

Development of Game-Based Learning Digital Modules in Class IV MI Datok Sulaiman Palopo

Misdawati¹, Baderiah², and Firman³

^{1,2,3}IAIN Palopo, Indonesia

misdawati991@gmail.com

Abstract. In today's digital era, innovation and creativity in education are important. This research develops a game-based learning digital module for material work at MI Datok Sulaiman, Palopo City. The ADDIE method is used in development with four stages: analysis, design, development, and implementation. Data was collected through observation, interviews, questionnaires and documentation analysed qualitatively and quantitatively. The needs analysis results show that teachers and students need clear, detailed, colourful, and pictorial digital modules. Product validation by expert validators gives very valid results (94.87%), and the practicality of the module is also very practical (84.79%). This module is feasible and practical to use in learning.

Keywords: Modul digital; Game-based learning

1. Introduction

The transformation of education occurs in line with technological developments covering various lifelines. Indonesia has only reached the Industrial Revolution era 4.0 stage in its development. The achievement of the Industrial Revolution 4.0 in Indonesia is not only pursued in terms of industry alone but also penetrates the field of Education (Purnasari & Sadewo, 2021). The development of information technology brings advantages to the world of Education by being used as an integrated means of progressive learning with an innovative, creative, and fun learning base integrated into the characteristics of 21st-century learning for Generation Z and Alpha in the industrial era 4.0. (Aini, 2019). So, in this case, learning, if specifically designed, technology can effectively contribute to learning and help students achieve their highest potential by the times (Aka, 2017). Besides that, technology can also help teachers facilitate learning, motivating and accelerating student learning (Hasriadi et al., 2022). Along with the advancement of information technology, in the learning process, using learning resources as material information providers in achieving learning objectives that teachers and students can use teaching material. Teaching materials that can be developed as a form of innovation in information technology are modules (Rofiyadi & Handayani, 2021; Tania, 2017). In this case, the module can be switched into a digital module.

Module development can help the learning process by systematically arranging material, methods, and evaluations to measure student ability in learning and achieving expected competency goals. This can help teachers create a good and directed learning atmosphere for students to achieve learning objectives (Khoirudin et al., 2022; Maharcika et al., 2021). Then, the module is used as an alternative to delivering creative, interesting, and innovative material that can increase student interest in participating in learning to motivate students to learn. Modules are one of the development products that can increase students' interests, attitudes, thinking abilities, and skills (Erinda et al., 2018; Mulyadi et al., 2016; Nizaar et al., 2021). So, in this case, the module can be

developed into a digital module. Digital modules can be inserted in audio, visual, and audio-visual media (Sanuaka et al., 2017), contain links, and become hyperlinks packaged as interactive modules.

Based on the advantages of these digital modules, designing digital modules creatively, interestingly, and innovatively in presenting material by utilising website-based game-based learning accessed through links so that links can be inserted in digital modules. Game-based learning, or Game-based learning, can provide meaningful learning experiences that can improve abilities, understanding, and knowledge to influence students' interests (Winatha & Setiawan, 2020; Yustina & Yahfizham, 2023). The positive impact of game-based learning on digital modules can increase the interest and motivation of students in using modules. In this case, modules are designed complexly and systematically based on components that can be used independently anytime and anywhere using digital devices (Hollis et al., 2017; Sidiq & Najuah, 2020). Referring to the development of a module, teachers must be innovative and creative in learning by utilising technological developments to provide experience and quality of learning by the times.

Based on the results of observations made at MI Datok Sulaiman, it was found that teachers were still more dominant in using printed media teaching materials such as teacher books or package books. In contrast, students used thematic printed books that were photocopied, which resulted in pictures as explanations of unclear material in books, thus reducing student interest and motivation. Learning that focuses on textbooks carried out by teachers results in learning that utilises technology that has not been fully carried out. The use of technology should be applied in the school because it is based on the vision of MI Datok Sulaiman Palopo, which is to become a leading Islamic institution, superior in the formation of faith, *taqwa* and *akhlakul karimah* and competitive in science and technology. Based on these problems, this study aims to develop game-based learning digital module development products based on the types of work developed based on needs analysis and knowing the validity test and practicality test of the module developed.

Various previous studies that have developed digital modules include the development of digital modules based on inquiry methods in thematic learning in elementary schools by (Violadini & Mustika, 2021), the development of digital modules in thematic learning in elementary schools by (Kuncahyono & Aini, 2020), the development of electronic modules (e-modules) based on flipbook makers by (Maharcika et al., 2021). Based on these three studies, the development resulted in digital modules. The difference in this study is that the digital modules developed are not game-based or game-based, while researchers develop digital modules based on game-based learning. In addition, the different types of applications used, namely, researchers use the Canva application and Flip PDF Corporate to develop digital modules. Furthermore, the difference lies in the subject matter of the material, which is developed in thematic learning on the subtheme of types of work in class IV.

2. Method

This research is a type of R&D (Research & Development) or development research. Development research is research with the Research and Development method, or research and development is a process or steps to develop new products or perfect existing products (Viscusi & Moore, 1993).

