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Training on the Use of EduStory-Gen for Developing Interactive Storytelling among Kindergarten and Early Childhood Education Teachers

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ABSTRACT

Background: Early childhood education plays an important role in supporting children's cognitive, social, and emotional development. However, many kindergartens and early childhood education teachers continue to rely on conventional storytelling approaches and have limited experience in utilizing digital and artificial intelligence (AI)-based technologies for learning activities.
Contribution: This community service program contributes to teacher professional development by introducing EduStory-Gen, an AI-assisted storytelling platform that integrates narrative generation and visual illustration creation.
Method: The program employed a participatory training approach involving 30 kindergarten and early childhood education teachers. The activities included needs analysis, training preparation, pre-assessment, hands-on training, mentoring, and post-training evaluation.
Results: The results showed substantial improvements in teachers' competencies related to digital storytelling and AI-assisted educational tools. The average competency score increased from 2.9 in the pre-assessment to 4.4 in the post-assessment. The highest improvement was observed in teachers' knowledge of AI-based tools (+1.7).
Conclusion: The EduStory-Gen training program effectively enhanced teachers' digital storytelling competencies and AI literacy while fostering positive learning experiences. The findings highlight the potential of AI-assisted storytelling tools to support innovative teaching practices and strengthen technology integration in early childhood education.

1. Introduction

Early Early Childhood Education (ECE) plays a crucial role in shaping children's cognitive, social, and emotional development during the most formative stage of their lives. Research has consistently shown that the learning experiences provided during early childhood significantly influence children's long-term academic achievement and socio-emotional competencies [1], [2]. Therefore, educators in kindergarten and early childhood settings are expected to implement learning strategies that are engaging, meaningful, and developmentally appropriate [3], [4].

One pedagogical approach widely recognized as effective in early childhood learning is storytelling. Storytelling not only enhances children's language development and vocabulary acquisition but also stimulates imagination, creativity, and moral understanding [5], [6]. Through storytelling activities, children can better comprehend social values, develop emotional empathy, and improve listening and communication skills. Consequently, storytelling has been widely adopted as an instructional strategy in early childhood classrooms [7].

Despite its educational benefits, many teachers still rely on conventional storytelling methods such as printed storybooks or verbal narration. These approaches, while valuable, are often limited in their ability to integrate multimodal elements such as visual illustrations, interactive content, and adaptive storytelling that can further enhance children's engagement [8], [9]. In the context of rapid technological advancement, educators are increasingly encouraged to integrate digital tools into teaching practices in order to create more dynamic and interactive learning environments [10], [11].

Recent developments in artificial intelligence (AI) have opened new opportunities for developing innovative educational media. Generative AI technologies, such as large language models and text-to-image systems, enable the automatic generation of narrative texts and visual illustrations based on user input [12]–[14]. These technologies have the potential to support teachers in creating educational content more efficiently while also enabling more personalized and interactive learning experiences for students [15].

However, many early childhood educators still face challenges in utilizing emerging digital technologies effectively. Studies indicate that teachers often lack adequate training and practical guidance in integrating AI-based tools into classroom activities [16], [17]. As a result, there remains a gap between the potential of advanced educational technologies and their actual implementation in early childhood classrooms.

To address this issue, a community service program was conducted to provide training on the use of EduStory-Gen, an AI-assisted storytelling tool designed to help teachers generate interactive stories and visual illustrations for educational purposes [18], [19]. The training aimed to improve teachers' competencies in developing engaging storytelling activities using digital technology while ensuring that the generated content remains appropriate for early childhood learners [20], [21].

Through this training program, teachers were introduced to practical strategies for integrating AI-assisted storytelling into classroom activities. By enhancing teachers' digital literacy and pedagogical skills, the program is expected to contribute to the development of more interactive, creative, and meaningful storytelling practices in kindergarten and early childhood education settings.

Previous studies have examined digital storytelling training and AI integration in education. However, limited studies have focused on AI-assisted storytelling tools specifically designed for early childhood education teachers, particularly those integrating narrative generation and visual illustration generation in a single platform. Furthermore, evidence regarding teachers' learning experiences from the perspectives of joyful, meaningful, and mindful learning remains scarce. Therefore, this community service program aims to address these gaps through the implementation and evaluation of EduStory-Gen training.

