

EMPOWERING EDUCATORS: THE TRANSFORMATIVE IMPACT OF TEACHER TRAINING ON TECHNOLOGY-BASED LEARNING MEDIA

Sabariah¹, Ruffi¹, Adi Bando¹, Andri Kurniawan¹, Supriyanto², Elsa Elvianti¹, Prema Karira Anas Sulaiman¹

¹Educational Technology, Postgraduate School, Universitas PGRI Adi Buana Surabaya, Surabaya

²Faculty of Education, Universitas Negeri Surabaya, Surabaya

sabariah@unipasby.ac.id

Article History

Received: 29 January 2025, Accepted: 30 March 2025, Published: 30 May 2025

Abstrak

Di era digital saat ini, meningkatkan kemampuan guru dalam mengembangkan media pembelajaran berbasis teknologi menjadi hal yang sangat penting karena berdampak langsung pada keterlibatan siswa dan hasil belajar mereka. Penelitian ini bertujuan untuk mengkaji pengaruh program coaching terhadap kemampuan guru SMA dalam merancang materi pembelajaran berbasis teknologi. Dengan menggunakan desain satu kelompok pretest-posttest, data dikumpulkan dari guru-guru di Surabaya yang telah mengikuti pelatihan pengembangan media pendidikan. Pemilihan sampel dilakukan secara purposive, dan pengumpulan data dilakukan melalui tes serta observasi untuk menilai kualitas media yang dikembangkan dan efektivitas coaching yang diberikan. Hasil penelitian menunjukkan adanya hubungan yang signifikan antara kualitas coaching dan keberhasilan guru dalam membuat media pembelajaran, dengan presentasi interaktif, aplikasi mobile, dan video edukatif sebagai produk yang paling banyak dikembangkan. Namun, keterbatasan infrastruktur dan kurangnya dukungan teknis menjadi tantangan utama dalam penerapannya. Penelitian ini memberikan wawasan baru dengan menekankan pentingnya dukungan teknis yang berkelanjutan dan akses terhadap sumber daya yang memadai untuk menjaga keberlangsungan integrasi media teknologi di dalam kelas. Kontribusi penelitian ini terletak pada bukti empiris mengenai strategi *coaching* yang efektif serta pentingnya dukungan menyeluruh dalam mendorong adopsi teknologi secara berkelanjutan di kalangan pendidik.

Kata Kunci: Pelatihan; Pengembangan; Media; Pembelajaran; Kualitas

Abstract

In the current digital age, strengthening teachers' skills in creating technology-based learning media is crucial, as it significantly influences student engagement and academic achievement. This research investigates how coaching impacts high school teachers' abilities to design instructional materials that leverage technology. Employing a one-group pretest-posttest design, data were obtained from educators in Surabaya who participated in training focused on developing educational media. Participants were selected through purposive sampling, and data collection involved both assessments and observational methods to evaluate the quality of media produced and the effectiveness of coaching. The results demonstrate a strong correlation between the quality of coaching and teachers' success in developing media, with interactive slideshows, mobile learning applications, and educational videos emerging as the most frequently created tools. However, limitations such as inadequate infrastructure and insufficient technical assistance were noted as key barriers. This study offers new perspectives by emphasizing the importance of continuous technical support and resource accessibility to ensure the sustained use of educational media in teaching. It adds to the body of knowledge in education by showcasing effective coaching practices and highlighting the necessity of holistic support systems to encourage long-term technology integration among teachers.

Keyword: Coaching; Development; Media; Instructional; Quality

To cite this article:

Sabariah, Ruffi'i, Bando, A., Kurniawan, A., Supriyanto, Elvianti, E., & Sulaiman, P. K. A. (2025). Empowering Educators: The Transformative Impact Of Teacher Training On Technology-Based Learning Media. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 8(2), 143–156. doi: [10.17977/um038v8i22025p143](https://doi.org/10.17977/um038v8i22025p143)

INTRODUCTION

Education in the digital era is undergoing a profound transformation, driven largely by the rapid advancement of information and communication technology (ICT). ICT has become a fundamental pillar in shaping educational practices and media, providing opportunities for more dynamic, interactive, and personalized learning experiences. The urgency of digital transformation in education became especially evident during the COVID-19 pandemic, which forced an unprecedented shift to remote learning across the globe. According to Budiarti (2019), approximately 1.5 billion students were affected by school closures, prompting a swift and large-scale adoption of distance learning strategies and digital educational media.

In light of this paradigm shift, the role of effective educational media has grown increasingly significant. As students and educators adapt to new learning environments, it becomes evident that the appropriate use of media can substantially enhance both student motivation and learning outcomes (Sindiani, 2023). Digital learning tools not only provide access to information but also transform the way students engage with knowledge. Studies have shown that the integration of innovative learning media—such as simulations, videos, and educational games—has a positive effect on student engagement and their ability to understand complex concepts (Annisa et al., 2022).

Recognizing these benefits, this study aims to explore the impact of teacher training on the development of technology-based learning media, particularly in the context of instructional material development. The underlying assumption is that when teachers are adequately trained in educational technology, they are more likely to create effective, engaging, and relevant learning materials that meet the needs of 21st-century learners.