The design of the development research model is carried out using the ADDIE model (analysis, design, development, implementation, evaluation). The stages of the ADDIE model are: 1) Analysis. This stage analyses the need for module products to be developed according to the needs and problems. 2) Design is a systematic process that starts from designing the concept and content of the product. At this stage, the product design is still conceptual and will underlie the development process in the next stage. 3) Development is the stage of realising product design made

in the previous stage, which is still conceptual to the research subject. 4) Implement is the testing stage of the product that has been developed. The trial phase is carried out to determine the product's practicality by involving teachers and students.

This research was conducted at MI Datok Sulaiman Palopo from January 18, 2022, to February 10, 2023. The subjects of this study were one teacher and 25 students. The module to be developed is a game-based learning digital module focusing on the material, namely Theme 4 subtheme 1 type of work in learning 1. The product development flow is as follows:

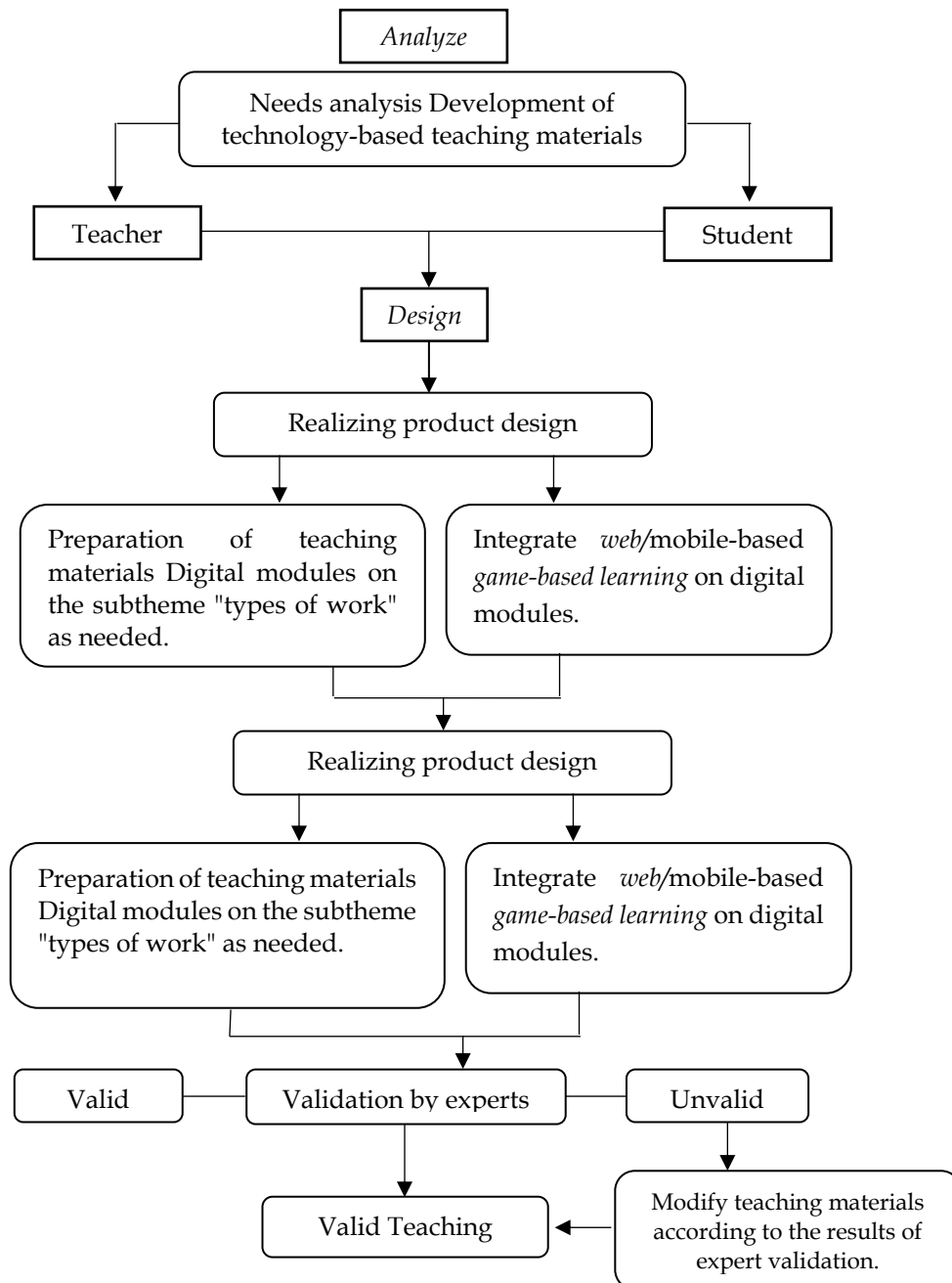


Figure 1 Product Development Flow

Observation, interviews, and questionnaires were used in data collection. Furthermore, the data is analysed with qualitative and quantitative techniques based on the characteristics of the data. Observational data collection is carried out directly by looking at the conditions or circumstances of

the research to be carried out. Observation is a type of open observation that allows and facilitates the author to record things that happen in the field without any answer restrictions. Then, an interview is conducted to allow the interviewee to answer more casually to make it easier to understand. Furthermore, the questionnaire is a data collection technique by provides a set of written questions by the data needed by the respondents to be answered.

