

---

## **Improving Students' Literacy, Numeracy, and Character through Creative and Innovative Technology-Based Learning Assistance in Elementary Schools**

**Nur Asiah<sup>1</sup>, Yudesta Erfayliana<sup>2</sup>, Hasan Sastra Negara<sup>3</sup>, Jimmy Malintang<sup>4</sup>, Athaillah Farrel Inandra<sup>5</sup>, Muhammad Rizky<sup>6</sup>**

<sup>1,2,3</sup> Universitas Islam Negeri Raden Intan Lampung, Indonesia

<sup>4</sup> Universitas Islam Negeri Walisongo Semarang, Indonesia

<sup>5</sup> Universitas Pelita Harapan, Indonesia

<sup>6</sup> INTI International University, Malaysia

Corresponding Author e-mail: [I26038918@student.newinti.edu.my](mailto:I26038918@student.newinti.edu.my)

---

### **Article History:**

Received: 29-08-2026

Revised: 02-09-2026

Accepted: 05-10-2026

**Keywords:** type 3-5 keywords here, separating them with a semicolon (;) between them

**Abstract:** *The Community Service Program (Kuliah Kerja Nyata/KKN) in Jaranguda Village, Merdeka Sub-district, Karo Regency, aimed to strengthen religious education while enhancing community capacity and participation through locally based empowerment activities. This community service program employed a qualitative approach using a Participatory Action Research (PAR) design involving children and adolescents, women's study groups, farmer groups and small and medium enterprises, religious leaders, village officials, and the wider community. The program was implemented over 14 days through four stages: social observation and mapping, participatory planning, program implementation, and evaluation and reflection. The main activities included mentoring at the Qur'anic Learning Center (Taman Pendidikan Al-Qur'an/TPA), mosque youth development, Qur'anic recitation training, community religious activities, training in the processing of local agricultural products, clean and healthy lifestyle education, and communal environmental activities. The results indicated increased community participation across the program activities, involving 42 children and adolescents in TPA and mosque youth activities, 28 participants in women's religious study groups, 15 participants from farmer groups and small and medium enterprises, and 60 community members in communal work and health education activities. The mentoring activities also contributed to increased knowledge and skills in religious education, agricultural product processing, health awareness, and community activity management. However, the short implementation period remained a major challenge in ensuring program sustainability after the KKN program*

---

---

*ended. The findings demonstrate that integrating religious education and community empowerment can strengthen community participation and local capacity when implemented through a participatory approach involving religious leaders, village government, and community members as active partners. Further mentoring and a community-based monitoring mechanism are recommended to sustain the outcomes of the program.*

---

## Introduction

The rapid digital transformation of education has reshaped the competencies expected of elementary school students, particularly in relation to literacy, numeracy, and character development. Literacy and numeracy are no longer understood merely as the ability to read, write, and perform basic calculations, but as foundational competencies that enable students to interpret information, reason critically, solve contextual problems, and participate meaningfully in increasingly digital learning environments. At the same time, technological development has created opportunities for schools to provide more interactive, adaptive, and student-centered learning experiences. A meta-analysis of technology-delivered literacy instruction for elementary students demonstrated a significant positive effect on literacy outcomes, indicating that appropriately designed digital interventions can strengthen foundational learning skills (Dahl-Leonard et al., 2024). Similarly, the growing body of research on technology education in primary schools emphasizes that technology should be positioned as part of pedagogical innovation rather than merely as an additional instructional device (Pappa et al., 2024). However, meaningful digital transformation also depends heavily on teachers' ability to connect technological resources with pedagogical objectives and students' actual learning needs (Wohlfart & Wagner, 2023).