Teacher training, in its essence, is a systematic and intentional process designed to improve teaching quality by equipping educators with knowledge, skills, and strategies aligned with current educational demands (Devi, 2020). The effectiveness of such training is amplified when it incorporates theoretical foundations like constructivist learning theory, which emphasizes student-centered approaches. According to Piaget and Vygotsky—two of the most influential proponents of constructivism—learning is an active, contextualized process of constructing knowledge rather than acquiring it passively. Social interaction and hands-on experiences are central to this learning process (Sindiani, 2023). In this context, learning media act as essential tools that support students in connecting new information with their prior experiences and developing deeper understanding (Waluyo & Hadi, 2014).

In the current digital landscape, where students are more exposed to technological devices and online content, the relevance of technology-based learning media has become even more critical. When used effectively, these media can not only facilitate learning but also stimulate critical thinking, creativity, and collaboration—skills that are vital for success in the 21st century (Ilmia, 2022). Empirical evidence supports the claim that multimedia tools, mobile apps, and gamified learning resources significantly improve students' comprehension and retention of content (Tanus, 2022; Annisa et al., 2022).

Despite the proven benefits of integrating technology into the classroom, a major problem persists: many teachers lack the necessary understanding and skills to develop or implement effective learning media suited for their students' needs. This skill gap is especially pronounced in developing countries, such as Indonesia, where uneven access to training and infrastructure continues to hinder the effective use of educational technology (Jai et al., 2020). The implications of this gap are far-reaching. Without addressing this challenge, the overall quality of education

may suffer, potentially impacting students' readiness to face global challenges and workforce demands (Yunita & Supriatna, 2021).

Research underscores that the absence of structured, continuous support for teachers in using educational technology limits their ability to innovate and adapt their teaching strategies (Rahmawati et al., 2019). While some teachers may attempt to integrate digital tools independently, the lack of pedagogical guidance often results in underutilization or ineffective application. Therefore, teacher training must be seen not as a one-time intervention but as an ongoing professional development process that evolves in tandem with technological advancements and pedagogical innovations (Pratama, 2023).

This study is thus guided by a central aim: to examine the impact of teacher training on the development of technology-based learning media in the framework of instructional material development. In order to fulfill this aim, several key objectives have been identified. First, the study seeks to analyze the effectiveness of training programs in enhancing teachers' technical and pedagogical skills in media development. By evaluating teachers' performance before and after training, the study aims to determine whether such initiatives lead to measurable improvements in their ability to design and implement digital instructional tools.

Second, the research aims to identify the types of learning media that are most effective in enhancing student learning outcomes. This includes an analysis of various formats—such as interactive videos, virtual simulations, and mobile applications—and how each medium affects student comprehension, motivation, and academic achievement (Hilmiati, 2022). Understanding which media formats are most effective allows educators and policymakers to invest in the most impactful solutions.

Third, the study intends to assess the overall impact of technology-based learning media on student motivation and engagement. Engagement is a key predictor of academic success, and modern learners often respond positively to interactive and multimedia-rich content (Rahmadhani et al., 2023). By exploring students' responses to different digital learning environments, the study seeks to establish a link between teacher-generated media and student-centered learning outcomes.

By addressing these objectives, the study aspires to make a meaningful contribution to educational development, particularly within the Indonesian context. As the country continues to embrace digital transformation across all sectors, the education system must also adapt to ensure that teachers are empowered, equipped, and supported in their journey toward innovation. Moreover, the findings of this research may serve as a basis for curriculum planners, training providers, and policymakers in designing future professional development programs that align with the demands of digital education.

In conclusion, the digital era demands a shift in both teaching practices and educational materials. Teacher training plays a pivotal role in this transformation, enabling educators to develop learning media that are not only technologically advanced but also pedagogically sound. As ICT continues to evolve, so too must the strategies used to train and support teachers, ensuring that they remain at the forefront of educational innovation. With proper investment in teacher training, the development of effective technology-based learning media can significantly enhance student learning experiences and outcomes, thereby contributing to a more resilient and future-ready education system.

METHOD

The study employs a quantitative approach using a pre-experimental design with a one-group pretest-posttest setup. Data collection is scheduled for the academic year 2024-2025, focusing on a

senior high school in Surabaya. The target population consists of high school teachers who have participated in a professional development program that integrates technology-based learning media with teaching materials. This sample was chosen to assess the impact of the program on teaching efficacy. The criteria for selection include the teachers' experience level and willingness to engage in the intervention. The decision to select this specific location is based on its relevance to technology-enhanced educational practices and its urban demographic, which aligns with the study's objectives.

The research utilizes both testing and observational instruments. The test instrument includes pretest and posttest evaluations designed to measure changes in teachers' ability to implement technology-based media in their teaching. This instrument was developed based on the theory of technology adoption in education, drawing from existing studies on professional development in technology integration. Observational instruments were also included to gather qualitative insights into teachers' interactions with the new media. The combination of these instruments aims to provide a comprehensive view of the program's effectiveness.

Data collection involves a pretest, posttest, and observation process. A purposive sampling technique was used to select teachers who had already undergone the training program, ensuring participants were equipped with baseline knowledge of the content. The data collection occurred on-site in classrooms where the training was applied, allowing for real-time observation of changes in instructional methods. The pretest measured initial performance, while the posttest assessed the impact post-intervention. Observations provided additional contextual data, capturing real-time adaptations and challenges faced by teachers during implementation.

The study employs both descriptive and inferential statistical analyses. Descriptive analysis provides a summary of the observed changes in teachers' instructional methods, while inferential analysis, specifically a paired t-test, evaluates the significance of the program's impact on teachers' ability to use technology-based media. The combination of these analyses offers a well-rounded perspective on the program's effectiveness, with descriptive statistics detailing overall trends and inferential analysis confirming statistical significance.

