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Strengthening Teachers' Strategies in Multigrade Teaching through Low-Cost Learning Media Innovation

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ABSTRACT

This community service program is motivated by the limitations faced by teachers in managing multigrade classrooms and the lack of access to adequate learning media. The main issues encountered by the partner include limited understanding of multigrade teaching strategies and minimal utilization of innovative learning media suited to school conditions. The objective of this program is to strengthen teachers' strategies in multigrade classroom instruction through low-cost media innovations that are easy to create, affordable, and contextually relevant. The empowerment methods applied include training sessions, workshops, and continuous mentoring in the implementation and evaluation of classroom learning. The solutions offered consist of enhancing teachers' understanding of multigrade teaching strategies, developing and utilizing low-cost learning media, and providing assistance in implementing and evaluating learning practices sustainably. The results indicate a significant improvement in teachers' capacity to manage multigrade classrooms, increased creativity in developing simple instructional media, and higher student engagement and learning independence. Furthermore, the mentoring process has positively influenced teachers' confidence in applying innovative teaching strategies. Therefore, this program has successfully improved the quality of multigrade learning. It is recommended that the program be sustained through institutional support, continuous teacher innovation in developing learning media, and periodic mentoring to ensure consistent implementation.

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1. INTRODUCTION

Learning in the current digital era has undergone significant transformation, particularly in terms of teaching strategies and the use of instructional media (Lillihata et al., 2023; Suarmita et al., 2025). Teachers are required to integrate technology into the learning process to improve the quality and effectiveness of student learning (Ekosantoso et al., 2025; Fajri & Fatimah, 2022). However, the reality in

the field indicates that not all educational institutions have adequate access to digital technology. This condition is particularly prevalent in elementary schools and madrasahs, especially in areas with limited educational facilities and infrastructure (Almeida et al., 2001; Rahmawati & Atmojo, 2021). Therefore, the use of instructional media does not necessarily have to rely on advanced technology; rather, it can be developed through simple, creative, and innovative media (Darmuki & Hidayati, 2019; Hidayah et al., 2021). Low-cost media can serve as a strategic alternative for supporting meaningful and effective learning. In this context, strengthening teachers' instructional strategies is a key factor in addressing the challenges of learning in the digital era.

Multigrade teaching is one of the educational realities that remains prevalent, particularly in Madrasah Ibtidaiyah. Multigrade teaching occurs when a teacher is required to teach two or more grade levels simultaneously (Day & Navani, 2025; Mahmud, 2024; Suarmita et al., 2025). This condition requires teachers to possess strong managerial and pedagogical competencies to ensure that learning remains effective (Lino, 2026; Qangule & Letuma, 2025). At the same time, students in multigrade classrooms are expected to demonstrate a higher level of learning independence than students in regular classrooms (Bojos et al., 2025; Casane, 2025; Fajri, Dewi Riza, et al., 2022). In practice, however, multigrade teaching is often not adequately supported by appropriate strategies and instructional media. This situation can result in suboptimal learning processes and may cause students to become passive (Fajri, Toba, et al., 2022; Khalid et al., 2024; Suayan-Bondad, 2026). Therefore, innovation in teaching strategies is urgently needed within the context of multigrade teaching.

More specifically, this condition is also evident at MI Mambaul Falah Bondowoso, which serves as the partner institution in this community service program. The madrasah continues to implement multigrade teaching due to limitations in the number of teachers and available classrooms. In addition, technology-based learning facilities remain limited, preventing teachers from fully utilizing digital media in an optimal manner (Jenahut & Lake, 2023; Selwyn et al., 2017). In classroom practice, teachers tend to rely on conventional, teacher-centered instructional methods. Consequently, students have limited opportunities to engage in independent and active learning. This condition presents both a challenge and an opportunity to develop more innovative teaching strategies. Therefore, an appropriate intervention is needed to improve the quality of learning at the madrasah.

Based on the results of the initial observation, several major problems were identified among the partner institution: (1) limited teacher understanding of how to manage multigrade teaching effectively; (2) limited utilization of simple instructional media as learning aids; (3) insufficient teacher creativity in developing low-cost media that meet students' learning needs; (4) low levels of student learning independence during the learning process; and (5) the absence of sustainable training and mentoring programs related to instructional innovation. These problems indicate a gap between the demands of learning in the digital era and the actual conditions in the field. If these issues are not addressed promptly, the quality of learning may continue to decline. Therefore, contextual and practical solutions are needed.