Within the Indonesian elementary education context, the need to strengthen literacy and numeracy has become increasingly important because learning gaps remain visible even after schools have returned to regular face-to-face instruction. Evidence from Indonesian elementary schools indicates that students experienced substantial difficulties in basic numerical operations during the period of learning disruption, including particularly serious difficulties in division and multiplication (Widodo & Umar, 2022). Further evidence demonstrates a relationship between distance-learning experiences and subsequent numeracy learning loss among upper-grade elementary students, suggesting that the consequences of disrupted learning cannot be addressed simply by restoring conventional classroom routines (Yektyastuti et al., 2023). At the same time, introducing digital applications does not automatically resolve these difficulties. Hikamudin et al. (2023) found that although schools had implemented literacy and numeracy strengthening programs and incorporated digital applications into assessment activities, such practices did not necessarily produce significant

improvements in students' understanding. These conditions indicate that elementary schools require more than access to technology; they require structured, creative, pedagogically meaningful assistance that connects technology with literacy, numeracy, active participation, and students' developmental characteristics.

Previous studies provide considerable evidence regarding the potential of technology-supported learning to enhance foundational competencies. Amorim et al. (2022), for example, demonstrated that game-enhanced mobile learning could substantially improve early reading and writing performance among children in resource-constrained educational settings, showing that well-designed technology can provide meaningful learning opportunities even where conventional instructional resources are limited. Similarly, Lee and Zhu (2022) showed that digital game-based learning can support literacy development through student-centered writing practices while simultaneously increasing learners' engagement with learning tasks. In the domain of numeracy, Hidayanthi et al. (2024) reported that STEAM-based digital learning provides opportunities to strengthen elementary students' numeracy literacy by connecting mathematical understanding with contextual, technology-supported learning activities. Taken together, these findings suggest that creative technology-based learning is most productive when students are actively involved in exploring, interpreting, discussing, and applying knowledge rather than simply receiving digital content.

Nevertheless, the existing literature also reveals important limitations and inconsistencies that are highly relevant to community-based educational assistance. While technology-supported interventions frequently generate positive outcomes, the magnitude and consistency of these outcomes vary considerably according to instructional design, learner characteristics, implementation conditions, and teacher involvement. Dahl-Leonard et al. (2024), based on 53 experimental and quasi-experimental studies, found an overall positive effect of technology-delivered literacy instruction but also emphasized the need to determine what works, for whom, and under what conditions. In Indonesia, Hikamudin et al. (2023) similarly demonstrated that the availability and use of digital applications did not automatically translate into significant gains in literacy and numeracy understanding. Moreover, the success of educational digitalization is strongly influenced by teachers' digital competence, pedagogical understanding, and ability to integrate technology meaningfully into learning activities (Wohlfart & Wagner, 2023). Another concern is that technology-oriented learning can become excessively focused on cognitive outcomes if ethical behavior, responsibility, discipline, collaboration, and other character dimensions are not deliberately embedded in the learning process. Hidayat et al. (2022) showed that teachers experienced particular difficulties in internalizing character values through technology-mediated learning,

highlighting the need for instructional models that maintain human interaction and value formation alongside technological innovation.

Accordingly, a clear practice gap emerges from previous scholarship. Many technology-based initiatives in elementary education have focused on specific competencies, such as reading, writing, digital literacy, numeracy, or technological skills, whereas fewer initiatives have deliberately integrated literacy, numeracy, and character development within a single structured assistance program. Research on primary technology education also remains fragmented in terms of learning objectives, implementation approaches, teacher development, and classroom practices (Pappa et al., 2024). Post-pandemic reviews further demonstrate that elementary digital literacy programs commonly emphasize digital content, games, devices, and competency assessment, while successful implementation continues to depend on the active role of teachers as facilitators, collaborators, curriculum implementers, and digital-content designers (Wijayanti et al., 2024). In parallel, technology can be utilized for character development when digital materials are intentionally designed to communicate and reinforce values, rather than treating character as an outcome that develops automatically through technology use (Fajarianto et al., 2023; Hidayat et al., 2022). Therefore, the central problem addressed by this community service program concerns how creative and innovative technology-based learning assistance can be designed and implemented to strengthen literacy and numeracy competencies while simultaneously cultivating positive character among elementary school students.