RESULT

The first objective of the study was to evaluate the quality of the training program provided to teachers. The analysis indicated that the training quality received a high rating, with an average score of 4.2 out of 5. This score reflects the overall satisfaction of teachers with the training they received. Notably, the segments focusing on the use of digital applications and interactive content creation were particularly well-received. Teachers expressed appreciation for these components, indicating that the training effectively addressed their needs for enhancing technological proficiency in the classroom.

Table 1. Evaluation of Training Effectiveness

Training Aspect	Mean Rating
General Effectiveness of the Training	4.2
Proficiency in Using Digital Tools	4.3
Skills in Designing Interactive Media	4.1

The feedback from the training program highlights its effectiveness in equipping teachers with practical tools and knowledge. The emphasis on digital platforms for creating engaging content was instrumental in helping educators feel more confident in integrating technology into their teaching practices. This positive reception suggests that the training program was successful in meeting its objectives and preparing teachers for modern educational demands.

The second objective examined the extent to which teachers developed technology-based media following the completion of the training program. The results revealed that 75% of teachers successfully integrated technology-based learning media into their classrooms. This significant adoption rate indicates a positive shift towards utilizing digital tools, likely influenced by the focus of the training program on technology integration.

The types of media developed by teachers varied, with interactive presentations being the most widely used at 40%. These presentations facilitate dynamic engagement during lessons, allowing for real-time interaction between teachers and students. Following closely, 35% of teachers utilized educational videos, which were found to be effective for visual learning, thereby enhancing students' comprehension of complex topics. Additionally, 20% of teachers developed mobile-based learning applications, primarily to support independent student learning outside the classroom. Lastly, simulations and educational games, though less common at 5%, provided hands-on learning experiences that fostered interactivity.

Table 2. Types of Technology-Based Learning Media Developed Development of Technology Based Learning Media

Media Format	Description	Usage Percentage
Interactive Presentations	Digital slides with interactive features and media	40%
Educational Videos	Instructional videos used to explain concepts visually	35%
Mobile-Based Learning Applications	Learning tools accessible via smartphones or tablets	20%
Simulations and Educational Games	Game-based or simulated learning activities	5%

The introduction of these technology-based media has led to improved student engagement, evidenced by an average satisfaction score of 4.3 out of 5. This score suggests that the use of technology in the classroom positively contributed to the learning experiences and accessibility of content for students. The findings indicate that teachers who embraced these digital tools were able to create more engaging and interactive learning environments.

Table 3. Key Factors Influencing the Success of Media Development

Influential Factor	Description	Coefficient
Relevance of Training Content	Alignment of training materials with classroom needs and practice	0.45
Post-Training Technical Support	Availability of guidance and troubleshooting after training sessions	0.35
Teacher Motivation and Openness	Educators' willingness to learn, adapt, and apply new media tools	0.32

The third objective of the study explored the relationship between the quality of training received and the development of technology-based learning media by teachers. A regression analysis was conducted, which confirmed a significant positive correlation between training quality and the efforts made by teachers to adopt and develop media. The regression coefficient was calculated at 0.68 ($p < 0.05$), indicating that higher-quality training is associated with more extensive media adoption and development.

Several key factors were identified that influenced the effectiveness of the training program. The relevance of the training content emerged as a crucial factor, with a coefficient of 0.45. This finding suggests that training content tailored to real classroom applications was essential for enabling teachers to effectively apply what they learned in their teaching practices. Furthermore, the availability of post-training technical support played a significant role, with a coefficient of

0.35. Access to ongoing support encouraged teachers to experiment with new tools without the fear of encountering technical issues.

Another influential factor was teacher motivation and openness to technology, which had a coefficient of 0.32. This indicates that teachers' readiness and enthusiasm to embrace technology significantly contributed to their success in implementing new media in their classrooms. The findings collectively affirm that well-designed and relevant training, coupled with continuous support, motivates teachers to adopt and develop new educational media. This ultimately enhances student engagement and improves the effectiveness of instructional delivery in educational settings.

DISCUSSION

The role of training quality in technology adoption among educators is paramount, particularly in the context of developing technology-based learning media. High-quality training equips teachers with the necessary skills and knowledge to effectively integrate technology into their teaching practices. This assertion is supported by Baharuddin, who highlights that training on various learning media, including virtual reality, prepares teachers to align their instructional methods with the demands of the Industry 4.0 revolution (Baharuddin, 2022). Such training not only introduces teachers to innovative tools but also emphasizes practical applications that can be directly implemented in the classroom, thereby enhancing their teaching efficacy.

Moreover, the effectiveness of training is significantly influenced by its design and delivery. Salihu emphasizes that technology-based learning media is rapidly evolving, necessitating that teachers continuously develop their competencies to utilize these tools effectively (Salihu, 2023). This aligns with the findings of Novitawati and Anggreani, who argue that the media used in educational settings must be engaging and interactive to facilitate learning (Novitawati & Anggreani, 2023). The practical focus of training sessions, as noted in these studies, fosters an environment where teachers can immediately apply what they have learned, leading to enhanced teaching practices and improved student engagement.

However, while immediate improvements in teaching practices are evident, questions regarding the sustainability of these effects over time remain. The concern is whether the skills and enthusiasm gained from initial training will persist without ongoing support and professional development. Fuzi and Fuzi's research indicates that continuous training and performance appraisal are critical for maintaining job satisfaction among teachers, which in turn affects their performance (Fuzi & Fuzi, 2019). This suggests that without regular opportunities for professional growth, the initial benefits of training may diminish over time.