2. Method

This community service activity was conducted using a participatory training approach aimed at improving teachers' competencies in utilizing digital storytelling tools in early childhood education. The program involved kindergarten and early childhood education teachers as the main participants and was designed to provide both conceptual understanding and hands-on practice in using the EduStory-Gen platform for interactive storytelling. The methodological stages of the program implementation are presented in Figure 1.

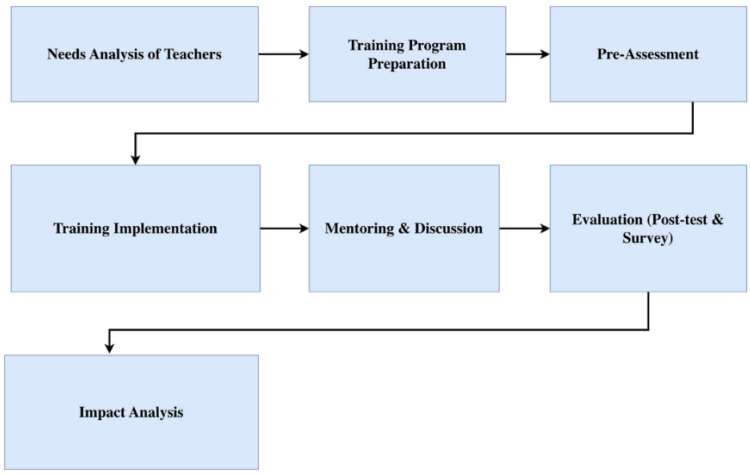

Figure 1. Framework of the Community Service Method

2.1. Need Analysis of Teachers

The first stage involved conducting a needs analysis to identify the challenges faced by kindergarten and early childhood teachers in implementing storytelling-based learning. This stage aimed to understand teachers' current teaching practices, their familiarity with digital learning tools, and the limitations they encounter in developing engaging storytelling activities for children. Information was collected through informal discussions, classroom observations, and preliminary surveys with teachers. The results of this analysis served as the basis for designing the training materials and determining the focus of the training program.

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2.2. Training Program Preparation

Based on the results of the needs analysis, the next stage involved preparing the training program. This stage included developing training modules, preparing instructional materials, and organizing technical requirements such as computers, internet connectivity, and presentation tools. The facilitators also prepared demonstration examples of interactive storytelling generated using the EduStory-Gen system. The training activity was conducted at Universitas Sains dan Teknologi Indonesia (USTI) by inviting kindergarten and early childhood education (PAUD) teachers as participants. This preparation stage ensured that the training process could run effectively and that participants would receive clear guidance during the hands-on activities.

2.3. Pre-Assessment

Before the training session began, a pre-assessment was conducted to identify the initial level of knowledge and experience of participants related to storytelling-based learning and the use of digital technologies in early childhood education. This stage aimed to obtain baseline information regarding teachers' familiarity with storytelling methods, their experience in utilizing digital media in classroom activities, and their understanding of artificial intelligence-based educational tools.

The pre-assessment was carried out using a structured questionnaire distributed to all participants prior to the training activities. The questionnaire consisted of several statements designed to measure teachers' initial competencies in storytelling practices, digital media usage, and their awareness of technology-assisted learning tools. Participants were asked to respond to each statement using a five-point Likert scale ranging from strongly disagree to strongly agree.

The questionnaire items used in this pre-assessment are presented in Table 1. The results obtained from the questionnaire served as baseline data for evaluating the effectiveness of the training program. In addition, the findings were used to adjust the training materials and instructional strategies to better match the participants' needs and level of understanding. Through this approach, the training activities could be delivered more effectively and provide meaningful learning experiences for the participating teachers.

Table 1. Pre-Assessment Questionnaire for Teachers' Initial Competencies

No	Statement	Scale
1	I understand the concept of storytelling in early childhood education.	1-5
2	I have used storytelling as a learning strategy in my classroom.	1-5
3	I have experience using digital media in teaching activities.	1-5
4	I am familiar with the use of technology for creating learning materials.	1-5
5	I have knowledge about artificial intelligence tools for educational content.	1-5

2.4. Training Implementation

The core stage of the community service program was the implementation of the training workshop. This stage was designed to provide participants with both conceptual understanding and practical experience in utilizing EduStory-Gen for developing interactive storytelling materials in early childhood education.

