

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.

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 <https://heyzine.com/flip-book/1c82c7a591.html>. 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 :

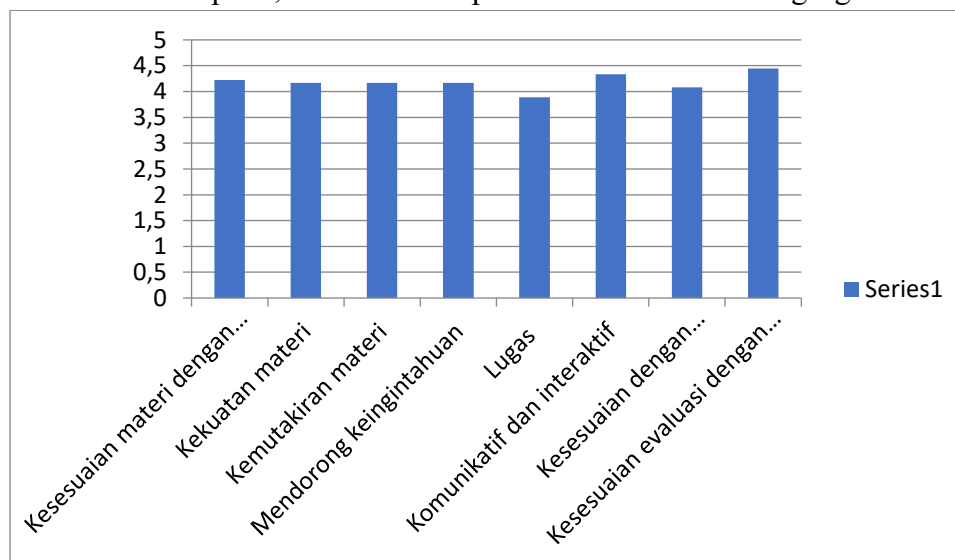


Figure 1. Recapitulation of the results of material experts, Nurul Hidayah, and Nurul Huda University.

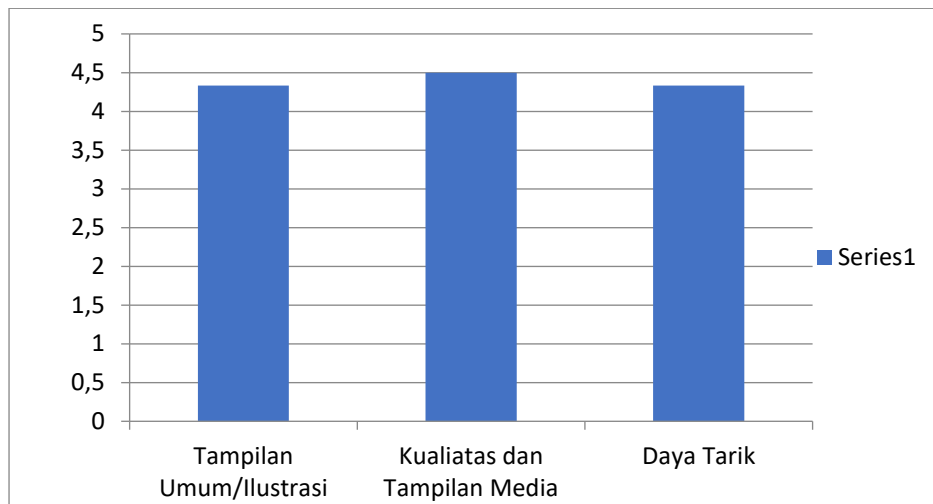


Figure 2. Recapitulation of the results of material experts, Nurul Hidayah, and Nurul Huda University.

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 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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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.