In the context of online training, particularly during the COVID-19 pandemic, the flexibility and convenience of webinars have been noted as significant advantages (Sakulprasertsri et al., 2022). These online platforms have allowed educators to engage in professional development while navigating the challenges posed by the pandemic. However, the effectiveness of such training modalities must be evaluated in terms of long-term impact on teaching practices and job satisfaction. As highlighted by Permanasari et al., the effectiveness of training can be gauged through teacher satisfaction, which serves as a critical indicator of training quality (Permanasari et al., 2021).

The integration of technology in education also necessitates that training programs consider the specific needs and contexts of teachers. For instance, the training on mobile learning-based media, as discussed by Setiawan et al., emphasizes the importance of making learning interactive and engaging for students (Setiawan et al., 2022). This tailored approach not only enhances the

relevance of the training but also ensures that teachers feel equipped to meet the diverse needs of their students.

Furthermore, the impact of training quality extends beyond individual teacher performance to influence overall educational outcomes. Research by Ahiri et al. indicates that job satisfaction among teachers is closely linked to their performance and, consequently, student achievement (Ahiri et al., 2023). This underscores the importance of investing in high-quality training programs that not only enhance teachers' skills but also contribute to a positive teaching environment.

In conclusion, while high-quality training is essential for empowering teachers to adopt technology-based learning media effectively, the sustainability of its benefits hinges on ongoing support and professional development. Future research should focus on exploring the long-term outcomes of such training initiatives, assessing how continuous professional development can maintain and enhance the skills and enthusiasm of educators in an ever-evolving technological landscape.

The integration of diverse technologies in teaching has become increasingly prevalent, particularly following training programs designed to enhance educators' pedagogical skills. Teachers who have undergone such training have reported utilizing a variety of technological tools, ranging from interactive presentations to mobile applications. This diversity in technology use suggests that these programs have successfully stimulated innovation and adaptability in teaching methods, allowing educators to tailor their approaches to meet the varied needs of their students. Kurniawati (2019) emphasizes that technological tools enable educators to diversify their instructional strategies, thereby addressing the different learning preferences and requirements of students (Aryani et al., 2021). This adaptability is crucial in maintaining student engagement and fostering a more inclusive learning environment.

The ability to diversify teaching methods is essential for addressing the diverse needs of students. Research indicates that when teachers are equipped with a range of technological tools, they can select the most appropriate resources based on classroom dynamics and individual student needs (Parvin & Salam, 2015). For instance, mobile applications have been shown to enhance learning experiences by providing interactive and engaging content that resonates with students (Flores-Velazquez et al., 2021). Furthermore, the use of interactive presentations, such as those facilitated by platforms like Mentimeter, allows for real-time engagement and feedback, which can significantly enhance the learning experience (Zhang, 2022). This freedom to choose different tools not only reflects teachers' growing confidence in using technology but also their commitment to improving educational outcomes.

However, the diversity in media usage raises important questions about accessibility and equity in technology adoption across different educational environments. While many educators in well-resourced schools can leverage a wide array of technologies, those in under-resourced settings may face significant limitations. Research has highlighted disparities in access to technology, which can hinder the ability of teachers in less affluent areas to diversify their teaching methods effectively (Almufarreh, 2023). This inequity invites further investigation into how educational institutions can bridge the technology gap and ensure that all teachers have the necessary resources to implement diverse instructional strategies.

Moreover, the impact of technology on student engagement and learning outcomes cannot be overstated. Studies have shown that the incorporation of mobile applications and interactive technologies can lead to improved student motivation and participation (Licorish et al., 2018). For example, educational mobile applications have been found to facilitate language learning by

providing interactive and accessible content that aligns with students' interests (Aryani et al., 2021). Additionally, the use of game-based learning technologies has been shown to enhance knowledge retention and engagement among learners, particularly in fields such as nursing and health education (Crowley-Barnett et al., 2020). These findings underscore the potential of technology to transform traditional teaching methods and create more dynamic learning environments.

Despite the benefits of technology in education, it is crucial to consider the pedagogical implications of its use. The effectiveness of technology in enhancing learning experiences is contingent upon thoughtful planning and implementation (Özcan & Kert, 2020). Educators must carefully select the appropriate tools and strategies to ensure that technology serves as a complement to traditional teaching methods rather than a replacement. This requires ongoing professional development and support for teachers to navigate the complexities of integrating technology into their curricula effectively (Kunaviktikul et al., 2022).

Furthermore, the role of teachers as facilitators of learning in technology-rich environments is evolving. As educators become more adept at using technology, they must also develop new pedagogical approaches that leverage these tools to foster collaboration and critical thinking among students (Almufarreh, 2023). This shift necessitates a reevaluation of teacher training programs to ensure that educators are equipped not only with technical skills but also with the pedagogical knowledge to effectively integrate technology into their teaching practices.

In conclusion, the diverse use of technology in teaching represents a significant advancement in educational practices. While the potential for innovation and adaptability is promising, it is essential to address the challenges of accessibility and equity in technology adoption. Future research should focus on identifying strategies to support teachers in under-resourced schools and exploring the long-term impacts of technology on student learning outcomes. By fostering an inclusive and equitable approach to technology integration, educators can better meet the diverse needs of their students and enhance the overall quality of education.

