



NEEDS ANALYSIS FOR A RENEWABLE ENERGY E-MODULE BASED ON DEEP LEARNING APPROACH AND LOCAL WISDOM ASSISTED BY CANVA AI TO FACILITATE STUDENTS' CREATIVE THINKING SKILLS

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Abstrak

Keterampilan berpikir kreatif merupakan salah satu kompetensi penting abad ke-21 yang perlu dikembangkan dalam pembelajaran fisika. Namun, penguasaan keterampilan tersebut masih tergolong rendah karena bahan ajar yang digunakan belum dirancang untuk memfasilitasi peserta didik berpikir secara mendalam, kontekstual, dan kreatif. Penelitian ini bertujuan untuk menganalisis kebutuhan pengembangan e-modul energi terbarukan berbasis *deep learning* dan kearifan lokal Minangkabau berbantuan Canva AI guna memfasilitasi keterampilan berpikir kreatif peserta didik. Penelitian ini menggunakan pendekatan *Research and Development* (R&D) dengan model 4D (*Define, Design, Develop, dan Disseminate*) yang dibatasi pada tahap *Define*. Penelitian dilaksanakan di SMAN 15 Padang dengan melibatkan 34 peserta didik kelas X Fase E dan guru fisika. Data dikumpulkan melalui tes keterampilan berpikir kreatif, angket analisis kebutuhan, observasi, dan wawancara. Data kuantitatif dianalisis menggunakan statistik deskriptif, sedangkan data kualitatif dianalisis melalui tahapan reduksi data, penyajian data, dan penarikan kesimpulan. Hasil penelitian menunjukkan tiga temuan utama, yaitu: (1) keterampilan berpikir kreatif peserta didik berada pada kategori sangat rendah dengan rata-rata sebesar 34,38%; (2) bahan ajar yang digunakan belum mengintegrasikan pendekatan *deep learning*, kearifan lokal, maupun teknologi kecerdasan buatan sehingga peluang peserta didik untuk mengembangkan kreativitas masih terbatas; dan (3) sebanyak 78,67% peserta didik membutuhkan bahan ajar digital terbuka yang lebih interaktif, menarik, dan mudah diakses. Dengan demikian, pengembangan e-modul energi terbarukan berbasis *deep learning* dan kearifan lokal Minangkabau berbantuan Canva AI sangat diperlukan untuk mendukung pembelajaran fisika yang bermakna sekaligus memfasilitasi pengembangan keterampilan berpikir kreatif peserta didik.

Kata Kunci : Canva AI, deep learning, e-modules, energi terbarukan, keterampilan berpikir kreatif

Abstract

Creative thinking skills are an important 21st-century competency that needs to be developed in physics learning. However, mastery of this ability is still relatively low because the teaching materials used have not been designed to facilitate students to think deeply, contextually, and creatively. This study aims to analyze the design needs of renewable energy e-modules based on deep learning and Minangkabau local wisdom assisted by Canva AI to facilitate students' creative thinking skills. The study used a 4D Research and Development (R&D) model approach

(Define, Design, Develop, and Disseminate) which was limited to the Define stage, conducted at SMAN 15 Padang involving 34 grade X Phase E students and physics teachers. Data were collected through creative thinking skills tests, needs questionnaires, observations, and interviews. Quantitative data were analyzed using descriptive statistics, while qualitative data were analyzed through data reduction, data presentation, and drawing conclusions. The results of the study revealed three main findings: (1) students' creative thinking skills were in the very low category with an average of 34.38%; (2) the teaching materials used have not integrated deep learning approaches, local wisdom, or artificial intelligence technology so that students' opportunities to develop creativity are still limited; (3) as many as 78.67% of students need digital open materials that are more interactive, interesting, and easily accessible. In conclusion, the development of renewable energy e-modules based on deep learning and Minangkabau local wisdom assisted by Canva AI is very necessary to support meaningful physics learning while facilitating students' creative thinking skills.

Keywords : Canva AI, deep learning, e-modules, renewable energy, creative thinking skills

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INTRODUCTION

The development of science and technology in the 21st century demands that students be prepared to face global dynamics and challenges. In this context, the learning process is no longer sufficient if it focuses solely on mastering cognitive domains, but must also be directed at strengthening 21st-century skills, known as the 4Cs: critical thinking, creativity, communication, and collaboration (Arnyana, 2019). Among these various competencies, creative thinking skills occupy a very strategic position to be developed, because this ability plays an important role in encouraging the emergence of new ideas, expanding the exploration of various alternative problem-solving options, and equipping students to respond to various problems innovatively (Anagün, 2018).

Creative thinking ability refers to a person's capacity to generate diverse, flexible, original, and detailed ideas to find solutions to problems. This ability plays a crucial role in physics learning, which focuses not only on concepts and theories but also on observing natural phenomena in students' everyday lives. (Sulistiyo, 2020). By mastering adequate creative thinking skills, students will be better able to formulate various alternative

solutions to the problems they face, while connecting physics concepts with real contexts in their surroundings (Manalu et al., 2025).

