

DIGITAL HEALTH EDUCATION AND TECHNOLOGY UTILIZATION FOR MIDWIVES AND VILLAGE HEALTH CADRES: A MULTI-MEDIA APPROACH

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ABSTRAK

Pemanfaatan teknologi digital dalam edukasi kesehatan oleh kader kesehatan masih suboptimal akibat rendahnya literasi digital dan ketergantungan pada sistem pencatatan manual. Program pengabdian ini bertujuan meningkatkan kapasitas kader dalam memanfaatkan teknologi digital sebagai media edukasi kesehatan. Kegiatan dilaksanakan di Desa Karangrau, Banyumas, melibatkan 25 peserta yang terdiri dari bidan desa dan kader pemberdayaan masyarakat. Metode yang digunakan adalah model SMART-CARE, mengintegrasikan pendekatan multi-media berupa *website* edukasi interaktif, buku saku, dan video tutorial. Hasil evaluasi menunjukkan peningkatan pemahaman yang substansial, dengan nilai rata-rata *pre-test* 81% meningkat menjadi 97% pada *post-test*. Peserta juga menunjukkan peningkatan kemampuan praktis dalam mengakses dan mengaplikasikan media digital, yang berdampak pada peningkatan keterampilan teknis dan kepercayaan diri. Kesimpulannya, pendekatan multi-media berbasis SMART-CARE efektif menjembatani kesenjangan literasi digital dan memberdayakan kader sebagai agen edukasi kesehatan masyarakat yang berkelanjutan.

Kata Kunci: Literasi Digital; Kader Kesehatan; Edukasi Kesehatan

ABSTRACT

The utilization of digital technology in health education by community health cadres remains suboptimal due to low digital literacy and reliance on manual systems. This community service program aimed to enhance the capacity of cadres in utilizing digital technology as an effective health education medium. Conducted in Karangrau Village, Banyumas, the activity involved 25 participants, comprising village midwives and community empowerment cadres. The intervention utilized the SMART-CARE Model, integrating a multi-media approach consisting of an interactive educational website, pocket guidebooks, and instructional videos. Evaluation results demonstrated a substantial improvement in participants' understanding, with the average pre-test score increasing from 81% to 97% in the post-test. Furthermore, participants showed enhanced

practical skills in accessing and applying digital media for health information delivery, leading to increased technical confidence. In conclusion, the SMART-CARE-based multi-media approach effectively bridged the digital literacy gap and empowered cadres as sustainable community health education agents.

Keyword: Digital Literacy; Health Cadres; Health Education

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1. INTRODUCTION

Maternal and child health remains a critical global priority, with maternal mortality rates still exceeding the Sustainable Development Goals targets in many developing regions (WHO, 2023). To address this issue, promotive and preventive efforts through community-based health services are essential. Digital technology offers significant opportunities to enhance the quality and reach of these basic health services (Erku et al., 2023; Senbekov et al., 2020). However, the utilization of digital tools remains suboptimal. A significant digital literacy gap exists among community health cadres, who heavily rely on conventional manual systems. This gap not only limits their ability to access up-to-date health information but also hinders the effective delivery of community-based health promotion programs (Subaedah et al., 2025; Zoraya et al., 2026).

Community health cadres serve as the frontline in delivering health education and bridging communication between formal healthcare providers and the public (Yanti, 2024). Despite their strategic role, many cadres face significant challenges in adopting digital health technologies due to low digital health literacy. Consequently, health data recording, reporting, and educational dissemination are predominantly conducted manually. This reliance on manual systems not only increases the risk of documentation errors and delayed reporting but also restricts the interactive dissemination of accurate health information to the community (Ardianto & Kartika Wibisono, 2023; Jaizul Wahid & Sugandha, 2024). Furthermore, the inability to leverage digital platforms limits the cadres' capacity to conduct engaging and far-reaching community health promotion, ultimately affecting the health awareness and behaviors of vulnerable groups such as pregnant women and children (Irawati et al., 2022; Setyoningsih, 2023).

Several previous community empowerment initiatives have attempted to integrate digital technology into health services, such as utilizing mobile applications and online forms for data management (Aprilia & Budiono, 2024; Pratama et al., 2024). While these efforts have shown potential in improving basic digital literacy, they predominantly focus on single-media or single-system approaches. This fragmented intervention often fails to accommodate

diverse learning styles, resulting in suboptimal interactive learning experiences and limited practical application among the cadres. Recent evidence suggests that comprehensive digital health literacy requires multi-faceted educational interventions rather than isolated technological tools (Guo et al., 2023; Shamsi et al., 2025).

