

From Village to Virtual Education: Advancing Literacy Through Innovation at SDN Sumberjati

Iman Subekti^{1*}, Gunawan Tanuwidjaja^{2,3*}, Michael Kurniawan², Efraim Jason Indargo²

¹Faculty of Teacher Education, Petra Christian University, Surabaya, 60236, Indonesia

²Faculty of Civil Engineering and Planning, Petra Christian University, Surabaya, 60236, Indonesia

³Engineering Faculty, Queensland University of Technology, Brisbane, Queensland 4000, Australia

*Correspondence should be addressed to Iman Subekti and Gunawan Tanuwidjaja;

imansubekti@petra.ac.id, gunteitb2012@gmail.com, gunte@petra.ac.id

(Received November 11, 2025; Revised December 4, 2025; Accepted December 4, 2025)

Abstract

This community engagement program was carried out with the aim of strengthening early literacy competency among elementary teachers and students in rural areas. It focused on SDN Sumberjati, where students and teachers still have limited access to learning materials, proper technology, and only a little exposure to digital literacy. The program tried to introduce a kind of hybrid learning idea called From Village to Virtual Education, combining literacy mentoring, use of simple digital classroom platforms, and creative learning activities adjusted to the rural situation. The implementation involved university volunteers working closely with the school, including students, teachers, and the school administrators. The process moved through four main stages, which were needs assessment, planning with capacity building, running the literacy activities, and then evaluation. The results showed a clear improvement in students' reading interest, their willingness to join digital learning sessions, and their ability to express ideas in more creative ways. The teachers also gained practical experience in using digital tools and trying literacy enrichment practices in their classrooms. The community around the school received social and economic benefits as well because collaboration between the school and parents became stronger, and some basic digital learning facilities started to be maintained in a more sustainable way. This program shows that these kinds of educational efforts can really help in reducing the learning gaps that still happen in many rural communities, and it gives students a chance to reach digital learning in a more equal way. For the future plan, the team plans to keep mentoring, propose open-source learning materials, and also expand the program to other schools in the region.

Keywords: *AI-based learning, digital literacy, library redesign, teacher training, universal design*

How to Cite:

Subekti, I., Tanuwidjaja, G., Kurniawan, M., & Indargo, E. J. (2026). From village to virtual education: Advancing literacy through innovation at SDN Sumberjati. *Journal of Innovation and Community Engagement*, 7(1), 1-13. <https://doi.org/10.28932/ice.v7i1.13669>

© 2026 The Authors. This work is licensed under a Creative Commons Attribution-Non-commercial 4.0 International License.



Introduction

Educational inequality continues to become a persistent concern across many rural regions in Indonesia, where schools are still struggling with limited learning resources, weak digital infrastructure, and not enough opportunities for teacher professional improvement. SDN Sumberjati, which is located in a rural agricultural area in East Java, can be seen as one example of a school that is still facing quite strong literacy difficulties. Similar studies have shown the digital literacy gap in indigenous and remote communities (Maisyaroh et al., 2023; Riley et al., 2025). From the early observation process and some informal talks with the teachers, it was more or less seen that many students were showing low reading fluency, not very wide vocabulary understanding, and only very limited experience with any kind of digital learning setting. As a result, their learning motivation became rather low, and classroom participation remained uneven.

The school itself has insufficient technological facilities, no structured digital literacy program, and very limited access to the library or enrichment materials. These conditions became more visible after the COVID-19 pandemic, when the gap between rural and urban schools increased more strongly. Because of this situation, there was an urgent need for some kind of learning innovation that could support literacy development and provide exposure to educational technology that is suitable for the capacity of the local community.

To respond to these challenges, a collaborative community engagement activity was developed between SDN Sumberjati (Sumberjati Elementary School) and Petra Christian University (PCU) with the project “Development of Reading Space and Digital Literacy at SDN Sumberjati, Mojokerto”. This project is supported by the Indonesian Ministry of Higher Education, Science, and Technology, known as KEMDIKTISAINTEK. The project combines innovative technology with empowerment in education. The intention of this program was not only to strengthen students’ literacy competence, but also to encourage teachers and parents to participate more actively in the learning process. The program introduced a hybrid literacy model that combines onsite mentoring with simple virtual learning, which is considered to have the potential to become a scalable strategy for improving education quality in rural contexts.