3. Result

Research on the development of game-based learning-based digital modules conducted at MI Datok Sulaiman Palopo with the subject of research of teachers and grade IV students. The number of students in class IV is 26 students. This research has followed the process of research stages using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The study results will be described using quantitative and qualitative data analysis approaches.

a. Analysis

1) Performance Analysis

Performance analysis was conducted using interviews and questionnaires of learners conducted by researchers. The results of class IV teacher interviews related to teaching materials used in the learning process are as follows:

"I use thematic books, and students use thematic books, but they are photocopied, so when studying, or while I am explaining and in the book they are not clear the picture is usually students complain about unclear pictures usually ask to see the picture in the book, I hold" (Lisnawati (26 years old), Class IV B MI Datok Sulaiman Palopo Teacher, Interview, on November 18, 2022)

This is by student response data obtained through questionnaires that the type of teaching materials used is only thematic printed books. The data is contained in the form of percentages as follows:

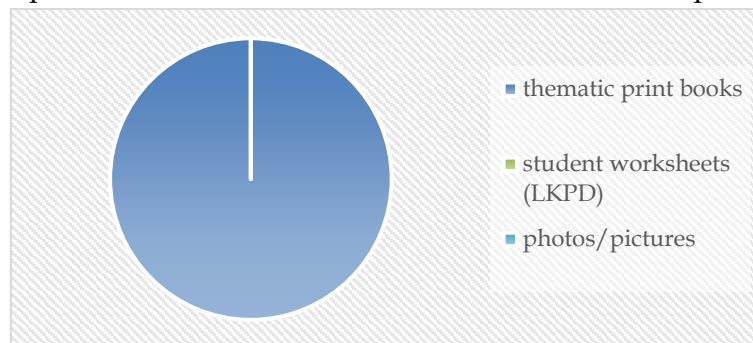


Figure 2 Student Questionnaire Types of Teaching Materials Used

The data on student responses related to the type of book they like is contained in the form of percentages as follows:

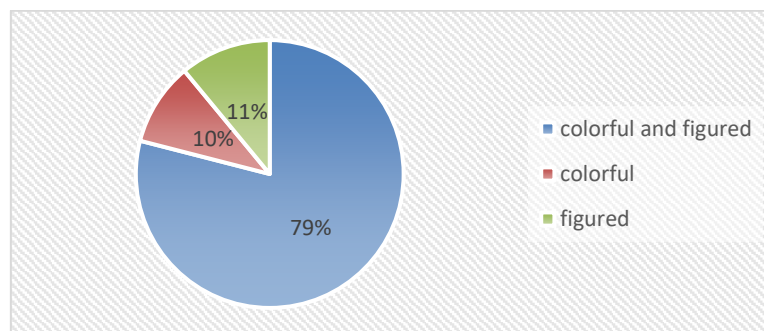


Figure 3 Student Questionnaire Preferred Book Type

Furthermore, in the material types of work, there are obstacles that students do not understand the relationship between types of work and their relation to natural resources. This is in line with the lack of learning resources that focus on thematic books alone, which results in students having difficulty understanding the material and seeming monotonous or boring. The statement of the class IV B teacher regarding learning resources is as follows:

"Usually, thematic books are not explained, so I have to look for references in other books or the internet to explain to the children. Moreover, the material types of work that are rather difficult for students to understand about natural resources must be explained repeatedly so that students can understand them." (Lisnawati (26 years old), Class IV B MI Datok Sulaiman Palopo teacher, *Interview*, on November 18, 2022)

As in the following diagram, 33% of students feel the learning atmosphere is boring, and 67% find it difficult to understand the material due to the absence of a companion book (Module).

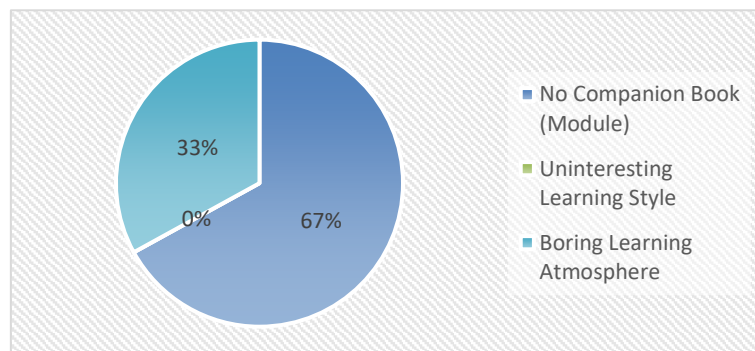


Figure 4 Questionnaire of Students' Difficulty in Understanding the Material

2) *Selecting Task Functions*

Things that need to be analysed are related to teacher assignments and how students do each task given by the teacher.