In the learning process, teaching materials play a crucial role as tools for students to understand concepts and construct knowledge independently. Systematically designed teaching materials play a crucial role in helping students grasp concepts, explore ideas, and independently find solutions to various scientific problems (Runco et al., 2012). With the rapid development of digital technology, learning materials can now be developed in more interactive and flexible electronic formats. One format deemed relevant to 21st-century learning needs is the e-module, which allows the integration of various media such as images, videos, animations, and interactive activities within a single platform. (Diyanti et al., 2026).

In addition to the use of digital teaching materials, current learning also uses a deep learning approach which emphasizes a mindful, meaningful, and joyful learning process so that students are able to understand concepts in depth while reflecting on their learning experiences.

(Kemendikdasmen, 2025), This approach is also believed to support the development of higher-order thinking skills, including creative thinking skills (Maelasari & Lusiana, 2025).). Therefore, integrating a deep learning approach into e-modules is a potential alternative for improving the quality of physics learning.

The social and cultural context surrounding students also needs to be considered, one way is by strengthening local wisdom content in learning materials (Aulia & Emiliannur, 2026). Local wisdom is a collection of values, knowledge, and various practices that develop within a community and have the potential to be used as contextual learning resources (Suastra et al., 2017). In renewable energy material, various local practices such as the use of solar energy, biomass, and hydropower can be used as concrete examples of the application of physics concepts. The integration of local wisdom in learning is expected to increase the meaningfulness of learning while encouraging the emergence of creative ideas from students in utilizing the potential of their region.

The development of artificial intelligence technology has also opened up new opportunities in the development of digital teaching materials, one of which is through the Canva AI platform, which offers various AI-based features to help make the design process more engaging, interactive, and efficient (Maulah et al., 2025). With its ability to produce illustrations, layouts, and interactive media tailored to learning needs, e-modules designed using Canva AI are expected to facilitate more meaningful learning.

Several previous studies have developed e-modules to facilitate creative thinking skills through various approaches,

such as the development of a STEM based physics e-module with self-directed learning (Lestari, 2023), a renewable energy e-module integrated with a problem-based learning model using smartphones (Rahmayani & Asrizal, 2024), a STEM-based renewable energy e-module (Sembiring et al., 2026), and a SETS-based physics e-module (Azzahra et al., 2022). However, no research has specifically integrated deep learning approaches, Minangkabau local wisdom, and Canva AI in a single e-module design on renewable energy material..

The novelty of this research lies in the combination of five elements: a renewable energy electronics module, an immersive learning approach, local wisdom, the use of Canva AI, and creative thinking skills. This combination of five elements distinguishes this research from previous studies. Therefore, this study aims to analyze the design needs of a renewable energy electronics module based on immersive learning and local wisdom, assisted by Canva AI, to facilitate students' creative thinking skills.

METHODS

This research is a research and development (R&D) that adopts the 4D model (Four-D Model) developed by Thiagarajan et al. (1974). The 4D model consists of four stages: *Define*, *Design*, *Develop* and *Disseminate*. However, this research is limited to the Defining stage, which aims to analyze the e-module design requirements as a basis for development in the next stage.

This research was conducted in January at SMAN 15 Padang. The sampling technique used was random sampling involving 34 students of class X Phase E and physics teachers. Data collection was carried out through three instruments: (1) a creative

thinking ability test in the form of essay questions with aspects of fluency, flexibility, originality, and elaboration to measure students' creative thinking abilities; (2) a needs questionnaire to identify students' learning motivation, learning interests, learning styles, and readiness for digital-based learning; and (3) interviews to obtain information regarding learning implementation, students' difficulties in understanding concepts, and teachers' perceptions of digital learning.

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

$$NP = \frac{R}{SM} \times 100 \quad \dots\dots\dots(1)$$

Description:

Np = Expected percentage value

R = Raw score

SM = Ideal maximum score

100 = Constant number

The criteria for creative thinking skills scores in percentage are as follows:

Table 1. Criteria for Creative Thinking Skills

Persentase (%)	Kategori
86-100	Sangat Tinggi
76-85	Tinggi
60-75	Cukup
55-59	Rendah
≤ 54	Rendah Sekali

Meanwhile, the percentage of student needs questionnaire results is calculated using the following formula:

$$P = \frac{\sum x}{\sum xi} \times 100\% \quad \dots\dots\dots(2)$$

Description

P = Percentage

X = Score obtained for each indicator

Xi = Number of responses

The results of the data analysis were then interpreted descriptively to determine the level of need for a renewable energy e-module based on deep learning and local wisdom to facilitate students' creative thinking skills.

RESULTS AND DISCUSSION

The test instrument was designed based on the four aspects of creative thinking skills proposed by Munandar: fluency, flexibility, originality, and elaboration. Analysis showed that students' creative thinking skills were still in the very low category, with an average percentage of 34.38%. This finding indicates that students still experience difficulties in generating diverse ideas, developing alternative solutions, generating original ideas, and explaining ideas in detail.

