Digital Storytelling for Environmental Education on YouTube: Findings from Social Forestry Context

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Abstract. *Digital storytelling is a method of telling stories using digital media. This method can be used for educational purposes including environmental education to support sustainability mindset. This study aimed to explore the use of digital storytelling for environmental education on Youtube in the context of social forestry in Indonesia. The research method used was Focus Group Discussion (FGD) and analyses using thematic coding. The findings from 15 professionals and experts in 3 FGD sessions showed that digital storytelling with Youtube can be an effective tool for environmental education. This is because YouTube as a digital storytelling media captures the attention of viewers, helps them understand complex environmental concepts, and promotes alignment to support sustainability. Digital storytelling in YouTube can be used to build relationships and collaboration among viewers in local and regional scope.*

Keywords: *Social innovation, digital storytelling, environmental sustainability, focus group discussion, youtube*

Abstrak. *Digital storytelling adalah metode berkisah dengan menggunakan media digital. Metode ini dapat digunakan untuk tujuan pendidikan termasuk pendidikan lingkungan untuk mendukung pola pikir yang mendukung pelestarian lingkungan. Penelitian ini bertujuan untuk mengeksplorasi penggunaan digital storytelling untuk pendidikan lingkungan hidup di Youtube, dengan konteks perhutanan sosial di Indonesia. Metode penelitian yang digunakan adalah Focus Group Discussion (FGD) dan analisis menggunakan koding tematik. Temuan dari tiga sesi FGD menunjukkan bahwa digital storytelling dengan Youtube dapat menjadi sarana yang efektif untuk pendidikan lingkungan. Ini karena mendongeng digital menarik perhatian pemirsa, membantu mereka memahami konsep lingkungan yang kompleks, dan mendorong keselarasan untuk mendukung keberlanjutan. Berkisah melalui media digital dapat digunakan pula untuk membangun relasi dan kolaborasi antar pemirsa dalam lingkup lokal dan regional.*

Kata kunci: *Inovasi sosial, cerita digital, pelestarian lingkungan, focus group discussion, youtube*

Introduction

Digital technology has revolutionized the way we communicate, learn, and interact with the world. It has become an integral part of our daily lives, shaping many ways in our society. From social media to online learning platforms, digital technology has been opening new avenues for collaboration. It also transforms how we access and share information, making knowledge more accessible than before (Braradwaj, 2013; Towns, 2014; Nambisan, 2017).

One phenomenon that has emerged in this digital age is digital storytelling. This approach leverages the 7 powers of narrative: author views, dramatic questions, emotional content, personalized voice, decorating soundtrack, non-overloading content, and story-aligning pace, to convey information and engage audiences in new and innovative ways (Robin, 2008). Through digital storytelling, complex ideas can be presented in an accessible and engaging format, making it a powerful tool for education and awareness-raising.

In the field of environmental education, digital storytelling has the potential to be the powerful tool for promoting knowledge, awareness, and action related to environmental issues. By using various communication mechanism to reach society, digital media can bring up complex environmental issues and engage audiences in a way that traditional educational materials may not (Bărbulescu et al., 2021; Gerli et al., 2021; Ghatak et al., 2020). Through digital storytelling, environmental educators can create compelling and memorable narratives that connect people to environmental issues in a more personal and emotional way.

Research on digital storytelling in environmental education has shown promising results. Harness and Drossman (2011) found that using digital storytelling in high school embeds the potential to give students with opportunities to encourage their responsibility in the environment.

Cisneros et al. (2023) proposed an integration of ecology, science, and engineering, with digital storytelling approach to promote sustainable futures within the context marginalized students. Johnston et al. (2020) proposed a method which combined participatory science and digital storytelling to increase youth understanding of air pollution in Los Angeles. Research progression provides a potential bridge to link digital approach to environmental sustainability support.

One of the important contexts in environmental education is social forestry which refers to any forestry policies and activities involving local communities in managing forests including trees as main component (Wiersum, 2004).