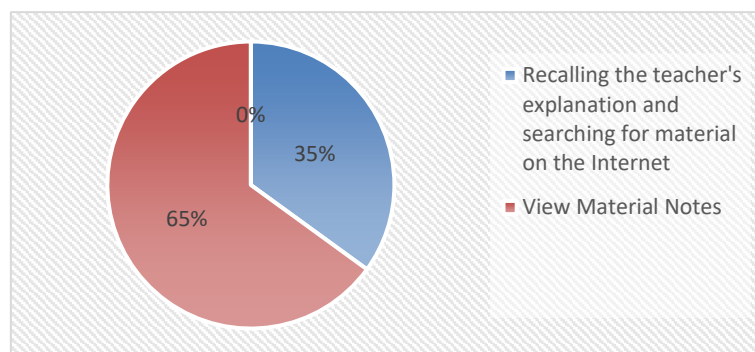


Figure 5 Questionnaire of Students Difficulty in Doing Assignments

3) *Constructing Performance Appraisals*

Constructing a performance assessment is an analysis to determine students' learning styles and performance results. In the questionnaire data of student responses about the ease of students in remembering the subject matter, 50% of students understand the material by listening, and 50% of students understand the material by reading. Furthermore, the ease of students understanding the material is that in percentage data there are 60% of students understand the material in real and 40% in theory. The percentage data can be seen as follows:

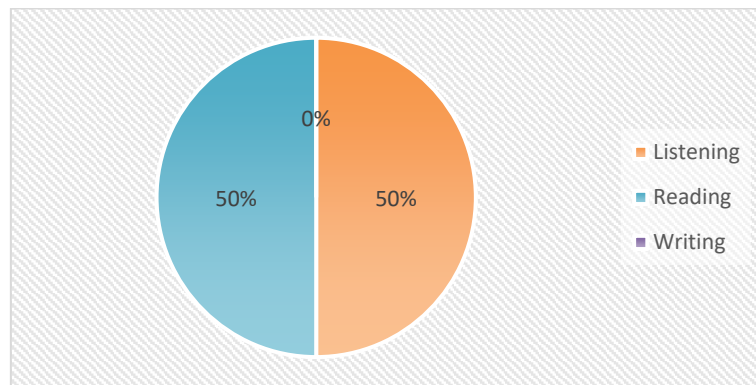


Figure 6 Student Questionnaire Ease of Remembering Material

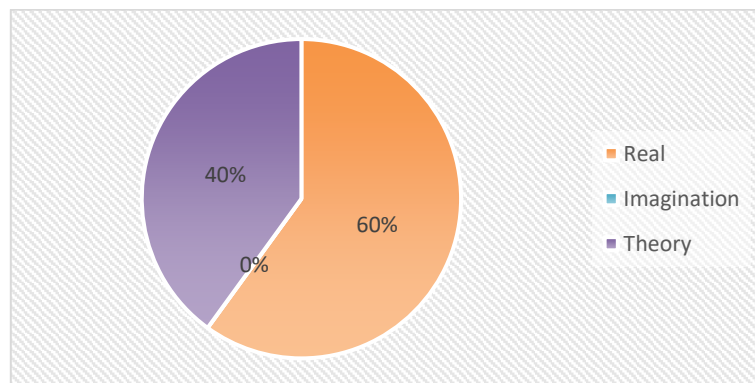


Figure 7 Student Questionnaire Ease of Understanding Material

Furthermore, the results of the student response questionnaire related to the time students prefer to learn and the comfort of student learning can be seen in the following percentage data:

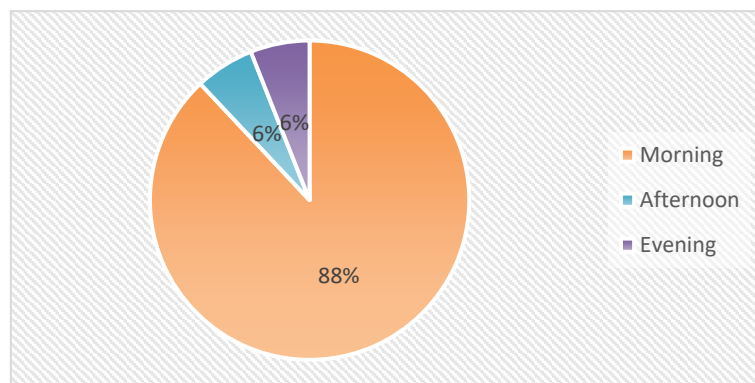


Figure 8 Learning Time Questionnaire Liked by Students

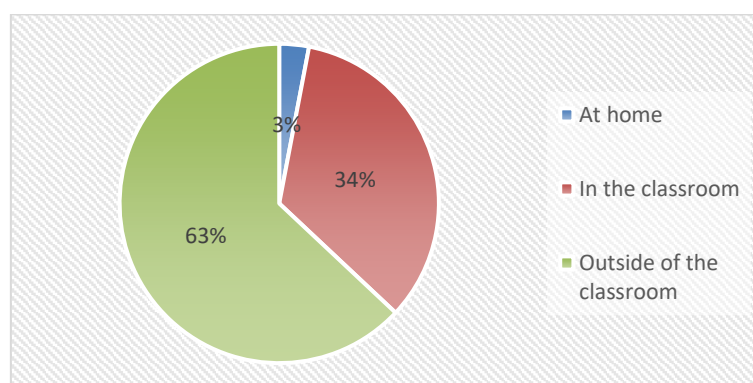


Figure 9 Learning Comfort Questionnaire Liked by Students

Based on the teaching materials to be developed, the results of student responses if there are companion books such as E-Modules (digital-based companion books accessed using mobile *phones*, laptops, or computers) that explain the subtheme material types of work. That there are 88% of students want a companion book, such as a digital module, that has an attractive design and appearance and has the concept of learning while playing, and 12% of students want a type of companion book, such as a digital module, to have an ordinary design and appearance. The data can be seen in the percentage data as follows:

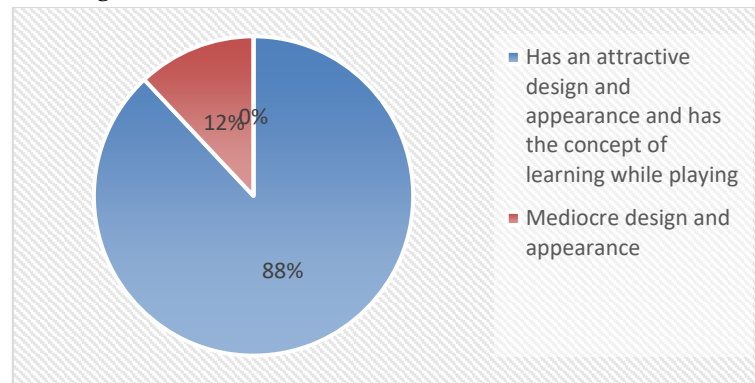


Figure 10 Student Questionnaire Desired digital module

4) Goal Analysis

Objective analysis is intended to analyse a basic competency contained in the curriculum, then formulate learning objectives and compile concepts of presenting material relevant to students' needs. The learning objectives in Theme 4 Subtheme 1 Learning Focus 1 are:

- 1) Students can assess the story's characters in detail.
- 2) Students can describe characters through pictures and writing in detail.
- 3) Students can compare the types of work that are around.
- 4) Students can completely develop reports on the type of work in written form.
- 5) Learners were informed of the importance of maintaining the balance of nature and preserving natural resources in mind maps.
- 6) Students can write examples of activities that completely maintain the balance and preservation of natural resources.

This analysis is carried out by observing the learning environment of students. The observations are as follows:

Table 1 Observation Sheet

No.	Things to Observe	Notes of Observations
1.	Classroom learning process	Learning begins with literacy activities (muroja'ah short surah) together. After that, the teacher explains the material in the textbook to students. After presenting the material, occasionally, the teacher conducts questions and answers to students and then instructs students to do practice questions in the package book. In the learning

		process, the dominant students look passive by only listening to explanations from the teacher.
2.	Facilities that support the learning process	Package books, learners' study chairs and tables, and whiteboards.
3.	Teaching materials used by teachers to support the learning process	Teaching materials used thematic textbooks
5.	Media used by teachers when teaching.	The media teachers use are blackboards and markers to write down learning material points.

b. Design Results

The *Design Stage* is the stage of designing or preparing the design of teaching materials that will be developed based on the results of consideration in the analysis of student needs that have been carried out. The preparation of teaching materials in the form of game-based learning digital modules consisting of components of *the learning* module content, namely cover, foreword, table of contents, instructions for use, standards Competencies (SK), learning objectives, material content types of work, exercises and bibliography. In designing and preparing the module, I used the Canva application to design the module's contents and using the Flip PDF Corporate application to turn PDF files into digital books and the Word wall Application, a website-based game-based learning inserted into digital modules. The design of teaching materials for digital-based modules based on *game-based learning* is presented in the following *flowchart*:

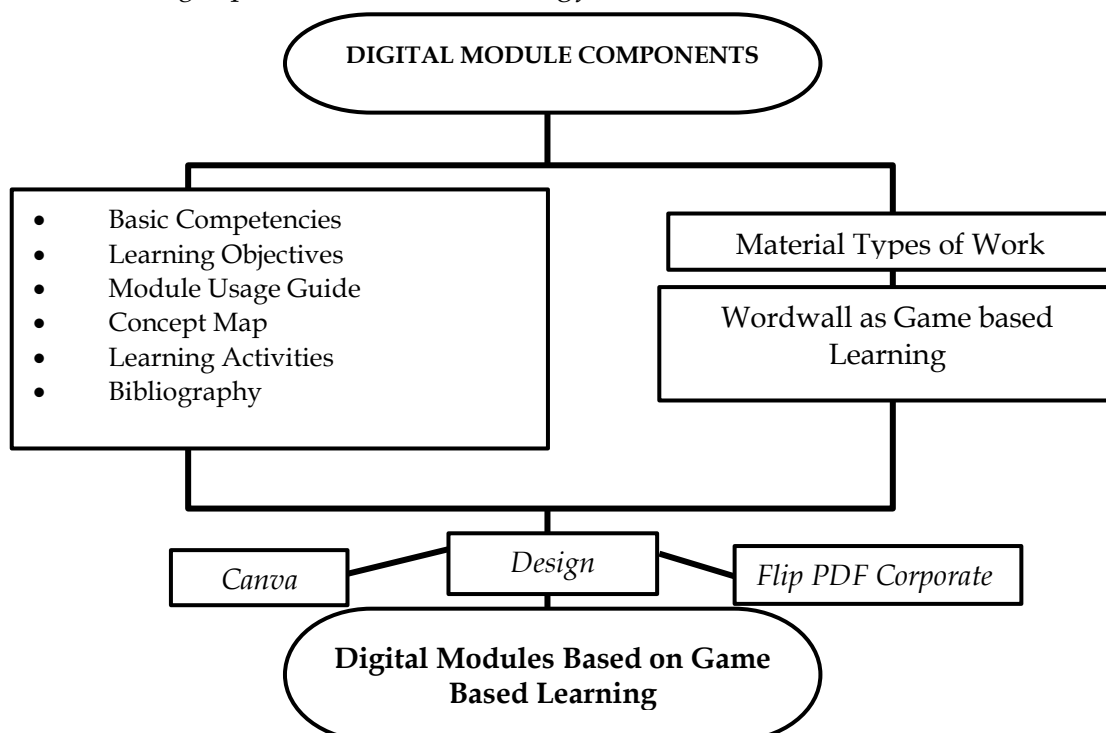


Figure 11 Module Design Flow

Based on the *flowchart*, it can be translated into *mind mapping* as the initial design design, while the initial design is as follows:

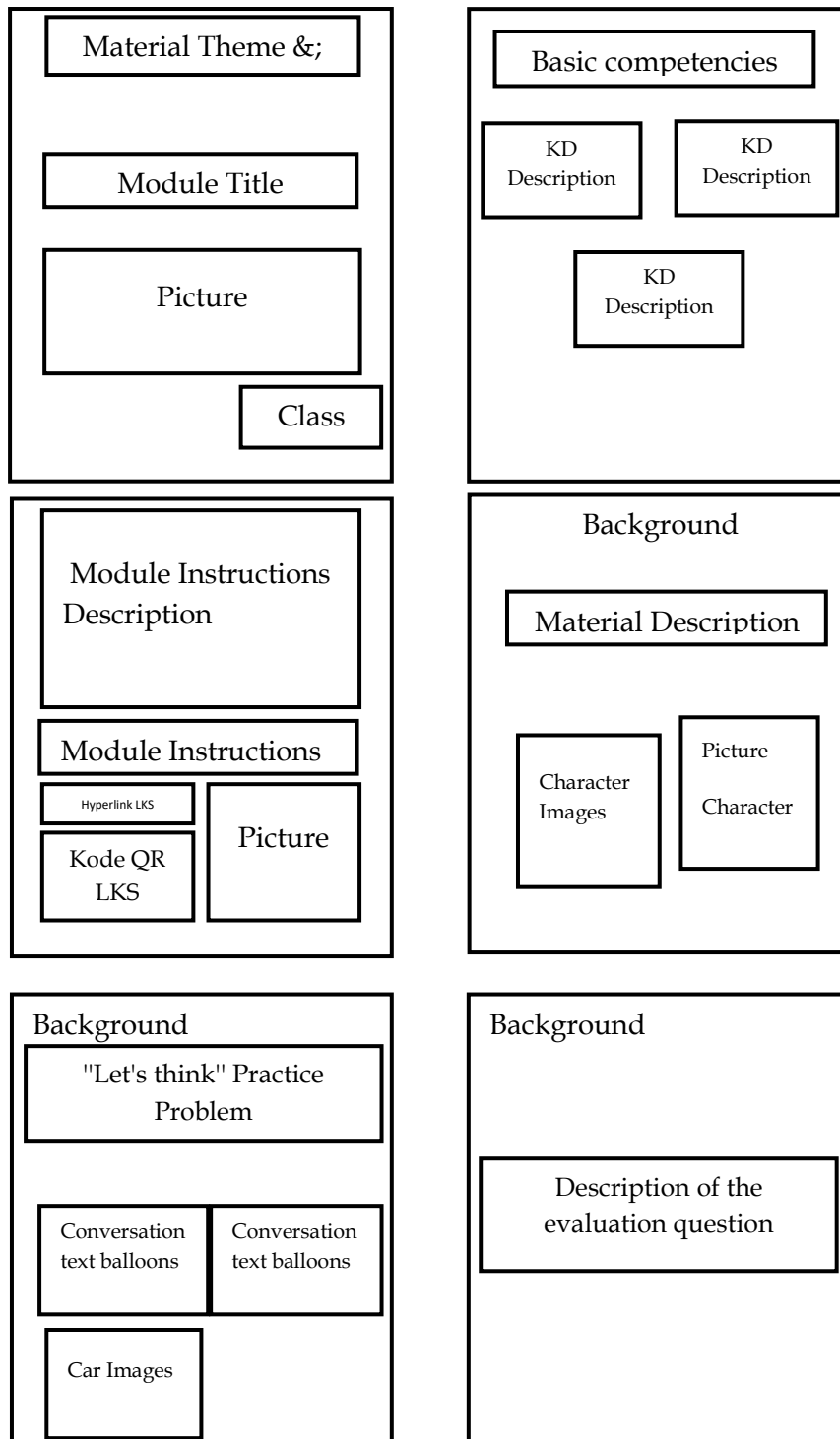


Figure 12 Module Design

c. *Development Results*

The development stage is to realise the design made and validate the product design results.

- 1) At this stage of writing a *draft* learning module that has been designed and based on module components, the learning module is developed into a digital teaching material based on game-based learning. The results of the module *draft* design are as follows:



Figure 13 Cover Design module, KD material, Learning Objectives.



Figure 14 Module usage guidelines and material description.

