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Development of Comic Strip Based Learning Media For Madrasah Ibtidaiyah Teachers

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Abstract

The integration of digital technology into teacher professional development is a strategic need in Indonesian education, particularly for Madrasah Ibtidaiyah teachers who often face limitations in designing engaging and interactive learning media. Many teachers still rely on conventional instructional materials, resulting in less optimal student engagement. This community service program aimed to improve teachers' conceptual understanding and technical skills in developing digital learning media through the use of comic strips, which were selected for their pedagogical value, visual appeal, and relevance to character-based education at the elementary level. The program employed a workshop-based approach conducted in two stages: online and offline. The online sessions introduced fundamental concepts of comic strip-based learning media, digital literacy, and the use of supporting applications and websites. The offline sessions were held at Madrasah Ibtidaiyah Nahdlatul Ulama Wadung and focused on hands-on practice through collaborative group work. Teachers were organized into three groups and guided through structured activities, including developing simple comic scripts, taking instructional photos, converting photos into cartoon images, removing backgrounds, and designing comic panels using digital applications. Program effectiveness was evaluated using pre-test and post-test surveys. The results showed a significant increase in teachers' competencies, with conceptual understanding of comic strip-based learning media improving from 4% in the pre-test to 74.67% in the post-test. Teachers also demonstrated substantial improvement in technical skills related to digital media production. These findings indicate that structured, practice-oriented training can effectively enhance teacher digital competence. This program provides practical and educational implications by equipping teachers with sustainable skills to develop innovative, character-based digital learning media that support student engagement and digital literacy in Islamic primary education.

Keywords*: learning media, comic strip concept, comic strip design*

1. INTRODUCTION

Madrasah constitute one of the main pillars of formal education in Indonesia and play a strategic role in shaping students' academic competencies and character. As Islamic-based educational institutions, madrasahs are not only responsible for transferring general knowledge but also for instilling religious and moral values from the early stages of education. Madrasah Ibtidaiyah (MI), as the Islamic elementary education level, holds a crucial role in building students' foundations in literacy, numeracy, and character education. Along with the rapid advancement of the times and the ongoing digital transformation in the education sector, MI is required to adapt to innovative learning approaches that align with the demands of 21st-century skills (Arifin, 2020).

The development of digital technology has brought significant changes to learning practices. Digital learning media have been proven to enhance learning motivation, conceptual understanding, and active student engagement, particularly at the elementary education level (Mayer, 2020). However, various studies indicate that Madrasah Ibtidaiyah teachers still face challenges in adopting and developing technology-based learning media. These challenges include limited digital competence, a lack of continuous professional development, and the scarcity of learning media development models that are appropriate to the context of Islamic education (Rahmawati et al., 2019).

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Learning media innovation has become one of the strategic solutions to address these challenges. Story-based visual media, such as comic strips, offer pedagogical advantages by integrating text and images within an engaging narrative flow, thereby facilitating students' understanding of learning materials, enhancing memory retention, and fostering learning motivation (Hosler & Boomer, 2019). In addition, comic strips enable the contextual and non-didactic integration of character education values, which is highly relevant to the learning characteristics of Madrasah Ibtidaiyah (Nurhayati et al., 2022).

Although the potential of comic strip media has been widely discussed in the literature, its implementation in Madrasah Ibtidaiyah remains relatively limited. Most teachers still function primarily as users of ready-made media rather than as independent developers of digital learning media (Maulana & Fitriani, 2023). In fact, independent learning media development provides teachers with flexibility to adapt instructional materials to students' needs and the local context of the madrasah. Previous studies emphasize that hands-on and collaborative teacher training constitutes a key factor in the successful integration of technology into learning (Koehler et al., 2019).