The integration of technology-based media in educational settings has been met with various challenges, particularly concerning infrastructure limitations. A significant portion of educators, approximately 25%, have reported difficulties in implementing these technologies due to inadequate hardware and unreliable internet access. This aligns with Purnomo's (2023) findings, which emphasize that technical limitations are a primary barrier to technology adoption in schools (Hoşgörür, 2016). The lack of sufficient infrastructure not only hinders the effective use of technology but also limits the potential benefits that such technologies can offer in enhancing educational outcomes.

Moreover, while training and professional development for teachers are vital for the successful integration of technology in education, they cannot be effective in isolation. Research indicates that without the necessary hardware and internet connectivity, even the most well-prepared educators face significant obstacles in leveraging technological advancements in their teaching practices (Zhai, 2024). This highlights the interconnectedness of infrastructure and training; both elements are essential for fostering an environment conducive to technological integration in education. As such, addressing these systemic issues necessitates a comprehensive approach that includes both training initiatives and infrastructural improvements.

Institutional support plays a crucial role in overcoming these barriers. Policymakers and educational administrators are pivotal in enhancing the infrastructure necessary for technology integration. Their involvement can lead to increased investments in educational technologies,

thereby improving the overall learning environment (Howlett et al., 2016). For instance, school administrators have expressed a desire to improve physical conditions and increase personnel to better support educational technologies, yet they often find themselves constrained by systemic limitations (Yatsenko, 2023). This indicates a need for a more robust support system that empowers educational leaders to implement necessary changes.

Furthermore, the development of digital culture within educational institutions is essential for fostering an environment that embraces technology. Institutions that actively cultivate a favorable digital culture not only enhance their operational capabilities but also contribute to the formation of socially responsible values among students and staff (Lytvyn, 2024). This cultural shift is critical in ensuring that both educators and students are equipped to navigate and utilize technological resources effectively. As such, educational institutions must prioritize the development of digital skills and knowledge among their stakeholders.

In addition to infrastructure and training, the role of technology leadership cannot be overlooked. Effective technology leadership within educational institutions is characterized by the integration of technological expertise and management skills, which are essential for driving educational innovation (Gabitanan, 2024). Leaders must be prepared to address the challenges posed by technology and facilitate a seamless integration of these tools into the educational framework. This leadership is crucial for fostering an adaptive learning environment that can respond to the evolving demands of the digital age.

Moreover, the ongoing digital transformation in education necessitates a reevaluation of existing policies and practices. The European Union has emphasized the importance of developing national digital skills strategies and coalitions to support the digitalization of education (Safonov et al., 2022). Such initiatives are vital for ensuring that educational institutions are not only equipped with the necessary tools but also have the strategic frameworks in place to utilize these tools effectively. Policymakers must therefore prioritize the establishment of comprehensive digital strategies that address both infrastructure and pedagogical needs.

Finally, the challenges faced in implementing technology-based media in education are not insurmountable. By fostering collaboration among stakeholders, including educators, administrators, and policymakers, it is possible to create a more supportive environment for technology integration. This collaborative approach can lead to the development of innovative solutions that address the existing barriers, ultimately enhancing the educational experience for both teachers and students (Alberghina, 2021). As educational institutions continue to navigate the complexities of digital transformation, a concerted effort to improve infrastructure, provide adequate training, and cultivate effective leadership will be essential for realizing the full potential of technology in education.

The integration of technology in education has become increasingly vital, necessitating ongoing support and mentoring for teachers post-training. Research indicates that teachers who receive continuous support, including technical consultations and mentoring, are more adept at developing effective technology-based media for their classrooms. This aligns with findings by (Ersin & Atay, 2021), which emphasize that sustained support not only enhances teacher motivation but also equips them to navigate technical challenges effectively (Ersin & Atay, 2021). The role of mentorship is crucial as it allows educators to refine their skills over time, fostering an environment conducive to the sustained development and adaptation of new media in teaching practices (Keller et al., 2020).

Training alone is insufficient for achieving long-term success in the integration of educational technology. The presence of follow-up support serves as a critical safety net for teachers, enabling them to address technical issues and adapt to new tools more confidently. This perspective is supported by (Quinlan et al., 2019), who argue that ongoing online support is essential for fostering positive mentoring relationships, particularly in the context of preservice teachers (Quinlan et al., 2019). Furthermore, Keller et al. (2020) highlight that mentors who have access to support contacts report higher satisfaction and better experiences in their mentoring roles, reinforcing the importance of structured support systems post-training (Keller et al., 2020).

The quality of training, access to diverse technological tools, and infrastructure support are fundamental components for the effective development of technology-based learning media in classrooms. While many training programs empower teachers, challenges such as resource accessibility and infrastructural limitations can hinder the full potential of these initiatives. Tynjälä et al. (2019) emphasize the need for new teachers to have opportunities to discuss challenges with their peers, which can be facilitated through structured mentoring programs (Tynjälä et al., 2019). This suggests that future professional development initiatives should not only focus on training but also on creating a robust support system that addresses these challenges.

Moreover, the integration of continuous support mechanisms is essential for equitable technology adoption across schools. Studies indicate that disparities in infrastructure can significantly impact the effectiveness of technology integration in education (Quinlan et al., 2019). For instance, Anderson and Sánchez (2021) found that effective mentoring can help educators navigate these disparities by providing tailored support and resources (Anderson & Sánchez, 2021). Therefore, educational institutions must allocate resources for technical mentorship to maximize the effectiveness of training programs and ensure that all teachers have the opportunity to succeed in their technology integration efforts.