Based on this gap, this community service program aims to improve elementary school students' literacy, numeracy, and character through creative and innovative technology-based learning assistance that combines meaningful digital learning experiences with active, contextual, collaborative, and value-oriented activities. The urgency of the program lies in the need to move beyond the simple provision of digital tools toward pedagogically guided technology use capable of responding simultaneously to foundational learning gaps and the social and ethical challenges associated with children's increasing interaction with digital environments (Wohlfart & Wagner, 2023; Hidayat et al., 2022). The novelty of the program lies in its integrative assistance framework, in which literacy, numeracy, and character are not treated as separate educational targets but are developed concurrently through technology-supported learning activities. This orientation extends previous approaches that have predominantly concentrated on individual domains such as technology-based literacy instruction or digital numeracy learning (Dahl-Leonard et al., 2024; Hidayanthi et al., 2024). From an academic perspective, the program contributes an applied model for integrating foundational competencies and character formation within technology-enhanced elementary education. From a practical perspective, it is expected to provide teachers and schools with adaptable learning practices that make technology more

purposeful, engaging, creative, responsible, and sustainable in supporting holistic student development.

## **Research Methods**

This community service research employed a qualitative approach with a participatory action research (PAR) design. PAR was selected because it positions the community as active subjects throughout the entire activity cycle rather than merely as passive recipients of the program (Chambers, 1994; Pranata & Wulandari, 2021). This approach aligns with the perspective of Sugiyono (2019), who asserts that qualitative research is capable of understanding social processes in depth within natural contexts. Sudaryono (2019) further emphasizes that participatory action research enables researchers and communities to collaboratively design improvement actions based on real problems identified in the field. Accordingly, the PAR design serves as an appropriate methodological framework for integrating the strengthening of religious education and community empowerment within a single comprehensive community service program.

The participants were residents of Jaranguda Village, Merdeka Sub-district, Karo Regency, selected purposively based on their involvement in religious activities and local economic potential. The inclusion criteria comprised elementary school-aged children attending the Qur'anic Learning Center, mosque youth members, women's study group participants, farmer groups or small enterprise actors, as well as village officials and religious leaders directly involved in program planning. The exclusion criteria included residents who did not maintain permanent residence in the village or were not engaged in community activities during the implementation period. This purposive selection of participants is consistent with Sugiyono's (2019) assertion that samples in qualitative research are chosen based on the richness of information rather than for statistical generalization. Kartika and Simanjuntak (2021) affirm that the active participation of relevant target groups is a critical determinant of the success of community service programs. The involvement of religious leaders and village government officials as strategic partners also strengthens the social legitimacy of the program, as noted by Hasibuan and Nasution (2020).

The instruments employed in this study included participatory observation guidelines, unstructured interview protocols, activity documentation, and field notes. Participatory observation was used to record the dynamics of program implementation, changes in participant behavior, and community responses to each activity. Unstructured interviews were conducted with religious leaders, village officials, and representatives of target groups to explore perceptions and impacts of the program in greater depth. Documentation in the form of activity photographs, attendance lists, and daily reports served as supporting data to strengthen the validity of the findings. Instrument validity was maintained through source triangulation and technique triangulation, while consistency in data collection adhered to the principles of reliability in qualitative research (Sugiyono, 2019; Emzir, 2018). Pranata and Wulandari (2021) add that in PAR, the researcher serves as the primary instrument interacting directly with the community, making reflexive sensitivity a critical component of the data collection process.

**Table 1. Schedule of KKN Activity Implementation for 14 Days**

| <b>Implementation Time</b> | <b>Activities</b>                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------------------------|
| Day 1                      | Reception and gathering with Jaranguda Village officials as well as religious leaders and community leaders |
| Day 2                      | Field observation and mapping of the religious and socio-economic potential of the community                |
| Day 3                      | Preparation of community work programs (village deliberations)                                              |
| Day 4-6                    | Assistance for the Al-Qur'an Education Park (TPA) and the development of mosque youth                       |
| Day 7                      | Routine recitation with congregation mothers and tahsin training in Qur'an recitation                       |
| Day 8-9                    | Training on processing local agricultural products (coffee and horticulture) for farmer groups/MSMEs        |
| Day 10                     | Health counseling and clean and healthy lifestyle (PHBS)                                                    |
| Day 11                     | Mutual cooperation on environmental cleanliness and arrangement of worship facilities                       |
| Day 12                     | Children's religious competitions (adhan, memorization of short letters, calligraphy)                       |
| Day 13                     | Evaluation of the program with village officials and the community                                          |
| Day 14                     | Closure and farewell of the KKN program                                                                     |