Indonesia's national education policies also emphasize the importance of digital literacy and the mastery of 21st-century skills. The *Merdeka Belajar* program, educational digital transformation initiatives, and the strengthening of the *Pancasila Student Profile* encourage teachers to be creative, innovative, and adaptive to technological developments (Kemendikbudristek, 2020). However, a gap persists between the availability of technological facilities in schools/madrasahs and teachers' ability to optimize these technologies to produce high-quality and sustainable digital learning media, including products with academic legitimacy such as ISBN-registered modules or works protected by intellectual property rights (Lestari & Fauzi, 2024).

Madrasah Ibtidaiyah Nahdlatul Ulama Wadung Malang is one of the madrasahs that already possesses relatively adequate technological facilities and utilizes technology in both administrative and instructional activities. Findings from a preliminary study conducted through observations and interviews indicate that although approximately 80% of technology-based facilities have been utilized, teachers' independent development of digital learning media remains suboptimal. Teachers therefore require systematic assistance and training to enable them to develop innovative learning media that align with the characteristics of Madrasah Ibtidaiyah students.

Based on these conditions, the development of comic strip–based learning media through a training program becomes an urgent necessity. Comic strips were selected because they are easy for teachers to adapt, relevant to character-based learning, and effective in increasing student engagement. This training is expected to enhance teachers' conceptual understanding and technical competencies in developing digital learning media, while simultaneously strengthening their role as agents of digital literacy in madrasahs.

Based on this background, the objectives of this activity are to: (1) improve Madrasah Ibtidaiyah teachers' conceptual understanding of comic strip–based learning media; (2) enhance teachers' technical skills in developing digital comic strips as learning media; and (3) identify teachers' perceptions of the usefulness of comic strip media in character-based learning.

2. METHOD

This program was implemented using the Rapid Rural Appraisal (RRA) approach. The RRA approach was selected due to its participatory, rapid, and contextual characteristics, which enable the service team to explore real needs, underlying problems, and partner potential directly through intensive interaction with the assisted subjects. RRA positions partners as the main actors

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throughout the entire community service process, starting from problem identification and program planning to evaluation and follow-up. This approach is considered relevant to the context of teacher competency development because it encourages active involvement, critical reflection, and program sustainability based on field-based needs (Kasmel & Andersen, 2024).

The target of this community service program was elementary school and Madrasah Ibtidaiyah (SD/MI) teachers in Malang Regency, with the implementation focused on Madrasah Ibtidaiyah Nahdlatul Ulama Wadung. A total of 15 teachers participated in the program, consisting of classroom teachers and subject teachers. Based on the initial mapping results, the participants had varied teaching experience, ranging from 5 to more than 15 years. In terms of technological literacy, most teachers were accustomed to using technology for administrative purposes and basic instructional activities (such as the use of Learning Management Systems and digital presentations), but they lacked sufficient experience in independently developing digital learning media, particularly creative visual-based media such as comic strips.

The implementation of the community service program was carried out systematically through several main stages as follows. First, Initial Mapping. This stage was conducted through field observations and semi-structured interviews to obtain an initial overview of the madrasah's conditions, technological readiness, and teachers' needs and constraints in developing digital learning media. Second, Building Social Communication. The service team conducted an initial approach with the head of the madrasah and teachers to build mutual understanding, commitment, and active participation throughout the program. Third, Participatory Mapping Based on RRA. The mapping was conducted collaboratively with teachers using focus group discussions (FGDs) and joint reflection to identify the main problems related to learning media development, as well as to map available potentials and resources. Fourth, Problem and Program Objective Formulation. Problems were formulated using the problem tree technique, while program objectives were developed using the objective tree technique, resulting in a clear program direction based on partners' needs. Fifth, Program Strategy Development. The program strategy was designed in the form of training activities, practice sessions, mentoring, as well as monitoring and evaluation, with a focus on developing digital comic strip–based learning media. Sixth, Training and Mentoring Implementation.

