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Development of AI-Based Website to improve the competence of teaching module for Trainees

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Abstract: This research aims to develop an artificial intelligence (AI)-based website specifically designed for the preparation of teaching modules for e-Guru.id trainees. With the increasing need for quality and relevant teaching materials, the development of this AI-based website is expected to facilitate educators in creating effective and innovative teaching modules. This research used the Borg n Gall development which was simplified by Sukmadinata 2013. Expert validation was conducted to assess the feasibility and effectiveness of the teaching modules produced, focusing on pedagogical and technical aspects. The results showed that this website not only increased efficiency in the preparation of teaching modules, but also provided a more interactive and interesting learning experience for trainees. Based on the validation results, the Artificial Intelligence-based website development was declared valid based on the assessment of media experts with an average of 88% and the assessment of material experts with an average score of 91%. In addition, the module is declared in accordance with the Learning and language rules to get an average score of 79% so that it is feasible to use in training in making teaching modules for trainees at e-Guru.id. These findings are expected to make a positive contribution to the development of teacher professionalism and improving the quality of education in the digital era.

Keyword: Teaching Module, Artificial Intelligence, Teacher, Learning.

INTRODUCTION

As a guide to the learning process, the curriculum is really needed by educators and students (Suratno et al., 2022). The independent curriculum is a curriculum concept that emphasizes independence for students. In this curriculum, learning not only takes place inside school but also outside school, and encourages the creativity of teachers and students (Jasrial, Dedi Syarif, Herawati Zainil, 2023). Teaching modules are curriculum-based learning designs that aim to help students achieve competency standards. The independent curriculum teaching module is a substitute for lesson plans that are formatted and varied in nature which includes learning material /content, learning methods, interpretation, and evaluation techniques that are arranged systematically and stunningly to achieve the expected success indicators (Maulida, 2022). Teaching modules have a major role to support teachers in designing learning (Nesri &

Kristanto, 2020). According to the Learning and Assessment Guidelines, the main purpose of developing teaching modules is to develop teaching tools. The purpose of developing teaching modules is to become a reference for teaching materials that can guide teachers in carrying out teaching in closed and open classes (Maulisa et al., 2024). Teaching tools serve to guide educators to carry out learning by meeting several criteria that are in accordance with the needs of the characteristics of students. The substantial essence of the Independent Curriculum is independence; liberating students and educators so that a strong independent mentality is formed in facing this era of disruption (Tedjokoesoemo et al., 2022). In an independent curriculum, teachers have the freedom to interpret the curriculum independently before being translated to students, and schools have the freedom to organize the curriculum according to school conditions (Dini et al., 2020). In line with this, the current independent curriculum no longer uses lesson plans but is replaced by teaching modules (Angelina, Bistari, 2022). In implementing the Independent Curriculum, teaching modules must be prepared based on the Learning and Assessment Guidelines as the main reference. This is in line with the strategic function of the teaching module as a pedagogical instrument designed to direct educators in organizing a learning process that is structured, goal-oriented, and consistent with the vision and mission of the curriculum. In the preparation of learning tools, teachers play a central role because they are required to hone their critical and innovative thinking skills, especially in designing teaching modules. One of the tasks of a professional teacher is as a learning designer in the sense of being able to design a good learning (Arsyad & Ifianti, 2022). Training for teachers can develop a teacher's pedagogical competence (Prawira & Nugraha, 2021). Therefore, the preparation of teaching modules is one of the pedagogical competencies that need to be developed in order to increase the effectiveness and efficiency of the learning process, as well as ensure the achievement of learning indicators in a systematic and directed manner.

However, in reality, based on the results of interviews with one of the instructors of e-Guru.id, which is one of the platforms implementing online training for teachers, said that there are still many teachers or trainees who have difficulty compiling teaching modules that suit the needs of their students. One of the obstacles to developing interactive learning modules is the lack of digital literacy skills of teachers (Usmeldi et al., 2023). One of the studies conducted by Nuryanti (Nuryanti et al., 2023) revealed that teachers face challenges in understanding the components of the teaching module and the significant differences between teaching modules and lesson plans in Curriculum 2013. The lack of training and assistance in preparing teaching modules is also a major contributing factor to this difficulty. Another study by (Maskur, 2023) highlighted that teachers need to compile teaching modules optimally. However, in practice, teachers do not understand the procedures for compiling teaching modules properly, especially the technique of developing teaching modules in the Merdeka Belajar Curriculum. This is compounded by the finding that the disparity in education quality between urban and rural areas remains high. Teachers in 3T (Disadvantaged, Frontier, Outermost) areas face limited access to training, digital resources and professional assistance in developing teaching tools, including teaching modules (Kunaifi & Wahyudi, 2024). A study by (Christian et al., 2020) showed that only 35% of teachers in non-urban areas developed teaching modules according to Merdeka Curriculum standards.