The project involves four activities, which include: (1) capacity building of teachers in making AI-powered learning videos using the eJourney platform, (2) improvement of the internet

capacity in the school from 30 Mbps to 100 Mbps, (3) improvement of computer hardware capacity, and (4) provision of new furniture and learning facilities in the school. These activities support the Indonesian National Agenda in KEMDIKTISAINTEK in terms of developing community service activities based on research, improving digital talent, and realizing Digital Vision 2045.

Architecture students from PCU also made their contribution in terms of renovating the interior design of the mini library in one of the local schools with the application of Universal Design, with the assistance of this article authors. This project demonstrates their contribution to ensuring the creation of an effective, accessible, and motivating learning environment not only for the students but also for teachers. This project carried out by a research team, shows PCU's multidisciplinary collaborations.

There are three objectives in the proposed project. Firstly, there is the objective of identifying the reading cultures and internet availability literacy needs at both the SDN Sumberjati and the surrounding community. Secondly, there is the objective of carrying out innovative projects such as AI-powered educator training, internet enhancement, and design improvement of the mini libraries in the school. Lastly, the project also seeks to develop a significant social impact through training more teachers, reaching new learners, and community members in digital literacy.

Internationally, the need to incorporate digital literacy in the curriculum has become an unavoidable imperative, as it assists schools and teachers in overcoming the ever increasing technological change. Rozali et al. (2024) presented concrete ideas regarding the digital competency framework developed for primary school's design and technology teachers, emphasizing the importance of self assessment (Rozali et al., 2024). However, Castaño et al. (2025) observed that active learning approaches such as project learning and challenge learning work effectively in developing sustainability literacy, creativity, and trans disciplinary teamwork (Castaño et al., 2025). Casquinha (2024) examined the use of ChatGPT through the Design Thinking approach. The ChatGPT is potential to for enhancing creativity and efficiency in advertising (Casquinha 2024). However, utilizing an extended version of the Theory of Planned Behavior, Costan et al. (2022) demonstrated the significant effect of self efficacy and

digital literacy on teachers' intentions during flexible learning system transitions (Costan et al., 2022).

Related to hybrid learning, Peñarrubia et al. (2021) and Maisyaroh et al. (2023) highlighted that the success of digital transformation in education relies on community support, technology availability, and human capital (Peñarrubia et al., 2021; Maisyaroh et al., 2023). These studies actually supported the importance of teamwork in Information and Communications Technology (ICT) development. Sharma and Tripathi (2019) justified the benefits of ICT in Indian schooling, shifting the mode of learning in education from teachers to learners if supported by effective policies (Sharma & Tripathi, 2019).

Serodes (2025) points out the need to effectively manage time, which plays an important part in integrating sustainability and technology in the classroom (Serodes, 2025). ICT's engaging advantages face practical limitations in terms of irregular usage patterns and overall workloads. These require proactive teachers, effective leadership, and approaches to cultural responsiveness, such as optimal timetables and dedicated classrooms.

Apart from physical infrastructure, other researchers' recommendations include inclusive and culturally responsive designs. Riley et al. (2025) and Edwards Vandenhoeck (2018) proved the benefits of integrating community heritage and arts designs to promote digital literacy (Riley et al., 2025; Edwards Vandenhoeck, 2018). On their part, Harper (2016) and Giovannella and Roccasalva (2024) emphasized the importance of transforming learning spaces and libraries into flexible learning environments enriched with technology to support collaboration, digital literacy, and student wellbeing (Harper, 2016; Giovannella & Roccasalva, 2024).

Methods

There are two methodologies employed in conducting the research: ethnographic research and participatory action research (PAR). The ethnographic research, according to Creswell (2015), is a qualitative research design utilized in exploring and explaining collective behaviors, beliefs, and language of a culture-sharing community (Creswell, 2015). The objective of ethnographic research is to understand and explain culture systematically conceived in relation to human behavior, communication, rituals, and social structure. Ethnographic researchers

often engage in immersion, interviews, and document analysis to fully grasp the realities of the subjects. Ethnographic studies are important when conducting an in-depth investigation of a particular group, which in turn might serve to give explanations of social and learning issues. Ethnographic research, according to Creswell, is an appropriation of cultural anthropology, involving extended involvement, commitment, and a participatory approach to observe and attend to how collective ideologies and actions shape behaviors.