The implementation procedure followed the PAR cycle, which consists of four main stages: observation and social mapping, program planning, action implementation, and evaluation and reflection. During the observation stage, students accompanied by supervising lecturers conducted field observations and preliminary interviews to identify the needs and potential of Jaranguda Village. The planning stage was carried out through village deliberations involving village officials, religious leaders, and community representatives to design a work

program relevant to local conditions. Program implementation was divided into two main areas, namely strengthening religious education and community empowerment, with a 14-day activity schedule as presented in Table 1. The evaluation and reflection stage was conducted participatively to assess program achievements and formulate recommendations for sustainability. This procedure aligns with PAR principles that emphasize the iterative cycle between action and reflection (Chambers, 1994; Pranata & Wulandari, 2021). Sinaga and Silalahi (2019) affirm that involving the community in every stage of planning and evaluation fosters a sense of ownership over the program, thereby enhancing the durability of its impact.

The collected data were analyzed descriptively and qualitatively following the interactive model proposed by Miles and Huberman, which encompasses data reduction, data display, and conclusion drawing. Data reduction was performed by sorting relevant information from field notes, interview transcripts, and activity documentation. Data display was organized in the form of thematic narratives describing the processes and outcomes of program implementation in each activity area. Conclusion drawing was conducted gradually by comparing field findings with previous literature to obtain valid interpretations. Manual coding was applied to identify key themes such as participation, capacity building, and program sustainability without the use of formal qualitative analysis software. This technique is consistent with the views of Sugiyono (2019) and Emzir (2018), who assert that qualitative analysis aims to understand the meanings underlying social phenomena holistically. Moreover, reflective analysis within PAR enables researchers and the community to evaluate changes that occur during the mentoring process (Pranata & Wulandari, 2021).

This study adhered to the principles of research ethics by prioritizing participant consent, data confidentiality, and respect for the social norms of the local community. Prior to implementation, the research team obtained official permission from the Jaranguda Village government and the Institute for Research and Community Service of the university. All participants received an explanation regarding the objectives, procedures, and benefits of the activities and were then asked to provide consent either verbally or in writing. Personal data and interview results were stored securely and used exclusively for academic reporting purposes. The confidentiality of participant identities was maintained by anonymizing names in publications. These ethical considerations refer to the fundamental principles of social research as articulated by Sugiyono (2019) and are reinforced by Kartika and Simanjuntak (2021), who emphasize the importance of informed consent in community service programs. Formal ethical clearance was not required by the proposing institution for low-risk community service activities; however, all procedures adhered to the applicable ethical guidelines.

## **Result and Discussion**

### **Strengthening Religious Education**

The religious education strengthening program was implemented through mentoring at the Qur'anic Learning Center (*Taman Pendidikan Al-Qur'an/TPA*), conducted regularly every afternoon. KKN students assisted in the learning process of reading and memorizing the Qur'an,



| Target Group                                    | Number of Participants | Participation Rate |
|-------------------------------------------------|------------------------|--------------------|
| The general public (gotong royong & counseling) | 60                     | Increase           |

The results of the activities indicate that the community, particularly farmer groups and small enterprise actors, acquired new knowledge regarding agricultural product processing techniques with greater economic value. This finding is consistent with the results reported by Ginting and Barus (2022) and Nasution and Harahap (2022), who assert that training in the processing of agricultural products based on local wisdom can enhance the economic capacity and self-reliance of rural communities. The communal clean-up activities and health education also received a positive response from the community, in line with the view of Tarigan (2021) that revitalizing the culture of mutual cooperation can serve as important social capital in sustainable village development.



**Figure 2. Trophies for children who won the competition**

Overall, the synergy between the religious program and the community empowerment program in the implementation of KKN in Jaranguda Village demonstrates that these two aspects complement each other. Strengthening spiritual values through religious education provides a moral foundation for the community in carrying out economic and social activities, while the empowerment program produces tangible impacts on improving community welfare. This reinforces the argument of Sinaga and Silalahi (2019) that thematic KKN models integrating various aspects of community life tend to generate more holistic impacts compared to programs focusing on a single domain. Nevertheless, the sustainability of the program following the completion of KKN remains a challenge that needs to be addressed by both higher education institutions and village governments through continued mentoring.

