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Needs Analysis to Develop of Project Based Learning Module Assisted by Heyzine Application to Improve Students' Creative Thinking Skills

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ABSTRACT

Efforts to develop 21st century skills have been carried out by changing the curriculum from the 2013 curriculum to an independent curriculum based on 21st century learning. One of the main focuses in this ability is the development of four core competencies known as 4C, including critical thinking and problem-solving skills, creativity and innovation, collaboration skills, and effective communication skills. One of the four most important skills that must be developed by students is creative thinking skills. However, in reality, mastery of this ability is still relatively low. This low ability is caused by the teaching materials used in the learning process that have not been fully designed to support students' creative thinking skills and the Project Based Learning (PJBL) learning model. This study aims to analyze the need for developing E-modules based on Project Based Learning. This study uses a development research approach with a 4-D model (Define, Design, Development, and Disseminate), which is limited to the Development stage. The results of the study revealed three main findings from the needs analysis: (1) students' creative thinking skills are still low, with a score of 36; (2) Based on teacher interviews, the teaching materials used in the learning process have not been fully designed to support students' creative thinking skills, and the Project Based Learning model is one of the learning models applied by teachers but is not yet optimal; (3) Determination of student characteristics, with scores for each indicator, student background 70.25, student learning interest 67.5, student learning motivation 66.67, student learning style 70.88, and digital learning 76.38. The research conclusion obtained from the needs analysis is that the development of an E-Module based on the Project Based Learning model assisted by the heyzine application to facilitate students' creative thinking skills is very much needed by students.

INTRODUCTION

The various efforts have been made to develop and update innovations in education in the 21st century. Efforts to develop 21st-century skills have been carried out by changing the curriculum from the 2013 curriculum to the independent curriculum based on 21st-century

learning. The Independent Curriculum is a new curriculum issued by the Indonesian government as an initiative to develop a more independent and contextual curriculum for students throughout Indonesia. This approach aims to create a learning environment that is not only oriented towards academic achievement, but also strengthens students' abilities to understand, analyze, and evaluate ideas in different contexts.

The 21st-century skills focus on a student-centered learning approach, where educators act as facilitators in supporting the learning process. One of the main focuses of this competency is the development of four core competencies known as the 4C, critical thinking and problem solving, creativity and innovation, collaboration, and effective communication (Redhana, 2019; Novitra et al., 2021; Ahmed & Taha, 2021; Asri et al., 2023). Without mastering these four skills, students will struggle to adapt to the rapid changes of the times, rapid technological developments, and the constant emergence of global challenges (Asrizal et al., 2022; Stanikzai, 2023).

One of the four most important skills students need to develop is creative thinking. Creative thinking skills really need to be trained continuously in learning activities so that students are able to solve problems (Alfitriyani et al., 2021; Usmeldi & Amini, 2022). Creative thinking helps students conduct in depth analyses of ideas, make informed choices, and reach logical conclusions (Suryandari et al., 2021; Asrizal et al., 2022; Putri & Alberida, 2022). Creative thinking extends beyond creating new things or products; it also encompasses the ability to develop, evaluate, and refine ideas to make them more effective and applicable in various life and learning contexts (OECD, 2023).

Although students' creative thinking skills play a crucial role in 21st-century learning, various studies show that high school students, particularly in physics, still have low mastery of these skills. Research by Afifah & Asrizal, (2025) at SMAN 1 Batuhampu found that students' overall creative thinking skills were in the low category. Similarly, research by Asniar et al. (2022) at SMAN 11 Makassar showed that some students had low creative thinking skills.

Furthermore, research by Hasanah et al., (2021) showed that students' creative thinking skills were in the low category. Students' low levels of critical and creative thinking skills impact their readiness to face the demands of 21st-century learning, which emphasizes higher-order thinking, problem solving, and innovation as core competencies (Suryandari et al., 2021; Soenarko et al., 2022). If this issue is not addressed appropriately, students will struggle to adapt to 21st-century learning. These difficulties can hinder the development of necessary skills, thus reducing their chances of future success (Asrizal et al., 2022). Therefore, efforts are needed to minimize these negative impacts.