The discussion surrounding ongoing support and mentoring underscores the necessity of a comprehensive approach to professional development in education. As highlighted by (Quinlan et al., 2019), mentoring relationships should be tailored to meet the diverse needs of mentees, which can enhance the overall effectiveness of educational initiatives (Quinlan et al., 2019). This individualized approach not only fosters a supportive learning environment but also encourages teachers to take ownership of their professional growth, ultimately leading to improved educational outcomes.

In conclusion, the synthesis of these findings reinforces the notion that sustainable educational improvement requires a multifaceted approach that includes robust training and systemic support. The evidence suggests that ongoing mentorship and support are critical for teachers to develop the necessary competencies to integrate technology effectively into their teaching practices. As educational institutions plan future initiatives, they should prioritize the establishment of structured support systems that address both the technical and emotional needs of educators, thereby fostering a culture of continuous improvement and innovation in teaching.

In addition, recent studies further support the argument for sustained post-training support and technology mentoring. Sari, Suharta, and Parwati (2025) highlight that the implementation of interactive E-LKPD using the ADDIE model and Liveworksheet platform proves to be both effective and practical in enhancing students' mathematical problem-solving skills, especially when teachers receive consistent support during media development and application. Their research underscores the significance of teacher involvement in media design and testing, suggesting that structured support not only improves media quality but also encourages pedagogical innovation in digital formats.

Pangesti, Sabariah, and Rahayu (2025) also affirm that the development of web-based learning media, such as through Google Sites, offers teachers a flexible, accessible, and pedagogically sound solution to classroom engagement issues—especially when backed by media validation from design experts and classroom feedback from students. Their findings reinforce the idea that accessible support tools and clear instructional design are essential to maintaining teacher motivation and effectiveness post-training.

Complementing these findings, Triretnoningrum, Degeng, and Setyosari (2025) demonstrate that the use of multimedia delivery strategies, particularly video-based instructional media, leads to significantly better learning outcomes than traditional textbook-based instruction. Their study further emphasizes that while internal learner traits (like locus of control) matter, the impact of well-executed delivery strategies—developed and sustained through teacher support—plays a more crucial role in improving procedural learning outcomes. These conclusions reinforce the growing consensus that professional development should not stop at training, but extend into mentorship and collaborative evaluation of media use in real classroom contexts.

To summarize, the importance of ongoing support and mentoring in education cannot be overstated. The combination of quality training, access to resources, and continuous mentorship creates a conducive environment for teachers to thrive in their integration of technology. Future programs must consider these elements to ensure equitable and effective technology adoption across educational settings.

CONCLUSION

This research successfully met its goals, revealing that high-quality coaching significantly enhances the development of technology-integrated learning media in the creation of instructional materials. The results indicate that hands-on, application-driven training strengthens teachers' skills in producing innovative media tools—such as interactive slideshows, educational videos, and mobile apps—which in turn boosts student engagement and comprehension. The study also underscores the critical role of continuous technical assistance and adequate infrastructure in addressing practical challenges during implementation. It contributes meaningfully to the educational technology field by offering concrete evidence of how targeted coaching initiatives can improve educators' competencies. Furthermore, its uniqueness lies in emphasizing the real-world application of training content in classroom settings, thereby reinforcing the value of practical approaches in professional teacher development. Despite its contributions, the study has certain limitations, including a relatively narrow scope limited to schools with specific levels of technological infrastructure, which may limit the broader applicability of its conclusions. Future studies should involve more diverse educational environments to gain a fuller picture of infrastructure-related barriers. Longitudinal research is also encouraged to evaluate the lasting effects of coaching on both media development and teacher effectiveness. Additionally, exploring the influence of educational policy in supporting infrastructure growth and ensuring ongoing technical support would offer further insight into the conditions needed for sustainable technology integration in education.

ACKNOWLEDGE

We extend our heartfelt gratitude to everyone who contributed to the completion of this research. Special thanks go to our advisors for their invaluable guidance and constructive feedback throughout the process. We are also deeply appreciative of those who provided financial support, as well as the proofreaders, typists, and suppliers who offered their assistance in refining and supporting the technical aspects of this study. Lastly, we thank our colleagues, peers, and family

members for their unwavering encouragement and moral support, which have been a source of strength and motivation during this journey.