The training activities were conducted through several sessions. The first session introduced the concept of digital storytelling in early childhood education and discussed the importance of integrating technology to support creative learning experiences for children. In this session, participants were also introduced to the basic concept of artificial intelligence in educational media. The second session provided an overview of the EduStory-Gen platform, including its main features and functionalities. Facilitators demonstrated how the system could generate storytelling narratives and visual illustrations based on user prompts.

The third session consisted of hands-on practice activities where participants were guided to directly use the EduStory-Gen system. During this session, teachers practiced creating story prompts, generating narrative texts, and producing visual illustrations that could be used as teaching materials in classroom activities. Facilitators provided guidance and assistance to ensure that all participants were able to operate the system effectively. Through these activities, participants were expected to gain practical skills in utilizing digital storytelling tools and to explore new ways of integrating technology into early childhood learning practices.

2.5. Mentoring and Discussion

After the practical training session, a mentoring and discussion stage was conducted to provide further guidance to the participants in using the EduStory-Gen platform. This stage aimed to assist teachers in applying the knowledge and skills obtained during the training to develop storytelling materials suitable for early childhood learning.

During the mentoring session, participants were encouraged to share their experiences, challenges, and ideas related to the use of EduStory-Gen in classroom activities. Facilitators provided feedback, suggestions, and technical assistance to help teachers refine the storytelling narratives and visual illustrations they had generated during the practical session.

In addition, the discussion session facilitated collaborative learning among participants, allowing teachers to exchange ideas and explore creative ways to integrate digital storytelling into their teaching practices. This interactive process helped strengthen participants' understanding and confidence in utilizing EduStory-Gen as a digital learning tool in early childhood education.

2.6. Evaluation (Post-test and Survey)

To evaluate the effectiveness of the training program, a post-test and questionnaire-based evaluation were conducted at the end of the training session. The post-test aimed to measure participants' improvement in understanding digital storytelling concepts and their ability to use the EduStory-Gen system after participating in the training activities.

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In addition, a structured questionnaire was administered to assess participants' perceptions of the training program. The questionnaire instrument was adapted from the concept of deep learning in education, which emphasizes three important dimensions of learning experience: joyful learning, meaningful learning, and mindful learning. These dimensions were used to evaluate how the training activities supported teachers' engagement, understanding, and reflective learning processes. The questionnaire items used to evaluate these dimensions are presented in Table 2.

The joyful learning dimension evaluated the extent to which participants felt enthusiastic, motivated, and actively engaged during the training activities. The meaningful learning dimension measured whether the participants perceived the training content as relevant to their teaching practices and whether they were able to connect the learning experience with real classroom situations. Meanwhile, the mindful learning dimension assessed participants' level of focus, awareness, and reflective thinking while participating in the training and practicing the use of the EduStory-Gen system.

Participants responded to each questionnaire item using a Likert scale, ranging from strongly disagree to strongly agree. The collected responses were analyzed descriptively to determine participants' satisfaction levels and the perceived usefulness of the training program. The results of this evaluation were used to assess the overall effectiveness of the training and to identify potential improvements for future community service programs.

Table 2. Training Evaluation Questionnaire Based on Deep Learning Dimensions

Dimension	Indicator	Statement	Scale
Joyful Learning	Engagement	The training activities were interesting and enjoyable for me.	1–5
	Motivation	The use of EduStory-Gen increased my enthusiasm for creating storytelling materials.	1–5
	Participation	I actively participated in the training activities and discussions.	1–5
Meaningful Learning	Relevance	The training materials are relevant to my teaching activities in kindergarten/PAUD.	1–5
	Practical Application	I can apply EduStory-Gen to develop storytelling activities in my classroom.	1–5
	Learning Value	The training provided new knowledge that is useful for improving my teaching practices.	1–5
Mindful Learning	Focus	I was able to focus on the training activities and follow the instructions clearly.	1–5
	Understanding	I clearly understood how to use EduStory-Gen to create storytelling content.	1–5
	Reflection	The training encouraged me to reflect on new ways of integrating technology into storytelling activities.	1–5

2.7. Impact Analysis

The final stage of the community service program involved conducting an impact analysis to examine the outcomes of the training activities. This stage aimed to evaluate the overall effectiveness of the training program in improving teachers' competencies in utilizing EduStory-Gen for developing interactive storytelling materials in early childhood education. The impact analysis was carried out by reviewing the storytelling products created by participants during the training sessions, analyzing the improvement in teachers' digital storytelling skills based on the pre-test and post-test results, and examining feedback collected through the training evaluation questionnaire. The questionnaire results, which were based on the dimensions of joyful, meaningful, and mindful learning, provided insights into participants' learning experiences and perceptions of the training program.

