Interactive E-Module Development on Temperature Matter for Junior class VII

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Abstract. This article discusses the development of an interactive e-module on temperature-related topics for 7th-grade junior high school students, aiming to enhance their learning skills. Employing the 4D development model (Define, Design, Develop, Disseminate), the research focuses on optimizing technology's role in education, motivating students to actively engage in learning, and facilitating easy access for independent learning. The developmental process involves defining needs, designing solutions, implementing them, and disseminating the final product. The resulting e-module, accessible online, incorporates multimedia features, quizzes, and interactive elements to increase student engagement with temperature-related concepts. Expert validation indicates a high level of validity, affirming the effectiveness of the e-module as a learning tool. The conclusion emphasizes the innovative role of e-modules in enriching students' learning experiences and boosting their interest in temperature-related subjects within the school environment.

Keywords - Interactive E-Module, Heyzine, Temperature.

I. INTRODUCTION

The progress of Science and technology has become a major driver in the renewal of science. In the education sector, visible signs of progress in efforts to update the curriculum and improve the quality of teaching. Educators are faced with the demand to develop abilities in creating effective teaching resources, facilitating the learning process. In this context, teaching materials are key instruments used by educators to guide teaching activities and facilitate the dissemination of content to students during learning.

In its role, teaching materials are not just a learning tool, but also a guide that supports students in gaining knowledge and understanding. Teaching materials have the capacity to facilitate individual learning and provide essential support for students in acquiring knowledge. Modules, as comprehensive educational entities, play a crucial role in achieving specific educational goals. The module development process involves the central role of the teacher, which significantly affects the effectiveness and efficiency of learning through the availability of high-quality teaching materials.

Amri, as described in the study of Larasati, Lepiyanto, Sutanto, and Asih (2020), suggests that the principles of development need to be followed sequentially [1], namely: (a) Repetition technique is considered a valuable method that can improve understanding. (b) the process of achieving a goal is likened to multilevel steps, advancing gradually to reach a certain height. (c) awareness of the results achieved serves as a motivating factor for students to strive to achieve their goaAmri, as described in the study of Larasati, Lepiyanto, Sutanto, and Asih (2020), suggests that the principles of development need to be followed sequentially [1], namely: (a) Repetition technique is considered a valuable method that can improve understanding. (b) the process of achieving a goal is likened to multilevel steps, advancing gradually to reach a certain height. (c) awareness of the results achieved serves as a motivating factor for students to strive to achieve their goals. (d) positive feedback has (d) positive feedback has an important role in improving students ' understanding and knowledge acquisition. (e) the learning process often begins with the understanding of simple concepts and progresses gradually towards the understanding of more complex ideas. (f) this development involves focusing on real observable phenomena before exploring more abstract and theoretical concepts. A high level of learning motivation is considered a crucial aspect in determining a person's performance in the learning process.

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Sujanem conveyed the idea that the purpose of developing this module includes several aspects [2], such as: (1) students and teachers work together to overcome the limitations of time, space, and sensory capacity. (2) modules can be utilized variously, including enhancing students 'motivation in acquiring knowledge, developing students' capacity to engage directly with alternative educational materials, facilitating personalized learning experiences based on individual abilitie(2) modules can be utilized variously, including enhancing students 'motivation in acquiring knowledge, developing students 'motivation in acquiring knowledge, developing students 'motivation in acquiring knowledge, developing students' capacity to engage directly with alternative educational materials, facilitating personalized learning experiences based on individual abilities and interests, facilitating personalized learning experiences based on individual abilities and interests, and empowering students to assess and evaluate their own educational achievement. (3) the module is directed to explain and optimize the delivery of content in order to avoid excessive explanation. The instruction in the module includes a set of actions necessary to effectively interact with its content.

Educational resources, as covered in the modules, involve a variety of components, including clear learning objectives, comprehensive descriptions of the material covered, brief summaries, thought-provoking tasks, and evaluative assessments. The practical worksheets in the modules are designed Educational resources, as covered in the modules, involve a variety of components, including clear learning objectives, comprehensive descriptions of the material covered, brief summaries, thought-provoking tasks, and evaluative assessments. The practical worksheets in the modules are designed to facilitate the development of students ' psychomotor abilities through involvement in hands-on activities. Students ' ability to acqui? to acquire knowledge independently is prioritized through the use of learning modules, without the need for guidance or the physical presence of educators as in conventional learning sessions. This educational approach aims at empowering students with the necessary skills to independently investigate and analyze information and materials, thereby encouraging independence and reducing dependence on instructors.