The urgency of addressing these problems is particularly high because multigrade teaching is a condition that cannot be avoided in the near future. Teachers need to be equipped with appropriate strategies to manage classrooms effectively and efficiently (Suayan-Bondad, 2026; Zoromski et al., 2021). In addition, the development of affordable and easy-to-produce instructional media represents a realistic solution under conditions of limited resources. Low-cost media not only assist teachers in delivering learning materials but may also enhance student engagement and learning independence (Ebile et al., 2022; Soccol et al., 2022). Accordingly, strengthening teachers' strategies through the innovation of simple instructional media is an urgent need. This effort is expected to contribute to the overall improvement of learning quality.

Previous studies have demonstrated that the use of instructional media, whether digital or simple in nature, can have a positive influence on students' learning independence. Research has also shown that creative teaching strategies can enhance student participation and learning motivation (Cecchinato et al., 2023). In the context of multigrade teaching, adaptive and flexible strategies are particularly necessary to accommodate differences across grade levels (Ritu et al., 2023). Nevertheless, most existing studies have

focused primarily on the use of advanced technology-based media. Research and practical initiatives concerning the utilization of low-cost media in multigrade teaching remain relatively limited (Meilani et al., 2021). Therefore, efforts are needed to develop approaches that are more contextual, practical, and responsive to the actual conditions of schools and madrasahs.

The novelty of this community service program lies in its focus on integrating multigrade teaching strategies with low-cost media innovations that are appropriate to the conditions of the partner madrasah. This approach emphasizes not only theoretical understanding but also hands-on practice through teacher training and mentoring. Furthermore, the program is designed based on the actual needs of the partner institution, thereby ensuring that the proposed solutions are more targeted and relevant. The use of creative and simple media is expected to provide an innovative alternative for supporting the learning process. Thus, this program offers added value compared with conventional training programs that are generally designed without sufficient consideration of local needs and conditions. This approach also has the potential to be replicated in other madrasahs with similar characteristics and resource constraints.

The objective of this community service program is to enhance teachers' competence in managing multigrade teaching through the utilization of innovative low-cost media (Bediou et al., 2020; Ediyani et al., 2020). In addition, the program aims to enhance students' learning independence through more effective and participatory teaching strategies. The program will be implemented through training, workshops, and direct mentoring for teachers. It is expected that teachers will be able to independently develop and implement simple instructional media suited to their classroom contexts. Consequently, the quality of learning at MI Mambaul Falah Bondowoso is expected to improve significantly. Ultimately, this program is expected to generate sustainable positive impacts on the development of education at the madrasah.

2. METHODS

The implementation of the Community Service Program (PKM) was systematically organized into four main stages: (1) preparation and initial assessment, (2) training and development of low-cost learning media, (3) implementation and mentoring, and (4) monitoring, evaluation, reflection, and dissemination(Andriani et al., 2025; Dacholfany et al., 2023). The activities were conducted in collaboration with MI Mambaul Falah Bondowoso throughout May 2026. Each stage was designed based on the actual needs of the partner institution and was implemented progressively to ensure the relevance, applicability, and sustainability of the program.

2.1 Preparation and Initial Assessment

The first stage focused on preparation, coordination, observation, and identification of the partner's needs. The activities began with initial coordination with the madrasah principal and teachers on May 1, 2026. This was followed by observations of multigrade teaching conditions on May 2–3, 2026, to identify the challenges faced by teachers and students in the implementation of multigrade teaching. On May 4, 2026, the team identified the needs for appropriate learning media based on the observed classroom conditions. The work program was subsequently prepared on May 5, 2026, followed by the preparation of equipment and materials for low-cost learning media on May 6–7, 2026. The program was then introduced to teachers and educational staff on May 8, 2026.