The training was conducted in two formats: (1) online sessions, which focused on strengthening conceptual understanding of digital learning media, the concept of comic strips as educational media, and the introduction of supporting applications; and (2) offline sessions, which emphasized hands-on practice through group work. Teachers were divided into several groups and engaged in technical stages, including writing simple comic scripts, taking photographs, converting photos into cartoon images, removing backgrounds, and designing comic panels using digital applications. Seventh, Monitoring and Reflection. Each stage of the activities was evaluated through reflective discussions with teachers to identify achievements, challenges, as well as supporting and inhibiting factors in program implementation. Eighth, Program Follow-Up. Follow-up activities were conducted through continued mentoring and the preparation of teachers who demonstrated significant progress to act as local leaders, ensuring program sustainability even without the direct involvement of facilitators. The following figure presents the implementation flow of the community service program.

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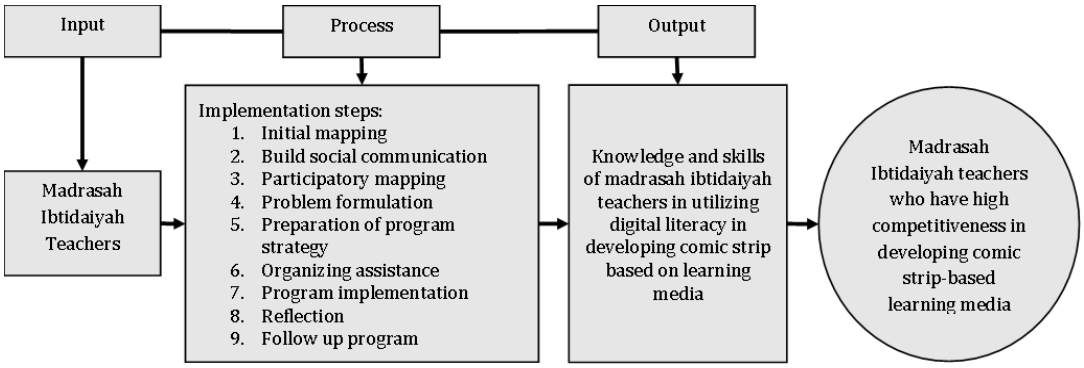

Figure 1. Community Service Implementation Process

Data were collected using several techniques, namely pre-test and post-test questionnaires, observations conducted during the training sessions, and documentation of teachers' work products. Quantitative data obtained from the questionnaires were analysed descriptively using percentages to measure improvements in teachers' conceptual understanding and technical skills. Meanwhile, qualitative data from observations and reflections were analysed thematically to describe teachers' perceptions of the program's usefulness.

All program participants took part voluntarily and were provided with explanations regarding the objectives and procedures of the activities. Informed consent was obtained prior to program implementation. The collected data were kept confidential and used solely for academic purposes and for reporting community service activities.

3. RESULTS AND DISCUSSION

The implementation of the community service program was carried out in a gradual and systematic manner, beginning with the initial mapping stage in October–November 2022, followed by the preparation stage starting in February 2023, the implementation of the workshop in May 2023, and the evaluation and reflection stage in June 2023. Each stage generated interrelated findings and provided a comprehensive overview of the improvement in teachers' competencies in developing digital comic strip–based learning media.

Program Planning Stage

The planning stage served as a crucial foundation for the implementation of this community service program. At this stage, the service team, together with the partner group, formulated program strategies based on the results of the initial mapping and participatory discussions. Teachers were actively involved in identifying the main problems they faced in the learning process, particularly those related to limited abilities to independently develop technology-based learning media.

The planning results indicated that although teachers had utilized technology in administrative tasks and basic instructional activities, they still encountered difficulties in designing digital learning media that were creative, contextual, and engaging for students. Therefore, it was agreed that a relevant solution would be a workshop on the development of comic strip–based learning media using a hands-on approach. At this stage, teacher working groups were also organized to support collaboration and peer learning throughout the program implementation process.

Implementation of the Online Workshop Program

The workshop implementation began with online activities aimed at providing participants with conceptual reinforcement and technical readiness. The online workshop was

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conducted in several sessions covering: (1) identification of learning problems and challenges in utilizing digital technology, (2) an introduction to the concept of comic strip–based learning media, and (3) a presentation of supporting applications and websites to be used in the development of comic strips.