REFERENCES

- Ahiri, J., Dunifa, L., Ramly, M., & Ahiri, Y. (2023). The effect of job satisfaction on teachers' performance: a survey with elementary school teachers in kendari city, indonesia. *International Journal of Education Learning and Development*, 11(1), 71-81. <https://doi.org/10.37745/ijeld.2013/vol11n17181>
- Alberghina, G. (2021). Makerspaces for innovation in teaching practices., 107-112. https://doi.org/10.1007/978-3-030-77040-2_14
- Almufarreh, A. (2023). Exploring the potential of mixed reality in enhancing student learning experience and academic performance: an empirical study. *Systems*, 11(6), 292. <https://doi.org/10.3390/systems11060292>
- Anggreani, C. (2023). Mobile learning based electronic worksheet to introduce the wetland environment to early children. *Asian Journal of Education and Social Studies*, 7-16. <https://doi.org/10.9734/ajess/2023/v38i4830>
- Anderson, A. and Sánchez, B. (2021). A pilot evaluation of a social justice and race equity training for volunteer mentors. *American Journal of Community Psychology*, 69(1-2), 3-17. <https://doi.org/10.1002/ajcp.12541>
- Aryani, O., Bharati, D., & Astuti, P. (2021). Teachers' practices in using educational mobile applications to teach english. *English Education Journal*, 11(1), 37-55. <https://doi.org/10.15294/ej.v11i1.40710>
- Baharuddin, H. (2022). Training on utilization of based learning media virtual reality for city science teachers jenepono. *IPMAS*, 2(3), 99-106. <https://doi.org/10.54065/ipmas.2.3.2022.298>
- Budiarti, Y. (2019). Pendidikan karakter: sebuah upaya kolektif. *Jurnal Civic Education Media Kajian Pancasila Dan Kewarganegaraan*, 3(1), 78. <https://doi.org/10.36412/ce.v3i1.910>
- Crowley-Barnett, J., Pagano, T., & Kent, M. (2020). Engaging perioperative learners using online game-based education. *Aorn Journal*, 112(5), 447-456. <https://doi.org/10.1002/aorn.13206>
- Devi, N. (2020). Pengembangan media pembelajaran puzzle angka untuk meningkatkan kemampuan mengenal lambang bilangan. *Jurnal Ilmiah Pendidikan Profesi Guru*, 3(3), 416. <https://doi.org/10.23887/jippg.v3i3.28331>
- Ersin, P. and Atay, D. (2021). Exploring online mentoring with preservice teachers in a pandemic and the need to deliver quality education. *International Journal of Mentoring and Coaching in Education*, 10(2), 203-215. <https://doi.org/10.1108/ijmce-11-2020-0077>
- Flores-Velazquez, S., Jaimez-González, C., & García-Mendoza, B. (2021). Mobile application to practice fractions through games for primary school children. *Universal Journal of Educational Research*, 9(1), 76-84. <https://doi.org/10.13189/ujer.2021.090109>
- Fuzi, I. and Fuzi, M. (2019). The influence of human resource practices on teachers' job satisfaction. *International Business Education Journal*, 12, 15-24. <https://doi.org/10.37134/ibej.vol12.2.2019>
- Gabitanan, C. (2024). Technology leadership techniques and competencies and the teaching effectiveness of the new millennium. *International Journal of Research Publications*, 148(1). <https://doi.org/10.47119/ijrp1001481520246454>
- Hilmiati, H. (2022). Pembinaan pengelolaan lembaga pendidikan keagamaan di desa sembalun bumbang. *Lumbang Inovasi Jurnal Pengabdian Kepada Masyarakat*, 7(2), 188-194. <https://doi.org/10.36312/linov.v7i2.715>

- Howlett, C., Ferreira, J., & Blomfield, J. (2016). Teaching sustainable development in higher education. *International Journal of Sustainability in Higher Education*, 17(3), 305-321. <https://doi.org/10.1108/ijshe-07-2014-0102>
- Hoşgörür, V. (2016). Views of primary school administrators on change in schools and change management practices. *Educational Sciences Theory & Practice*. <https://doi.org/10.12738/estp.2016.6.0099>
- Ilmia, N. (2022). Pengembangan media pembelajaran science board game berbasis science-edutainment pada materi tekanan zat. *Experiment Journal of Science Education*, 2(1), 35-42. <https://doi.org/10.18860/experiment.v2i1.15275>
- Jai, A., Rochman, C., & Nurmila, N. (2020). Peran pendidikan agama islam dalam membentuk karakter jujur pada siswa. *Al-Tadzkiyyah Jurnal Pendidikan Islam*, 10(2), 257-264. <https://doi.org/10.24042/atjpi.v10i2.4781>
- Keller, T., Drew, A., Clark-Shim, H., Spencer, R., & Herrera, C. (2020). It's about time: staff support contacts and mentor volunteer experiences. *Journal of Youth Development*, 15(4), 145-161. <https://doi.org/10.5195/jyd.2020.879>
- Kunaviktikul, W., Ang, E., Baridwan, N., Bernal, A., Dones, L., Flores, J., ... & Shorey, S. (2022). Nursing students' and faculty members' experiences of online education during covid-19 across southeast asia: a photovoice study. *Nurse Education Today*, 111, 105307. <https://doi.org/10.1016/j.nedt.2022.105307>
- Licorish, S., Owen, H., Daniel, B., & George, J. (2018). Students' perception of kahoot!'s influence on teaching and learning. *Research and Practice in Technology Enhanced Learning*, 13(1). <https://doi.org/10.1186/s41039-018-0078-8>
- Lytvyn, S. (2024). Introduction of digital technologies and digitalisation in higher education institutions of ukraine: current state and prospects. *Scientific Journal "Library Science Record Studies Informology"*, 20(1), 89-92. <https://doi.org/10.63009/lrsi/1.2024.88>
- Özcán, M. and Kert, S. (2020). Use of mobile applications in collocation teaching. *Cypriot Journal of Educational Sciences*, 15(5), 1176-1190. <https://doi.org/10.18844/cjes.v15i5.4629>
- Pangesti, E. D., Sabariah, & Rahayu, E. Y. (2025). Pengembangan media pembelajaran Google Sites mata pelajaran IPS kelas VIII. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 8(1), 15–25. <https://doi.org/10.17977/um038v8i12025p015>
- Parvin, R. and Salam, S. (2015). The effectiveness of using technology in english language classrooms in government primary schools in bangladesh. *Fire Forum for International Research in Education*, 2(1). <https://doi.org/10.18275/fire201502011049>
- Permanasari, A., Hadi, S., Hartanto, R., & Sholihin, M. (2021). The advantage of augmented reality technology for supporting learning media in ethics learning., 204-208. <https://doi.org/10.1109/icet53279.2021.9575114>
- Pratama, M. (2023). Meningkatkan mutu pembelajaran melalui peran kepala madrasah dan guru. *Jurnal Bahana Manajemen Pendidikan*, 12(2), 116. <https://doi.org/10.24036/jbmp.v12i2.125721>
- Quinlan, E., Crowe, T., Deane, F., & Whittington, M. (2019). Functions of peer mentoring, satisfaction and the "real" relationship in postgraduate psychology education. *International Journal of Mentoring and Coaching in Education*, 8(1), 52-68. <https://doi.org/10.1108/ijmce-06-2018-0033>
- Rahmadhani, C., Pujiastuti, H., & Fathurrohman, M. (2023). Pendekatan stem dalam pembelajaran matematika: study literature review. *Jiip - Jurnal Ilmiah Ilmu Pendidikan*, 6(1), 549-557. <https://doi.org/10.54371/jiip.v6i1.1280>

