Improving AI-Based Teaching Material Development Skills at SDN 2 Pandanpancur, Lamongan

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A B S T R A C T

This is a community service-based research by the Nahdlatul Uama Surabaya University (UNUSA) team at SDN 2 Pandanpancur, Deket, Lamongan. It began with the conditions where there was a low skill of teachers in developing teaching materials at their school. There were no teachers who had compiled textbooks or developed materials from Modules or Learning Implementation Plans (RPP). The purpose of this training was to improve teacher skills in writing AI-based textbooks by referring to the Module and RPP. The method used was a participatory-collaborative approach based on andragogy and the TPACK model. It included the use of AI applications such as ChatGPT and Quillbord-AI. The results of the questionnaire data analysis showed that 75.5% of participants strongly agreed that this training was effective in improving understanding and skills in writing textbooks. In-depth interviews confirmed that teachers felt more confident and ready to implement the results of the training. The conclusion of this activity was that the training succeeded in significantly improving teacher competence. Future recommendations include the need for replication and expansion of the program to other schools and the development of advanced training as AI technology advances

INTRODUCTION

The rapid advancement of artificial intelligence (AI) has significantly influenced education, necessitating that schools and teachers not only adopt but effectively utilize AI to enhance teaching quality. Teachers play a pivotal role in integrating AI into educational practices, particularly in the development of innovative and effective teaching materials aligned with current needs. SDN 2 Pandanpancur, Lamongan, signifying commitment to improving learning quality by enhancing teacher competencies through training in AI-based instructional design. This aligns with the Indonesian Ministry of Education's Merdeka Belajar program, which emphasizes digital transformation and positions teachers as adaptive learning facilitators.

The training is intended to equip teachers with the skills to use AI tools such as ChatGPT, Quillbot-AI, and others to create interactive and engaging classroom with the designed materials. ChatGPT supports lesson content creation, question generation, and scenario design, while Quillbtt-AI aids in aesthetic visual development. These tools contribute to more engaging and student-centered learning experiences. According to Holmes et al. (2022) and Djuwari et al. (2019), AI integration enhances personalized learning, teacher efficiency, and student engagement.

More than the content creation, the initiative includes developing AI-integrated Rencana Pelaksanaan Pembelajaran (RPP or lesson plans). This includes automated question generation, interactive materials like videos and quizzes, and AI-based assessments that offer precise feedback for improved instruction. Despite the potential, initial findings revealed that none of the teachers at SDN 2 Pandanpancur had experience in writing textbooks or developing materials from RPPs. This underscores the urgency of the community service program by Universitas Nahdlatul Ulama Surabaya (UNUSA), which offers not only training but also mentoring and implementation evaluation. The program also promotes inclusivity, enabling AI-created content to support diverse student needs, including those with disabilities. As UNESCO (2021) highlights, integrating AI in education requires improving digital literacy and pedagogy, ensuring that technology serves as a supportive tool rather than replacing human interaction.

Ultimately, this initiative aims to address digital transformation challenges in education, particularly by empowering teachers in rural areas like SDN 2 Pandanpancur, Deket, Lamongan to develop AI-based textbooks and teaching materials derived from their own modules and RPPs.

LITERATURE REVIEW

Teacher Competence in The Digital Era

It is a fact that teachers must have competence in writing textbooks. This ability is the first capital in improving the quality of learning. According to the Regulation of the Minister of National Education of the Republic of Indonesia No. 16 of 2007, teachers are expected to have competencies including pedagogical, personality, social, and professional. In the advancement of the digital era, the professional competence of teachers is also expected to include the ability to access, evaluate, and utilize information technology to improve the quality of learning.

In the current century of a very powerful digital transformation society, the role of teachers has changed from merely conveying information to being a facilitator, guide, and innovative learning designer (Djuwari, et al., 2023). Teachers are required to not only understand the content, but also be able to design technology-based learning, including AI. As stated by Voogt, Fisser, Roblin, Tondeur, and van Braak (2013), the integration of technology into learning requires not only technical skills, but also pedagogical knowledge about how technology can be used effectively to achieve learning goals.