Figure 2. Flyer and Online Workshop Activities

At this stage, teachers were introduced to the Toon App application for converting photos into cartoon images, the Remove Background website for removing image backgrounds, as well as the use of comic panel templates and PowerPoint as tools for the final design process. Observations during the online workshop indicated that participants followed the activities enthusiastically, as reflected in their active involvement in discussion sessions and the questions they raised. Teachers also began to understand that the development of comic strips can be carried out in a simple manner, even by utilizing mobile phone devices, thus not relying entirely on high-specification computer equipment.

Implementation of the Offline Workshop Program

The next stage was the implementation of an offline workshop focused on hands-on practice. The offline workshop was conducted at Madrasah Ibtidaiyah Nahdlatul Ulama Wadung Pakisaji, Malang Regency, and involved all participants fully. At this stage, teachers were divided into several working groups to facilitate the mentoring process and collaboration.

Figure 3. Delivery of material and hands-on practice in developing stories and comic strips

The offline workshop implementation consisted of several main practical sessions, namely: (1) drafting stories and simple comic scripts; (2) determining protagonist and antagonist characters drawn from group members; (3) conducting photo sessions for comic visual materials; (4) converting photos into cartoon-style images using Toon App; (5) removing image backgrounds using Remove Background; and (6) designing comic strips within comic panels according to the predetermined storyline.

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Figure 4. The results of story development and comic script creation by Groups 1, 2, and 3.

The practical results indicate that teachers were able to express their creative ideas in the form of stories that are contextualized to students' real-life experiences. The use of teachers' own photographs as comic characters emerged as an interesting finding, as it enhanced a sense of ownership toward the developed media. This process also stimulated teachers' imagination and creativity in designing scenes, dialogues, and storylines that are both communicative and educational.

Pre-test and Post-test Results of Teachers' Competence, Conceptual Understanding

Table 1. Pre-test Survey Results

No	Indicator	Statement	Respondents' Answer Scores (Teachers)									
			Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
			f	%	f	%	f	%	f	%	f	%
1	Understanding of strip comic concepts, applications, remove background, comic panels, toon app	Teachers have an understanding of comic strip story concepts.	0	0	1	6,67	3	20	2	13,33	9	60
2		Teachers have an understanding of background removal.	2	13,33	3	20	7	46,67	2	13,33	1	6,67
3		Teachers have an understanding of comic panels.	0	0	1	6,67	3	20	6	40	5	33,33
4		Teachers have an understanding of the Toon app.	1	6,67	2	13,33	5	33,33	3	20	4	26,67
5		Teachers have an understanding of comic strip design.	0	0	1	6,67	6	40	5	33,33	3	20
			3	4	8	10,67	24	32	18	24	22	29,33
6	Technical application of strip comics, applications, remove background, comic panels, toon app	Designing comic story concepts	0	0	1	6,67	3	20	5	33,33	6	40
7		Using background removal applications	4	26,67	2	13,33	2	13,33	5	33,33	2	13,33
8		Using comic panels	0	0	2	13,33	5	33,33	5	33,33	3	20
9		Using toon app	0	0	3	20	3	20	4	26,67	5	33,33
10		Designing comic strips	0	0	2	13,33	2	13,33	7	46,67	4	26,67
			4	5,33	10	13,33	15	20	26	34,67	20	26,67

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The results of the pre-test survey (Table 1) indicate that teachers' conceptual understanding of comic strip–based learning media remains relatively low. Only 4% of teachers reported a very high level of understanding, 10.67% indicated that they understood the concept, and 32% reported a moderate level of understanding. Meanwhile, the remaining 53.33% of teachers fell into the categories of low understanding and very low understanding. These findings suggest that the majority of teachers have not yet developed sufficient conceptual understanding of comic strips and their supporting applications.