Social forestry became an important program because according to the latest information from Global Forest Watch (GFW), Indonesia experienced a significant loss of 94,800 square kilometers of primary forests between 2002 and 2019. This amount accounts for 36% of Indonesia's total forest cover lost during the same timeframe. The wildfire that happened throughout the year is the main cause of this problem. The loss of most Indonesian forest cause many other problems such as poor air quality, water quality, land erosion, flooding, loss of biodiversity, and so on.

Participation of local communities plays an important role in forest conservation efforts to support sustainability (Dash et al., 2018). The participation of local communities is important because it will improve their overall livelihoods through forest management (Olivia et al., 2023). Participation is influenced by psychological, ecological, cultural, and economic factors (Hasbullah et al., 2016).

Despite the growing interest in digital storytelling as a tool for environmental education, there is a notable gap in the research literature on digital media to support sustainability, particularly Youtube, despite the popularity of the platform. Youtube is found to be able to increase confidence in digital storytelling projects (La Rose, 2021).

YouTube is also intriguing as a digital storytelling media because it provides convenience, cost saving, and easy accessibility to larger audiences (Amalia, 2021). However, the Scopus research database found only 13 research manuscripts related to digital storytelling for environmental education using Youtube, most of them from the recent 2018-2023 era and none of them addressing social forestry (see Figure 1). It is therefore relevant to understand the prospects of digital storytelling as a form of digital social innovation to promote sustainability.

This research aims to fill the gap in the literature by examining the effectiveness of digital storytelling on YouTube as a means of promoting sustainable behaviors and attitudes among community members. By examining this approach, the study will provide insights and recommendations for educators and policymakers who seek to leverage YouTube as a digital storytelling media in their efforts to promote environmental sustainability.
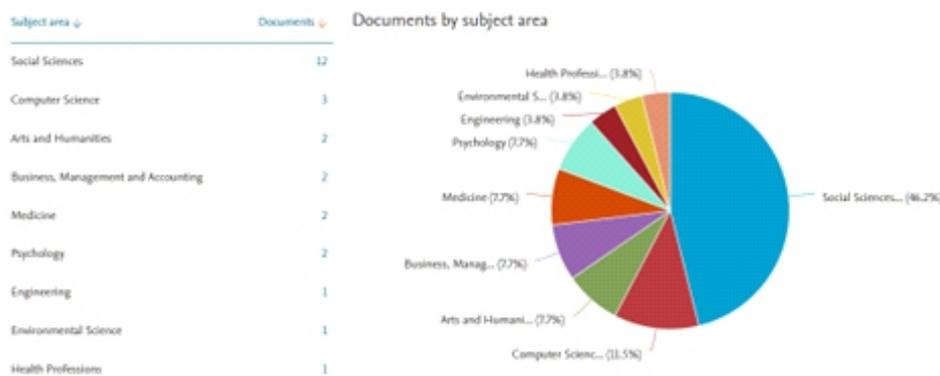

Figure 1.
Subjects of 13 Scopus search: "digital storytelling", "environmental education", "youtube"

Literature Review

Environmental Sustainability
One of sustainability's main pillars is environmental (Hansmann et al., 2012). Goodland (1995) conceptualized environmental sustainability as the preservation of the sources of raw materials essential for human needs, aiming to enhance human well-being while staying within the limits of available resources.

Environmental sustainability can be improved digitally. A study by Balogun et al. (2020) explained that there is a digitalization trend for improving environmental sustainability, where nine cases in different countries adopt digital technologies to face climate change. Feroz et al. (2021) also suggest a framework where digital transformation promotes environmental sustainability.

Digital Storytelling
Digital storytelling refers to a way to generate a story about certain issues by utilizing multimedia tools and software, sharing it through a multimedia environment (Nguyen, 2011; Robin, 2008). Most of these digital stories combine multimedia components (text, voice-over, video, music, and visuals) with a genuine and organic story on a specific matter (Kotluk & Kocakaya, 2016). However, these stories can produce meaningful narrative with informative and constructive aims (Robin, 2008). Digital storytelling has applied in a learning environment inside or outside the classroom environment, creating active learners and communities, fostering collaboration and enrich technology literacy (Karakoyun, 2014).

