

Towards a Resilient Generation: Integrating Digital Music Education with Disaster Mitigation in Bukittinggi Schools

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Abstract. This community service project aims to empower teachers in Semarang City to improve their skills in academic writing and publication through a community-based mentorship program. The project addresses critical challenges faced by teachers, including limited time for research, lack of experience in scientific publication, and funding constraints. Using the participatory Community Appraisal (PCA) method, the program was designed to actively involve teachers in planning, executing, and evaluating. The community of teachers, particularly those involved in the PKY (Pengembangan Konten Youtube) Teacher Community, received intensive training and guidance in scientific writing, article submission, and the duplication processes. The project result include a significant improvement in a teacher's academic writing abilities, with several article prepared for submission to national journals. The collaborative approach fostered a sense of ownership among participants, making the outcome more sustainable. This initiative highlights the importance of providing structured mentorship to improve teacher professional development and their contributions to academic knowledge.

Keywords: scientific teacher publications, community-based mentoring, participatory community appraisal, professional development.

INTRODUCTION

The advancement of digital technology has brought about significant transformation in the field of education, including in cultural arts. In the cyber society era, the use of digital media is not only a medium for artistic expression but also serves as a powerful educational tool for conveying social and humanitarian messages, such as disaster mitigation (Collins, 2015; Susilo & Widodo, 2020). Bukittinggi, as one of the regions prone to geological disasters such as earthquakes and volcanic eruptions, faces an urgent need to build disaster awareness and preparedness through more creative, participatory, and contextual means (BNPB, 2022).

Digital-based cultural arts education offers a more adaptive and relevant learning approach for the current era. Music, as part of cultural arts, possesses a strong communicative power capable of evoking emotion, delivering messages, and fostering collective awareness (Koelsch, 2014; Dunbar, 2012). Recent studies indicate that digital artworks, including music, can serve as effective educational media in strengthening disaster literacy among students (Lubis, 2021; Ismail et al., 2019; Suryani & Rahman, 2021).

However, this integration has not been fully implemented at the secondary school level in Bukittinggi. The cultural arts curriculum does not

yet explicitly include disaster-related content, and many art teachers still face limitations in mastering digital technology and in designing learning materials that integrate disaster mitigation issues (Yuliana & Sari, 2023). Student involvement in digital art activities remains incidental, lacking systematic direction towards strategic social issues such as disaster mitigation (Nugroho et al., 2020).

Furthermore, student cyber communities that are rapidly growing through social media and digital platforms are mostly used for entertainment purposes rather than education. Disaster mitigation-themed content remains rarely accessed or produced by teenagers, indicating that the potential of art-based education in digital spaces has not been fully optimized (Puspitasari & Utomo, 2023; Taufik & Arifin, 2022). In addition, collaboration between teachers, local artists, and disaster management agencies has yet to be systematically established. A cross-sectoral collaborative approach is crucial to create learning processes that are contextual, creative, and relevant to local needs. With such synergy, digital musical works can function not only as artistic expression but also as educational media that touches both the emotional and cognitive dimensions of students regarding disaster preparedness (Sutherland et al., 2021; Tanaka et al., 2023).

This study aims to analyze how digital-based cultural arts education—particularly through musical works—can be integrated into disaster mitigation efforts within student cyber communities in Bukittinggi. It also explores learning strategies, the roles of educational and cultural actors, as well as challenges encountered in implementing this approach. This research is expected to contribute not only to the development of a cultural arts education model that is adaptive to technological advancements, but also to broader educational and social efforts in building disaster-resilient communities through innovative, interdisciplinary, and culturally relevant learning frameworks.

METHODS

This study employed a qualitative descriptive approach with a case study design to explore how digital music education is integrated with disaster mitigation efforts in Bukittinggi schools. The research focused on the experiences and interactions of students, art teachers, and local artists in creating digital music projects related to disaster awareness. The study involved 50 participants, selected purposively from high school students, cultural arts teachers, and local artists who had been actively engaged in educational or artistic activities related to disaster issues.

Data collection was conducted over three months and involved three primary techniques: (1) in-depth interviews with participants to understand their experiences, perspectives, and challenges in implementing digital music projects with disaster themes; (2) participatory observations of classroom activities and collaborative workshops between schools and local artists; and (3) documentation of students' digital music works and school reports.