Prastowo, as conveyed in research by Lestari, Sutarno, Rohadi, Sakti, and Nirwana [3], said that the module consists of various components. Some of them are module titles, module instructions that include basic competencies, indicators, references, learning strategies, activity sheets, individual instructions, and evaluations. In addition, the modules also include material followed by semester evaluations. Therefore, it can be explained that the components of the modules are carefully designed and deliberately arranged to produce high-quality teaching materials, which distinguishes them from other types of learning resources. Furthermore, this module is structured as an interactive teaching material with the aim of developing independent learning among students.

The increase in learning behavior and creativity in the 21st century demands the adoption of innovative approaches, such as active learning design, which includes the use of electronic modulThe increase in learning behavior and creativity in the 21st century demands the adoption of innovative approaches, such as active learning design, which includes the use of electronic modules. As expressed by Widayanti, Amaliah, Kurniawan, and Sholikhah [4], electronic modules are considered as one form of educational resources that are in line with the characteristics of teaching materials. These modules are integrated into a coherent whole, structured and designed to enable students to engage in independent and participatory learning experiences. With the modules, students have the freedom to follow the material at their personal pace or based on individual abilities, without having to depend on the direct guidance of the teacher.

At this time, modules are generally deployed in print format. However, with the advancement of electronic and At this time, modules are generally deployed in print format. However, with the advancement of electronic and computer technology, modules can now be available in digital form which is often referred to as e-modules. This digital Format provides the advantage of easy and

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affordable accessibility [5]. In general, the field of electronics can be defined as In general, the field of electronics can be defined as the study related to the manipulation and control of low-intensity electric currents, which are achieved through the regulation of the flow of electrically charged electrons or particles in various devices, including but not limited to computers, electronic equipment, thermocouples and semiconductors.

The article "development of interactive E-modules on Temperature Materials for Junior High School students in grade VII" aims to improve students ' learning skills by focusing on understanding the concept of temperature. Through the develo.

II. METHODS

The research method applied in this study is research and development (R&D), with the main focus on the creation of Concrete Products [6]. The methodological approach adopted in this study follows the 4D model Define (defining), Design (design), Develop (development), and Disseminate (deployment). This Model is generally used in the context of project development, be it a software project, a technology project, or any other project. The choice of 4D models is justified by their Systematics and ease of understanding. Each phase of development involves diverse activities, which are outlined as follows.

1. Define (Defined):

In the first stage, the main focus is on gaining a deep understanding of the needs and objectives of the project. The process begins with identifying the problem or opportunity that the project will address, paving the way for detailing the project requirements in detail, determining the scope of the project, and understanding stakeholder expectations. During this stage, close cooperation takes place between the developer and the client or stakeholder, with the aim of clearly defining the parameters of the project. The entire process is aimed at ensuring that the foundation of the project is well built, in line with existing needs, and able to meet the expectations of all parties involved.

2. Design (Planning):

After passing the definition stage, the next step is the design, which aims to detail in depth how the solution will be implemented. This design process involves creating a detailed plan, determining the system architecture, and designing the optimal interface. At this stage, the design includes not only technical aspects, such as choosing the right technology, efficient database structure, and suitable algorithms, but also focuses on creating a solid framework. The main goal is to detail how all elements of the project will harmoniously interact with each other, creating a solid basis for the subsequent development process. Thus, the design stage has a key role in guiding the careful and effective implementation of the solution.

3. Develop (Development):

At the development stage, the process of implementing the solution into reality begins. This is the phase in which the development team builds the actual code or physical product, drawing on pre-made plans and designs. The development team is dedicated to implementing the solution according to the specifications that have been established in the design phase. During this process, trials and tests are carried out on an ongoing basis to ensure that the developed product or software is of high quality and in accordance with the established requirements. This stage of development becomes an important milestone in ensuring that the resulting solution not only meets expectations, but also functions optimally in accordance with previously identified needs.

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4. Disseminate:

Once the development phase is complete and the solution is considered ready, the next step is to start the deployment phase. This deployment process includes the launch of a product or the implementation of a solution into a production or end-user environment. In this stage, the possibility of user training appears as an integral part, where users may need to gain sufficient understanding of the use of the new solution. Technical support can also be provided to ensure a smooth transition and overcome potential obstacles. Effective communication plays an important role in this stage, providing information to all relevant parties and ensuring a clear understanding of the changes taking place. In addition, post-deployment monitoring becomes a crucial part to ensure the success and satisfaction of users, allowing for any necessary improvements or adjustments according to the feedback received from the end user.