An article by Tzima et al. (2020) explores the application of digital storytelling as an educational instrument to increase awareness about sustainability concerns, including environmental sustainability. Another study by Andriopoulou et al. (2021) founds that digital storytelling significantly improves scientific and environmental literacy among high school students in informal educational settings, fostering positive behavior and sustainable attitudes regarding marine litter.

COP

To address the research gap, this study will draw on the Communities of Practice (CoP) theory to examine how digital storytelling can promote knowledge-sharing and collaboration among community members. This literature review covers digital social innovation and social forestry to provide theoretical and context underpinning.

The Community of Practice (CoP) refers to a social process model (Wenger, 1998; Wenger, 2000) emphasizing competence negotiation process with social interaction and knowledge sharing. This theory was originally developed to examine the learning between practitioners in a social environment. It evolves from the novice versus expert interaction, to individual participation in a group setting, and later to managerial tool to improve organization's competitiveness (Li, 2009).

In a community of practice, there are several processes of learning from the lenses of organizational behavior: imagination, engagement, and alignment (Wenger, 1998; Farnsworth, 2016; Randhawa, 2016). The community learning system starts with imagination process which is the construction of images of community membership. It then transforms into an engagement process in which community members engage each other and shape experience. Engagement results in alignment process which local activities are more effectively aligned with other processes.

Digital Social Innovation

Digital social innovation within the CoP explores how digital technologies and platforms, such as YouTube, can be harnessed to learn social change and sustainable practices. Digital storytelling emerges as a powerful tool within this framework, enabling individuals to share experiences, perspectives, and knowledge through engaging narratives on social platforms like Youtube (Pozzo, 2020; Arndt, 2021). This approach fosters engagement and alignment from CoP's mode of learning.

The integration of the CoP with digital social innovation highlights the significance of collaborative efforts and safe space for shared learning in addressing environmental challenges (Pereira, 2015). It recognizes the importance of engaging stakeholders, such as local communities, government, businesses, and researchers, in the form of environmental education, sustainable innovation design, and creativity (Pereira, 2015; Steins, 2021; Pozzo, 2020)

In the specific context of social forestry or sustainability, digital social innovation with CoP approach could increase the learning results of previous digital initiatives (Tsenbazar, 2015; Widianingsih, 2023). Five potential learning factors in digital social innovation to support sustainability include social innovation, social mission, sustainable innovation design, creativity, and government policy evaluation (Kleverbeck et al., 2017; Qureshi et al., 2021; Jiatong et al, 2021; Ko et al., 2019; Valle-Mestre et al., 2022). Related research is still limited and covers case studies such as land cover mapping and low-carbon living stories. Digital storytelling on platform like YouTube enhances the collective capacity of stakeholders involved in social forestry initiatives by fostering a sense of community, facilitating knowledge exchange, and promoting collaborative problem solving (Sanchez, 2021). Research by Widianingsih (2023) mentioned digital engagement with platform like Youtube demonstrate support for green economies.

Research Methodology

To address the objective of the study, the experiences and opinions from sustainability activists and experts in Indonesia need to be captured. Since the aim of this study was to examine the idea of a new model in promoting support to sustainability and to gain opinions about it, Focus Group Discussion (FGD) was seen as an applicable data collection strategy. This qualitative research allows researchers to delve into a phenomenon while providing rich and detailed insights uncovering underlying factors that influence behaviors, beliefs, and attitudes (Cresswell, 2018).

The idea of discussion with FGD approach is that participants are satisfactorily homogeneous and use the same overall definitions of a given problem or task (Krueger and Casey, 2009; Hamunen et al, 2015). Compared with individual interviews, the overall aim of FGD is to ignite active conversation, get reasoned opinions about the issues of concern, and generate new ideas (Krueger and Casey, 2009).

Table 1
FGD/Focus Group Interview Guide

Type of Question	Question
Opening question	• In general, how communities and society manage social forestry activities to improve environmental awareness and support?
Introductory question	• What are the forms of social innovation activities assisted by digitalization that can benefit environmental education?
Key question	• What are the roles of social innovation, social mission, and sustainable innovation design in advancing digital-based environmental education?
	• What are the roles of creativity in advancing digital-based environmental education?
	• What are the roles of government policy evaluation in advancing digital-based environmental education?
Ending question	• What do you think are other forms of activities that can support digital-based environmental education?