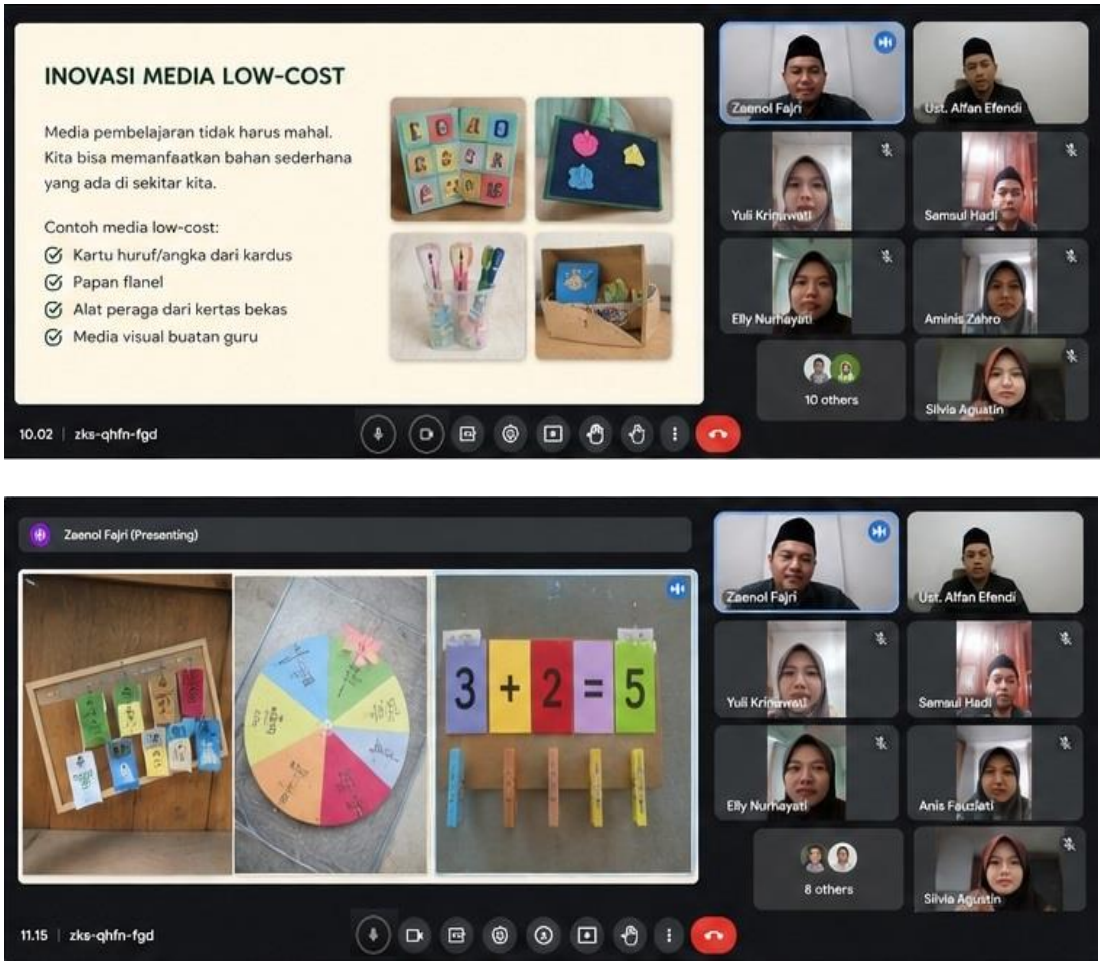
This stage was intended to establish a clear understanding of the partner's needs and ensure that the subsequent activities were contextually appropriate. The parties involved included the community service team, the madrasah principal, teachers, and educational staff. The main achievement indicators at this stage were the completion of the activity plan, identification of partner needs, availability of equipment and materials, and readiness of the participants.

2.2 Training and Development of Low-Cost Learning Media

The second stage focused on strengthening teachers' knowledge and skills through workshops and training. The workshop on simple learning media was conducted on May 9–10, 2026, followed by training

on the development of low-cost learning media on May 11–12, 2026. The activities employed interactive presentations, discussions, demonstrations, and hands-on practice. Teachers were introduced to strategies for managing multigrade classrooms and were guided in designing and developing simple learning media that could be produced using affordable and easily accessible materials.

The training emphasized not only conceptual understanding but also practical skills that teachers could directly apply in their classrooms. The success indicators for this stage included teachers' active participation, improved understanding of multigrade teaching strategies, and the production of simple learning media relevant to the learning needs of multigrade classrooms.



Picture 1. Training and Development of Low-Cost Learning Media

2.3 Practice, Implementation, and Teacher Mentoring

The third stage involved practicing the use of the developed media and implementing it in multigrade classrooms. Teachers practiced using the learning media on May 13, 2026, with guidance from the community service team. This activity was followed by teacher mentoring in multigrade teaching from May 14–18, 2026. During the mentoring process, teachers received technical guidance and feedback on the application of learning strategies and low-cost media.

The implementation of the media in student learning was conducted from May 19–21, 2026. Teachers applied the media in their respective classrooms, while students participated directly in learning activities supported by the newly developed media. The team monitored the implementation to identify the effectiveness of the media and the extent to which it encouraged student engagement and learning independence. The achievement indicators at this stage were teachers' ability to apply the media appropriately, increased student participation, and greater opportunities for students to engage in independent learning.