The findings from this stage were used to determine the effectiveness of the training program and to identify areas that could be improved in future community service activities. The results of the impact analysis also served as an important basis for assessing how the EduStory-Gen platform could support teachers in developing more engaging and interactive storytelling practices in early childhood education.

3. Results and Discussion

This section presents the results of the community service program, including the demonstration of the EduStory-Gen system, the improvement of teachers' competencies after the training, and the evaluation of participants' learning experiences during the training activities.

3.1. EduStory-Gen System Interface

During the training session, participants were introduced to the EduStory-Gen system, an artificial intelligence-based platform designed to assist teachers in generating interactive storytelling content for early childhood learning. The system enables users to generate narrative stories and corresponding visual illustrations based on simple prompts provided by the user.

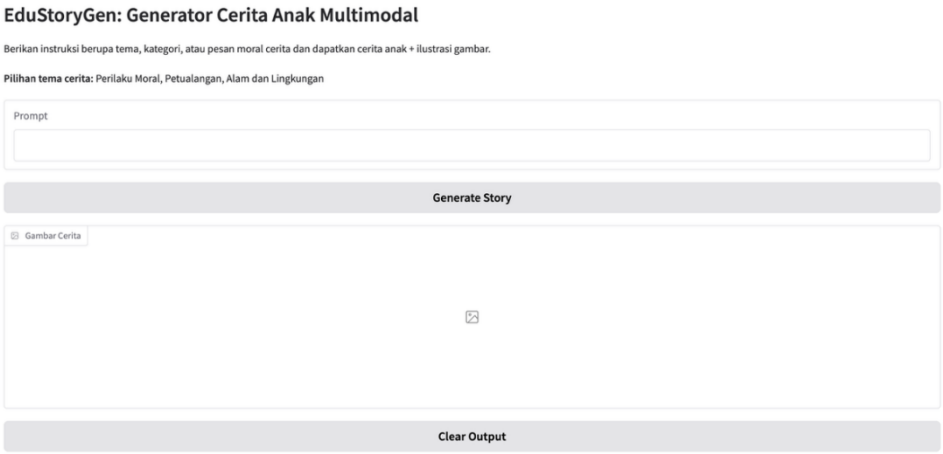

Figure 2. EduStory-Gen System Interface

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The interface of the EduStory-Gen system is designed to be simple and user-friendly so that teachers with limited technical background can easily operate the system. Through this platform, teachers can generate storytelling narratives and visual images that can be used as learning materials in classroom activities. The interface of the EduStory-Gen system used during the training is shown in Figure 2.

3.2. Examples of Storytelling Output Generated by EduStory-Gen

During the hands-on session, teachers practiced generating storytelling content using EduStory-Gen. Participants were asked to create simple prompts related to early childhood learning themes such as friendship, kindness, and environmental awareness. Based on these prompts, the system generated narrative stories along with visual illustrations suitable for children. The generated stories typically consisted of short narratives with simple language structures that are appropriate for early childhood learners. An example of storytelling content generated using EduStory-Gen is presented in Figure 3.