FGD data were gathered by conducting sessions from June to December 2022. FGD participants were specifically selected to minimize error in discussions of related themes. Therefore, participant profiles cover local social forestry professionals, experts representing Java and Kalimantan, as well as national forestry policy makers. FGD sessions were attended by 15 professionals and experts, organized in 3 focus group sessions in Bogor (West Java province), Palangkaraya (Central Kalimantan province), and Balikpapan (East Kalimantan province). Bogor is chosen because of the location of major forestry research centers in Indonesia, while Palangkaraya and Balikpapan are chosen because of the vicinity to the social forestry activities in Kalimantan Island. The first focus group in Bogor consisted of 2 experts from a government research agency in forestry, 2 senior leaders from ministry of environmental and forestry, and 2 practitioners in social forestry. The second focus group in Palangkaraya consisted of 1 professional from government-owned forestry companies, 1 senior leader of a non-government organization (NGO), and 3 experts from local units of Ministry of Environment and Forestry.

The third in Balikpapan consisted of 3 researchers in social forestry and 1 employee of local governments. In this study it is assumed that the blend of professionals and experts are familiar with promoting sustainable behavior through digital means and can offer broader perspective in community learning.

The core topic of focus group discussions was "digital knowledge sharing from community members to support sustainability or environmental education". The FGD began with the facilitator leading through questions and participant giving opinions. In addition, participants also provided short answers and categorized them based on five potential learning factors on a digital board (this FGDs used Mural.co web-based platform). All FGDs lasted approximately for 3 hours, recorded (with participant consent), and transcribed.

Validity criteria in all FGDs follows descriptive, interpretative, and theoretical validity (Chioncel et al, 2003). Descriptive validity refers to mitigation of mis-transcription or misremembrance, which were done by four researchers trained and experienced in conducting qualitative research. Interpretative validity refers to the use of participants language; it was done by having two researchers familiar with and already member of the community.

Table 2
Expert FGD Participants

Participant Code	Expertise background	FGD Time
A1	25 years of forestry research National Research and Innovation Agency	June 2022 September 2022
A2	13 years of forestry research National Research and Innovation Agency	
A3	23 years of forestry research University	
A4	13 years of forestry policy management Ministry of Environment and Forestry	
A5	23 years of forestry program management Ministry of Environment and Forestry	
A6	23 years of forestry program monitoring Public Sector Development Supervisory Agency	
B1	23 years of forestry operation Central Kalimantan Forest Management Unit	July 2022
B2	13 years of forestry program operation Tanjung Puting National Park	
B3	15 years of forestry program operation WWF (World Wildlife Fund)	
B4	15 years of forestry management Central Kalimantan River Basin Management Office	
B5	20 years of program reporting Central Bureau of Statistics	

Theoretical validity refers to the inference from data to report; it was achieved by having two researchers with more than 20 years of experience in the technology management field. Reliability in all FGDs relates to the data and the method. All FGDs were approached toward completing rather than limiting the data (Chioncel et al, 2003). Data were analyzed qualitatively in two phases. The data collected during the FGD was transcribed and then all transcripts were anonymized to ensure confidentiality. Next, a thematic content analysis of the transcripts was carried out to interpret the obtained results. Three researchers manually coded the FGD results separately and agreed on subthemes through team consultation meetings.

Results and Discussion

Participation from community members can emerge in various levels of evidence. Detecting these forms of participation assist us to validate social learning system formation and personal identities (Wenger, 2000). Following the COP mode of belongings, the results and discussion discuss the three modes: Engagement, Imagination, and Alignment (Wenger, 2000).

COP in Social Innovation
The results of FGD revealed insights related to the role of CoP in digital social innovation learning. The findings underscore key social innovation learning behaviors which are effective to be promoted via digital means, such as protecting local commodities, promoting products or services, encouraging ecotourism, and driving local community participation in the context of sustainability.