Table 2. Post-test Survey Result

No	Indicator	Statement	Respondents' Answer Scores (Teachers)									
			Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
			f	%	f	%	f	%	f	%	f	%
1	Understanding of strip comic concepts, applications, remove background, comic panels, toon app	Teachers have an understanding of comic strip story concepts.	10	66,67	5	33,33	0	0	0	0	0	0
2		Teachers have an understanding of background removal.	12	80	3	20	0	0	0	0	0	0
3		Teachers have an understanding of comic panels.	11	73,33	4	26,67	0	0	0	0	0	0
4		Teachers have an understanding of the Toon app.	13	86,67	2	13,33	0	0	0	0	0	0
5		Teachers have an understanding of comic strip design.	10	66,67	4	26,67	0	0	1	6,67	0	0
			56	74,67	18	24	0	0	1	1,33	0	0
6	Technical application of strip comics, applications, remove background, comic panels, toon app	Designing comic story concepts	7	46,67	5	33,33	3	20	0	0	0	0
7		Using background removal applications	8	53,33	5	33,33	2	13,33	0	0	0	0
8		Using comic panels	5	33,33	5	33,33	5	33,33	0	0	0	0
9		Using toon app	9	60	5	33,33	0	0	1	6,67	0	0
10		Designing comic strips	8	53,33	5	33,33	2	13,33	0	0	0	0
			37	49,33	25	33,33	12	16	1	1,33	0	0

Conversely, the post-test survey results (Table 2) indicate a very significant improvement. A total of 74.67% of teachers reported that they strongly understood the concept of comic strips, while 24% stated that they understood it, with the category of not understanding being almost nonexistent. The increase from 4% to 74.67% in the "strongly understand" category demonstrates the effectiveness of the training program in substantially enhancing teachers' conceptual understanding.

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Technical Skills

In terms of technical skills, the pre-test results indicate that most teachers had no prior experience in applying comic strips as learning media. A total of 61.27% of teachers fell into the disagree and strongly disagree categories regarding statements about their technical experience in designing comic strips.

After participating in the workshop, the post-test results show a significant change. A total of 49.33% of teachers strongly agreed and 33.33% agreed that they were able to apply comic strips as learning media. This finding indicates that the workshop not only improved teachers' theoretical understanding but also enhanced their practical skills in using the Toon App and Remove Background applications, as well as in independently designing comic strip panels.

Evaluation of Workshop Implementation

Table 3. Evaluation of Workshop Implementation Survey Result

No	Statement	Scale (%)				
		1	2	3	4	5
1	Overall implementation of the workshop				64,29	35,714
2	Attractiveness of the workshop topic				64,29	35,714
3	Benefits of the information presented				42,86	57,143
4	Quality of the presentation				35,71	64,286
5	Materials delivered during the workshop				57,14	42,857
6	Your level of understanding of the presentation		7,14		50	42,857
7	The presenter's ability to master the material				28,57	71,429
8	The presenter's service in supporting the workshop implementation				14,29	85,714
9	Evaluation of the scheduling and time management of the workshop				42,86	57,143
10	Based on your participation in this workshop, how likely are you to participate in future workshops?				50	50

Note: 1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent

The results of the workshop implementation evaluation (Table 3) indicate a very high level of participant satisfaction. Most indicators were rated in the good and very good categories. Participants perceived the workshop topics as relevant to their needs, the materials as being delivered clearly and contextually, and the delivery methods as effectively balancing theory and practice.

Nevertheless, several aspects require attention for future improvement, particularly in terms of time management and activity scheduling. Some participants indicated that the practical sessions needed a longer duration to allow for more optimal exploration of creativity.

Qualitative Findings and Teachers' Perceptions

Qualitative findings derived from interviews and open-ended responses in the questionnaire indicate that teachers experienced direct benefits from the activity. Teachers reported that the workshop provided a learning experience that was enjoyable, practical, and relevant to classroom instructional needs. They also expressed expectations that similar activities could be conducted on a sustainable basis and further developed into other forms of digital learning media.

Several teachers' statements revealed that they felt more confident in independently developing learning media and were motivated to implement comic strips in classroom learning.