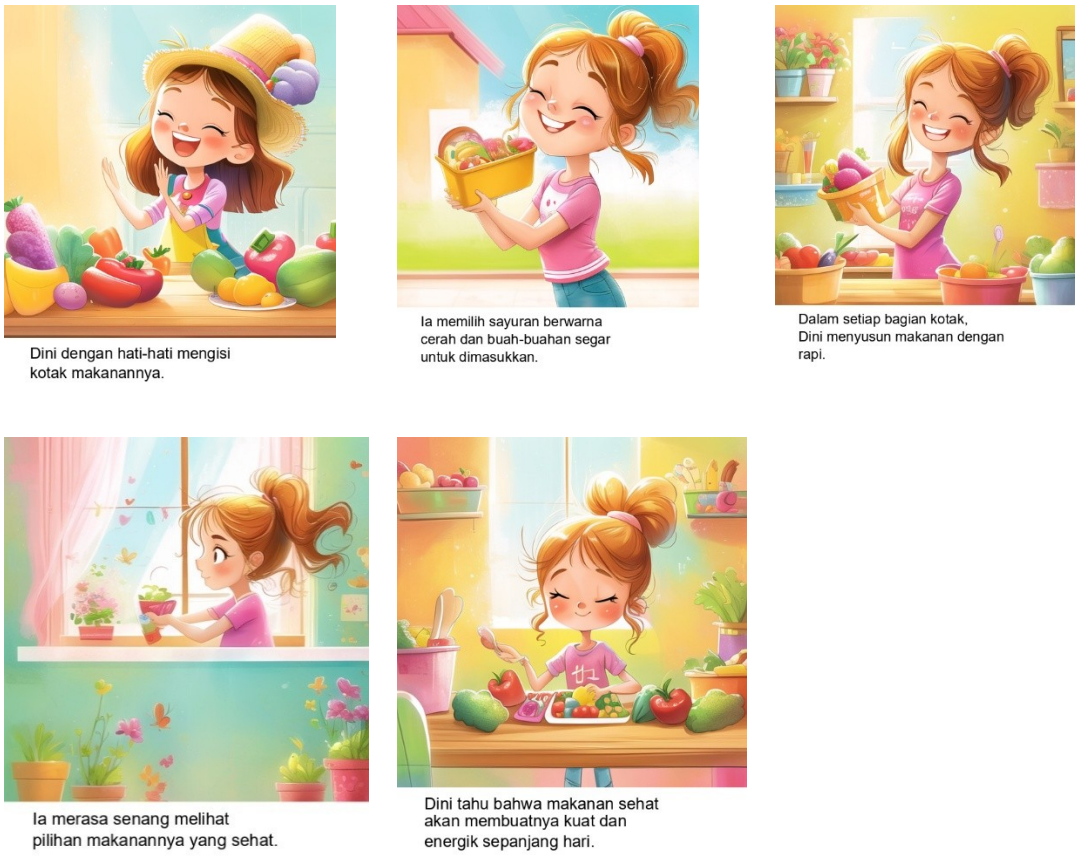

Figure 3. Example of Storytelling Output Generated by EduStory-Gen

3.3. Improvement of Teachers' Competencies

The improvement of teachers' competencies after participating in the training program was evaluated using pre-assessment and post-assessment questionnaires. The results showed that teachers experienced an increase in their understanding of digital storytelling concepts and their ability to utilize digital tools for creating learning materials.

Table 3. Comparison of Pre-test and Post-test Results

Indicator	Pre-test Mean	Post-test Mean	Improvement
Understanding storytelling concepts	3.1	4.5	+1.4
Ability to use digital media	2.9	4.3	+1.4
Knowledge of AI-based tools	2.5	4.2	+1.7
Ability to create digital storytelling	2.8	4.4	+1.6

The observed improvements across all indicators are consistent with previous studies highlighting the effectiveness of technology-enhanced professional development programs for teachers in Table 3. Filiz reported that exposure to AI-related training significantly improves educators' readiness to integrate artificial intelligence into teaching practices, while Ng demonstrated that digital storytelling activities can enhance technological competence and creative content development in educational settings. These findings suggest that practical engagement with AI-assisted storytelling tools can bridge the gap between technological innovation and classroom implementation. Notably, the largest improvement was observed in teachers' knowledge of AI-based tools (+1.7) [22]–[25].

As seen in Table 3, this result may be attributed to the relatively low baseline score recorded during the pre-assessment phase (2.5), indicating limited prior familiarity with artificial intelligence technologies among participants. Consequently, the training introduced a substantial amount of new knowledge, leading to greater learning gains. This finding reflects the growing need for AI literacy development among early childhood educators, particularly as AI technologies become increasingly integrated into educational environments.

The results also indicate that competency improvement was not limited to conceptual understanding but extended to practical skill development. Through direct interaction with the EduStory-Gen platform, participants were able to transform prompts into complete storytelling materials consisting of narrative texts and visual illustrations. This practical component may have contributed substantially to the observed learning outcomes, as experiential learning approaches are generally more effective in promoting technology adoption than purely theoretical instruction.

From a community service perspective, these findings demonstrate that AI-assisted storytelling platforms can serve as effective tools for supporting teacher capacity building in early childhood education. The integration of narrative generation and visual illustration features provides teachers with opportunities to develop more engaging and interactive learning materials while reducing the time and technical expertise typically required for content creation [26], [27].

3.4. Evaluation Based on Deep Learning Dimensions

Participants' learning experiences during the training were evaluated using a questionnaire based on three dimensions of deep learning: joyful learning, meaningful learning, and mindful learning in Table 4.