To overcome these limitations, a comprehensive multi-media educational approach is necessary. Integrating web-based educational platforms with supplementary materials like pocket guidebooks and instructional videos can provide a more interactive, flexible, and practical learning experience (Nisa & Soali, 2020). This multi-media strategy not only addresses the varying digital competencies of the cadres but also aligns with the national priority for digital transformation in the health sector (Suri & Pangesti, 2024). By enhancing digital health literacy through diverse media, cadres can be better equipped to execute community-based health promotion effectively (Al-pansori et al., 2025; Caliston, 2025).

Based on these considerations, this community service program aims to enhance the capacity of health cadres in understanding and utilizing digital technology as an effective medium for health education. The program is conducted in Karangrau Village, Banyumas, involving village midwives and community empowerment cadres. By applying a systematic and participatory approach, this initiative expects to empower cadres as sustainable agents of community-based health education, ultimately improving local health outcomes.

2. METHOD

This community service program was conducted in Karangrau Village, Banyumas District, over a period of [insert duration, e.g., two months, from August to September 2024]. The initiative involved 25 participants, comprising one village midwife and 24 community health cadres. Participants were selected using a purposive sampling technique based on specific inclusion criteria: (1) being an active village midwife or registered community health cadre in Karangrau Village; (2) having a frontline role in community health education and data recording; (3) possessing basic access to a digital device (smartphone or computer); and (4) providing informed consent to participate in the entire program series.

The program utilized the SMART-CARE model to ensure a systematic and participatory approach. The implementation followed five structured stages: (1) Social Mapping, which involved field observations and coordination with local health partners to identify the baseline digital literacy conditions and specific needs of the cadres; (2) Material Design, where tailored, context-specific educational contents were developed based on the mapping results; (3) Application, focusing on the deployment and introduction of the multi-media tools (website, guidebooks, and videos) to the participants; (4) Real Practice, during which participants engaged in interactive discussions and direct, hands-on simulations using the web platform to bridge theoretical knowledge with practical application; and (5) Test & Evaluation, aimed at measuring the effectiveness of the intervention and gathering feedback for sustainability.

To address the diverse digital literacy levels among the participants, the intervention employed a comprehensive multi-media approach during the Application and Real Practice

stages. This included a web-based educational platform as the primary interactive learning tool, supplemented by offline pocket guidebooks and instructional videos to accommodate various learning styles and ensure flexible access to health education materials.

To evaluate the program's effectiveness, data were collected using pre-test and post-test questionnaires administered before and immediately after the intervention. The evaluation instrument consisted of 10 Likert-scale items (ranging from 1 = strongly disagree to 5 = strongly agree) that measured two main dimensions: digital health literacy (understanding digital health concepts and accessing digital information) and technology utilization (ability to apply digital media for health education). The instrument was developed based on relevant literature and validated by public health and digital education experts to ensure content validity. The quantitative data were analyzed using a descriptive percentage approach to compare the participants' competencies before and after the intervention. Throughout the program, active collaboration with local partners, including the village government and health professionals, was maintained to ensure contextual relevance and program sustainability.

3. RESULTS AND DISCUSSION

RESULTS

a. Initial Conditions and Social Mapping Analysis

The social mapping phase revealed critical insights into the current state of digital technology utilization among community health cadres in Karangrau Village. Through direct observation and coordination with local health partners, the research team identified significant gaps in digital literacy that directly impacted the quality of health service delivery. The majority of cadres demonstrated limited familiarity with digital platforms, relying predominantly on manual documentation systems that were prone to errors and delays. This dependency on conventional methods created bottlenecks in health information management, ultimately affecting the timeliness and accuracy of health data reporting to higher administrative levels.

The mapping process further uncovered that cadres faced multiple interconnected challenges that hindered their effectiveness as health education agents. Beyond technical limitations, there was a noticeable lack of confidence in using digital tools, which stemmed from insufficient training and exposure to technology-based solutions. The absence of interactive media for health education meant that information dissemination to the community remained largely one-directional and conventional. These findings underscored the urgent need for a comprehensive intervention that would address both technical skills and psychological barriers to technology adoption among health cadres.