Nonetheless, the research team utilized an ethnographic approach in an endeavor to grasp the learning processes and social interactions occurring in Sumberjati Village. The activities in the field included carrying out surveys on learning needs and issues in the community, teaching children to interact with learners, observing teachers to grasp their teaching approaches, and training teachers to enhance inclusive and successful approaches in teaching, involving 12 teachers from local primary and secondary schools, observed and trained, and community leaders. Moreover, the project supported the improvement of digital literacy facilities and ensured adequate provision of technological support. The team also improved the interior design of the mini library to create a conducive environment for learning. These actions tapped into the deep understanding of local cultures and community values as described by Creswell (2015).

Participatory action research (PAR) was also employed, as recommended by Lizandra et al. (2025), to contribute to the enhancement of a physical education intervention in two secondary schools. The process took place in the environment of the classroom and school, involving students, physical education teachers, and school administration, with activities co-designed and embedded in the daily school curriculum. Based on the plan proposed by Lizandra et al., the team was formed to pursue four major tasks:

1. Training for school teachers to create stimulating learning videos on the e-Journey platform, and utilizing an AI-enabled e-Journey platform.
2. Expanded wireless in the school from 30 Mbps to 100 Mbps.
3. Renovate the computer lab and classes with SSD and WiFi.
4. Get supportive facilities at libraries, including bookshelves, cabinets, tables, and chairs for teachers as well as children's study tables.

Moreover, the team also evaluated the success achieved in the training of teachers. The success achieved in the training of teachers was indicated by the measurements taken through pre- and post-training tests, helping to evaluate if teachers have progressed during their training. The team also have an opportunity to discuss and present at the conclusion meeting to evaluate the teachers' skills gained in the project.

Results and Discussions

Results

The ethnographic study in Sumberjati Village also brought out significant findings in terms of the local education environment. The learners were very eager to learn with digital platforms, showing their level of curiosity and interest in the activities conducted with the help of technology. The teachers were also highly motivated and innovative, taking part in training activities and changing their methods of teaching.

However, there were also identified limitations, such as the WiFi connection being restricted, the availability of learning facilities in the school being substandard, and the school location, which could be affected by landslides. To mitigate such limitations, the team were able to contribute short tables, bookshelves, an instructor's desk with a chair, and new texts to improve the functionality of the mini library. Apart from the contribution, the team also offered designs on how the interior of the future mini library would be constructed to make the environment conducive, comfortable, and interesting enough to facilitate creativity and teaching.

Discussion

Figure 1 shows the digital literacy training at SDN Sumberjati. The program was prepared and conducted from June to October 2025. The e-Journey platform was utilized to train teachers for creating learning videos. Figure 2 shows the original condition of the mini library at SDN Sumberjati. The room is originally converted from the multi-purpose room and library room. The mini library was greatly improved with the addition of new furniture, including bookshelves, cabinets, tables, and chairs for teachers as well as children's study tables. Furthermore, the Universal Design process for the SDN Sumberjati mini library by architecture students is shown in Figure 3. The design was adapted in a short time. There are some limitations on the funding and furniture options in Mojokerto, which limit the design. Figure 4

shows the Universal Design proposal for the SDN Sumberjati mini library. Additional wallpaper, wall paintings, and other elements can be proposed in the future. Additionally, Figure 5 and 6 show the ceremonial handover and donated furniture for the SDN Sumberjati mini library, including bookshelves, cabinets, tables, and chairs for teachers as well as children's study tables.