2.4 Monitoring, Evaluation, Reflection, Improvement, and Dissemination

The fourth stage focused on monitoring, evaluation, reflection, improvement, reporting, and dissemination. Initial monitoring and evaluation were conducted on May 22, 2026, to identify the strengths and challenges encountered during implementation. On May 23, 2026, the team conducted a joint reflection with teachers to obtain feedback regarding the implementation of the program. Based on the evaluation and reflection results, teaching strategies and learning media were improved on May 24–25, 2026.

The final program evaluation was conducted on May 26, 2026. The team then prepared the program report from May 27–29, 2026. Documentation and dissemination of the program results were carried out on May 30, 2026, followed by the closing of the program and the handover of the program outputs to the madrasah on May 31, 2026. This final stage was intended to ensure that the results of the program were properly documented and that the partner institution had a clear basis for continuing the use and development of low-cost learning media after the completion of the program.

The overall implementation process was designed as a continuous cycle of preparation, training, practice, implementation, evaluation, and improvement. This structure ensured that the activities were directly connected to the needs of the partner institution and that teachers were not only introduced to the concept of low-cost learning media but also trained to develop, implement, evaluate, and improve their use in multigrade classrooms.

Table 1. Community Service Activity Schedule

No.	Activity	Date	Person in Charge	Implementation Stage
1	Initial coordination with the madrasah principal and teachers	01-May-26	Izzatu Alvin Nisa’	Preparation and Initial Assessment
2	Observation of multigrade teaching conditions	May 2–3, 2026	Entire Team	Preparation and Initial Assessment
3	Identification of learning media needs	04-May-26	Zaenol Fajri	Preparation and Initial Assessment
4	Preparation of the KKN work program	05-May-26	Izzatu Alvin Nisa’	Preparation and Initial Assessment
5	Preparation of equipment and materials for low-cost media	May 6–7, 2026	Silvia Agustin	Preparation and Initial Assessment
6	Program orientation for teachers and educational staff	08-May-26	Implementation Team	Preparation and Initial Assessment
7	Workshop on simple learning media	May 9–10, 2026	Zaenol Fajri	Training and Development
8	Training on the development of low-cost media	May 11–12, 2026	Entire Team	Training and Development
9	Practice in the use of media by teachers	13-May-26	Teachers & Team	Practice, Implementation, and Mentoring
10	Teacher mentoring in multigrade teaching	May 14–18, 2026	Entire Team	Practice, Implementation, and Mentoring
11	Implementation of media in student learning	May 19–21, 2026	Classroom Teachers	Practice, Implementation, and Mentoring
12	Initial monitoring and evaluation	22-May-26	Zaenol Fajri	Monitoring and Evaluation
13	Joint reflection with teachers regarding challenges	23-May-26	Izzatu Alvin Nisa’	Monitoring and Evaluation

No.	Activity	Date	Person in Charge	Implementation Stage
14	Improvement of teaching strategies and learning media	May 24–25, 2026	Implementation Team	Monitoring and Evaluation
15	Final program evaluation	26-May-26	Entire Team	Monitoring and Evaluation
16	Preparation of the activity report	May 27–29, 2026	Ghefira Kamelia Jalil	Reporting
17	Documentation and dissemination of program results	30-May-26	Silvia Agustin	Dissemination
18	Program closing and handover of program outputs	31-May-26	Entire Team	Closing and Sustainability

3. FINDINGS AND DISCUSSION

3.1. Strengthening Teachers' Understanding of Multigrade Teaching

The community service program began with an initial coordination meeting with the principal and teachers of MI Mambaul Falah Bondowoso on May 1, 2026. This activity was followed by an observation of multigrade teaching conditions on May 2–3, 2026, and an identification of teachers' learning media needs on May 4, 2026. The observations focused on the organization of multigrade classrooms, teachers' instructional practices, students' participation, and the availability of learning media. The findings were used as the basis for preparing the program work plan and determining the types of training and learning media needed by the partner institution. The preparation of the work program was completed on May 5, followed by the preparation of equipment and materials for low-cost learning media on May 6–7, 2026. The program was formally introduced to teachers and educational staff on May 8, 2026.