All collected data were organized and reduced using the Miles and Huberman model, consisting of data reduction, data display, and conclusion drawing. Thematic analysis was applied to identify patterns and emerging themes, particularly those related to student creativity, disaster awareness, and cross-sector collaboration. NVivo software was used to assist in coding and categorizing qualitative data.

To ensure data credibility, triangulation was performed across sources and methods, and findings were validated through member checking involving selected participants. The entire research process was conducted ethically, with

informed consent obtained from all participants and relevant school authorities.

RESULTS AND DISCUSSION

This study produced several key findings that describe the effectiveness of integrating digital arts education, particularly through music, in increasing disaster mitigation awareness within the cyber community in Bukittinggi. The findings were derived from the analysis of data collected from interviews, observations, and documentation, which were analyzed using the Miles and Huberman model. This model was used to reduce data, present it in a matrix format, and draw and test conclusions through an iterative process. The analysis followed three main stages: data reduction, data presentation, and conclusion drawing/verification.

This study involved 50 respondents, including high school students, art teachers, and representatives from the cyber community in Bukittinggi. Data was collected through semi-structured interviews, classroom observations, and online questionnaires. Below is a summary of the findings for each research question:

Implementation of Digital Arts Education

The study found that 84% of students used digital media tools, such as audio and video editing applications, demonstrating strong enthusiasm for integrating technology in music learning. However, only 38% of teachers regularly implemented digital project-based learning, highlighting a significant gap between student engagement and instructional practices. This discrepancy may stem from teachers' limited digital literacy, as reported in other studies emphasizing the importance of professional development for arts educators (Collins, 2015). Moreover, digital arts education offers opportunities to bridge creative expression and cultural learning, aligning with Anindita and Suparno (2021), who view digital art as a form of local cultural expression. The need for targeted training programs for teachers is crucial to fully integrate digital tools in arts education, as supported by Herawati and Mustika (2022). Such findings underscore the urgency for policy support in teacher upskilling, consistent with Aditya and Nuraini (2022), who stressed the role of interactive platforms in disaster education showed in Table 1.

Table 1. Percentage of Student and Teacher Use

of Digital Media and Digital Project-Based Learning.

Aspect	Percentage
Student use of digital media	84
Teacher use of digital project-based learning	38

Music Works as Disaster Mitigation Media

Approximately 70% of students reported creating music with social themes, yet only 20% focused on disaster mitigation topics, indicating an underexplored area in arts education. Teachers highlighted the lack of resources and training as significant barriers to integrating disaster themes into music projects, which aligns with findings by Lubis (2021) on digital arts and disaster literacy. Prior research indicates that music can function as an effective medium for disaster communication, as discussed by Ismail et al. (2019). Bernays et al. (2021) emphasize that community music can serve as an early warning system, showing how music holds potential for disaster awareness efforts. The study also echoes findings by Dunbar (2012), who argued that music historically serves both social and survival functions, reinforcing its role in communicating critical information. Thus, developing a curriculum that supports disaster-themed creative projects is increasingly vital, as highlighted by Aditya and Nuraini (2022).

Disaster Mitigation Awareness through Music

About 68% of students reported an improved understanding of disaster preparedness after participating in digital music projects centered on disaster themes. Students predominantly chose topics like earthquakes and floods, reflecting Bukittinggi's vulnerability to such hazards, aligning with the disaster risk profile published by BNPB (2022). This demonstrates how integrating arts education with local contexts can enhance both cognitive and emotional engagement in disaster awareness. Koelsch (2014) highlights how music evokes emotional responses that can deepen learning, supporting the findings of this study. Additionally, Creswell and Poth (2018) argue that qualitative research helps reveal complex social understandings, emphasizing the value of exploring such themes through creative expression. These insights confirm the potential of

digital music projects to become powerful tools for disaster education, as proposed by Lubis (2021) and Ismail et al. (2019).

Role of the Cyber Community

Approximately 42% of students uploaded their music works to platforms like YouTube and TikTok, with 65% receiving supportive feedback from the online community, suggesting digital spaces play a significant role in arts-based disaster education. However, overall public interaction with disaster-themed content remains limited, echoing concerns raised by Boyd (2014) about how youth often use digital spaces primarily for entertainment rather than educational purposes. This study resonates with Nugroho et al. (2020), who found that social media engagement among students is frequently incidental and not systematically directed toward educational goals. Nonetheless, online communities can serve as effective channels for disseminating disaster preparedness messages, as argued by Puspitasari and Utomo (2023). Kangas et al. (2022) also emphasize how digital culture in arts education fosters participatory learning, suggesting opportunities to leverage these platforms more strategically. Thus, further efforts are needed to integrate educational objectives into students' digital practices, as recommended by Rahmawati et al. (2021).