Specifically for protecting local commodities, FGD participants recognized that through digital storytelling, especially YouTube, broader communities could raise awareness about the significance of preserving local resources, such as indigenous or traditional crops, or local handicrafts; for example, sharing of organic farming in Megamendung West Java

or promoting ecotourism in Tanjung Putin Central Kalimantan. Here, the term "broader communities" means not only the community which resides in the related forest areas but also other communities which concern with social forestry of sustainability in common. The activities create ownership among community members, fostering a commitment to protect cultural heritage and natural assets, and resonating the sustainability support spirit via YouTube as their digital platform.

FGD participants from social forestry practitioners pointed out how YouTube digital storytelling could communicate the environmental and social benefits of locally produced goods by showcasing the stories behind these offerings, such as the use of local eco-friendly practices, local-regional community collaboration, or natural beauty showcase. This approach touches on a more emotional aspect of discussion rather than a mechanistic one commonly found in Communities of Practice (Hamunen et al, 2015).

The discussion also emphasized the role of YouTube as a digital storytelling tool to inspire and ignite broader community members to engage in environmental projects such as reforestation mapping or simple agriculture community practice ("Kelompok Tani Hutan", or "Kelompok Usaha Perhutanan Sosial") mapping with low-end smartphones. This learning behaviour encourage coalition building between different communities, consistent with recent findings by Adefile et al (2021). According to Wenger (2000), out of the six elements in CoP self-design, the coalition creates at least artifacts and connectivity.

COP in Social Mission
Social mission learning provides a media to identify the knowledge and purpose gaps for related community members. One of the key goals of Community of Practices (CoPs) is to engage the community in social forestry activities. This can be done through a variety of tools, such as "Kelompok Tani Hutan" or forestry farmer group (KTH) and "Lembaga Masyarakat Desa Hutan" or forestry village council (LMDH).

These organizations help to build trust and relationships between the community and the CoP. They also train the community to get involved in the decision-making process related to the community mission.

In addition to engaging the community, CoPs can also help to guide social forestry farmer groups related to commodity selection. For example, in Central Sulawesi, CoP helped to guide a group of farmers in selecting red cherries and green cherries for coffee commodities. This decision basically helped the farmers to align the mission to increase community income.

CoPs can also help to change the mindset of the community. For example, a CoP in Bulu, Rembang, Central Java, helped to increase the confidence of the farmers by providing them with basic skills training. This training helped the farmers to see the potential of social forestry, and it gave them the confidence to start their own businesses.

CoPs can also help to align the interests of the community with the goals of social forestry. For example, a CoP called Santripreneur in Ciamis, West Java Province, helped to shift the perspective of the community towards solving poverty with social forestry. This was done by providing the community with training and support to start their own businesses.

Recent research indicates that social mission learning built a snowball of collaboration at institutional and community outreach (Anand et al., 2015; Alkaher et al., 2018). The research discussed education as a tool to influence citizen behaviour toward sustainability. Education influenced the social mission by incorporating strategies such as professor support and curriculum integration.

COP in Government Policy Evaluation

Particularly in the context of developing countries like Indonesia, the role of the government policy evaluation in community learning ensures business security and communication optimization. They felt that the government should play a more active role in securing businesses from illegal logging and other threats. They also felt that the government should maintain communication with the community and community leaders to ensure that everyone is on the same page. This is common for a context like Indonesia, where regional or central government activities play as "the cushions" to keep economic growth momentum.

The participants also discussed the role of the local government as part of the LMDH. They felt that the local government should be more involved in the day-to-day operations of the LMDH. They also felt that the local government should act as a bridge between farmer groups and Perhutani, the state-owned forestry company.

The participants discussed the role of the government in providing access to appropriate technology. They felt that the government provides less support for the development and adoption of new technologies that can help social forestry farmers to improve their productivity. They also felt that the government should integrate various stakeholders and upstream to downstream sectors to create a more efficient and effective social forestry value chain. The case in Central Kalimantan proved that government evaluation learning is needed, for example when KTH needed to check official and actual social forest border using drone technology. In some cases, regional government can allocate the budget to buy quadcopter or fixed-wing drones. This sensing (i.e., for government budget allocation) is important to drive social innovation support toward sustainability.