The lack of training and mentoring in the preparation of teaching modules is also a major contributing factor to this difficulty. Lack of digital literacy is also a significant obstacle in the development of technology-based teaching modules. Teachers who are not familiar with the use of information technology have difficulty integrating digital learning resources into their teaching modules. This is in line with the findings of (Wahjusaputri et al., 2024), who stated that teachers in vocational schools still face challenges in adopting artificial intelligence-based systems due to limited understanding of technology and digital literacy.

Related to the above, it is necessary to develop AI website-based media to assist teachers in developing teaching modules comprehensively, efficiently and effectively for teachers. This is because advances in technology and information should be optimally utilized for the learning process. The development of this AI-based website was developed to improve the ability of trainees so that they can formulate the teaching modules needed based on the characteristics of students. In other words, understanding the teaching modules of the Merdeka Curriculum in welcoming differentiated learning is an absolute and absolute necessity for teachers in Indonesia. In differentiated learning, teachers must pay attention to the individual needs of each student, identify different abilities, interests and learning styles, and choose appropriate teaching strategies for each student. When teachers respond to learners' learning needs, this means that teachers are differentiating learning by adjusting, extending or adding time to achieve optimal learning outcomes (Sarnoto, 2022). In addition, teachers also need to provide a variety of choices in learning and assessment activities, so that students can choose how to learn and assess themselves (AZ Sarnoto, 2024). This allows every educator in Indonesia, who comes from various ethnicities and cultures, to have diverse learning approaches according to their own characteristics (Fauzia & Hadikusuma Ramadan, 2023). The aim is to ensure that the learning approach used is appropriate to the individual needs and characteristics of each learner (Jurais, 2023).

METHOD

This research belongs to the type of Research and Development (R&D) which aims to develop educational products based on user needs. The development model used in this study refers to the Borg and Gall model which has been simplified by (Nana Syaodih Sukmadinata, 2013) so it consists of three main stages, namely: (1) preliminary study, (2) development, and (3) testing. The selection of this model is based on considerations of suitability to the research context, as well as its advantages in presenting a systematic, efficient, and easy-to-implement development procedure. This model allows researchers to comprehensively explore needs, design and revise products based on validation results, and test the effectiveness of products empirically. An illustration of the flow of the development model used in this study can be seen in Figure 1.

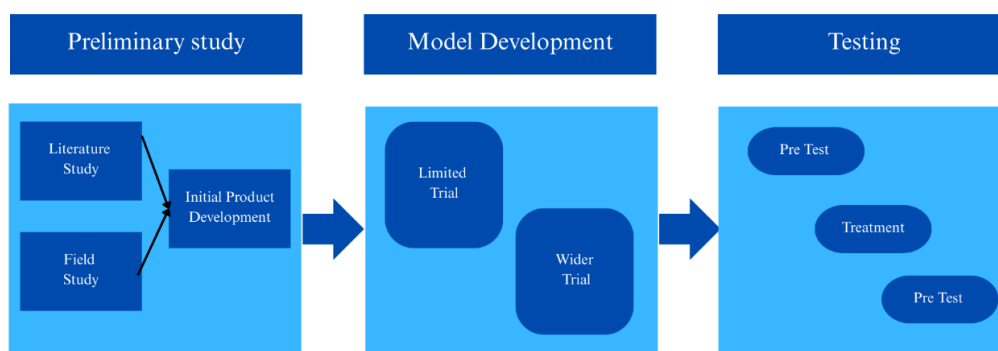


Figure 1. Borg and Gall model simplified by Sukmadinata 2013

These subjects include 2 media experts, 2 material experts, 2 language experts, and 1 training. Validity refers to the level of accuracy of an instrument (measuring tool) that wants to be measured. In the context of learning, a research and development product is assessed through content validity and construct validity. According to (Prilianti, L. D., Kurniasih, D., 2018) the validity of learning devices is assessed by expert validators who focus on appearance, language, and content. Practicality is assessed based on user assessment. The media experts evaluate the design, interactivity, website design, language rules and functionality of AIRU website, this is done to ensure that AIRU has met the educational technology standards. The material experts