The first substantive intervention was implemented through a workshop on simple learning media on May 9–10, 2026. The workshop introduced teachers to the basic principles of multigrade teaching, classroom organization, instructional time management, and strategies for managing students across different grade levels. The training used interactive presentations, discussions, contextual cases, and teacher-sharing sessions based on actual classroom experiences. Teachers were encouraged to identify specific problems encountered when teaching multiple grade levels simultaneously and to discuss possible solutions with their colleagues. This approach enabled the training content to be directly connected to teachers' classroom realities rather than being limited to theoretical explanations.

The training also emphasized practical instructional planning for multigrade classrooms. Teachers were guided to consider differences in students' abilities, learning tasks, instructional time, and levels of independence when designing classroom activities. Particular attention was given to strategies that allow one group of students to work independently while the teacher provides direct instruction to another group. Teachers were also introduced to task-based activities and simple learning resources that could reduce teachers' dependence on continuous direct instruction. Through these activities, teachers began to develop more flexible instructional scenarios that could accommodate the characteristics of multigrade classrooms.

The strengthening of teachers' understanding was supported by the involvement of the madrasah principal and the teaching staff throughout the program. The principal provided institutional support and encouraged teachers to participate actively in the training and subsequent implementation stages. Teachers also shared their experiences and challenges with one another, creating a collaborative learning environment. The program therefore combined training, discussion, reflection, and practical planning rather than relying solely on lecture-based instruction.

The implementation results indicated that teachers developed a better conceptual understanding of multigrade teaching and became more prepared to apply structured instructional strategies. More importantly, the program encouraged a shift in teachers' perspectives from viewing multigrade

teaching solely as a consequence of limited resources toward recognizing it as a classroom condition that can be managed through appropriate pedagogical strategies. This strengthened understanding became the foundation for the subsequent development and implementation of low-cost learning media.

3.2. Development and Utilization of Low-Cost Learning Media

The second intervention focused on the development and utilization of low-cost learning media. The activity was implemented through a workshop and hands-on training conducted on May 9–12, 2026. Before developing the media, the team identified the learning media needs of the partner institution and considered the availability of materials and the characteristics of multigrade classrooms. The main principle was to develop learning media that were inexpensive, easy to produce, reusable, and appropriate for different student ability levels.

During the training on May 11–12, teachers were directly involved in producing simple learning media. The activities included designing learning cards, concept boards, interactive visual materials, and simple teaching aids using readily available materials. The community service team demonstrated the production and use of the media, after which teachers practiced developing their own materials. Teachers worked collaboratively and received technical guidance from the team throughout the production process. Each teacher was encouraged to adapt the media to the learning materials and classroom conditions they encountered in their daily teaching.

The practical nature of the workshop enabled teachers to move from simply understanding the concept of low-cost media to actually producing and testing instructional materials. On May 13, 2026, teachers practiced using the media they had developed. This activity served as an initial trial before the media were implemented in regular multigrade classroom activities. Teachers received feedback regarding the suitability of the media, clarity of instructions, ease of use, and their potential to support students' independent learning.

The implementation of low-cost media was particularly relevant to the conditions of MI Mambaul Falah Bondowoso, where access to technology-based learning facilities remained limited. Rather than requiring teachers to depend on expensive digital equipment, the program encouraged them to optimize locally available and affordable resources. This approach also allowed teachers to modify or reproduce the media according to the learning needs of different groups of students.

The implementation results showed that teachers were able to produce a variety of simple learning media and integrate them into multigrade learning activities. The media provided additional learning resources that students could use while the teacher was working with another group. In this way, low-cost media supported classroom organization and created greater opportunities for students to engage in learning activities independently. The approach therefore addressed both the resource limitations of the madrasah and the instructional demands of multigrade teaching.

3.3. Mentoring for Classroom Implementation and Evaluation

The third intervention focused on the direct implementation and mentoring of the strategies and learning media developed during the training. Teacher mentoring was conducted from May 14–18, 2026, followed by the implementation of the learning media in student learning activities from May 19–21, 2026. During the mentoring stage, the community service team assisted teachers in applying multigrade teaching strategies, organizing student activities, managing instructional time, and utilizing the low-cost media that had been developed during the workshop.

Teachers were encouraged to apply the media in actual classroom situations rather than treating the products as workshop outputs only. In multigrade classrooms, the media were used to support learning tasks for different groups of students while the teacher provided direct instruction to another group. This arrangement provided students with structured activities that could be completed individually or collaboratively. The mentoring process also allowed the team to identify difficulties encountered by teachers and provide immediate technical and pedagogical feedback.

