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Development of Meaningful and Fun Learning with a Gamification-Based GI Model for Primary School Students

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Abstract: Meaningful learning is when students are actively and constructively involved and the role of students is dominant in every series of learning. Therefore, in order for students to truly carry out their role as the center of learning, learning must be fun and not boring. This study developed a learning design with an integration between the Group Investigation (GI) model and the Gamification approach. The purpose of the study was to produce a learning design (teaching module) on the material of grade V Elementary School in the subject of science with the topic "Human Blood Circulation" that is valid, interesting and practical to be used in creating meaningful and enjoyable learning for students. The learning device development model in this study is the 4-D model with the stages of Define, Design, Develop, and Disseminate. For the practicality and effectiveness of the developed learning design, it was tested in the learning process by 5 elementary school teachers in Kupang City. Departing from the process and stages of development carried out, it can be concluded that the learning device developed by implementing the GI model based on gamification is valid, interesting, and practical and ready to be used in creating a meaningful and enjoyable learning process for students.

Keywords: Fun; Gamification; GI; Learning; Meaningful learning

Introduction

The implementation of learning is one of the most important parts in improving the quality of education. Varied learning with innovative designs certainly has a great opportunity to overcome the problems experienced so far. One form of the lack of development of learning quality is seen in the implementation of learning that still does not leave the habit of teachers as the center of learning with assignment activities that seem rigid and do not optimally develop the abilities of students. Such learning can be said to be meaningless learning for students. It is very important for teachers to strive for the presence of meaningful and enjoyable learning for students. Meaningful learning allows students to remember the information and material received to be much stronger and last longer (Marlina et al., 2022). Meaningful learning is a learning concept put forward by Kwangmuang et al. (2021), namely learning that trains students to have the ability to connect the knowledge and abilities they have with new information that is always found in the learning process. Meaningful learning is when students are actively and constructively involved and the role of students is dominant in each series of learning. Therefore, in order for students to truly carry out their role as the center of learning, learning must be fun and not boring.

The principles of meaningful learning for students are, Information, materials and concepts learned by students in the learning process must be relevant to what

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they experience in everyday life, especially related to real problems experienced, Students as the center of learning, which means that the active role of students must be accommodated in the learning design that is made, The role of the teacher as a facilitator who strives for students to be able to carry out learning activities, for example by directing students to be involved in interactions and collaborative activities in any form with groups by providing introductory questions, Providing exercises that can lead students to evaluate what has been learned and implemented in the learning process, learning resources need to be provided that can be used as references when students collect information and learn independently. Teachers have an important role and are the main actors in bringing renewal to the implementation of learning. Teachers can present learning that is in accordance with needs based on the material, competencies to be achieved and student characteristics. All learning designs that are part of teacher creativity are expressed and poured into devices that contain several components in them, namely learning devices.

The design of learning devices is very important because it is a guideline as well as a tool that helps teachers to create meaningful learning for students. The design of learning devices is an action taken by teachers in accommodating the learning process and various activities that will be carried out by students that lead to the achievement of goals and competencies that need to be mastered. The success of learning is largely determined by the readiness of the design or design of learning devices made by teachers (Mahlianurrahman, 2020). Learning devices that contain complete components related to plans and other supporting materials in learning in their curriculum are called teaching modules. Teaching modules consist of several items in them, namely, General information consisting of school identity (Verhoeven et al., 2019) subject identity or theme; class/semester; main material; time allocation; learning objectives; initial competencies; Pancasila Student Profile; learning facilities and infrastructure; student targets, Core Components consisting of: Learning Achievements and Learning Objectives; Learning models, approaches, methods and media; Meaningful understanding; trigger questions; Learning Activities; Assessment; Enrichment and Remedial; student and teacher reflections. Student worksheets; Teacher and student reading materials; Glossary and Bibliography (Maulida, 2022).

If we examine further the learning devices, of course, it cannot be separated from the components integrated in them, some of which are learning models and approaches. In line with the importance of learning devices, the learning model applied will lead to how learning trains and develops the competencies possessed by students in accordance with learning objectives. A learning model is a form of concept and design that is prepared to execute a learning activity with various patterns and core activities in it with certain privileges and is related to the use of supporting facilities such as the learning environment, learning resources, use of technology and the main one is guided by the applicable curriculum. The function of the model chosen and applied in learning is the main guideline that becomes the benchmark for the direction and implementation of learning activities.