Table 1. Initial Observation Results of Cadre Problems in Digital Technology Utilization

No	Problem Aspect	Field Findings
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1	Digital Literacy	1. Cadres are not accustomed to using digital media as educational tools 2. Understanding of website usage remains limited 3. Difficulty in accessing and managing digital-based information
2	Data Recording	4. Health activity recording is still done manually 5. Data is not documented systematically 6. Potential for recording errors and data loss
3	Technology Utilization	7. Technology has not been utilized as a health education medium 8. Health information is still delivered conventionally 9. No interactive media supporting the learning process

The comprehensive assessment presented in Table 1 illustrates the multifaceted nature of challenges faced by community health cadres in Karangrau Village. The findings reveal that digital literacy deficits extend beyond mere technical inability, encompassing difficulties in information access, management, and application in real-world scenarios. The manual data recording practices identified pose significant risks to data integrity and service efficiency, potentially compromising the quality of health monitoring and evaluation. Furthermore, the complete absence of interactive educational media represents a missed opportunity to enhance community engagement and health knowledge retention. These interconnected problems necessitated an intervention strategy that would simultaneously address skill development, confidence building, and practical application of digital tools in daily health service activities.



Figure 1. Opening Activity and Coordination with Partners and Participants

The opening session depicted in Figure 1 marked the formal commencement of the community service program, establishing crucial rapport between the implementation team, village government, health professionals, and cadre participants. This initial gathering served multiple strategic purposes, including the articulation of program objectives, clarification of implementation procedures, and reinforcement of the cadres' vital role as community health education agents. The active involvement of village officials and the village midwife from the outset demonstrated strong institutional support and commitment to the program's success. This collaborative foundation proved essential for creating an environment conducive to

learning and ensuring that participants felt valued and supported throughout the intervention process.

b. Implementation of Multi-Media Educational Intervention

The educational intervention was executed through a carefully structured approach that integrated multiple learning media to accommodate diverse learning preferences and digital competency levels among participants. The implementation encompassed three interconnected phases: material design, application development, and real practice sessions. During the material design phase, educational content was meticulously crafted to align with the specific needs and characteristics of the cadres, emphasizing simplicity, practicality, and immediate applicability to their daily responsibilities. The content focused on fundamental concepts of digital health literacy, website navigation, and strategies for leveraging technology in community health education, all presented in an accessible and non-intimidating manner.

The application phase introduced participants to an integrated multi-media learning ecosystem consisting of a web-based educational platform, printed pocket guidebooks, and instructional video tutorials. The website served as the primary interactive learning tool, enabling participants to explore health education materials through simulated scenarios and self-paced modules. Complementing this digital platform, the pocket guidebooks provided offline reference materials that cadres could consult independently, ensuring continuous access to information regardless of internet connectivity. The video tutorials offered visual demonstrations of key procedures and concepts, catering to visual learners and reinforcing the theoretical knowledge acquired through other media. This multi-modal approach recognized that effective learning occurs when information is presented through various channels, thereby enhancing comprehension and retention.



Figure 2. Delivery of Educational Materials to Participants

Figure 2 captures the active engagement of participants during the educational material delivery session, illustrating the dynamic interaction between facilitators and cadres. The image reflects the participatory nature of the learning process, where participants were encouraged to ask questions, share experiences, and relate the content to their real-world challenges. The attentive posture and focused expressions of the cadres indicate their genuine

interest and commitment to acquiring new skills that would enhance their service delivery capabilities. This face-to-face interaction was crucial for building confidence and addressing individual concerns, creating a supportive learning environment that facilitated knowledge transfer and skill development.

The real practice phase represented the culmination of the educational intervention, providing participants with hands-on experience in utilizing the digital tools introduced during earlier stages. Through guided simulations and supervised practice sessions, cadres had the opportunity to navigate the educational website, access health information resources, and explore the features designed to support their educational activities. One participant expressed, "Initially, I was afraid to touch the computer and use the website, but after practicing directly with guidance, I realized it is not as difficult as I thought." This sentiment reflected a common transformation among participants, who moved from apprehension to growing confidence as they gained practical experience. The interactive discussions that accompanied the practice sessions allowed cadres to troubleshoot challenges collectively, share tips and strategies, and learn from each other's experiences, fostering a sense of community and mutual support.