During the implementation period, the team observed classroom activities and paid attention to teacher–student interaction, student participation, the use of learning media, and students' ability to complete learning tasks independently. Teachers were also encouraged to document the implementation of the media as part of the monitoring process. The classroom implementation demonstrated that simple learning media could be integrated into multigrade teaching without requiring sophisticated technological infrastructure.

Monitoring and evaluation were conducted on May 22, 2026. The evaluation focused on the implementation of the program, the usability of the learning media, teacher experiences, and students' responses during learning activities. This was followed by a joint reflection with teachers on May 23, 2026. During the reflection session, teachers discussed challenges encountered during implementation and identified aspects of the instructional strategies and media that needed improvement.

Based on the monitoring and reflection results, the team and teachers revised the instructional strategies and learning media on May 24–25, 2026. The final program evaluation was conducted on May 26, 2026. This iterative process ensured that the program did not end with the delivery of training but continued through classroom application, feedback, revision, and evaluation.

Overall, the mentoring and implementation stages demonstrated that the program generated practical changes in teachers' instructional practices. Teachers became more confident in applying multigrade teaching strategies and utilizing simple learning media. Students were provided with more structured opportunities to participate in learning activities and complete tasks independently. The program therefore established a practical cycle of training → media development → classroom implementation → monitoring → reflection → improvement, which provides a stronger basis for the sustainability of the intervention at MI Mambaul Falah Bondowoso.

3.4. Program Outputs and Sustainability

The concrete outputs of the program included the implementation of teacher training and workshops, the development of simple low-cost learning media, the practical application of the media in multigrade classrooms, teacher mentoring, monitoring and evaluation activities, and documentation of the program. The final stage also included the preparation of the activity report, dissemination of the program results, and handover of the program outputs to the madrasah. These activities were conducted from May 27–31, 2026.

The sustainability of the program was supported by the fact that the learning media were designed using affordable and accessible materials. Teachers could reproduce, modify, and adapt the media for different subjects and grade levels without requiring substantial additional resources. The program also strengthened teachers' capacity to independently develop instructional media based on their classroom needs. Consequently, the intervention was not limited to a one-time training activity but was designed to provide teachers with transferable skills for continuing instructional innovation after the completion of the community service program.

4. CONCLUSION

This community service program demonstrates that strengthening teachers' strategies in multigrade teaching through low-cost learning media innovation can significantly enhance the effectiveness of the learning process. Teachers became more creative in utilizing simple resources available in their immediate environment. The implementation of these media also encouraged students' learning independence within heterogeneous classroom settings. In addition, the mentoring activities contributed to the practical enhancement of teachers' pedagogical competencies. Thus, the objective of the community service program to improve the quality of multigrade teaching can be considered achieved.

The implications of this program indicate that the use of low-cost learning media can serve as a strategic solution for schools with limited educational facilities and infrastructure. This approach is relevant for sustainable implementation in primary education contexts, particularly in madrasahs.

Furthermore, the mentoring model implemented in this program can be replicated in other educational institutions with similar characteristics and challenges. The results also reinforce the importance of collaboration between the implementation team and partner institution in fostering instructional innovation. Therefore, systematic and continuous efforts to strengthen teachers' capacity are essential.

This community service program has several limitations. First, its relatively short implementation period did not allow for a comprehensive assessment of its long-term impacts. Second, variations in teachers' competencies and students' conditions influenced the outcomes of implementation in the field. Another limitation concerns the availability of resources, which varied across classrooms. Therefore, the findings of this program need to be further examined in broader educational contexts. These limitations provide opportunities for future research and community service programs to explore the sustainability and wider applicability of low-cost learning media innovations.

Based on these findings, it is recommended that the school continue to develop low-cost learning media innovations independently. Teachers are encouraged to engage in continuous reflection and improvement of their instructional practices. Educational institutions should also provide policy and institutional support to promote and sustain such innovations. In addition, similar mentoring programs should be conducted periodically to maintain consistency in implementation and strengthen teachers' professional capacity. In this way, the quality of multigrade teaching can be continuously improved in a sustainable manner.

REFERENCES

Almeida, J. M., Krueger, J., Eager, D. L., & Vernon, M. K. (2001). Analysis of Educational Media Server Workloads. *Proceedings of the IEEE International Workshop on Network and Operating System Support for Digital Audio and Video*, (Nossdav), 21–30. https://doi.org/10.1145/378344.378348

Andriani, Z. Z. D., Faruk, A., Khawa, D., Rizkiyah, F., Abshor, M. L., & Setiyawan, A. F. (2025). Strengthening Digital Literacy and Ethical Social Media Use Among Vocational Students. *Communautaire: Journal of Community Service*, *4*(1), 25–40. https://doi.org/10.61987/communautaire.v4i1.846

Bediou, B., Psychology, F., & Science, E. (2020). Digital Media and Cognitive Development. *Benoit Bediou, Faculty of Psychology and Education Science, Department of Psychology, University of Geneva, Switzerland*, *8*(2), 69–81.