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In addition, teachers expressed their intention to disseminate the acquired skills to their colleagues and students.

Discussion of Program Outcomes

The development of comic strip–based learning media has proven to offer tangible opportunities for teachers to enhance their pedagogical competence and digital literacy through hands-on practice. Practice-oriented training that emphasizes product creation (digital comics) tends to increase technology adoption and bring about changes in teaching practices more effectively than training that is purely theoretical (Montero-Mesa, 2023).

The results of the workshop in this study—indicating that teachers found comic creation not as complicated as imagined and manageable even with a mobile phone—align with research showing that easily accessible digital comics/flipbooks enhance student interest and engagement, as well as facilitate adoption by teachers (Elfina, 2023). Similar findings were also reported in studies on the development of digital comics for science and Pancasila material, emphasizing ease of access and effectiveness in increasing learning motivation (Putri et al., 2022).

From a pedagogical standpoint, visual media and narrative illustrations (such as comics) support cognitive processing by presenting concepts visually and narratively, thus facilitating understanding and retention of material—particularly among elementary and secondary school students (Hidayat, 2024). Research on the development of digital comics based on Project-Based Learning (PBL) demonstrates increased attention, affective engagement, and learning outcomes when comics are used as learning stimulants (Rammayani, 2025).

In the realm of character education and the context of madrasas/Islamic schools, comic strips offer a narrative medium that allows for the contextual and non-directive incorporation of Islamic values, ethics, and religious moderation. Studies on digital comics that integrate character education show positive effects in value internalization when stories and characters represent local and religious values (Fitri et al., 2022). Thus, comic strips can serve a dual purpose: conveying academic content while also being a means of teaching values.

Regarding student engagement, empirical evidence from various studies (2021–2025) indicates that digital comic media enhances behavioral, cognitive, and emotional engagement—especially when combined with active learning strategies (project-based, problem-based, or blended approaches). For instance, vocational and secondary studies show strengthened motivation and understanding when digital comics are used as interactive teaching materials (Yanto, 2023).

The convergence of digital comics and blended learning supports flexible access (both in-class and out-of-class), allowing for differentiation and self-paced learning, which are essential in blended learning models in Islamic institutions that emphasize values (Wulandari, 2022). Digital comics accessible via mobile phones or LMS strengthen hybrid learning modes—consistently bringing the narrative of values from face-to-face classrooms to the digital environment (Rammayani, 2025).

From the perspective of teacher training (TPD), modern literature emphasizes key components: (1) direct practical engagement, (2) collaboration among teachers, (3) ongoing mentorship, and (4) institutional/infrastructural support. Short training without follow-up tends to yield smaller and transient effects; conversely, continuous programs with coaching result in more stable changes in practice (Huang, 2024). Therefore, the results of this workshop should be interpreted as a promising initial step that requires follow-up to achieve long-term integration.

The role of data literacy and big data in education is starting to gain attention: teachers need to develop data literacy skills to leverage digital learning data (student interactions with digital comics, LMS analytics, etc.) as instructional feedback. Although this workshop did not focus

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on analytics or big data processing, the introduction of digital content can serve as an entry point for the future development of teachers' data competencies (Sarki, 2024).

Sustainability Efforts of the Program

The program is carried out continuously, either by a team still involving facilitators or guided by local leaders.

1. The assisted teachers are increasingly enthusiastic about developing learning media based on comic strips.
2. The assisted teachers have succeeded in implementing learning media based on comic strips.
3. Teachers can create learning media based on comic strips in collaboration with other teachers or students.

Based on the evaluations and monitoring conducted, we propose similar activities for sustainable implementation to enhance knowledge and skills in developing learning media based on comic strips, resulting in more varied comic outputs.Sustainability

4. CONCLUSION

This community engagement program demonstrates that targeted workshops on comic strip–based digital learning media effectively strengthen teachers' digital competence and pedagogical creativity in Islamic educational settings. The results indicate a marked improvement in teachers' confidence and skills in utilizing simple digital tools, including Android smartphones, to design instructional comic strips that integrate character education values. The practical and hands-on workshop approach successfully increased participant engagement and encouraged active involvement throughout the training process.