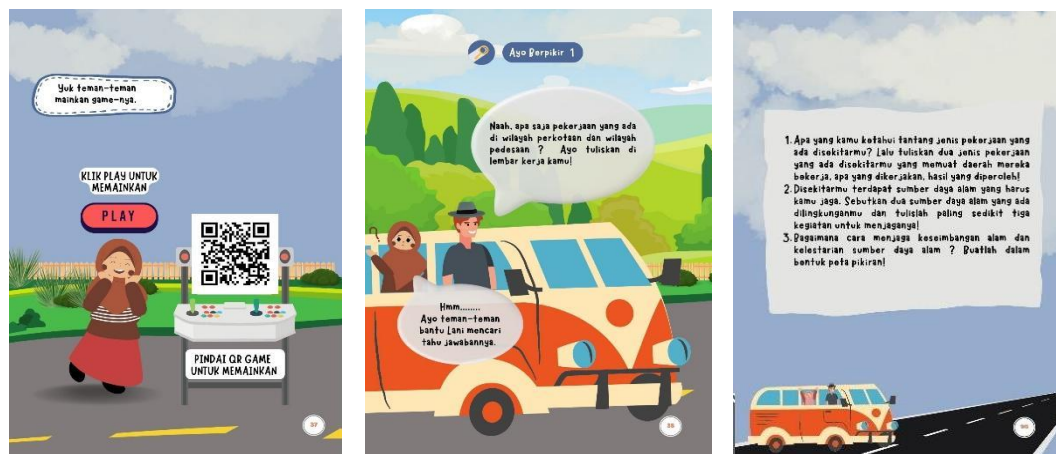


Figure 15 Game links, practice questions, and evaluations

- 2) The results of product validation tests by three experts, namely material experts, media experts, and design experts, as follows:

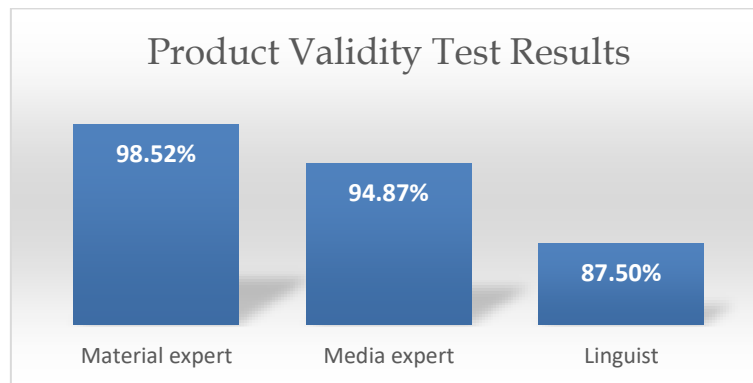


Figure 16 Module Practicality Test Results Graph

Based on the graph, the validation results of the three product validation experts are 98.52% material with "Very Valid" criteria, 94.87% media expert scores with "Very Valid" criteria, and 87.50% value from linguists with "Very Valid" criteria. Based on the results of validity tests by three experts, *game-based learning* digital module teaching materials have a total percentage of 94.87% scores with valid criteria for use in schools.

4. Implementation Results

The implementation phase is carried out in practical trials. In the trial process, researchers collected data using questionnaires distributed to students and interviews were conducted with teachers after using digital modules based on *game-based learning*. The results of the practicality test are as follows:

Indicator	Number of Scores	Max Score	Result %	Criterion
Digital module				
1. <i>SelfInstructional</i> • Presentation of material concepts based on learning experiences • Engaging, Meaningful and Challenging. • Interactive and illustrative • Relevant and Contextual • Sustainable	907	1040	87,21%	Very Practical
2. <i>SelfContained</i>	90	104	86,53%	Very Practical
3. Adaptive to the development of science and technology and flexible in its use	233	312	74,67%	Practical
4. <i>User Friendly</i> (Easy to use).	82	104	78,84%	Practical
Game-based learning				
1. Suitability of the Game to learning objectives	93	104	89,42%	Very Practical
2. The use of games in learning	368	416	88,46%	Very Practical

3. Influence on student learning motivation.	79	104	75,96%	Practical
Total	1.852	2184	84,79%	Very Practical

Based on the data on the percentage of student responses to the practicality questionnaire in the first indicator of the practicality of the digital module, the *self-instructional* section obtained 87.21% results, including very practical criteria. The second indicator, self-contained, obtained a result of 86.53% and was included in the practical criteria. The third indicator, namely, Adaptive to the development of science and technology and flexible use, obtained a result of 74.67% and was included in practical criteria. The fourth indicator, *User Friendly* (easy to use), obtained a result of 78.84% and included practical criteria. The next indicator, namely in the *game-based* learning section, the first indicator, namely the suitability of the *game* with learning objectives, obtained 89.42% results and was included in very practical criteria. The second indicator obtained a result of 88.46%. It was included in the very practical criteria, and the third indicator on the influence on student learning motivation obtained a result of 75.96% included in the practical criteria. Based on the results obtained on each indicator then accumulated to get an average of 84.79% with very practical criteria in this case that students use the module very practically.