Bojos, W., Almerez, Q. L., Trinidad, A., Arnado, J. A., & Arnado5, J. A. (2025). Leadership Complexities of School Heads in Multigrade Education. *Journal of Interdisciplinary Perspectives*, *3*(6). https://doi.org/10.69569/jip.2025.240

Casane, L. (2025). Teacher's Attitude and Challenges in Teaching Multi-Grade Classes. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.5266065

Cecchinato, N., Toma, A., Drioli, C., Oliva, G., Sechi, G., & Foresti, G. L. (2023). Secure Real-Time Multimedia Data Transmission from Low-Cost UAVs with A Lightweight AES Encryption. *IEEE Communications Magazine*, *61*(5), 160–165. https://doi.org/10.1109/MCOM.001.2200611

Dacholfany, M. I., Azis, A. A., Mardiati, Zulhayana, S., Ahmad, R., Bay, W., & Mokodenseho, S. (2023). Peningkatan Kualitas Pendidikan Masyarakat Melalui Program Pelatihan dan Bimbingan Studi. *Easta Journal of Innovative Community Services*, *1*(03), 129–141. https://doi.org/10.58812/ejincs.v1i03.121

Darmuki, A., & Hidayati, N. (2019). *An Investigation of The Cooperative Learning Using Audio Visual Media in Speaking Skill Subject*. https://doi.org/10.4108/eai.19-10-2018.2282555

Day, M., & Navani, M. T. (2025). Equity, inclusion and multigrade classrooms in Indian context. *International Journal of Educational Research*, *132*, 102619. https://doi.org/10.1016/j.ijer.2025.102619

Ebile, P. A., Opata, J., & Hegele, S. (2022). Evaluating suitable low-cost agar substitutes, clarity, stability, and toxicity for resource-poor countries' tissue culture media. *In Vitro Cellular & Developmental Biology - Plant*, *58*(6), 989–1001. https://doi.org/10.1007/s11627-022-10285-6

Ediyani, M., Hayati, U., Salwa, S., Samsul, S., Nursiah, N., & Fauzi, M. B. (2020). Study on Development of Learning Media. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, *3*(2), 1336–1342. https://doi.org/10.33258/birci.v3i2.989

Ekosantoso, F., Cholik, M., Soeryanto, S., & Arizal, H. (2025). Pengaruh Penggunaan Media Pembelajaran Interaktif Google Sites terhadap Kemandirian Belajar Siswa Teknik Kendaraan Ringan. *JIPI (Jurnal Ilmiah Penelitian Dan Pembelajaran Informatika)*, *10*(2), 1565–1572. https://doi.org/10.29100/jipi.v10i2.7615

Fajri, Z., Dewi Riza, I. F., Azizah, H., Sofiana, Y., Ummami, U., & Andila, A. (2022). Pemanfaatan Media Pembelajaran Visual Berbasis Apilkasi Canva dalam Meningkatkan Minat dan Motivasi Belajar Anak Usia Dini di PAUD Al Muhaimin Bondowoso. *Equilibrium: Jurnal Pendidikan*, *10*(3), 397–408. https://doi.org/10.26618/equilibrium.v10i3.8583

Fajri, Z., & Fatimah, I. D. (2022). *Training for Compiling Scientific Work References Using the Mendeley Application for PIAUD Undergraduate Students FAI Nurul Jadid University 2022 1 Introduction*. *01*(01), 23–35.