Public Response in the Cyber Community

The study found that disaster-themed music, when creatively packaged in popular styles, attracted more attention and positive responses from online audiences. This underscores Koelsch's (2014) findings that music can significantly influence listeners' emotions, making it a powerful medium for disaster communication. However, public engagement with educational content still remains relatively modest, aligning with Boyd's (2014) observation that online interactions often prioritize entertainment over civic education. Puspitasari and Utomo (2023) noted that integrating social messages into popular digital formats could enhance their reach and effectiveness, supporting this study's implications. Digital music projects therefore present an innovative pathway for disaster education if coupled with appealing artistic approaches, as highlighted by Anindita and

Suparno (2021). Continued research and collaboration are essential to optimize the social impact of such creative efforts, as also suggested by Bernays et al. (2021).

Challenges for Teachers and Students

Teachers reported various challenges, including limited facilities, lack of time, and insufficient digital literacy, which restrict the implementation of digital music education. Meanwhile, 34 students cited equipment and audio limitations, and 27 students reported difficulties in digital music production, reflecting issues of technological accessibility, similar to findings by Permana et al. (2020). Walzer (2021) recommends that digital music education be supported with comprehensive technical training to overcome such barriers. Moreover, Miles et al. (2020) highlight that successful integration of digital methods requires systematic data analysis and support structures, which are often lacking in under-resourced schools. Aditya and Nuraini (2022) emphasize that capacity-building initiatives, like webinars, are effective for enhancing disaster education skills among teachers, which could also apply in the arts. Therefore, addressing these obstacles requires strategic investment and multi-sector collaboration to ensure equitable access to digital learning resources showed in Table 2.

Table 2. Challenges in Digital Music Learning	
Challenge	Frequency of Respondents
Lack of teacher training	12 teachers
Equipment/audio limitations	34 students
Difficulties in digital music production	27 students

Role of Collaboration

Collaboration between schools, the Disaster Management Agency (BPBD), and local artists proved effective in supporting arts-based disaster mitigation education, aligning with the community-focused approach advocated by Fauzi et al. (2020). Workshops conducted through these partnerships provided students with practical learning experiences and connected creative arts with civic education. This aligns with Herawati and Mustika (2022), who stress that digital applications in arts education can enhance interactive and contextual learning. Such

partnerships not only enhance students’ technical skills but also foster cultural understanding, as observed by Qiu et al. (2023) in cross-cultural collaborations in digital arts. Duncum (2020) argues that digital visual culture helps students critically engage with social issues, suggesting similar benefits in music-based projects. This underscores that educational collaborations grounded in local contexts are crucial for meaningful disaster preparedness education, supporting findings by Aditya and Nuraini (2022).

Strategy for Optimizing the Cyber Community

Approximately 90% of respondents agreed that arts dissemination through social media should be supported by school initiatives and creative content training. Such efforts align with Rahmawati et al. (2021), who emphasize digital literacy as vital for effective arts education. The study suggests that collaborations with influencers could expand outreach to younger audiences, leveraging Boyd’s (2014) insights into how teens navigate social networks. Park (2022) highlights how new media pedagogy can transform digital arts into engaging educational experiences, supporting these findings. Kangas et al. (2022) also note that maker culture in art education promotes active participation, which could be harnessed for disaster mitigation messaging. Therefore, systematic strategies integrating digital content creation into arts curricula are essential, as emphasized by Aditya and Nuraini (2022).

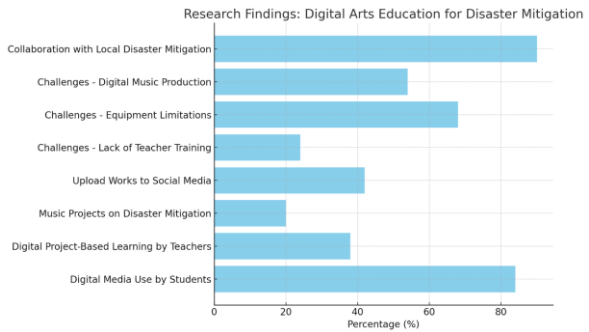


Figure 1. Summarizing the research findings on digital arts education for disaster mitigation