## Conclusion and Recommendation

The implementation of the 14-day Community Service Program in Jaranguda Village successfully strengthened religious education through consistent mentoring at the Qur'anic

Learning Center, mosque youth development, and regular religious gatherings, while simultaneously fostering community empowerment through agricultural product processing training, health education, and communal environmental clean-up activities. The findings demonstrate that the synergy between spiritual strengthening and socio-economic empowerment effectively increased community participation and local capacity, thereby addressing the identified gap regarding the limited integration of these two dimensions within a single structured service program. Despite these positive outcomes, the relatively short implementation period constrained the ability to ensure program sustainability after the KKN concluded, and the qualitative nature of the study limited the generalizability of the findings to broader contexts. Future research should therefore employ longitudinal designs to examine the long-term effects of integrated religious and economic empowerment programs, while also considering mixed methods approaches to quantify participation impacts and explore the role of local cadres in sustaining program outcomes. Higher education institutions and village governments are advised to establish formal mentoring mechanisms and periodic follow-up activities to reinforce the gains achieved during the program. The limitations of this study provide a foundation for improving the design of subsequent community service initiatives, particularly in rural settings with strong religious traditions and underutilized agricultural potential.

### **Acknowledge (Centaur, size 15, Bold)**

The authors would like to express their sincere gratitude to the Institute for Research and Community Service (*Lembaga Penelitian dan Pengabdian kepada Masyarakat/LPPM*) of Sekolah Tinggi Ilmu Tarbiyah Al-Bukhary Labuhanbatu for granting permission and providing support for the implementation of this community service program. Appreciation is also extended to the Field Supervising Lecturer for guidance and direction throughout the planning and execution stages. The authors are deeply grateful to the Village Government of Jaranguda, religious leaders, community leaders, and all residents of Jaranguda Village, Merdeka Sub-district, Karo Regency, whose hospitality, active participation, and collaborative spirit were instrumental in the successful completion of the 14-day *Kuliah Kerja Nyata* program. Their collective commitment contributed significantly to the strengthening of religious education and the advancement of community empowerment initiatives described in this article.

### **References**

- Arifin, Z., & Rahman, T. (2021). Peran mahasiswa KKN dalam penguatan pendidikan agama di masyarakat pedesaan. *Jurnal Pengabdian Kepada Masyarakat*, 6(2), 112–121. <https://doi.org/10.31004/jpm.v6i2.1123>
- Astuti, D. W., & Prasetyo, B. (2020). Model pemberdayaan masyarakat berbasis potensi lokal melalui program KKN. *Jurnal Pengabdian Masyarakat Ilmu Terapan*, 2(1), 45–56. <https://doi.org/10.30596/jpmit.v2i1.4210>
- Chambers, R. (1994). The origins and practice of participatory rural appraisal. *World Development*, 22(7), 953–969. [https://doi.org/10.1016/0305-750X\(94\)90141-4](https://doi.org/10.1016/0305-750X(94)90141-4)
- Daulay, N. K., & Siregar, R. (2019). Efektivitas program TPA dalam meningkatkan kemampuan baca Al-Qur'an anak usia sekolah dasar. *Jurnal Pendidikan Islam Al-Ilmi*, 2(1), 33–44. <https://doi.org/10.32529/al-ilmi.v2i1.221>