Figure 3. Interactive Discussion Between Participants and Implementation Team

The interactive discussion session illustrated in Figure 3 demonstrates the collaborative learning environment that characterized the real practice phase. Participants actively engaged in dialogue with the implementation team, posing questions, seeking clarifications, and sharing their perspectives on how the digital tools could be integrated into their existing workflows. This two-way communication was instrumental in addressing individual learning needs and adapting the training approach to accommodate varying levels of digital proficiency. The facilitators employed a patient and encouraging approach, validating participants' efforts and celebrating small victories, which significantly boosted morale and motivation. Such interactive engagement not only enhanced technical understanding but also reinforced the cadres' sense of agency and ownership over their learning journey.

c. Evaluation of Learning Outcomes and Competency Enhancement

The evaluation phase employed a pre-test and post-test design to quantitatively assess the effectiveness of the educational intervention in enhancing participants' digital health literacy and technology utilization competencies. The assessment instrument consisted of ten Likert-scale items measuring various dimensions of digital literacy, including basic understanding of digital health concepts, ability to access web-based media, comprehension of technology as an educational tool, capacity to interpret digital information, and skills in applying digital media for health education purposes. This comprehensive evaluation

framework enabled the research team to capture both knowledge acquisition and practical skill development, providing a holistic view of the intervention's impact on participant competencies.

Table 2. Evaluation Results of Participant Understanding Based on Indicators

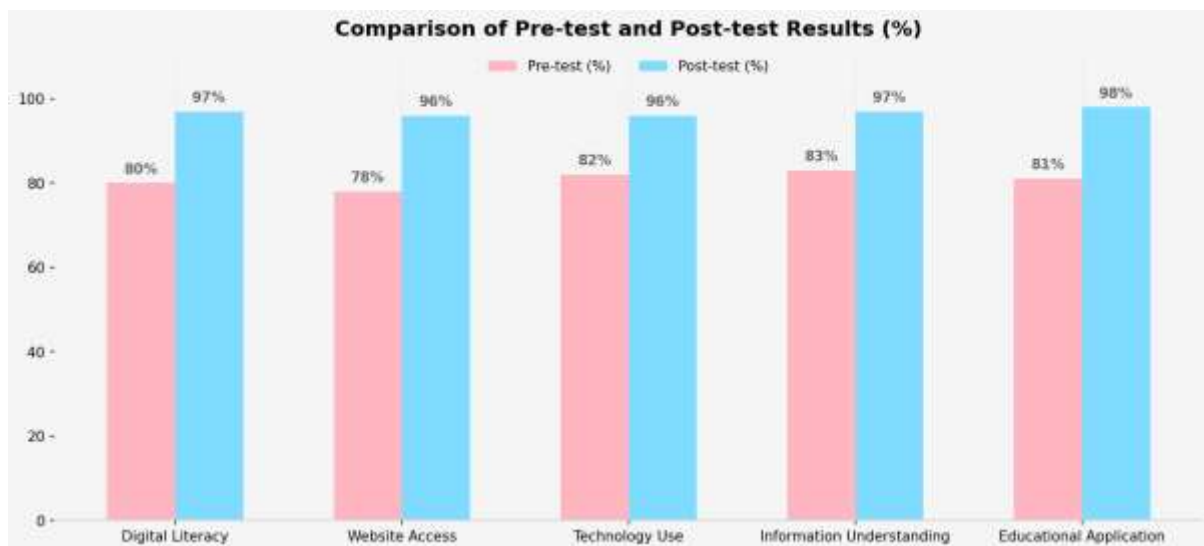
No	Evaluation Indicator	Pre-test (%)	Post-test (%)	Description	No	Evaluation Indicator
1	Basic understanding of digital health literacy	80	97	Significant increase	1	Basic understanding of digital health literacy
2	Ability to access website-based media	78	96	Very good increase	2	Ability to access website-based media
3	Understanding of technology use as educational media	82	96	Very good increase	3	Understanding of technology use as educational media
4	Ability to understand information from digital media	83	97	Significant increase	4	Ability to understand information from digital media

The data presented in Table 2 reveals a remarkable improvement in participant understanding across all evaluated indicators, with the average score increasing from 81% in the pre-test to 97% in the post-test. This substantial 16-percentage-point gain demonstrates the high effectiveness of the multi-media educational approach in bridging the digital literacy gap. Notably, the competency that showed the most significant improvement was the ability to access website-based media, which jumped from 78% in the pre-test to 96% in the post-test. This indicates that the initial technical barriers and apprehension towards using digital platforms were successfully mitigated through the guided simulations and video tutorials. Furthermore, the basic understanding of digital health literacy and the ability to understand information from digital media both reached 97% in the post-test, confirming that participants not only acquired the technical skills to navigate the website but also developed the critical digital literacy needed to interpret and deliver health information effectively to the community.