validate the materials and evaluation questions presented, ensuring the materials are relevant, accurate, and in accordance with the learning objectives. Language experts validate the language used, ensuring clarity, accuracy, and appropriateness of the language with the target audience and learning objectives. 1 training instructor implemented AIRU in class and provided feedback on its effectiveness in improving trainees' ability to create teaching modules. A total of 25 for the limited scale trial. This approach was taken to ensure that the media could be used by the class in the wide-scale trial. Trainees' performance and engagement were analyzed to assess the impact of AIRU on trainees' teaching module creation skills.

Meanwhile, data were collected through several techniques, including interview guidelines and observation sheets for the analysis stage. Media validation by 2 media validators, material validation by 2 material validators and language validation by 2 language validators, then the validation instruments were analyzed using the instruments shown in table 1, table 2 and table 3 where the validators gave ratings based on a Likert scale of 1 to 5 (1; not good, 2; less good, 3; quite good, 4; good and 5; very good). This validation instrument covers aspects that are relevant to the quality of the website and learning materials (Sulistio & Qohar, 2020).

Table 1 Media Expert instrument lattice

No.	Aspects	Instrument Indicator
1.	User Interface/Display	<ul style="list-style-type: none"> a. The interface design (UI) of the website is user-friendly and easy to use by trainees. b. The navigation structure of the website is clear and makes it easy for participants to access the training materials. c. Utilization of AI in the website enhances the interactivity and learning experience of participants. d. Visual and multimedia features used on the website have supported the effectiveness of material delivery. e. Graphic design and visual elements on the website support participants' focus and understanding of the teaching module preparation material.
2.	User Experience	<ul style="list-style-type: none"> a. Access speed and website performance are optimized to support AI-based online learning. b. The AI-based website is responsive and can be accessed well through mobile devices (smartphones/tablets) c. The use of AI to provide automatic feedback on participants' assignments is very helpful in the learning process d. AI features in this website should make it easier for teachers to visually organize the layout and design of teaching modules. e. AI in this website is able to help create flexible teaching media formats (text, images, videos, etc.).

Adapted from (Harasim, 2000)

Table 2. Material Expert instrument grids

No.	Aspects	Instrument Indicator
1.	Material content	a. The material presented on the website is

	relevant to the applicable teaching module preparation curriculum.
	b. The preparation of teaching modules on this website makes it easier for participants to understand the material well.
	c. AI technology can help develop teaching modules that are more interactive and interesting for trainees.
	d. AIRU website is able to provide teaching module preparation materials that are in accordance with the needs of the trainees.
	e. The quality of material resources (text, video, infographics) in the website has met the standards of good teaching module preparation..
2. Benefits	a. AI features in the e-guru.id website can help trainees understand the material with a more personalized approach.
	b. This AI-based website is flexible enough to provide a wide selection of learning resources according to the teaching module topic.
	c. I suggest that the AI feature on this website can be further developed to provide automatic feedback on the preparation of teaching modules.
	d. The use of AI in learning will increase the effectiveness of learning in e-Guru.id.
	e. The development of this AI-based website can improve the quality of education and training at e-Guru.id

Adaptation from Dick and Carey's research (Dick, 2005).

Table 3 Linguist's grid

No.	Aspects	Instrument Indicator
1.	Straightforward	a. The accuracy of the sentence structure produced by AI on the teaching module results.
		b. Effective sentences on the AI website material for making teaching modules
		c. The standardization of the use of sentences on the website and the results of making teaching modules.
2.	Communicative and Dialogical	a. Understanding of the language used on the AI website
		b. Use of the website motivates trainees to learn
3.	Suitability to the trainee	a. Suitability of the website to the trainees' intellectual knowledge
		b. The suitability of the website to the trainee's emotional state
		c. Suitability to the trainee's flexibility of use
4.	Conformity with language rules	a. Appropriateness of language on the website

Adaptation of standards from the National Education Standards Agency (2008) (BNSP, 2008)

Each Validator, including media experts, material experts, linguists, instructors and trainee representatives evaluated this artificial intelligence-based website according to their respective expertise (Hasyim et al., 2021). Data from this evaluation, mainly collected through questionnaires during the product trial, were analyzed descriptively by calculating the average percentage of validation results (Pujawan, 2019). Likert scale will be used to measure the answers obtained from the trainees' questionnaire responses. The formula used to assess the proportion of participants' answers from the data collected is as follows:

Description:

P = percentage of feasibility

F = number of scores

N = highest score

$$P = \frac{F}{N} \times 100$$

The feasibility level of the AIRU website product used is then confirmed using the calculation results with the following criteria.