The results of the interview conducted with MI grade IV teacher Datok Sulaiman Palopo as a supporter of student questionnaire data are as follows:

"The module you made is interesting and good, especially the content of the module has a clear picture, unlike books that students usually use, only photocopies and the material is easy to understand by students, especially your module has games in it and children like that games and related to the ease of using modules and accessing games are easy, especially if students now know more about cellphone problems but the shortcomings of this module can only be accessed if they have data and the network is good, and the module is feasible and practical"

Based on the results of interviews conducted with teachers, the researchers concluded that *the game-based learning* digital module that the researchers developed was feasible.

4. Discussion

In Research and Development conducted by researchers and based on the development model used, namely the ADDIE model (Analyze. Design. Development. Implementation, Evaluation), researchers follow the flow of the development model. The analysis stage is to determine and analyse the needs of a teaching material to be developed, namely the digital learning module. Based on the needs analysis results, researchers concluded that the learning resources of students in class IV MI Datok Sulaiman only use photocopied thematic package books. Hence, students need companion books, namely digital modules and illustrative books (colour and pictures). In addition, learners love a book with clear instructions for use and the concept of learning by playing.

The next analysis is the student's learning style, learning time, learning comfort, the ability to remember the material, and the ability to understand the material. In students' learning styles, varied answers were found as in the data described by researchers. After knowing the needs analysis, the researcher has a basis for formulating the concept of design to develop digital module products based on game-based learning so that they can be used by teachers and students independently that are relevant to the learning experience and needs of students.

In the design stage (design), researchers design the module concept based on the needs analysis results. The developed module design has bright colours and clear and directed images

according to the material. The images in a book aim to clarify the purpose of the material so that it is not too verbal and adds to the interest, which in this case is adjusted to the cognitive level that can increase the interest and motivation of learning students. The illustrations contained in a book aim to clarify the purpose of the material and also not too verbal, which in this case is by the age range (7-9 years), including in the concrete phase that requires a book that is clearly illustrated so that it can add to the attractiveness which in this case is adjusted to the cognitive level that can increase the interest and motivation of learning students (Tamami, 2020). Furthermore, designing the module concept, namely learning while playing by choosing word wall. This website-based game is accessed digitally and as game-based learning in the module. Wordwall educational games are one type of learning media in the form of quiz games that have an interesting and varied appearance that can be made based on the material that will be used as a quiz so that it can increase student understanding (Restu et al., 2023). Then, researchers collect material on the types of work from books and the internet with material content, namely IPA, Indonesian, and IPS. The presentation of the material is elaborated thematically and follows the module components with the concept of a travel storyline that presents two main characters, namely, Father and Lani".

After going through the module design stage, the next step is the development stage (implementation) this stage, the researcher compiles a module draft based on the design that has been prepared. While preparing the module, researchers used Canva Education to compile and design the layout and type of font used. Furthermore, researchers use the Wordwall game and make quizzes according to basic competencies, then create game links and enter them into modules to become hyperlinks. After the preparation of the module is complete, researchers use the Flip PDF Corporate application to make a PDF file look like a digital book accessed via a link. Then, the module draft is validated by several experts to test the feasibility of the learning module developed before implementation. The validation results are based on indicators with a rating scale of 1-4 on material experts obtaining an assessment percentage of 98.52% with the criteria "Very Valid", media experts obtaining an assessment percentage of 94.64% with the criteria "Very Valid", linguists obtaining a percentage of assessment 87.5% with criteria "very valid". The results of the scores of each expert averaged to get a value of 94.87% with the criterion "very valid". Through this validation process, there are several improvements so that they get the criteria of "very valid" and can be tested.

The implementation stage is the product trial stage, based on the third problem formulation, namely how the practicality of the learning modules developed. The results of practical trials on game-based learning-based digital modules through questionnaires given to students obtained 84.79% results with the criterion of "very practical" The results of practicality were also supported by the results of teacher interviews, which stated that game-based learning-based digital modules could be used easily or practically and interestingly.

Game-based learning-based digital modules on the types of work that have gone through the development stages so that they can be used or tested for students and teachers. In the results of the stages described by the researcher, the learning module can be used independently; this is by the characteristics of the module and can increase the interest and motivation of students as well as the needs of students. Then add to the learning experience of students by using this technology to fulfil or implement a vision of MI Datok Sulaiman Palopo, which is to become a leading Islamic institution, superior in faith formation, taqwa and akhlakul karimah and competitive in science and technology.

5. Conclusion

The development process uses the ADDIE development model, namely: (1) Analyze stage, which contains information about student needs for teaching materials; (2) Design Stage, which contains game-based learning digital module design; (3) Development stage, the development process is the preparation of module drafts based on design and information about expert assessments of game-based learning digital module teaching materials in class IV MI Datok Sulaiman Palopo.

The feasibility or validity of the module can be seen from the validity test conducted by several experts or experts. As for the assessment results, some experts declared the results declared very valid. This is evidenced by the calculation of the value of the material expert 98.52% with the criteria "Very Valid", the value of the media expert 94.64% with the criteria "Very Valid", the value of the linguist 87.50% with the criterion "Very Valid".

The practicality of developing teaching materials certainly has a positive impact on students and teachers and for further learning. The results obtained from the practicality test of teaching materials for digital-based learning modules are 84.79%. These results show that the teaching materials for game-based learning-based digital modules are considered very practical.

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