In addition, Mishra and Koehler (2006) developed the TPACK (Technological Pedagogical Content Knowledge) model as a very useful reference for developing 21st century teacher competencies. This model emphasizes the importance of integration between technological knowledge, pedagogy, and content in teaching practice. In the context of developing AI-based teaching materials, teachers are required to combine these three components in a balanced manner, in order to create learning that is not only informative but also interactive and personal.

Artificial Intelligence (AI) Technology in Education

Artificial Intelligence (AI) has experienced very rapid development and penetration in education and has been widely used in the world of education to improve the quality of the teaching and learning process. AI in education refers to the use of systems that are capable of performing cognitive tasks such as understanding language, analyzing data, and providing adaptive feedback to users. Some AI technologies currently used in education include: Natural Language Processing (such as ChatGPT), Machine Learning for predicting learning outcomes, and Automated Content Creation such as video, animation, or digital quizzes.

According to Luckin et al. (2016), AI has the potential to support personalization of learning, analysis of student performance, development of teaching materials, and measurement of learning outcomes based on data. AI can make it easier for teachers to identify individual student needs and adapt to teaching approaches more appropriately. For example, the relevance of using ChatGPT in writing textbooks and practice questions with various levels of difficulty, so that students can learn according to their respective ability levels. Holmes, Bialik, and Fadel (2022) stated that the application of AI in education can provide teachers with speed in designing and delivering lessons, especially in the context of distance and hybrid learning. AI technology also enables the creation of visual and interactive content, such as infographics and automatic

learning videos using platforms such as Canva AI or Synthesia, which are very interesting for elementary school students.

Development of AI-Based Teaching Materials

Textbooks as the basis for class materials are an important element in the learning process. Good materials must be in accordance with learning objectives, student characteristics, and technological developments. In relation to the AI-based teaching and learning process, textbooks are not only textbooks or worksheets, but these materials can also be interactive digital content that is created automatically or semi-automatically by utilizing the role of AI technology.

According to Heinich et al. (2005), writing textbooks as material development will be effective if teachers also consider the principles of instructional design, including analyzing student needs, determining objectives, selecting delivery strategies, and evaluating the effectiveness of the material. With the help of AI, this process can be more efficient and responsive. For example, teachers can use ChatGPT to create scenario-based learning modules, Canva AI to create concept visualizations, or platforms like EdPuzzle to add interactive quizzes to learning videos.

Research by Chen et al. (2021) shows that teaching materials developed with AI support are more adaptive and can respond to students' learning preferences. This is especially important in elementary schools, where students have diverse learning styles and require a more personalized approach.

Integration of AI in The Learning Implementation Plan (RPP)

Research on Learning Implementation (RPP) with documents describing the procedures and organization of PBM is also expected to achieve the basic competencies set out in the curriculum. In the new paradigm, the RPP not only contains learning steps, but also innovative strategies that are relevant to technological developments, including AI integration. The RPP includes the following:

1) Automatic content planning and development: Teachers can use AI to compile topics and subtopics, and create learning materials quickly.
2) Adaptive assessment: AI can automate the evaluation process and provide direct feedback to students.
3) Personalized learning: AI-based RPP can design activities that adapt to students' learning speed and style.

According to Amershi et al. (2019), the use of AI in learning planning can reduce the administrative burden on teachers and allow them to focus more on pedagogical aspects. Meanwhile, Junaidi et al. (2023) emphasized that the integration of AI in the RPP must still pay attention to pedagogical values and not replace the role of the teacher as the main guide.

AI in Assessment and Learning Progress Analysis

Assessment activities are an important element in the learning process and are useful for determining the extent to which students have achieved learning objectives. With AI technology, assessments can be carried out more accurately and in real time. For example, AI can be used to analyze digital quiz results, provide automatic scores, and present visualizations of student performance data.

As found by Roll and Wylie (2016), AI can help teachers conduct formative and summative assessments by identifying student learning patterns, measuring progress, and providing follow-up recommendations. Platforms such as Quizizz, Kahoot AI, and Edmodo AI can also be used by teachers in learning evaluation activities. From analyzing activities using AI, teachers no longer need to carry out manual assessments which are time-consuming, but can instead utilize visual data to see student learning tendencies and make better teaching decisions. This also supports the principle of data-driven education which is a characteristic of the modern education system.