Fig. 1. Digital literacy training at SDN Sumberjati



Fig. 2. Original condition of the mini library at SDN Sumberjati



Fig. 3. Universal Design process for the SDN Sumberjati mini library by architecture students



Fig. 4. Universal Design proposal for the SDN Sumberjati mini library (image created using PromeAI Blender)



Fig. 5. Ceremonial handover of furniture for the SDN Sumberjati mini library



Fig. 6. Donated furniture for the SDN Sumberjati mini library, including bookshelves, cabinets, tables, and chairs for teachers as well as children's study tables

The application of the Development of Reading Space and Digital Literacy program at the SDN Sumberjati has produced significant findings in relation to contemporary theories and approaches in education. First, the results demonstrate strong teachers' motivation for using AI learning support tools, in particular the e-Journey platform. This result confirms the suggestion of Costan et al. (2022) that the teachers' self-efficacy and digital nativity would have the greatest impact in persuading teachers to use the flexible learning platforms. The teachers are willing to change their teaching practice.

Secondly, the intervention led to noticeable improvements in teachers' competency. An analysis of pre- and post-testing showed an increase in digital literacy competency and teaching competency, consistent with the approach of Rozali et al. (2024), which emphasized the importance of continuous personal development for primary teachers.

Third, students positively commented on the use of digital media in the technology, which fostered high levels of engagement and curiosity. This coincides with the opinion of Castaño et al. (2025), who stated that dynamic learning methodologies encourage student creativity, work with other disciplines and with technology, and enhance work in teams.

Fourth, the mini library was greatly improved with the addition of new furniture and learning materials. The design, which was universally designed as recommended by Harper (2016) and

Giovannella and Roccasalva (2024), was on flexible learning environments equipped with technology.

Lastly, the SDN Sumberjati showed keen interest in furthering the training program, which highlights the commitment to the development of digital literacy. Again, this emphasizes the need to design culturally responsive approaches, which Riley et al. (2025) and Edwards Vandenhoeck (2018) support, in creating sustainable transformation in education.

The implementation of the program generated measurable social and economic benefits for the school community. Socially, the program strengthened collaboration among teachers, students, and parents through regular mentoring sessions and joint learning activities. Students demonstrated increased enthusiasm for reading and improved participation in digital learning platforms, contributing to a more engaging classroom environment. Teachers gained new competencies in integrating technology into lesson delivery, which increases their professional capacity and long-term teaching quality.

Economically, the program reduced dependency on printed materials by introducing digital learning resources, thereby lowering learning costs for students' families. The provision of digital equipment and learning platforms also created opportunities for ongoing literacy enrichment without requiring additional material expenditure. Furthermore, the improvement in student learning outcomes supports long-term community development, enabling better educational attainment and future economic opportunities. This initiative demonstrates that community-based literacy intervention supported by technology can improve both social cohesion and educational access while reducing financial barriers. The model has potential for wider replication in similar rural contexts.

Conclusion

The Development of Reading Space with Digital Literacy project at the SDN Sumberjati, Mojokerto, was established as an attempt to improve literacy practice and bridge the digital divide in rural schooling. This study was guided by three main objectives. These were to determine the literacy needs of the area of the school, to provide the school with specified

interventions, and to measure the social influence of such assistance. An ethnographic approach was applied to the study.

The result showed high student excitement in e-learning as they wanted to be active in the world of digital activities. The teachers showed a high degree of creativity when teaching in the classroom, which was reflected in their readiness to take part in training in digital literacy. However, the principal disadvantages cited in the planning of the project were a weak WiFi signal, scarce resources in the library, and security in the school premises. To address the limitations, the team made contributions in the form of books, furniture, and electronics. They also submitted the design for the Universal Library.

The study's importance exposes the need for integrating digital facilities development with teacher empowerment, student guidance in selecting content, and continuous training. However, the project was limited by restrictions on financial resources, infrastructure, time, and the digital competence of teachers.

In the future, research should focus on the development of local digital literacy materials, on the determination of children's choices in digital learning, and on the development of learning adaptations using Gardner's Theory of Multiple Intelligences as a guide. Culturally contextualized methodologies of teaching and learning can guarantee the sustainability of emerging digital literacy projects for the future. Overall, the project represents how collaboration between community and rural schools can be transformed into an inclusive learning environment supported by technology in the Indonesian digital era.

Acknowledgements

The authors are grateful to express their sincere thanks to the *Kementerian Pendidikan Tinggi, Sains, dan Teknologi* (KEMDIKTISAINTEK) in terms of project grants. We also appreciate the support given by the Institute for Research and Community Service (LPPM) of Petra Christian University (PCU).