Figure 4. Website Educational Simulation

Figure 4 depicts participants actively engaged in simulating the use of the educational website, demonstrating the practical application of skills acquired during the training sessions. The image shows cadres working individually and in small groups, navigating the website interface, accessing health information modules, and exploring various features designed to support their educational activities. This hands-on practice was crucial for consolidating theoretical knowledge and building the confidence necessary for independent technology use. The focused engagement visible in the photograph reflects the participants' commitment to mastering the digital tools and their recognition of the potential benefits for enhancing their service delivery to the community.

**Figure 5. Graph Comparison of Pre-test and Post-test Results**

The graphical representation in Figure 5 provides a visual illustration of the dramatic improvement in participant performance from pre-test to post-test across all evaluation indicators. The steep upward trajectory of the bars clearly demonstrates the consistent and substantial gains achieved through the educational intervention, with no indicator showing stagnant or declining performance. This uniform improvement pattern suggests that the multi-media approach effectively catered to diverse learning needs and that no single aspect of digital literacy was neglected during the training process. The visualization serves as compelling evidence of the program's success in transforming cadres from technology-hesitant individuals to confident users of digital health education tools.

d. Participant Engagement and Practical Application

Throughout the implementation process, participants demonstrated remarkable enthusiasm and active engagement, which emerged as a critical factor contributing to the

program's success. The transition from passive recipients of information to active learners was evident in the increasing frequency and quality of questions posed during discussion sessions, the willingness to experiment with digital tools despite initial apprehension, and the collaborative spirit displayed in peer-to-peer learning interactions. Participants frequently shared personal experiences and challenges related to their work in the community, creating rich opportunities for contextualizing the training content and identifying practical solutions to real-world problems. This participatory dynamic fostered a sense of collective ownership over the learning process and strengthened the social bonds among cadres, which would prove valuable for ongoing mutual support beyond the formal training period.

The practical application of newly acquired skills became increasingly apparent as the program progressed, with participants beginning to envision concrete ways to integrate digital media into their routine health education activities. Several cadres expressed intentions to use the website platform as a reference source during community gatherings, to share video tutorials with community members who had access to smartphones, and to utilize the pocket guidebooks as quick reference materials during home visits. One participant noted, "Now I feel more confident to explain health information to mothers because I have various media that can help me deliver the message more clearly." This statement encapsulates the transformative impact of the intervention, which extended beyond technical skill development to enhance participants' professional confidence and perceived self-efficacy in their role as health educators.

e. Sustainability and Community Impact Potential

The sustainability potential of this community service program lies in its multi-faceted approach to capacity building, which equipped cadres with not only technical skills but also the confidence and motivation to continue utilizing digital tools independently. The integration of multiple learning media ensured that participants had access to resources that matched their individual learning preferences and technological access levels, thereby reducing barriers to continued use. The pocket guidebooks, in particular, serve as a lasting resource that cadres can consult long after the formal training has concluded, providing reinforcement and guidance as they encounter new situations or challenges in applying digital tools to their work. Furthermore, the establishment of a supportive network among participants, facilitated through interactive discussions and collaborative learning activities, creates a foundation for ongoing peer support and knowledge sharing that can sustain and amplify the program's impact over time.

The broader community impact potential stems from the strategic position of health cadres as intermediaries between formal health services and the community, enabling them to disseminate health information and promote digital literacy among community members. As cadres become more proficient in utilizing digital media for health education, they are better equipped to reach larger audiences, deliver more engaging and informative health messages, and respond more effectively to community health needs. The ripple effect of this capacity enhancement extends beyond individual cadres to potentially improve health

knowledge, attitudes, and behaviors among community members, particularly mothers and families who are primary recipients of cadre-led health education. This multiplier effect underscores the strategic value of investing in cadre capacity development as a means of achieving broader public health objectives and advancing community health outcomes in a sustainable manner.