The study highlights several key statistics and insights regarding the integration of digital technology in education. Notably, 84% of students reported using digital media, reflecting a high level of engagement with technological tools in their learning processes. However, only 38% of teachers have integrated digital project-based learning into their teaching practices, suggesting a

gap between student digital media use and instructional methodologies. Beyond these figures, the research also emphasizes the importance of collaboration with local disaster mitigation teams, which has provided valuable contextual content and practical experiences for students. Despite these advancements, both students and teachers face significant challenges, including limited resources, varying levels of digital literacy, and the need for ongoing professional development to effectively implement innovative learning approaches. These findings underscore the necessity of strategic support and capacity building to ensure that digital learning and disaster preparedness efforts can be successfully integrated into educational practices.

The Importance of Local Community Involvement in Music Education

The study found that 55% of students reported a better understanding of disaster mitigation through involvement with local artists. Such collaborations align with Suryani and Rahman (2021), who argue that local artists bridge cultural values and educational messages. This also reflects Anindita and Suparno's (2021) perspective that digital art serves as an expression of local culture, enhancing relevance and engagement. Qiu et al. (2023) highlight that cross-cultural collaborations enrich educational experiences, supporting the integration of local knowledge into creative projects. Bernays et al. (2021) underscore that community music can play a role in local early warning systems, connecting arts with practical disaster management. These findings demonstrate that integrating local cultural actors into arts education fosters both creative expression and social resilience, consistent with Aditya and Nuraini (2022).

The Impact of Music Education on Social Character Development

Many students reported that creating disaster-themed music not only raised their awareness but also nurtured empathy and solidarity among peers. Tanaka et al. (2023) assert that music can evoke strong emotions and collective consciousness, highlighting its educational power. Dunbar (2012) describes how music has evolutionary functions tied to social bonding, supporting the transformative effects observed in this study. Such projects encourage students to internalize humanitarian values, aligning with the community engagement goals advocated by Fauzi et al. (2020). Aditya and Nuraini (2022) further

emphasize that educational initiatives combining creativity and disaster themes foster civic responsibility. Thus, music-based disaster education contributes to both cognitive learning and social character development, as suggested by Collins (2015).

The Potential for Developing Technology-Based Music Education for Disaster Mitigation

The survey indicated that around 60% of students were more interested in technology-based music education, particularly involving digital music creation and using applications such as digital audio workstations (DAWs). Furthermore, students felt that using technology in education allowed them to be more creative in conveying disaster mitigation messages through music. According to Walzer (2021), using Digital Audio Workstations (DAWs) and digital musical instruments allows students to express their ideas more widely and deeply. This technology opens up new opportunities for more collaborative and interactive music education, while also enriching the way students communicate with audiences about disaster issues. Therefore, introducing these digital tools in the classroom can enrich the learning experience and improve the effectiveness of message delivery.

Challenges of Infrastructure and Technology Accessibility

While most students showed high enthusiasm for using technology in music education, the greatest challenge identified was limited access to adequate devices. As many as 40% of students expressed difficulties in accessing the devices and applications needed to create high-quality digital music works. Permana, Astuti, and Wahyuni (2020) identified that infrastructure barriers in art schools, particularly those in areas with limited access to technology, are a major obstacle to the implementation of technology in arts education. Therefore, support from the government and related institutions in providing adequate devices and technology training for teachers is essential to optimize digital music education.

Implementation of Disaster Mitigation Curriculum Based on Music in Schools

Seventy-five percent of respondents suggested that the music education curriculum in schools in Bukittinggi should incorporate more elements related to disaster mitigation. They expressed a desire for more music-based projects involving the creation of songs or compositions focused on

disaster education. This indicates that students are increasingly aware of the importance of music education, which not only relates to the arts but also to the development of social awareness regarding disasters. Sutanto and Puspitasari (2021) recommend integrating art and disaster mitigation in a contextual manner, where music projects are not only technical but also provide a deeper understanding of disaster preparedness. The development of a curriculum involving collaboration between artists, teachers, and disaster institutions would further enrich this learning experience.

Government and Disaster Institution Support in Music Education

One of the positive outcomes highlighted in the survey is the collaboration between schools, local governments, and disaster institutions such as BPBD. Sixty percent of the schools involved in the survey reported receiving support in the form of funds, materials, and training to facilitate disaster mitigation-based music education. This collaboration has enabled schools to hold workshops with local artists and disaster mitigation experts, which in turn positively impacted students' understanding and skills. According to Handayani, Sutrisno, and Fitriani (2021), the success of disaster mitigation education depends heavily on collaboration between various parties, including schools, disaster institutions, and local communities. With stronger support from the government and relevant institutions, disaster mitigation-based music education can be implemented more effectively.