Fajri, Z., Toba, R., Muali, C., Ulfah, M., & Zahro, F. (2022). The Implications of Naturalist Illustration Image Media on Early Childhood Learning Concentration and Motivation. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *6*(4), 3278–3290. https://doi.org/10.31004/obsesi.v6i4.2092

Hidayah, Y., Suyitno, S., & Ali, Y. F. (2021). A Study on Interactive–Based Learning Media to Strengthen the Profile of Pancasila Student in Elementary School. *JED (Jurnal Etika Demokrasi)*, *6*(2), 283–291. https://doi.org/10.26618/jed.v6i2.5591

Jenahut, K. S., & Lake, A. C. O. R. (2023). Articulate Storyline-Based Learning Media Loaded with Local Wisdom Values in Historical Narrative Text Material for Elementary School Students. *Jurnal Ilmiah Sekolah Dasar*, *7*(3), 566–578. https://doi.org/10.23887/jisd.v7i3.54079

Khalid, M. U., Manzoor, A., & Rashid, A. (2024). The Experiences of Teachers at Multi Grade Classrooms at Special Education Schools. *Annals of Human and Social Sciences*, *5*(I). https://doi.org/10.35484/ahss.2024(5-I)30

Lillihata, S., Karesina, D. M., Alfons, A., & Pulung, R. (2023). Pemanfataan Media Pembelajaran Berbasis IT dalam meningkatkan Kemandirian Belajar siswa di era digital. *Jurnal Pendidikan DIDAXEI*, *3*(2), 377.

Lino, K. A. B. (2026). Multigrade Instructional Needs and Challenges in Tuba Benguet: Towards an On-Boarding Program. *Journal of Management, and Development Research*, *3*(1), 102–116. https://doi.org/10.69739/jmdr.v3i1.1845

Mahmud, R. (Ed.). (2024). Analysis of The Need for Development of A Multigrade Management Model In The Era of Independent Learning in Souths Sulawesi Elementary School. In *Proceedings of the 2nd International Conference of Science and Technology in Elementary Education (ICSTEE 2023)* (Vol. 826, pp. 202–211). Atlantis Press SARL. https://doi.org/10.2991/978-2-38476-210-1_17

Meilani, Z. D., Nizar, I. M., Sunandar, M. F., & Hidayati, S. C. (2021). Lawyering Social: Navigating Legal Issues on Social Media Posts with a Low-cost Data Algorithm. *2021 5th International Conference on Informatics and Computational Sciences (ICICoS)*, 266–271. https://doi.org/10.1109/ICICoS53627.2021.9651801

Qangule, T., & Letuma, M. C. (2025). One teacher, many grades: Foundation Phase teachers' experiences in multigrade classroom management. *Frontiers in Education*, *10*, 1685825. https://doi.org/10.3389/feduc.2025.1685825

Rahmawati, F., & Atmojo, R. I. W. (2021). Analisis Media Digital Video Pembelajaran Abad 21 Menggunakan Aplikasi Canva pada Pembelajaran IPA. *Jurnal Basicedu*, *5*(3), 6271–6279.

Ritu, J. R., Khan, S., Hossain, Md. S., & Haque, Md. M. (2023). Effects of Rotten Vegetable-Based Low-Cost Media on the Growth and Morphology of an Astaxanthin-Producing Green Alga, Monoraphidium Littorale. *Aquaculture Research*, *2023*, 1–14. https://doi.org/10.1155/2023/6626962

Selwyn, N., Eynon, R., & Potter, J. (2017). A decade of Learning Media and Technology: Looking back and looking forward. *Learning, Media and Technology*, *42*(2), 127–129. https://doi.org/10.1080/17439884.2017.1324483

Soccol, C. R., Karp, S. G., Letti, L. A. J., Biagini, G., Balla, G., Boligon, A. P., Candelario, J. P. M., Faria, T. F., Mattos, P. B. G. D., Piazenski, I. N., Raymundo, L. C. K., Valeixo, D. A. R. R., & Soccol, V. T. (2022). Is the development of low-cost media one of the greatest challenges to produce cultivated meat on an industrial scale? *Biotechnology Research and Innovation*, *6*(2), e2022005. https://doi.org/10.4322/biori.20226201

Suarmita, S., Suarman, S., & Gusnardi, G. (2025). Development of Multimedia-Based Interactive Module Teaching Materials to Increase Learning Independence Learners. *Journal of Education and Learning Research*, *2*(2), 141–151. https://doi.org/10.62208/jelr.2.2.p.141-151

Suayan-Bondad, C. B. (2026). Teachers' Participation in the Guidance Services in Elementary Multigrade Schools. *International Journal of Sustainability and Advanced Integrated Research*, *2*(2), 910–917. https://doi.org/10.65339/ijsair.V2.I2.271

Zoromski, A., Evans, S. W., Owens, J. S., Holdaway, A., & Royo Romero, A. S. (2021). Middle School Teachers' Perceptions and Use of Classroom Management Strategies and Associations With Student Behavior. *Journal of Emotional and Behavioral Disorders*, *29*(4), 199–212. https://doi.org/10.1177/1063426620957624