Our FGD participants discussed the role of the government as a facilitator for mindset-changing programs and training. They felt that the government should play a more active role in helping social forestry farmers to change their mindsets and adopt more sustainable practices, one of the ideas was to work with UPR (Palangka Raya University) to develop and deliver training programs that are tailored to the needs of social forestry farmers.

The FGD participants also discussed the role of the government in increasing collaboration that supports social forestry programs. They felt that the government should provide more support for the development of joint ventures and other forms of collaboration between social forestry farmers and other stakeholders, for example the idea from the professionals in Ministry of Forestry to assist social forestry value chain integration by clustering products and regions in Indonesia.

The FGD participants also discussed the role of the government in providing and regulating optimal regulations; they felt that the government should simplify and address current overlapping regulatory environment in social forestry and provide more support for the development of regulations that are tailored to the specific needs of social forestry farmers. This is consistent with recent findings from the research which found that government agencies need to influence optimally to re-orient citizen activities toward sustainability (Reed et al, 2014; Christie et al., 2017; Sletto et al, 2019).

COP in Marketing Creativity
The addition of "digital" term in social innovation learning requires that creativity is embedded in the community or group practices (Ko et al, 2019; Qureshi et al., 2021). The FGD participants discussed the importance of learning from other success stories to spark creativity. They felt that by studying what has worked well for other social forestry programs, they could identify new and innovative marketing strategies that could be used to promote their own programs.

The participants also addressed the effectiveness of using local champions. They felt that by identifying and empowering individuals who are passionate about social forestry, they could create more effective marketing campaigns to support sustainability. In the country context where sustainability is still far from everyday life and related activities are not yet ubiquitous, local champions which essentially innovators do the frugal approach with less resources (Christensen et al., 2006).

The importance of developing collaboration between communities by working together in community centers to pool resources and create a more powerful marketing message was also eminent in the discussion.

The participants highlighted the importance of ensuring the availability of product offtaker. They felt that by having a clear understanding of the market, they could ensure that their products were being sold to the right people. By convincing people that social forestry is a valuable investment, they could create a more receptive market for their products.

The participants also discussed the importance of creating products according to market needs. They felt that by understanding what people want, they could create products that would be more likely to sell.

Here are some specific examples of marketing creativity learning that were discussed in the FGD, based on customer and product validation approach:
1. Learning from other success stories: in Tarakan and Balikpapan, Kalimantan, social forestry programs have been successful in increasing income by using optimal land use. This suggests that other social forestry programs could learn from these success stories and adopt similar marketing creativity strategies.
2. Using local champions: in Bogor, West Java Province, a social forestry program has been successful in using local champions to promote its products. These champions are passionate about social forestry and have been able to connect with the community in a way that the program itself could not.
3. Changing people's mindsets: in several cases, social forestry programs have been successful in changing people's mindsets about social forestry. This has been done by convincing people that social forestry is a valuable investment and that it can help to improve their lives. This is found from the practitioners in "Kelompok Usaha Perhutanan Sosial" (KUPS) from Subang, Palangkaraya, and Samarinda.

4. Developing collaboration between communities: In Subang, West Java Province, a social forestry program has been successful in developing collaboration between communities. This collaboration has helped to increase internet access coverage and promote the program's products on social media and radio.

5. Ensuring the availability of product offtaker: In Sulawesi, a social forestry program has been successful in ensuring the availability of product offtakers. This has been done by becoming offtakers of agricultural products themselves or by working with institutions that can connect buyers with sellers.

COP in Sustainable Innovation Design
Community learning program design for sustainability needs engagement in belonging mode and at least mutuality (social capital) in progress dimension (Mead et al., 2021). In our FGD, participants started the discussion with the importance of institutional innovations, including articles of association (or AD/ART in Indonesian legal term), group member data collection, business analysis simulations for various commodities, which support environmental preservation. They felt that by innovating the institutions, they could create a stronger and more efficient structure for managing social forestry activities toward environmental sustainability.

The participants also discussed the importance of dividing long-term objectives into activities that change mindsets through short trainings. They felt that by providing short trainings, they could help farmers to change their mindsets about the importance of environmental preservation. The Santripreneur in Ciamis, West Java Province, clearly adopted this approach by integrating innovation design and practice into academic boarding school curriculum.