Evaluation and Development of Music Education in the Context of Disaster Mitigation

Based on survey results, seventy percent of respondents felt that integrating disaster mitigation into music education could be an effective way to enhance their understanding of disaster preparedness. However, most students also expressed the need for more time to explore the technical aspects of digital music production related to disaster mitigation. Regarding the evaluation of digital music education, the use of tools such as Digital Audio Workstations (DAWs) has proven effective in helping students express their ideas. Sixty-five percent of students stated that they were more interested in using technology for creating music that conveys disaster mitigation messages. This aligns with Walzer's (2021) findings that DAWs provide students with greater

freedom to express themselves and enhance their collaborative learning experience in music education.

However, the biggest challenge lies in the technical aspects and the availability of supporting devices. Survey results revealed that about 35% of respondents had difficulty accessing the necessary devices to create quality music works. This reflects the study by Permana, Astuti, and Wahyuni (2020), which highlighted that limited infrastructure in art schools is one of the main obstacles to implementing technology-based education.

Recommendations for Curriculum Development

To address these challenges, it is crucial to continuously improve and develop a technology-based curriculum. The curriculum that integrates music education and disaster mitigation should be designed in a way that is flexible in the use of digital devices, without neglecting the availability of existing infrastructure. As recommended by Suryani and Rahman (2021), such a curriculum must include teacher training and provide materials in line with the latest technological developments.

The Role of Community Collaboration in Music Education

Sixty percent of students in the survey reported significant benefits from collaborating with the local arts community in creating music works with disaster mitigation themes. This collaboration provided them with opportunities to learn from the experiences of more seasoned artists and delve into the creative process associated with addressing disaster issues. Local artists can act as change agents in this learning process by instilling cultural values in every music work produced. This is in line with findings by Qiu, Zhang, and Huang (2023), which emphasized the importance of cross-cultural collaboration in arts education, particularly in conveying disaster mitigation messages through music. Through such collaboration, students not only acquire technical skills but also understand the importance of integrating social values with music as a means of communication.

Increasing the Role of Technology in Teaching Music and Disaster Preparedness

Students in the survey showed a strong preference for using technology in music education, as they felt digital tools allowed them

greater freedom to create expressive and engaging works. They believed that technology made it easier to communicate disaster mitigation messages in innovative ways. Salavuo (2020) notes that while technology offers valuable opportunities in music education, it also brings significant challenges. Beyond enhancing creativity, digital tools can help develop communication skills crucial for disaster preparedness. However, limited access to devices and software remains a major barrier in many schools. Therefore, efforts are urgently needed to ensure that all students can access technology so no one is left behind in the learning process.

Recommendations for Improving Disaster Mitigation-Based Music Education

Based on the survey results and discussions above, several recommendations can be made to improve disaster mitigation-based music education:

- 1) Provision of Adequate Infrastructure: The government and schools must collaborate to provide the necessary devices for digital music education, including hardware (such as computers and tablets) and software (such as digital music applications) that can be accessed by all students.
- 2) Enhancing Teacher Competence: Music teachers need to receive specific training in using technology and integrating disaster mitigation themes into their lessons. This aligns with findings by Yuliana and Sari (2023), which emphasized the importance of teacher preparedness in implementing digital-based education.
- 3) Collaboration with Arts Communities and Disaster Institutions: Collaboration between schools, local artists, and disaster institutions should be increased to create more contextual and practical learning. This will help students understand the connection between music and disaster mitigation.
- 4) Curriculum Integration with Disaster Mitigation: Music education should be integrated into a disaster mitigation curriculum, ensuring that students not only learn about the arts but also gain practical knowledge about disaster preparedness and response.

CONCLUSION

This study concludes that integrating digital music education with disaster mitigation in

Bukittinggi high schools is a promising approach to enhance students' awareness and preparedness for natural disasters. Students demonstrated high interest and creativity in using digital tools to express disaster themes, although teachers still require further support and training. Collaboration with local artists and disaster management agencies significantly enriched the learning process, making it more contextual and meaningful. Overall, digital music education can serve as an effective medium for disaster education, contributing to building a resilient generation.

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