Table 4. Ideal scoring criteria

Range	Kriteria Kelayakan
80,0 – 100,0%	Very good, can be used without revision
60,0 – 79,9%	Feasible, usable but needs revision
40,0 – 59,9%	Not suitable, recommended not to be used because it needs major revisions
20,0 – 39,9%	Not suitable, should not be used

RESULTS AND DISCUSSION

This research is a continuation of the previous stage, where briefly in the initial stage the researcher has conducted a needs analysis which shows that the learning media used in the training of making teaching modules for physics teachers tend to be limited and still rely on instructors for the practice of making teaching modules for trainees. unfortunately, the existence of AI technology that is developing rapidly at this time has not been maximally utilized. The innovative use of this human intelligence-based website can make one of the alternatives that can be used to improve the ability of teaching module development trainees in developing teaching modules that suit the needs of their respective students. Based on preliminary studies found in the field through the interview process with participants and training instructors. that a medium is needed that can assist trainees in the teaching module development training process to increase the effectiveness and efficiency of time in making it. This is very relevant considering the learning conditions in the training of teaching module development in physics subjects are very favored by trainees. the attractiveness of this human intelligence-based website can motivate trainees to make teaching modules effectively and efficiently. Apart from that, this AI-based website was first developed at e-Guru.id to assist trainees in making teaching modules. Thus, the use of human intelligence-based website media is expected to improve self-learning abilities as well as significantly contribute to the achievement of teaching module making skills of trainees.

In the next process, namely the process of perfecting this AI-based website to perfect the website, so as to produce the required website content structure according to the learning needs of trainees. meanwhile, the purpose of this research is to develop an AI-based website for training. in this discussion, the results of product assessment and development will be described. The testing stage is carried out in accordance with the research procedure, which includes validation of material experts, media experts, linguists and training instructors.

The following are the results of the assessment of the feasibility of AI-based website products by media experts after the questionnaire was distributed to each assessor.

Table 5. Media Expert Validation Results

Expert	Average Score	Percentage	Category	Decision
Media expert 1	4,60	92,00%	Very Feasible	Eligible
Media expert 2	4,20	84,00%	Very Feasible	
Average	4,40	88,00%	Very Feasible	

Source: Research data

Based on the results of the media expert assessment presented in table 5, an average score of 4.40 or 88.00% was obtained, which means that this human intelligence-based website has very feasible qualifications. Some suggestions for improvement given by the validator team such as the need to add a description of the navigation button symbol, the addition of a guidebook for using the website, and feedback for trainees in using the website. Therefore, these results indicate that the components that make up this human artificial intelligence-based website product have fulfilled one of the requirements as learning media based on the perspective of media experts. In addition to media expert validation, validation was also carried out by material experts, namely experts who have expertise in the field of teaching module material in the independent curriculum, with the results presented in table 6.

Table 6. Material Expert Validation Results

Expert	Average Score	Percentage	Category	Decision
Material expert 1	4,60	92,00%	Very Feasible	Eligible
Material expert 2	4,50	90,00%	Very Feasible	
Average	4,55	91,00%	Very Feasible	

Source: Research data

Table 6 shows the results of the material expert assessment with an average score of 4.55 or 91%, which means that this human intelligence-based website is included in the very feasible qualification. Material experts also suggest that the website still does not explicitly display guidelines or instructions on how users (teachers) can utilize AI-based features. Basic AI-based modules can be strengthened, and the expert suggested that each component in the teaching module (learning objectives, learning activities, assessments, etc.) be given a functional description or explanation. This will help teachers understand the role and importance of each part, as well as how to organize them effectively. Therefore, these results show that the components of the teaching module components, the materials incorporated in this human intelligence-based website have successfully fulfilled one of the requirements as learning media from the material expert's point of view. In addition to media and material experts, the development of this website also uses linguists, who are experts in compiling and editing text so that it has a good sentence structure, uses correct spelling and grammar, and is easily understood by users. The following results presented by linguists are shown in table 7.

