Nizam Nasrifan, & Zaharul Lailiddin Saidon. (2019). Designing online interactive application of learning music theory in blended learning mode. *International Journal of Recent Technology and Engineering, 7*(6), 226–233.

Reich, J., & Ito, M. (2017). *From good intentions to real outcomes: Equity by design in learning technologies*. Digital Media and Learning Research Hub.

Selwyn, N. (2022). *Education and technology: Key issues and debates* (3rd ed.). Bloomsbury Academic.

UNESCO. (2019). *The role of digital technologies in safeguarding cultural heritage*. UNESCO Publishing.

Voogt, J., & Roblin, N. P. (2020). A comparative analysis of international frameworks for 21st-century competences: Implications for national curriculum policies. *Journal of Curriculum Studies, 52*(3), 315–331.

Zuboff, S. (2019). *The age of surveillance capitalism: The fight for a human future at the new frontier of power*. Public Affairs.

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