Table 2. Percentage of Students' Creative Thinking Skills

No	Aspek Berpikir Kreatif	Persentase (%)	Kategori
1	Fluency	40,44	Rendah Sekali
2	Flexibility	34,93	Rendah Sekali
3	Originality	31,99	Rendah Sekali
4	Elaboration	30,15	Rendah Sekali
Rata-rata		34,38	Rendah Sekali

Based on Table 2, it can be seen that all aspects of creative thinking skills are still in the very low category. The fluency aspect obtained the highest percentage, namely 40.44%, but is still categorized as very low, while the elaboration aspect obtained the lowest percentage, namely 30.15%. The low elaboration aspect proves that students still have difficulty in developing and detailing an idea in depth. This was also found in research by Sofia Wafa et al (2025) which showed that student achievement in the elaboration aspect of creative thinking skills was classified as the lowest, namely 24.37%.

Current physics instruction does not fully provide students with the opportunity to develop ideas deeply and creatively. This situation aligns with Munandar's (2012) opinion, which states that creative thinking skills require students to explore various possible solutions, develop ideas, and relate knowledge to relevant contexts. The low level of creative thinking skills also indicates the need for innovative teaching materials that can encourage students to think more broadly, flexibly, and deeply when solving physics problems.

Interviews with physics teachers at SMAN 15 Padang indicate that the school has implemented the Independent Curriculum. However, student engagement and focus are still suboptimal, technology utilization is limited due to restrictions on digital devices, teaching materials are still dominated by textbooks and printed modules, and existing teaching materials do not fully facilitate the development of students' creative thinking skills. Teachers believe that the development of e-modules based on deep learning and local wisdom is relevant to current educational developments because it can help students understand physics concepts more deeply and connect them to everyday life.

The needs questionnaire revealed that 80.88% of students were more interested in lessons relevant to their daily lives. Furthermore, 77.20% of students understood physics better through real-world experiences. Furthermore, 79.41% were more interested in learning physics through digital teaching materials, which could be accessed anywhere. 78.67% of students agreed with the use of e-modules in physics learning, hoping for teaching materials that were attractive, easily accessible, equipped with supporting images and videos, and provided more interactive activities. These high

percentages reflect the undeniable need among students for digital teaching materials that align with the characteristics of today's generation.

This need is increasingly relevant with the rapid development of digital technology in education. E-modules offer a solution that enables the integration of various learning media such as videos, animations, illustrations, and interactive activities, optimizing student engagement in the learning process. This finding is supported by the findings of Salsabilla et al. (2024), who confirmed that e-modules have been shown to increase learning effectiveness due to their engaging, flexible nature and support for independent learning.

To support the presentation of engaging and interactive teaching materials, utilizing Canva AI is a relevant alternative because it enables the development of e-modules with more engaging visuals, systematic information presentation, and the integration of various digital media within a single platform. Therefore, the developed e-modules are expected to increase student engagement while facilitating creative thinking skills through contextual and in-depth learning activities.

Based on the results of the needs analysis, the specifications for the renewable energy e-module that need to be developed can be formulated. The e-module is designed to contain sub-materials contextualized within the local wisdom of the Minangkabau people as an authentic and meaningful learning resource. The integrated local wisdom includes the jirah waterwheel, biogas from agricultural waste, solar-powered rice drying as a traditional form of solar energy utilization, and energy efficiency in traditional rumah gadang buildings. The integration of this local wisdom is expected to help students

understand the concept of renewable energy more contextually and encourage the emergence of creative ideas based on regional potential.

Each sub-material in the e-module is designed to include learning activities that specifically facilitate the four aspects of creative thinking skills. All activities are based on the principles of a deep learning approach that emphasizes mindful, meaningful, and joyful learning through interactive and engaging presentation of materials. Canva AI is used as a design tool to produce concept illustrations, local wisdom infographics, and a responsive e-module layout that aligns with the learning characteristics of today's students.

The findings of this needs analysis confirm that the development of a renewable energy e-module based on deep learning and local wisdom, supported by Canva AI, is a relevant alternative to addressing challenges in physics learning. The results of this study can be used as a basis for designing e-modules that meet student needs and facilitate students' creative thinking skills. Furthermore, the developed e-module is expected to create a better learning experience and facilitate students' creative thinking skills.

CONCLUSION

The analysis shows that students' creative thinking skills in physics learning, across all aspects—fluency, flexibility, originality, and elaboration—are still categorized as very low. This is because the current learning process is too focused on delivering concepts and solving routine problems, while the teaching materials used do not provide opportunities for students to freely explore ideas or connect physics

concepts to the realities of their daily lives. Furthermore, the needs analysis indicates that both students and teachers require digital teaching materials that are more interactive, contextual, and capable of supporting meaningful and in-depth learning.

Based on these findings, the development of a renewable energy e-module based on deep learning and local wisdom, supported by Canva AI, is needed to facilitate students' creative thinking skills. The developed e-module needs to be designed with learning activities that encourage students to generate diverse ideas, explore alternative solutions, develop ideas in detail, and connect renewable energy concepts to the potential and local wisdom of their surroundings. The integration of deep learning principles, local wisdom, and the use of Canva AI is expected to produce more engaging and contextual teaching materials, thereby supporting the development of students' creative thinking skills in 21st-century physics learning.

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