References

- Casquinha, A. C. B. (2024). *Creativity and problem solving in advertising: The impact of chatgpt within the design thinking framework* [Master's thesis, Universidade NOVA de Lisboa, Portugal]. <https://www.proquest.com/openview/d55f1bc15b96dc1229338ece71bcc97a/1?cbl=2026366&diss=y&pq-origsite=gscholar>
- Castaño, C., Caballero, R., Noguera, J. C., Austin, M. C., Bernal, B., Jaén-Ortega, A. A., & Ortega-Del-Rosario, M. D. L. A. (2025). Developing sustainability competencies through active learning strategies across school and university settings. *Sustainability*, *17*(19), 8886. <https://doi.org/10.3390/su17198886>
- Costan, F., Gonzales, G., Gonzales, R., Valle, L., Dela Cruz, J., Alcantara, G., ... & Ocampo, L. (2022). Teachers' turnover intentions in view of implementing a flexible learning system: An extended theory of planned behavior. *Sustainability*, *14*(20), 13009. <https://doi.org/10.3390/su142013009>
- Creswell, J. W. (2015). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Pearson Education Inc.
- Edwards-Vandenhoeck, S. (2018). 'Over there, in the future': The transformative agency of place based design education in remote Aboriginal communities. *International Journal of Art & Design Education*, *37*(4), 622-637. <https://doi.org/10.1111/jade.12209>
- Giovannella, C., & Roccasalva, G. (2024). People centered smart learning ecosystems: Frameworks of reference for optimal design and planning to support individual well-being and learning by being. In M. Kanaani (Ed.), *The Routledge companion to smart design thinking in architecture & urbanism for a sustainable, living planet* (pp. 286-297). Routledge. <https://doi.org/10.4324/9781003384113-34>
- Harper, M. S. (2016). Designing an innovative school library environment to facilitate 21st century literacy skills. *2016 IASL annual conference proceedings*. <https://doi.org/10.29173/iasl7203>
- Lizandra, J., Valencia-Peris, A., Ferriz, R., & Peiró-Velert, C. (2025). Using participatory action research to enhance physical education interventions for promoting active lifestyles in schools: A study design and protocol. *Healthcare*, *13*(18), 2362. <https://doi.org/10.3390/healthcare13182362>
- Maisyaroh, Juharyanto, Wiyono, B. B., Adha, M. A., & Saputra, B. R. (2023). Hybrid learning in schools: analysis of the community's role in ICT-based learning facilities management. *Proceedings of eight International Congress on Information and Communication Technology, Singapore*, 733-743. https://doi.org/10.1007/978-981-99-3043-2_60
- Peñarrubia-Lozano, C., Segura-Berges, M., Lizalde-Gil, M., & Bustamante, J. C. (2021). A qualitative analysis of implementing e-learning during the COVID-19 lockdown. *Sustainability*, *13*(6), 3317. <https://doi.org/10.3390/su13063317>
- PromeAI. PromeAI Blender [AI-generated image creation tool]. Retrieved October 22, 2025, from <https://www.promeai.pro/blender>

- Riley, T., Meston, T., Wallis, L., & Kim, E. J. A. (2025). From sandstone to screen: A culturally responsive arts-based approach to digital literacy in a remote indigenous community in Australia. *Learning, Media, and Technology*, 1-15. <https://doi.org/10.1080/17439884.2025.2457669>
- Rozali, M. Z., Go, C. H., Samshul, S. N., Ismail, A., & Zakaria, A. F. (2024). A new digital competence framework for primary school design and technology teachers. *Journal of Technical Education and Training*, 16(2), 175-185. <https://doi.org/10.30880/jtet.2024.16.02.015>
- Serodes, F. (2025). Teachers' time (I): Integrating sustainability and technology into teaching time. In *Teachers time management for the digital and green age: A practical guide to transforming European education* (pp. 99-136). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-97864-7_4
- Sharma, N. K., & Tripathi, A. (2019). Mapping of major ICT initiatives in school education of India: an overview. *Library Philosophy and Practice*, 1(1), 1-10. https://www.academia.edu/97846011/Mapping_of_major_ICT_initiatives_in_school_education_of_India_an_overview