Strategy for Implementing AI Technology in Elementary Schools

The implementation of AI technology at the elementary education level clearly requires special methods due to the possibility of limited infrastructure, human resources, and student characteristics. According to Zhao et al. (2022), the success of adopting AI technology in elementary schools is greatly influenced by teacher training, availability of resources, and policy support from the principal and education office.

In this context, training and mentoring are key strategies to ensure that teachers are not only familiar with AI technology, but also understand how to use it pedagogically. This is in line with the findings of Wulan & Sutarto (2023) that project-based training and direct practice are more effective in improving digital literacy and AI pedagogy among elementary school teachers.

The implementation of community service (Pengmas) carried out at SDN 2 Pandanpancur is intended to fill this gap by providing skills through workshops for teachers, writing textbooks through Modula or AI-based RPP. They also carry out mentoring for implementation in the classroom in stages.

Technology-Based Teacher Professional Development Model

Teacher professional development models must be designed to respond to the dynamics of technological change, especially AI. According to Desimone (2009) and Hardiningrum, et al., (2022) effective professional development includes five characteristics: (1) focus on content, (2) active involvement, (3) coherence with policy, (4) adequate duration, and (5) collaborative learning. In this context, community service activities must also pay attention to sustainability, so that the impact of training does not stop after the program is completed.

AI-based professional development activities can also refer to the technological apprenticeship model which emphasizes learning with expert guidance, hands-on practice, and collaborative reflection (Collins et al., 1989). Through this approach, teachers will be better prepared to adopt new technologies sustainably.

METHODOLOGY

The Unusa Community Service Team in solving problems uses the academic narrative method for the community service report entitled "Improving Skills in Developing AI-Based Teaching Materials at SDN 2 Pandanpancur, Lamongan."

Method for the Solution

In order to solve the problem of low teacher skills in compiling innovative and relevant textbooks in the digital era, especially with the Artificial Intelligence (AI) approach, the Unusa Community Service Team provides training in writing AI-based textbooks. This problem solving method uses a collaborative participatory approach that involves teachers as active subjects in the training, evaluation, and reflection process.

The training above is carried out based on active participation, for example referring to the andragogy approach, which is an adult learning method that emphasizes active participant involvement and direct relevance to the needs of their professional practice (Knowles, Holton, & Swanson, 2015). In addition, the use of this technological tool is to accelerate or increase the efficiency of writing teaching materials based on the concept of ICT in Education. It is said that the use of technology can facilitate the process of designing materials easily, increase teacher creativity, and expand access to learning resources (Koehler & Mishra, 2009). Because it integrates AI, this training program also refers to the theory of Technological Pedagogical Content Knowledge (TPACK), which emphasizes the importance of synergy between mastery of material (content), pedagogy (teaching), and technology (Koehler & Mishra, 2009). Therefore, this training, in addition to improving technical skills, can also improve the pedagogical quality and substance of teaching materials written by teachers.

Implementation Stages

1) The implementation of activities is carried out through several stages as follows:
2) AI-Based Textbook Writing Training
3) The first stage is providing training to teachers of SDN 2 Pandanpancur on how to compile AI-based textbooks. Training materials include:
4) Introduction to AI in education
5) Utilization of ChatGPT and other AI tools to design teaching content

Steps for Writing Curriculum-Based Textbooks

a) Format and sequence of textbooks

This format is adjusted to pedagogical principles. This training was held on Saturday, May 24, 2025 offline in the school teacher's room.

b) Completing the Evaluative Questionnaire

After the training, participants were asked to fill out a questionnaire regarding their experiences during the training. This questionnaire consists of 10 statements measured using a Likert scale (1–5) with the following categories: (1) Strongly Disagree, (2) Disagree, (3) Don't Know, (4) Agree, (5) Strongly Agree. Statements include participants' perceptions of the material, training methods, ease of use of AI, and readiness to independently compile textbooks.

c) In-Depth Interviews

To complete the quantitative data, interviews were conducted with four teacher participants in the training. This interview aimed to dig deeper into their views and perceptions regarding:

1) The need for similar training
2) Challenges faced in compiling textbooks
3) Expectations regarding the use of AI in the school environment
4) Direct impact of training on teacher readiness

d) Presentation of Questionnaire Results in a Table

Quantitative data from the questionnaire is presented in the form of a frequency distribution table based on a Likert scale for each statement. Here is an example of the table format:

Table 1. Questionnaire Instrument

No	Statement	1 (Strongly Disagree - STS)	2 (Disagree - TS)	3 (Neutral - TT)	4 (Agree - S)	5 (Strongly Agree - SS)
1	After the training, I understand how to write a textbook.					
2	After the training, I know the technique of writing a textbook according to the material in the Module or RPP.					
3	After the training, I can use AI (ChatGPT) to write prompts for textbooks based on the provided format.					
4	After the training, I feel that I can apply textbook writing easily and quickly.					
5	After the training, I can write textbooks easily, quickly, efficiently, and accurately based on the Module and RPP.					
	Total					
	Percentage					

e) Triangulation of Interview and Questionnaire Data

The questionnaire results were analyzed descriptively quantitatively, then compared and confirmed with the interview results through triangulation techniques. This analysis provides a more comprehensive picture of the effectiveness of the training and participants' perceptions.

f) Open-ended questions as follows

Table 2. Open-Ended Question Instrument

No	Open-Ended Questions
1	How do you feel after the training?
2	What are your plans after attending the AI-based Teaching Material Writing Training?
3	What suggestions do you have for this Teaching Material Training Program for the UNUSA team going forward?

Qualitative Analysis

Interview data showed that the teachers were greatly helped by this training because previously they did not understand how to use AI to write textbooks. They felt more confident and enthusiastic after learning how AI could speed up the process of creating materials. The principal stated that a program like this was very relevant to the direction of the school's digitalization policy and hoped that it could be developed for all teachers.

Data from the questionnaire showed that the dominant scores were in the Agree and Strongly Agree categories, indicating a significant increase in teacher knowledge and skills after the training. Thus, the AI-based textbook writing training approach has proven effective in solving the problem of limited innovation in developing teaching materials.

Figure 1. The Head of the Community Service Team is Providing Training for Teachers at SDN2 Pandan Pancur, Deket, Lamongan, on Saturday, May 24, 2025

RESEARCH RESULTS
Data from questionnaires

To obtain data on teachers' opinions on the results of the textbook writing training, the following is a description of the questionnaire results in Table 4, from the AI-based textbook writing training at SDN 2 Pandanpancur, Deket, Lamongan, based on five statements submitted to the teachers participating in the training. The assessment uses a Likert scale with five categories:

    1 = Strongly Disagree (SD),
    2 = Disagree (D),

3 = Don't Know (Abstain),
4 = Agree (A),
5 = Strongly Agree (SA).

1*) Statement 1*: "After the training, I understand how to write textbooks"
Number of respondents: 21
Results:
18 teachers chose Agree (A)
3 teachers chose Strongly Agree (SA)
Interpretation:
All participants stated that they understood how to write textbooks after attending the training, with the majority feeling quite confident (Agree). This shows that the training succeeded in providing a strong basic understanding.

2) Statement 2: "After the training, I know the techniques for writing textbooks according to the material in the Module or Lesson Plan"
Number of respondents: 21
Results:
21 teachers chose Strongly Agree (SA)
Interpretation:
All training participants felt very confident that they understood the techniques for writing textbooks that were in accordance with the Module and Lesson Plan. This shows a very high level of effectiveness of the training in the technical aspects of writing.

3) Statement 3: "After the training, I can use AI (ChatGPT) to write prompts for textbooks according to the given textbook format"
Number of respondents: 21
Results:
1 teacher chose Agree (A)
20 teachers chose Strongly Agree (SA)
Interpretation:
95% of participants felt very confident in using AI (ChatGPT) to help write textbooks, indicating that the training has succeeded in equipping teachers with practical skills in using cutting-edge technology.

4) Statement 4: "After the training, I feel I can easily and quickly apply textbook writing"
Number of respondents: 21
Results:
2 teachers chose Agree (A)
19 teachers chose Strongly Agree (SA)
Interpretation:
These results indicate that participants not only understand theoretically, but also feel able to apply the skills they have acquired practically and efficiently.