- Rahmawati, A., Anggraini, D., & Masykur, R. (2019). Pengembangan modul berbasis poe (predict observe explain) pada materi trigonometri. *Kreano Jurnal Matematika Kreatif-Inovatif*, 10(2), 193-201. <https://doi.org/10.15294/kreano.v10i2.20337>
- Salihi, J. (2023). Competence of history teachers in managing it-based interactive learning at zaria nigeria. *IJHE*, 8(2), 125-142. <https://doi.org/10.15294/ijhe.v8i2.49577>
- Sakulprasertsri, K., Tangkiengsirisin, S., Phoocharoensil, S., Kanokpermpoon, M., & Koowuttayakorn, S. (2022). Online english teacher training during the covid-19 pandemic in the thai contexts. *Asia Pacific Journal of Educators and Education*, 36(2), 299-316. <https://doi.org/10.21315/apjee2021.36.2.15>
- Safonov, Y., Usyk, V., & Bazhenkov, I. (2022). Digital transformations of education policy. *Baltic Journal of Economic Studies*, 8(2), 127-136. <https://doi.org/10.30525/2256-0742/2022-8-2-127-136>
- Sari, N. K. A. I., Suharta, I. G. P., & Parwati, N. N. (2025). Pengembangan E-LKPD interaktif berbasis problem based learning untuk meningkatkan kemampuan pemecahan masalah matematis siswa SMA kelas X. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 8(1), 1–14. <https://doi.org/10.17977/um038v8i12025p001>
- Setiawan, A., Thohir, M., Dea, L., Alawiyah, I., & Jannah, A. (2022). Training in making and utilizing mobile learning-based learning media using “rumah belajar” application. *Jurnal Pengabdian Masyarakat Bestari*, 1(9), 953-964. <https://doi.org/10.55927/jpmb.v1i9.2016>
- Sindiani, P. (2023). Pengaruh penggunaan media pembelajaran moodle terhadap hasil belajar peserta didik pada mata pelajaran ppkn. *Equilibrium Jurnal Pendidikan*, 11(2), 203-214. <https://doi.org/10.26618/equilibrium.v11i2.10584>
- Tanus, R. (2022). Pengembangan media pembelajaran tutorial pada mata kuliah animasi 3 dimensi. *Edutik Jurnal Pendidikan Teknologi Informasi Dan Komunikasi*, 2(3), 386-398. <https://doi.org/10.53682/edutik.v2i3.5307>
- Triretningrum, A. N., Degeng, M. D. K., & Setyosari, P. (2025). The effect of different delivery strategies and locus of control on procedural learning outcomes. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 8(1), 26–34. <https://doi.org/10.17977/um038v8i12025p026>
- Tynjälä, P., Pennanen, M., Markkanen, I., & Heikkinen, H. (2019). Finnish model of peer-group mentoring: review of research. *Annals of the New York Academy of Sciences*, 1483(1), 208-223. <https://doi.org/10.1111/nyas.14296>
- Waluyo, G. and Hadi, S. (2014). Pengaruh penerapan mbs, pengelolaan pembelajaran dan partisipasi komite sekolah terhadap mutu pendidikan sd/mi. *Jurnal Akuntabilitas Manajemen Pendidikan*, 2(2), 159-173. <https://doi.org/10.21831/amp.v2i2.2446>
- Yatsenko, V. (2023). Formation of social responsibility in higher education institutions: modeling mechanisms in the context of structural and innovation transformations. *journal*, 5(1), 35-41. <https://doi.org/10.32782/2707-8019/2023-1-6>
- Yunita, S. and Supriatna, U. (2021). Pengaruh penggunaan media puzzle terhadap hasil belajar siswa. *Syntax Idea*, 3(8), 1999-2006. <https://doi.org/10.46799/syntax-idea.v3i8.1451>
- Zhang, D. (2022). Engaging, impressing and captivating language learners by interactive presentations – a review of mentimeter. *Teaching English as a Second or Foreign Language-Test-Ej*, 26(101). <https://doi.org/10.55593/ej.26101m1>
- Zhai, W. (2024). Exploring the practice of enterprise education in higher education institutions in information age. *Applied Mathematics and Nonlinear Sciences*, 9(1). <https://doi.org/10.2478/amns-2024-1196>