A major outcome of the program is the successful production of character-based comic strips that present moral and religious values through simple, contextual narratives aligned with students' everyday experiences. These media products serve not only as alternative learning resources but also as supportive tools for character education and student engagement within blended learning environments. Furthermore, collaborative activities during the workshop fostered peer learning and strengthened professional interaction among teachers.

To ensure sustainability, continuous follow-up mentoring and structured professional development are recommended to support consistent classroom implementation. Integrating comic-based digital media into the regular curriculum will enhance its instructional impact. Future studies should examine the long-term effects of such media on classroom practices, student engagement, and character development through longitudinal and classroom-based evaluations.

REFFERENCES

Arifin, Z. (2020). Pendidikan Islam dan tantangan abad ke-21: Transformasi pembelajaran di madrasah. *Jurnal Pendidikan Islam*, *6*(2), 145–158.

Chambers, R. (2023). *Participatory approaches for development research*. Routledge.

Elfina, E. (2023). Flipbook-based digital comic to enhance student learning interest. *Jurnal Pendidikan*.

Fitri, M. R., Saregar, A., & Latifah, S. (2022). Character education-based physics digital comic for secondary school students. *OLER Journal*.

Hidayat, N. R. (2024). Digital comics for differentiated learning in elementary education. *Jurnal Teknologi Pendidikan*.

Hosler, J., & Boomer, K. B. (2019). Are comic books an effective way to engage nonmajors in learning science? *CBE—Life Sciences Education*. https://doi.org/10.1187/cbe.18-03-0038

Huang, L. (2024). Technology-enabled teacher professional development during the COVID-19 era: A systematic review. *Computers & Education*.

Kemendikbudristek. (2020). *Kebijakan Merdeka Belajar dan transformasi pendidikan nasional*. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.

Koehler, M. J., Mishra, P., Kereluik, K., Shin, T. S., & Graham, C. R. (2019). The technological pedagogical content knowledge framework. In *Handbook of research on educational communications and technology*. Springer.

Lestari, S., & Fauzi, A. (2024). Kesenjangan literasi digital guru dan pengembangan media pembelajaran berbasis teknologi. *Jurnal Inovasi Pendidikan*, *10*(2), 201–215.

Maulana, R., & Fitriani, Y. (2023). Peran guru sebagai pengembang media pembelajaran digital di sekolah dasar. *Jurnal Pendidikan Dasar*, *14*(2), 120–132.

Mayer, R. E. (2020). *Multimedia Learning* (3rd ed.). Cambridge University Press. https://doi.org/10.1017/9781316941355

Montero-Mesa, L. (2023). Digital technology and teacher professional development: Trends and challenges. *Education and Information Technologies*.

Nurhayati, E., Widodo, A., & Suryani, N. (2022). Comic-based learning media in elementary education. *Cogent Education*. https://doi.org/10.1080/2331186X.2022.2045761

Putri, A. R. P. C., Khotimah, H., & Hidayat, N. (2022). Interactive digital comic teaching materials to increase student engagement and learning outcomes. *Curricula Journal*.

Rahmawati, Y., Ridwan, A., & Hadinugrahaningsih, T. (2019). Teachers' challenges in integrating ICT in Indonesian schools. *Journal of Education and Learning*. https://doi.org/10.1080/1475939X.2019.1685481

Rammayani, W. (2025). Project-based learning with digital comics to enhance student creativity. *Didaktika Journal*.

Sarki, M. (2024). Digital comic media development based on problem-based learning. *Eduvest Journal*.

Wulandari, W. (2022). Implementation of blended learning in Islamic elementary schools. *Mudarrisa Journal*.

Yanto, E. S. (2023). Student engagement through digital comic strips in vocational education. *Journal of Innovative Workplace Practice*.