As education continues to adapt to the demands of the times, educators can make various efforts to improve students' creative thinking skills, especially in physics learning (Alfitriyani et al., 2021). Changes in curriculum, teaching methods, and the use of educational technology are important aspects in creating a more effective and relevant learning environment, so that students can develop their potential optimally (Malik, 2018; Ayani et al., 2023). According to Abdurahimovna, (2020), the development of global education has experienced significant progress, creating a more diverse, innovative, and open atmosphere. The use of technology in learning makes learning interactive, engaging, and increases students' independence (Herawati et al. 2018) . With the rapid development of technology in the world of education, educators are expected to be more aware of how to utilize it in the

form of teaching materials, both visual and audio visual, so that the learning material being conveyed can be well understood by students (Akpan & Okoli, 2017; Pikhart et al., 2024).

Teaching materials are all forms of material used in teaching and learning activities and must be studied by students (Majid et al., 2012; Asrizal et al., 2018). One such innovation is developing teaching materials in the form of modules. Modules are simple teaching materials systematically structured using language that is easily understood by students (Marta et al., 2025). Modules must be designed to be as efficient and engaging as possible to facilitate independent or autodidactic learning. Modules contain general information, core components, and appendices. Core components include learning objectives, meaningful understanding, trigger questions, learning activities, and assessments.

The development of information technology has had a significant impact on the learning process (Dhawan, 2020; Dapat et al., 2023). This technology is often used as an aid in carrying out learning activities. One form of implementation is the use of electronic modules (E-Modules), which represent a transformation from printed teaching materials to digital form (Anjarsari et al., 2023). This change aligns with the rapid development of technology and information. E-modules can be integrated to enrich the learning experience and visualize abstract concepts (Valfa et al., 2023). Electronic modules have significant potential to improve learning effectiveness, particularly in facilitating students' creative thinking skills. However, this potential needs to be optimized by implementing appropriate learning models.

There are various innovative learning models that educators can implement in the teaching and learning process, such as problem-based learning, project-based learning, cooperative learning, and discovery learning. These models aim to enhance conventional learning methods, which require active students' participation through collaboration and engagement in creative and innovative learning (Ningsih et al., 2025; Subiyantoro, 2025). One learning model that encourages creative thinking skills is project-based learning. Project based learning is a learning model in which students confront real life problems they have experienced during the learning process. Project based learning helps students build knowledge through a series of structured projects (Sukaesih et al., 2022; Siringoringo et al., 2023).

This project based learning model also trains students to be independent of the teacher in the process, a problem is presented and students then think creatively about how to solve it (Anggraini & Wulandari, 2020; Putri Naomi et al., 2023). Project based learning models correlate with creative thinking skills because, in their implementation, students go through a series of learning syntaxes, starting with defining basic questions, designing a project plan, creating a schedule, monitoring project progress, testing results, and evaluating the learning experience (Siringoringo et al., 2023; Yuni et al., 2025). However, in developing electronic modules, applications are also needed that can make the learning process more engaging by adding digital visualizations in the form of videos, images, and graphics.

One application that can be used is heyzine, an electronic module developed using the heyzine application. Conventional teaching modules can be transformed into interactive e-books in the form of digital books with flippable pages like printed books. The media used to create these digital books are Canva, Microsoft Word, and a computer or laptop (Rahayu et al., 2021; Haniah et al., 2023). Heyzine has features that allow the addition of images, text, and videos, making the learning process more engaging and interactive. Furthermore, heyzine also supports the addition of audio, which can increase student motivation and creativity in learning (Pratiwi et al., 2023; Yuni et al., 2025). In addition, heyzine allows electronic Modules

to be accessed anytime and anywhere using a laptop or smartphone without the need for additional installation (Ula et al., 2023; Tifani et al., 2024). Heyzine has become an effective alternative digital learning medium to support interactive teaching and learning processes in today's technological era.

METHODS

The type of research applied is development research, also known as Research and Development (R&D). This method is used to create a specific product while simultaneously testing the effectiveness of the resulting product. The research design used in this development is the 4D (Define, Design, Develop, Disseminate) model proposed by Thiagarajan et al. (1974). This model was chosen based on the consideration that the 4-D model research design is systematic and based on the theoretical foundation of educational product design, so that the resulting product meets feasibility standards. The 4-D model has clear procedures that will facilitate researchers in producing a product.