DISCUSSION

The significant improvement in participants' understanding, evidenced by the increase in average evaluation scores from 81% to 97%, strongly supports the effectiveness of digital technology integration in community health education. Specifically, the most substantial competency gains were observed in the ability to access website-based media and the ability to understand information from digital media. This indicates that the multi-media intervention successfully transformed cadres from being hesitant about technology to confident users capable of navigating digital platforms and extracting relevant health information. This finding aligns with several previous studies, which demonstrated that the utilization of digital health applications and mobile-based educational interventions significantly enhances the digital literacy, website navigation skills, and technical competencies of community health cadres (Saádah et al., 2026; Subaedah et al., 2025; Zoraya et al., 2026). Furthermore, the results are corroborated by Caliston (2025), Guo et al (2023), and Shamsi et al (2025), who found that interactive digital tools effectively improve health-related knowledge and digital information retrieval skills among target groups.

A critical factor contributing to these superior outcomes, particularly in website access and digital information delivery, is the integration of multi-media learning tools, which contrasts with previous interventions that often relied on single-media approaches. While several previous studies successfully utilized digital forms and mobile applications for health data recording, their focus was primarily on administrative efficiency rather than comprehensive educational engagement (Kraus et al., 2021; Lee et al., 2025). Similarly, several previous studies noted that single-media technological training often fails to accommodate diverse learning styles, leading to suboptimal interactive experiences (Huang et al., 2026; Restellini et al., 2026). By combining a web-based platform, pocket guidebooks, and video tutorials, the current study addresses this gap. The use of video tutorials, in particular, played a crucial role in improving the cadres' ability to access and understand digital media, a finding supported by Kumar et al. (2021) and Lu & Hanim (2024), who emphasized that web-based and visual media significantly enhance interactive learning, website navigation, and information retention compared to single conventional methods.

The initial social mapping revealed substantial digital literacy barriers among the cadres, a challenge frequently reported in community health settings where manual recording systems still dominate (Ardianto & Wibisono, 2023). However, the application of the SMART-CARE model, particularly the "Real Practice" stage, effectively mitigated these barriers by providing hands-on experience. This approach resonates with the findings of Angkat et al

(2025), who highlighted that direct socialization and practical use of digital media are crucial for improving digital literacy and preventing technological apprehension among community members. Moreover, the systematic structure of the SMART-CARE model ensures that technological interventions are practically applicable, a principle also validated by Dabukke et al (2024) in their health service empowerment programs, where structured practical stages significantly improved participants' technical competencies and confidence.

Beyond individual skill enhancement, the results underscore the strategic role of health cadres as vital agents of community empowerment. The increased confidence of cadres in utilizing digital media for health education directly translates to more effective information dissemination at the grassroots level. This aligns with Irawati et al (2022), who emphasized the critical role of cadres in accompanying and educating vulnerable groups, such as high-risk pregnant women, through structured community classes. The empowerment of cadres through digital education also mirrors the community empowerment strategies discussed by Fitrianingtyas et al (2024) and Al-pansori et al (2025), who argued that capacity building for local health agents is essential for the success of broader public health programs. Additionally, Setyoningsih (2023) supports this by showing that empowered and well-trained cadres are more capable of conducting early detection and continuous health monitoring in their respective villages.

Finally, the success of this digital health education program strongly aligns with the national and regional priority for digital transformation in the health sector. The sustainability of this intervention is highly promising, as the cadres are now equipped to act as independent digital health educators within their communities, creating a multiplier effect. This sustainable model of community-based health education is consistent with the findings of Sumiyati et al (2021), who noted that digital opportunities at the basic service level can continuously improve health service quality when supported by competent local actors. Furthermore, the collaborative and participatory nature of this program, involving local government, midwives, and health professionals, ensures long-term viability, echoing the principles of successful community empowerment through collaborative health counseling advocated by *Rahman & Patilaiya (2023)*.

4. CONCLUSION

The community service program in Karangrau Village demonstrated that integrating the SMART-CARE model with a multi-media approach significantly enhances the digital literacy and health education capacity of community health cadres. The substantial improvement in evaluation scores from 81% to 97% confirms that this strategy effectively bridges the digital divide, transforming cadres into confident digital health agents capable of utilizing technology for community education.

To ensure the sustainability of this intervention, it is highly recommended to conduct continuous follow-up mentoring and periodic evaluations to reinforce the cadres' digital skills. Furthermore, broader implementation of this multi-media educational model should

be expanded to other villages facing similar digital literacy challenges. Integrating this empowerment model into routine local health programs will accelerate digital health transformation and improve grassroots maternal and child health outcomes.

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