Table 7. Linguist Validation Results

Expert	Average Score	Percentage	Category	Decision
Linguist 1	3,70	74,00%	Eligible	Eligible with

Linguist 2	4,20	84,00%	Very Feasible	revision
Average	3,95	79,00%	Eligible	

Source: Research data

Table 7 shows the results of the linguist assessment with an average score of 3.95 or 79%, which means that this human intelligence-based website is qualified to be used. Linguists also gave some suggestions, including The use of punctuation, especially commas in details of more than two things, must be considered so as not to cause ambiguity or misunderstanding. The writing of subheadings on pages in the website must be consistent, both in terms of format, font style, and capitalization, so that the website looks more professional and facilitates navigation. There were some nonstandard words used. The expert's suggestion is that all vocabulary should be checked using the Big Indonesian Dictionary (KBBI) to ensure compliance with good and correct Indonesian language standards. Although there are still some things that need to be improved, in general, the language used in the content and appearance of the website is suitable for use in an educational context, especially as a tool for preparing teaching modules. Therefore, these results show that the components of the teaching module components, the language used in this human intelligence-based website have successfully fulfilled one of the requirements as learning media from the linguist's point of view.

Based on the three results of each expert's assessment, overall that the product of the human intelligence-based website (AIRU) for making teaching modules, is considered “very feasible” by all validators as an AI-based learning website (AIRU) to be tested to trainees in making teaching modules for physics subjects in the next research or stage. This website product that has been validated is shown in Figure 2.

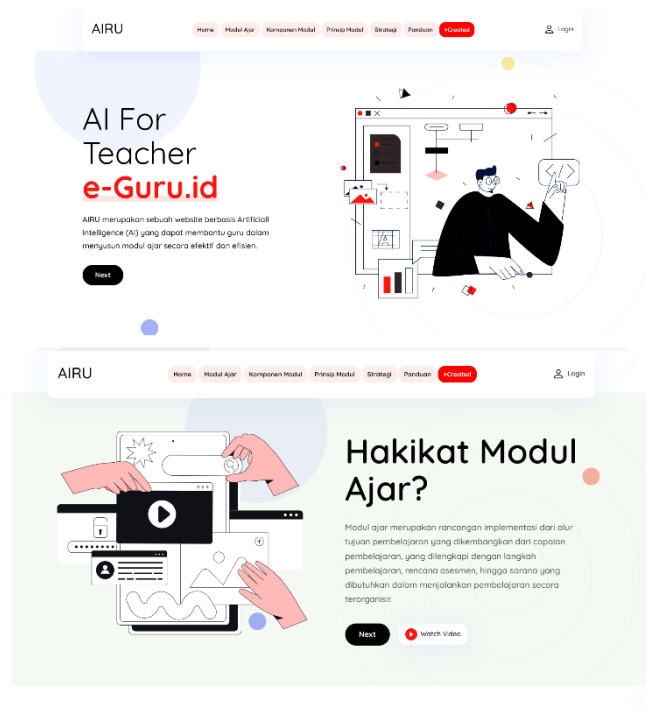


Figure 2. Product of Artificial Intelligence based Learning Website

CONCLUSION

The use of artificial intelligence (AI)-based websites has been shown to contribute significantly to improving the efficiency, effectiveness, and independence of trainees in developing teaching modules. In terms of efficiency, the integration of AI features can accelerate the module design process by providing systematic and contextualized content recommendations. Effectively, the development of this website provides relevant and adaptive

material delivery to the needs of physics teachers. Furthermore, the implementation of this website encourages the independence of trainees through flexible self-learning experiences, so that teachers have more space to develop their professional competencies. This finding has important implications for improving the quality of educator professionalism and supporting the strengthening of the implementation of the Merdeka Curriculum. Through the use of AI technology, teachers are encouraged to develop learning modules that are contextual and in accordance with the characteristics of students, in line with the principle of freedom of learning and creativity which is the foundation of the Merdeka Curriculum. Thus, the website product based on Artificial intelligence (AIRU). which has been developed and declared very feasible based on the results of expert validation, is considered ready to enter the field trial stage. Feedback from the next implementation stage is expected to enrich product improvement and strengthen the effectiveness of its use in the real training process on the e-Guru.id platform.

Further research is recommended to examine the long-term impact of AIRU on the ability of trainees to create teaching modules, collaboration with practitioners and government agencies specifically in the field of the Ministry of Education and Culture to refine and adapt AIRU for various contexts of teaching tools that are also important and develop different digital media to develop teaching tools to assist teachers in preparing all the administration of learning which is still a common task in education.

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