This development research focuses on an electronic module based on the project-based learning model on climate change, aimed at students of SMA Negeri 1 Kubung. The electronic modules is designed to support physics learning and facilitate students' creative thinking skills. Validation of the electronic modules was carried out by three experts, namely physics lecturers from the Faculty of Mathematics and Natural Sciences, Padang State University (UNP). If the validation results indicate that the product is valid, the research will proceed to the practicality test stage involving students at SMAN 1 Kubung.

Furthermore, this research has empowerment problems in this research, namely, Analysis of the needs of teaching materials developed in the form of electronic modules based on the Project Based Learning model to facilitate students' creative thinking skills assisted by the heyzine application on climate change material.

This research was conducted at SMAN 1 Kubung with a population consisting of physics teachers and 30 students of phase E. Furthermore, data was collected through creative thinking ability test instruments, physics teacher interview instruments, and student characteristic determination instruments. The teacher interview sheet in this study aims to find out the information needed for the development of electronic modules based on the project-based learning model. Furthermore, the creative thinking ability test in the form of an essay question sheet contains indicators of creative thinking abilities that aim to determine the extent to which students have mastered one of the important abilities to be developed in the 21st century. As well as the student characteristic determination instrument filled out directly by students who aim to find out what problems occur during learning in class. Each instrument is systematically arranged and adjusted to the needs of the analysis to provide more contextual, interactive, and real based learning materials.

This study employed qualitative data analysis through interviews and quantitative analysis using descriptive statistics to assess the results of the creative thinking ability test and the student characteristics questionnaire. To clarify the quantitative results, the data are presented in tables and group summaries. This descriptive analysis aims to provide a more in-depth interpretation of the obtained values. The analysis categories for determining student characteristics were determined based on the scores calculated from each respondent. The value of each indicator was obtained using the following formula.

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

Where P represents the percentage of achievement, x represents the score obtained for each indicator, and xi represents the number of respondents. The percentage results are then used as a basis for grouping student achievement levels into predetermined categories, thus providing a clear picture of the overall condition and characteristics of students.

To measure students' creative thinking abilities, this is done by calculating the value obtained according to opinion Purwanto (2013: 92) using the following formula.

$$NP = \frac{R}{SM} \times 100$$

Description:
NP = Percentage value sought or expected
R = Raw score obtained by the student
SM = Ideal maximum score from the test in question
100 = fixed number
The interpretation categories of the results of the analysis of creative thinking skills can be seen in Table 1 below.

Table 1. Criteria for Creative Thinking Ability

Intervals	Category
86-100	Very high
76-85	Tall
60-75	Enough
55-69	Low
≤ 54	Very low

Source: Purwanto (2013)

RESULTS AND DISCUSSION

Results

The first research result is an analysis of students' creative abilities. Data were obtained through essay question sheets administered to 30 students in phase E of class X. The sheets were in the form of essay question sheets containing indicators of creative thinking abilities. Analysis of the results obtained through the worksheets on students' thinking skills can be seen in Table 2.

Table 2. Results of Students' Creative Thinking Abilities

No	Indicator	Score (%)	Category
1	Flexibility	41	Very low
2	Originality	31	Very low
3	Elaboration	34	Very low
4	Fluency	30	Very low

Based on the data in Table 2, it is known that students' creative thinking skills in physics learning are still relatively low and require serious attention. Students' creative thinking skills showed an average score of 34, which is included in the very low category. The data obtained indicate that students' have not demonstrated optimal abilities in generating new ideas, thinking originally, and developing alternative solutions in the context of solving real life physics problems. Students' low creative thinking skills are caused by a pattern of knowledge transfer that does not consider students' creative thinking skills. The physics learning process in schools is often still teacher centered and dependent on textbooks. Conventional methods, such as lectures and question and answer sessions, tend to make students passive and less engaged in the learning process. Tests and questions given to students often only focus on low level cognitive thinking, with an emphasis on memorization. This condition indicates the importance of developing teaching materials that not only convey material but also facilitate students' creative abilities. The teaching materials in question are in the form of electronic modules, which have great potential to increase learning effectiveness, especially in facilitating students' creative thinking skills. However, this potential needs to be optimized by implementing an appropriate learning model. Therefore, developing project-based e-modules is a good strategy, especially to facilitate students' creative thinking skills.