The participants discussed the importance of designing new financial impacts since planning stage, such as new revenue streams to gain farmers' trust and loyalty (as an initial support for sustainability). They felt that by designing new financial impacts, they could help farmers to increase their income and at the same time support environmental preservation.

The participants also addressed the importance of having program monitoring and evaluation tools for collaboration with KPH (provincial-level forest managers for non-Java regions) or Perhutani (forest managers within Java regions). They felt that by collaborating with KPH or Perhutani, they could be more effective in managing social forestry activities.

Some specific examples of sustainable innovation design that were discussed in the FGD were as follows:
1. Institutional innovations: In West Java, a social forestry program has developed new institutional arrangements that allow farmers to have more daily control over their land, such as by registration and regular monitoring of the community managers in related forestry lands. This has helped to reduce conflict and promote sustainable practices.
2. Mindset-changing trainings: In Sulawesi, a social forestry program has developed short trainings that help farmers to understand the importance of environmental preservation. These trainings have helped to change farmers' mindsets and promote sustainable practices.

Activities that promote awareness of reduce business risk: Central and West Kalimantan provice, social forestry programs have developed activities that help farmers to reduce business risk. These activities include crop diversification, risk sharing arrangements, and access to technical assistance in forestry farming.

Figure 2.
FGD Thematic Coding With The Topic Of "Digital Knowledge Sharing From Community Members To Support Sustainability Or Environmental Education".

Limitation, Implication, and Future Research Direction

This research has several limitations which resulted from related research methodology. First, the study was conducted in a specific context, namely social forestry in Indonesia. The findings may not be generalizable to other contexts. Further, the study only used one data collection strategy, namely focus group discussion and therefore it may have limited the depth of the findings. The study only used thematic coding as the data analysis method; this may have limited the richness of the findings.

Nonetheless, having these research findings develops several implications. In academic context, the findings suggest that digital storytelling can be an effective tool for environmental education. This is because digital storytelling can engage learners, help them to understand complex concepts, and promote critical thinking. Another implication suggests that there is a need for more research on the use of digital storytelling for environmental education in different contexts.

This is because the findings of this study were based on a specific context, and it is important to determine whether the findings are generalizable to other contexts.

This study also only focuses on YouTube as the digital storytelling tool. It is important to broaden the digital media scope for future studies to find alternative digital platform for environmental education.

In managerial context, the findings suggest that digital storytelling can be an effective tool for environmental product or solution design. The Community of Practice can be a useful framework for understanding the use of digital storytelling for environmental education.

Future research directions apply to replication of the study in other contexts: this would help to determine the generalizability of the findings. Use of other data collection and data analysis methods would help to enrich the findings. Exploration of the use of digital storytelling for other environmental education purposes is also possible for the reason of expanding the scope of this research topic.

Conclusion

This article has explored the current knowledge of digital social innovation in the form of environmental education which supports sustainability. The context of digital-related activities, social forestry and its impact on sustainability were explored using the Focus Group Discussion approach.

To sum up, the FGDs explored 5 thematic factors in Digital Social Innovation: social innovation, social mission, sustainable innovation design, creativity, and government policy evaluation. The framework of FGD discussion followed Community of Practice theory.

In the context of Indonesia, some factors like government policy evaluation and sustainable innovation design are still peculiar for learning context. Possible reasons include the overlapping of current regulations and the low familiarity of sustainable education for the majority of citizens in developing countries.

The study's limitations are its specific focus on social forestry in Indonesia, the reliance on a single data collection strategy (focus group discussions), and thematic coding as the sole data analysis method may have restricted the depth and richness of the results, respectively. It also only focuses on YouTube as the only digital platform.

Despite its limitations, the impact of a study like this can be twofold. First, it can help improve the quality of environmental education programs by providing insights into how YouTube as a digital storytelling tool can be used to engage learners and promote environmental awareness. Second, it can help inform the development of new digital storytelling initiatives by providing guidance on how to design and implement effective digital storytelling programs which support sustainability.

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