The 4D development Model helps organize and detail the project development process systematically, from conception to implementation, focusing on a deep understanding of needs and stakeholders.

III. RESULT AND DISCUSSION

A. Result

The interactive E-module on temperature materials provides an inspiring end result, allowing users to explore through multimedia, quizzes, and other interactive features. The final product of the interactive e-module on temperature material can be seen on the link <u>https://heyzine.com/flip-book/1c82c7a591.html</u>. This E-module is web-based and in use must be connected to the internet network (online). The parts of the Interactive E-module on temperature material that has been developed are the initial part (containing cover, Mid mapping, objectives and indicators), the material part, student worksheets, and evaluation.

The validation results obtained through a one-stage process, namely expert tests, including material experts and media experts, which will be presented in the following figure :



Figure 1. Recapitulation of the results of material experts, Nurul Hidayah, and Nurul Huda University.

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Figure 2. Recapitulation of the results of material experts, Nurul Hidayah, and Nurul Huda University.

B. Feasibility of Interactive e-module on temperature system materials

The feasibility of the designed E-module is determined by the completion of the validation test conducted by the expert. The expert validation process includes two main components, namely media expert validation and material expert validation. The validation phase of the e-module design is carried out in two stages. The findings of media expert validation analysis conducted by 3 validators obtained an average score of 4.38. This result if converted based on Arikunto then obtained validation criteria is very valid [7]. And in the findings of the material expert validation analysis also conducted by 3 validators get an average score of 4.18. These results if converted based on Arikunto then obtained validation then obtained validation criteria are very valid [7].

After the product design undergoes validation by media and material experts, errors or deficiencies are then found in the developed modules. The identified deficiencies have been reduced and corrected to improve the evaluation of the resulting product based on better criteria.

IV. CONCLUSION

This article highlights the crucial role of scientific and technological progress in the renewal of education, especially in the development of teaching materials such as modules. The modules, which are not only learning tools but also guides, are designed with principles such as repetition techniques, graded steps, and positive feedback to improve learning effectiveness. The use of electronic modules in the 21st century is recognized as an innovative solution that enriches the student's learning experience and allows easy access. R&D research methods with 4D development model were used to create interactive e-modules on temperature materials, which successfully passed expert validation with a high degree of validity. Thus, this e-module is ready to be used to increase student learning interest in the classroom.

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REFERENCES

- [1] A. D. Larasati, A. Lepiyanto, A. Sutanto, and T. Asih, "Development of E-Modules Integrated with Islamic Values on Respiratory System Material," J. Research. Educ. Biol., vol. 4, no. 1, pp. 1-9, 2020.
- [2] R. Sujanem, "Development of Web-based Interactive Contextual Physics Module to Improve Concept Understanding and Physics Learning Outcomes of High School Students in Singaraja," J. Nas. Educ. Tech. Inform., vol. 1, no. 2, p. 103, 2012.
- [3] A. D. Lestari, S. Sutarno, N. Rohadi, I. Sakti, and N. Nirwana, "Development of Physics Modules Based on Science, Environment, Technology, and Society (SETS) to Train Students' Creative Thinking Skills on the Material of Effort and Energy," J. Kumparan Fis., vol. 4, no. 2, pp. 147-154, 2021.
- [4] Widayanti, K. Amaliah, A. Kurniawan, and A. U. Sholikhah, "The Use of Ethnoscience-Based E-Modules in High School Physics Subjects: Literature Study," SNPPM-4 (Seminar Nas. Penelit. dan Pengabdi. Kpd. Masyarakat), vol. 4, pp. 117-122, 2022.
- [5] R. Sidiq and Najuah, "Development of Android-Based Interactive E-Modules in Teaching and Learning Strategy Courses," J. Educ. Sej., vol. 9, no. 1, pp. 1-14, 2020.
- [6] Sugiyono, Quantitative, Qualitative and R&D Research Methods. Bandung: Alfabeta, 2016.
- [7] S. Arikunto, Basics of Educational Evaluation. Jakarta: Jakarta: PT Bumi Aksara, 2015.

Conflict of Interest Statement:

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.