The second research result was an interview with a physics teacher at SMAN 1 Kubung. The teacher's interview questionnaire consisted of three aspects: physics learning, the use of learning models, and the teacher's perspective on digital learning. A summary of the teacher responses to several interview questions is presented in Table 3.

Table 3. Summary of Teacher Interview Results

No	Question Indicator	Teacher Response
Physics Learning		
1	What are your views and assessment regarding physics learning?	Physics learning becomes enjoyable for students when it is presented through direct practice that provides concrete evidence aligned with the learning material.
2	How is the implementation of physics learning in school?	The implementation of physics learning in school has not been carried out optimally as expected.
3	What problems and obstacles are encountered in implementing physics learning?	Many physics concepts cannot be practiced due to limitations in equipment and time
4	What factors cause these problems and obstacles in implementing physics learning?	There is a lack of teaching materials designed to align time allocation with the scope of the material
Use of Learning Models		
1	What are your views and assessments regarding the learning models used in teaching?	Learning models can be effectively implemented when the material is not too dense and the concepts can be understood by students.
2	Which learning models do you use?	The teacher has implemented the project-based learning model.
3	How do you implement PJBL? Do you follow its syntax?	The implementation is not yet optimal, and many students remain less active.
4	What problems occur when using this model?	Many students still have limited prior knowledge in physics.

Teacher Perspective on Digital Learning		
1	How do you perceive digital learning development?	Digital learning has developed, but teaching is still conventional
2	What is your experience with digital materials?	No specific experience; still uses textbooks and worksheets.
3	Which digital materials are most effective?	Still relies on conventional teaching materials.
4	Have you used Electronic Modules?	Never used electronic modules; still uses conventional materials.
5	What are the advantages of Electronic Modules?	Electronic modules are practical, accessible, and can include multimedia

Based on teacher interviews conducted, it shows that there is a significant gap between the demands of 21st-century learning and physics learning practices that are still dominated by conventional approaches. Learning that should develop critical thinking, creativity, collaboration, and communication skills has not been fully facilitated due to limited laboratory facilities, dense material, and limited time allocation. This condition causes the learning process to be more oriented towards delivering material rather than deepening concepts meaningfully. Although teachers at SMA 1 Kubung have implemented a project-based learning learning model that is relevant to the characteristics of 21st-century learning, its implementation has not been optimal due to varying student readiness and the lack of structured learning tools according to syntax. Furthermore, the use of digital technology in physics learning is still completely absent. Therefore, it is necessary to develop contextual, flexible, and integrated digital technology based PJBL teaching materials to make learning more systematic and effective. Thus, the integration of project based learning and digital technology is expected to improve the quality of conceptual understanding, activeness, and independence of student learning in physics learning.

The third research result relates to the problem of determining student characteristics in physics learning. Data were obtained by distributing questionnaires to 30 students in phase F of grade XI. The analysis results show that students' characteristics in physics learning. The questionnaire analysis consists of five aspects: students' background (LBS), student learning interest (MIBS), students' learning motivation (MOBS), students' learning style (GBS), and digital learning (PD). The results of determining student characteristics can be seen in Figure 1.

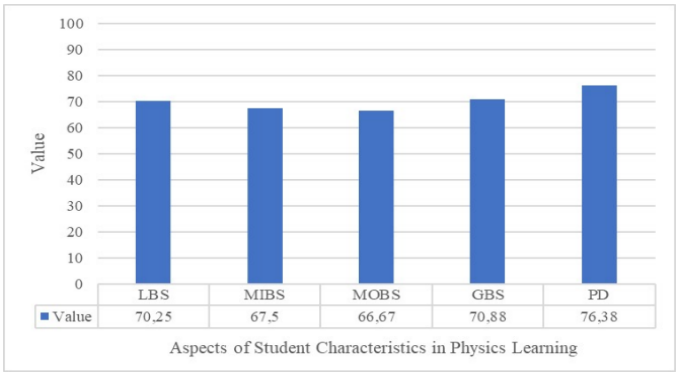

Figure 1. Results of Analysis of Students' Characteristics in Physics Learning

The data in figure 1 shows that the student background aspect obtained a score of 70.25. This indicates that the initial conditions of students are in the fairly good category in supporting digital learning. Students' learning interest obtained a score of 67.5. This indicates

that students' interest in participating in learning has begun to develop, but is not yet optimal. Students' learning motivation obtained a score of 66.67. This indicates that students' learning drive is present, but is not yet optimal in supporting active and consistent learning. Students' learning styles obtained a score of 70.88. This indicates that students already have a tendency towards learning methods that support the learning process, although not yet fully optimal. Digital learning obtained a score of 76.38. This indicates that although digital learning has not been fully implemented in schools, students' already show interest and a positive response to the use of digital based learning.