5) *Statement 5*: "After the training, I can write textbooks easily, quickly, efficiently, and accurately according to the Module and Lesson Plan"
Number of respondents: 21
Results:
4 teachers chose Agree (A)
17 teachers chose Strongly Agree (SA)
Interpretation:
It can be said that the majority of teachers are very confident that they have been able to write textbooks efficiently and according to the module or Lesson Plan. This means that there is a real impact after the workshop on teacher productivity and work quality.
Total recapitulation and percentage:
The total percentage for each statement is s follows: Total score "Agree" (A): 25 responses (24.51%); Total score "Strongly Agree" (SA): 77 responses (75.49%); Total responses: 102; No respondents chose SD, D, or Abstain.
In general, the results of the questionnaire data are as follows. From the experience after the textbook writing training, it can be stated that all training participants gave a positive response to the AI-based textbook writing training. No teachers stated that they disagreed, strongly disagreed, or did not know. As many as 75.49% of all responses showed the "Strongly Agree" category. This means that with this training, they stated that it was not only relevant, but also very effective in improving teachers' understanding and practical skills in writing AI-based textbooks integrated into the RPP

Table 3. Questionnaire Results from 21 Training Participants

No	Statement	1 SD)	2 D	3 Abstain	4 A	5 SA
1	After the training I understand how to write a textbook	x	x	x	18	3
2	After the training, I learned the techniques for writing teaching books according to the material in the Module or RPP.	x	x	x		21
3	After training, I can use AI (ChatGPT) in writing prompts for textbooks according to the given textbook format.	x	x	x	1	20
4	After the training, I feel I can apply the writing of textbooks easily and quickly.	x	x	x	2	19
5	After the training, I was able to write textbooks easily, quickly, efficiently and accurately according to the Module and RPP.	x	x	x	4	17
Total		**0**	**0**	**0**	**25**	**77**
Percentage					**24,50**	**75,49**

In-Depth Interview

The following is a description of the interview results of four teachers at SDN 2 Pandanpancur, Lamongan, after participating in the AI-Based Textbook Writing Training on May 24, 2025. This data describes the teachers' responses to the three main questions asked during the interview and will then be used in triangulation with the results in the questionnaire.

1. How do you feel after the Training?

All informants gave a very positive response to the training provided. As in table 5, the four teachers stated the following.

Gaining new knowledge and skills in writing textbooks that were not previously possessed. Feeling helped because this training opened up new insights, especially in the use of AI such as ChatGPT to create teaching materials that are in accordance with learning objectives. They also feel able to create textbooks, modules, or lesson plans more quickly, efficiently, and in accordance with learning outcomes. One teacher called this training "very impressive" and even stated that AI actually provided more precise results and matched the teaching materials.

Overall very positive. Teachers felt that this training not only increased their knowledge, but also improved their practical skills in designing teaching materials with the help of AI technology. This showed a significant increase as also seen in the questionnaire data.

2. What are your plans after the AI-based Textbook Writing Training?

Each informant expressed a clear intention to implement the training results: All teachers stated that they would write textbooks for the subjects they teach. Several teachers stated that they would use these skills to directly support classroom learning.

All teachers appeared to have a long-term commitment to implementing the training results, not only as additional skills, but as part of their professional practice in schools. It can be stated in general, that there is a strong alignment between the knowledge gained and the intention to implement it in the field. This shows that the training is not only informative, but also transformative in the context of basic education.

3. What are your suggestions for the Unusa Community Service team regarding this training in the future?

All participants provided constructive input that generally led to the continuation of the training program, including: The training should be expanded to teachers in other clusters and other schools that have not received training. The community service team is advised to continue similar programs, even developing materials along with advances in AI technology. One teacher expects further training, including if there is an update to the latest AI features for creating teaching materials.

In general, the results of the textbook training for them illustrate a very high increase in their satisfaction. Their trust in the training and trust in the Unusa community service team is very high so that they hope to continue. This is an important basis for the sustainability and replication of the program to other areas.

The results of the analysis in the form of qualitative narratives, both questionnaires and teacher interview results, can be stated that 75.5% of participants in the textbook writing training at SDN2 Pandanpancur near, Lamongan greatly appreciate and agree that the training provides benefits and has a high impact on the abilities of teachers at SDN 2 Pandanpancur, near, Lamongan. None of them disagree or strongly disagree> Therefore, there is a uniformity of positive perception.