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Table 4. Training Evaluation Results

Dimension	Mean Score	Category
Joyful Learning	4.6	Very Good
Meaningful Learning	4.5	Very Good
Mindful Learning	4.4	Very Good

The findings also provide empirical support for the application of the joyful, meaningful, and mindful learning framework as an evaluation approach for teacher professional development programs involving emerging technologies. According to the deep learning framework, effective learning experiences should not only promote enjoyment and engagement but also encourage meaningful knowledge construction and reflective thinking. Therefore, the three dimensions were selected because they collectively represent cognitive, affective, and reflective aspects of teacher learning, which are essential for successful technology adoption in educational settings [28], [29].

The consistently high scores across all dimensions indicate that the EduStory-Gen training succeeded in creating a balanced learning experience. The strong joyful learning score reflects participants' positive emotional engagement with the training activities, while the meaningful learning score demonstrates the perceived relevance of the acquired knowledge to classroom practice. Furthermore, the mindful learning score suggests that participants critically reflected on the opportunities and challenges of integrating artificial intelligence into storytelling activities. These findings are consistent with previous studies reporting that meaningful, mindful, and joyful learning experiences contribute to greater motivation, deeper understanding, and increased willingness to implement innovative teaching practices.

From a practical perspective, the results suggest that future teacher training programs related to artificial intelligence and digital learning technologies should not focus solely on technical skill acquisition. Instead, training should also be designed to foster participant engagement, contextual relevance, and reflective learning processes. Such an approach may enhance both immediate learning outcomes and the long-term sustainability of technology adoption in educational environments [30].

Several limitations should be considered when interpreting the findings of this community service program. First, the evaluation employed a one-group pre-test and post-test design without a control group. Consequently, improvements observed after the training cannot be attributed exclusively to the intervention, as other external factors may have influenced the outcomes. Second, the participants were recruited from a limited group of kindergarten and early childhood education teachers using a convenience-based participation approach.

Therefore, the findings may not be fully generalizable to broader teacher populations in different educational contexts. Third, the evaluation relied primarily on self-reported questionnaire responses. While self-assessment provides valuable insights into participants' perceptions and experiences, it may not fully reflect actual competency levels or long-term

behavioral changes in classroom practice. Fourth, the analysis was limited to descriptive statistics. Although improvements in mean scores were observed across all competency indicators, inferential statistical testing could not be performed because individual participant-level data were not retained after the completion of the community service activity. As a result, the statistical significance of the observed improvements could not be formally evaluated. Finally, the assessment was conducted immediately after the training program, preventing the examination of long-term retention of knowledge and sustained implementation of AI-assisted storytelling in educational settings.

Future studies are encouraged to employ more rigorous evaluation designs, preserve participant-level data for advanced statistical analysis, include objective performance measures, and investigate the long-term impact of AI-assisted storytelling technologies on both teaching practices and children's learning outcomes.

4. Conclusion

This community service program successfully enhanced the competencies of kindergarten and early childhood education teachers in utilizing AI-assisted digital storytelling technologies through the EduStory-Gen training program. The findings demonstrated notable improvements in teachers' understanding of storytelling concepts, digital media utilization, AI-based educational tools, and their ability to develop digital storytelling materials. Furthermore, the evaluation results indicated highly positive learning experiences, as reflected by the high scores in the dimensions of joyful learning, meaningful learning, and mindful learning. From a theoretical perspective, the findings support the growing body of literature suggesting that AI-assisted educational technologies can contribute to teacher professional development by improving digital literacy and pedagogical innovation.

The results also provide empirical support for the application of the joyful, meaningful, and mindful learning framework as an effective approach for evaluating teacher training programs involving emerging educational technologies. Practically, this program demonstrates that AI-assisted storytelling tools such as EduStory-Gen can serve as accessible and effective resources for helping teachers develop engaging learning materials in early childhood education. The integration of automated narrative generation and visual illustration creation enables teachers to design interactive storytelling activities more efficiently while promoting creativity and learner engagement in classroom settings. Future community service and research initiatives are recommended to involve larger and more diverse participant groups, incorporate more rigorous evaluation designs, and examine the long-term impact of AI-assisted storytelling on teaching practices and children's learning outcomes. Further development of EduStory-Gen may also explore additional interactive features and personalized content generation to better support early childhood learning environments.

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