Discussion

Based on the research results obtained, the study focused on three main findings: low students' creative thinking abilities, conventional physics learning conditions, and student characteristics that show potential to support digital based learning. The first finding shows that students' creative thinking abilities are in the very low category, with an average score of 34. The creative thinking ability indicator values proposed by Munandar (2012) are flexibility, originality, elaboration, and fluency. This indicates that students are unable to develop diverse ideas, produce original ideas, or elaborate in-depth solutions to physics problems. This condition is in line with previous findings by Sucilestari et al., (2023) which show that teacher-centered and memorization-oriented learning tends to hinder the development of higher-order thinking skills, including creative thinking. This is further strengthened by the latest research by Novitasari & Ambarwati, (2024); Juliangkary et al., (2024) that the teaching materials used by teachers in learning also affect students' creative thinking abilities. Therefore, innovation is needed in the development of teaching materials that not only convey material, are memorization-oriented, but can also facilitate the development of students' creative thinking abilities.

The second finding from teacher interviews indicated that the implementation of physics learning has not been optimal. Some of the obstacles encountered include time constraints, dense material, and limited laboratory facilities. This results in learning that is more oriented towards delivering material than developing in depth conceptual understanding. Although teachers have attempted to implement the project-based learning model, its implementation has been less than optimal due to the lack of structured teaching materials that align with the PBL syntax and low student readiness.

On the other hand, the use of technology in learning is still very limited. Teachers have not yet utilized digital teaching materials such as electronic modules, so learning is still dominated by printed textbooks and lecture methods (Ramadhan et al., 2023; Anjarsari et al., 2023). Soenarko et al., (2022) explain that integrating technology into learning can increase students' interactivity, motivation, and independence in learning. Therefore, the development of digital based teaching materials integrated with innovative learning models such as PJBL is essential to make the learning process more effective and meaningful.

The third finding relates to student characteristics, which indicate that students generally have quite good potential to support learning. This is evident from scores on student background (70.25), learning interest (67.5), learning motivation (66.67), learning style (70.88), and digital learning (76.38). Although not optimal, these data indicate that students' have a positive disposition toward learning, particularly in the use of digital technology. High scores on digital learning indicate that students are interested in technology-based learning, even though its implementation in schools is not yet optimal.

This situation presents a significant opportunity to develop digital-based teaching materials, such as electronic modules integrated with the heyzine application. These electronic modules are based on Project-Based Learning supported by heyzine. Heyzine can provide more interactive learning through the integration of text, images, videos, and animations (Anggreni & Sari, 2022; Pratiwi et al., 2023; Yuni et al., 2025). Furthermore, the project based learning model allows students to actively engage in the learning process through contextual project activities, thus optimally training their creative thinking skills (Siringoringo et al., 2023; Yuni et al., 2025). Therefore, the results of this study confirm that there is a gap between the ideal conditions of 21st-century learning and learning practices in the field. To address this problem, the development of innovative learning materials in the form of project-based learning based electronic modules supported by digital technologies such as heyzine is urgently needed. This development is expected to increase student engagement, facilitate various learning styles, and optimize students' creative thinking skills in physics learning.

CONCLUSION

Based on the data analysis conducted, three findings emerged from the needs analysis in this study. First, students' creative abilities are categorized as very low, with critical thinking 36. Second, there are no technology-based teaching materials available that support the development of students' creative thinking. Third, although the characteristics of students are classified as good, the lack of support for models and teaching materials causes creative thinking abilities to remain very low. Based on the findings from the needs analysis, it can be concluded that the development of an electronic modules based on the project-based learning model assisted by the heyzine application to facilitate students' creative thinking abilities is very much needed by both teachers and students.

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