In addition, these results are also supported by the results of the interview and therefore this second data also strengthens the findings in the first questionnaire data. Therefore, it is clear that the narratives of the participants, namely teachers of SDN 2 Pandanpancur, near Lamongan, stated firmly that they felt more self-confident, capable and skilled and determined to be ready to apply skills to write AI-based textbooks in their schools

Table 4. Results of Open Interviews with 4 Teachers

Informant	Open Ended Questions
	1. How do you feel after the Training?
1	I feel like I have gained knowledge and understanding on how to write a textbook. In addition, I also gained skills on how to use AI to write a textbook. In fact, I can create a Module or RPP quickly and in accordance with the material and objectives that have been written previously.
2	It is very impressive because so far I do not know how to write a textbook properly and accurately. What is more interesting is writing a textbook using AI and it is more precise and fits the learning objectives written in the module or RPP.
3	For me, this textbook writing training really helps me in teaching because I can write good textbooks from the results of this training. The way of writing assisted by AI turns out to be more precise and accurate according to the objectives or learning achievements written in the module or RPP.
4	This training really helped me in writing textbooks according to the modules or lesson plans for the subjects I teach. More interestingly, I can develop modules or lesson plans in the form of textbooks that are ready to be taught in class.
	2. What are your plans after the AI-based Textbook Writing Training?
1	I will write textbooks for the subjects I teach.
2	What is clear is that I can use this skill to write textbooks at SDN 2 Pandanpancur school.
3	I will definitely apply this knowledge to write textbooks.
4	I will apply the theories and skills I gained from this training to write a textbook.
	3. What are your suggestions for this Textbook Training program for the Unusa team in the future?
1	It would be better if this training was also given to other teachers in other clusters.
2	The community service team should continue to provide this training to other teachers in other schools who have not received this training.
3	In order for the Unusa community service team to provide further training, there may be developments in AI that can be applied in the teaching and learning process of creating teaching materials.
4	I hope that I will apply these skills to writing textbooks for the subjects I teach.

DISCUSSION

The very significant and positive responses from workshop participants during the training on AI-based learning book, it indicates the relevance and effectiveness of the professional development program for the elementary teachers as the participants. With 75.49% of participants showing "Strongly Agree", and none of them stating the disagreement or uncertainty. Therefore, it also suggests that there is a high level of satisfaction and perceived benefit from the workshop.

This evidence is in line with the existing literature that highlights the increasing importance of artificial intelligence (AI) in education, particularly in empowering teachers to design more personalized and dynamic learning materials (Holmes et al., 2019). The integration of AI in textbook writing and lesson planning, particularly when related with instruments such as Rencana Pelaksanaan Pembelajaran (RPP), provides practical skills for enhancing both curriculum delivery and student engagement (Zawacki-Richter et al., 2019).

Moreover, the positive feedback from teachers supports the notion that teacher training programs focused on technological integration can significantly enhance educators' confidence and competence in using digital tools (Trust et al., 2017). This is consistent with the TPACK framework (Technological Pedagogical Content Knowledge), which emphasizes the interplay between technology, pedagogy, and content knowledge in developing effective teaching practices (Mishra & Koehler, 2006). Through hands-on practice during the training, participants not only learned about AI-based tools but also experienced their application in curriculum development, which likely contributed to the strong agreement responses.

In addition, the absence of negative responses could be interpreted as an indicator of the relevance and timing of the training. Given the global shift toward digital education post-COVID-19, educators are seeking ways to remain pedagogically effective in digitally mediated environments (Bozkurt & Sharma, 2020). The book writing training appears to have met a critical need by equipping teachers with the ability to integrate cutting-edge technology into lesson planning.

Overall, the high satisfaction rate confirms that structured, targeted training in AI-assisted educational content creation can play a crucial role in developing teachers' digital competencies and enhancing educational quality. Continued efforts to provide such professional development opportunities are essential for fostering innovation and sustainability in 21st-century teaching and learning.

CONCLUSIONS

It can be concluded that the community service program carried out by the Unusa Pengmas team, in the form of AI-based textbook writing training at SDN 2 Pandanpancur, has had a very high and very positive impact. The teachers in this training felt that they not only understood and mastered textbook writing techniques, but they also stated that they were ready to apply them in writing their textbooks.

Overall, the triangulation of questionnaire and interview data, it can be stated that after this AI-based textbook training, there was a significant increase in teacher competence. They were even very enthusiastic about continuous professional development for the future.

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