- Ginting, P. S. B., & Barus, A. (2022). Pemberdayaan masyarakat desa melalui pengembangan produk olahan pertanian di dataran tinggi Karo. *Jurnal Pengabdian Masyarakat Agro*, 4(2), 78–89. <https://doi.org/10.31289/jpma.v4i2.789>
- Hasibuan, A. F., & Nasution, R. (2020). Kuliah Kerja Nyata sebagai sarana penguatan nilai keagamaan dan sosial masyarakat. *Jurnal Ilmu Sosial dan Pengabdian*, 3(2), 101–110. <https://doi.org/10.24014/jisp.v3i2.9876>
- Kartika, Y., & Simanjuntak, H. (2021). Partisipasi masyarakat dalam program pengabdian mahasiswa: Studi kasus KKN tematik. *Jurnal Pengabdian dan Pemberdayaan Masyarakat Indonesia*, 1(2), 89–98. <https://doi.org/10.36596/jppmi.v1i2.135>
- Manurung, T., & Tarigan, E. (2019). Model pembinaan remaja masjid sebagai upaya penguatan pendidikan karakter religius. *Jurnal Dakwah dan Pengembangan Masyarakat*, 4(1), 55–66. <https://doi.org/10.24952/jdpm.v4i1.1654>
- Muhtarom, A. (2018). Pendidikan keagamaan berbasis masyarakat: Konsep dan implementasi. *Jurnal Pendidikan Agama Islam*, 15(2), 145–158. <https://doi.org/10.14421/jpai.2018.152-04>
- Nasution, M. Y., & Harahap, D. (2022). Strategi penguatan ekonomi masyarakat desa melalui pelatihan keterampilan berbasis kearifan lokal. *Jurnal Ekonomi dan Pengabdian Masyarakat*, 5(1), 12–23. <https://doi.org/10.30651/jepm.v5i1.987>
- Pranata, A. Y., & Wulandari, S. (2021). Participatory action research sebagai pendekatan pengabdian masyarakat berkelanjutan. *Jurnal Pengabdian Kepada Masyarakat*, 5(3), 201–212. <https://doi.org/10.31004/jpm.v5i3.998>
- Purba, R. A., & Sinuraya, J. (2020). Pengembangan potensi desa wisata religi melalui program KKN mahasiswa. *Jurnal Pariwisata dan Pengabdian Masyarakat*, 3(1), 21–30. <https://doi.org/10.25078/jppm.v3i1.1345>
- Ritonga, S., & Lubis, F. (2021). Peningkatan kapasitas masyarakat melalui program penyuluhan kesehatan berbasis komunitas. *Jurnal Kesehatan Masyarakat Nasional*, 15(4), 233–241. <https://doi.org/10.21109/jkmn.v15i4.4567>
- Samaroh Hasibuan. (2026). Implementation of Quranic Recitation at Morning Assembly to Improve Quran Memorization of Students at MTs Nur Ibrahimy Rantaupraptat Labuhanbatu Regency. *Zeniusi Journal*, 3(1), 92–104. <https://doi.org/10.70821/zj.v3i1.96>
- Sembiring, M., & Perangin-angin, D. (2020). Kearifan lokal masyarakat Karo dalam pengelolaan sumber daya pertanian berkelanjutan. *Jurnal Sosial Budaya*, 12(2), 88–99. <https://doi.org/10.24252/jsb.v12i2.1122>
- Sinaga, L. R. W., & Silalahi, R. (2019). Model Kuliah Kerja Nyata tematik berbasis pemberdayaan masyarakat desa. *Jurnal Pengabdian Kepada Masyarakat Cendekia*, 2(2), 66–77. <https://doi.org/10.31004/jpmc.v2i2.556>
- Suhardi, Fatimah Purba, Leli Hasanah Lubis, Irhamuddin, & Rokiba Hasibuan. (2026). The Relevance of Educational Hadiths to Strengthening Student Character in the Digital Era. *Zeniusi Journal*, 3(1), 21–30. <https://doi.org/10.70821/zj.v3i1.88>
- Tarigan, R. B. (2021). Revitalisasi gotong royong sebagai modal sosial dalam pembangunan desa. *Jurnal Ilmu Sosial dan Pembangunan*, 9(1), 15–26. <https://doi.org/10.20527/jisp.v9i1.3312>
- Yusuf, M., & Fitriani, R. (2022). Strategi dakwah dan penguatan pendidikan agama di wilayah pedesaan Sumatera Utara. *Jurnal Dakwah dan Komunikasi Islam*, 8(1), 40–52. <https://doi.org/10.24014/jdki.v8i1.11234>