The model chosen is always attempted in accordance with the goals and competencies to be achieved, supporting facilities and infrastructure, learning concepts or materials, and student abilities or development. In addition to the model, the approach used by the teacher also plays a part in striving for the success of the learning process. learning approach is an act of accommodating a learning activity that results in the creation of a certain interpretation of the learning process. The approach is also interpreted as a view that is applied in actions or steps that seek to achieve a goal. So that the approach in learning can be said to be a framework of views that are expressed in the form of a learning design as an action to present maximum learning in order to achieve goals. Models and approaches are often not considered important in the implementation of learning by teachers. In fact, with the accuracy of the selection and application of models and learning approaches, it can lead students to achieve instructional impacts such as understanding concepts and materials, but also achieving accompanying impacts such as student attitudes and skills.

One of the most effective learning models and approaches that can be the right choice is the Group Investigation (GI) model or group investigation and the Gamification learning approach. The GI model is defined as a model that creates learning activities with the main focus being the activeness of students in various activities, such as searching for and finding information related to concepts that must be learned from sources available around students (Sailer et al., 2021). This model is able to train students to have 21st century skills that are very necessary to be able to compete to meet future challenges, such as critical thinking, creativity, communication and cooperation competencies. GI type cooperative learning or group investigation is one model that presents investigation activities with the aim of making students have a level of development in critical thinking skills. In addition to investigations, the division of responsibilities and the formation of social interactions between students are the focus of this model (Eviyanti et al., 2020).

Adauyah & Aznam (2024) and Parker et al. (2022) stated that learning activities using the GI model go

through systematic stages of activities, namely presenting topics and grouping students, students preparing discussion plans and completing assignments, investigation activities, compiling investigation results in the form of reports, presentation of reports that have been prepared, and evaluation activities. These learning steps are adjusted to research needs without eliminating these activities from each stage and learning syntax so that they become (Hsiao et al., 2022): presentation of topics and formation of student groups; students preparing investigation plans and collecting information; students conducting investigations; compiling reports of investigation results; students conducting report presentations; evaluation activities. The GI model has advantages over other learning models, including being able to develop students' critical thinking and train their skills in conducting more complex research, student-centered learning so that students are truly active in forming their concepts and knowledge, improving skills to work together and collaborate with others, training critical, creative, and communicative skills, and getting students used to managing group activities (Christina & Kristin, 2016; Eskiyurt & Özkan, 2024; Le et al., 2018). Given the characteristics of students who are easily bored and quickly fed up when the learning process takes a long time with less enjoyable activities, especially when learning is carried out in elementary schools (Jasni et al., 2019). Therefore, it is very appropriate if the application of the GI model is combined with a gamification approach. The gamification approach is the application and adoption of game features or components to be included in certain fields outside the game with the aim of providing enthusiasm, motivation and interest (Koivisto & Hamari, 2019). The application of gamification learning is the right solution in providing enthusiasm and motivation and building interest in learning in students because the learning process does not seem boring (Suci et al., 2017). The use of a gamification approach can stimulate students to be more enthusiastic and motivated, both during learning activities and when conducting evaluations.

This gamification learning is often implemented through online applications and games, but of course this is not required if the supporting facilities are lacking. The essence of gamification learning is for students to feel motivated and have the enthusiasm to learn with the presence of games in learning activities (Rini et al., 2021). The adoption of gamification learning increases the interaction between teachers and students because information is presented in a different and more interesting way (Leon & Peña, 2022). Amriani et al. (2013) revealed that the elements in gamification learning include; Score, Badges, Leaderboard, Nicknames or designations, Presentation of completion paths. Not all of these elements will be adopted and applied in the preparation and development of this learning tool. The design of this learning tool will adopt only a few gamification elements or features, namely scores, badges and rankings. The games or challenges and features implemented are also not digital, but traditional because they adapt to conditions and situations in the field, namely that students are no longer allowed to bring cellphones to school at this time. Traditional games or challenges are able to train to improve motor skills and help participants become more unified (Jafar et al., 2023).

Method

This study uses a development method with a 4-D model. According to Moshood et al. (2022), the development research method is a research implementation mechanism that attempts to design and produce a product to overcome a problem that has been tested through testing its effectiveness. The product produced in this study is a learning device with a gamification-based GI model developed with a 4-D development model. The procedures and stages of development can be seen in the following diagram.

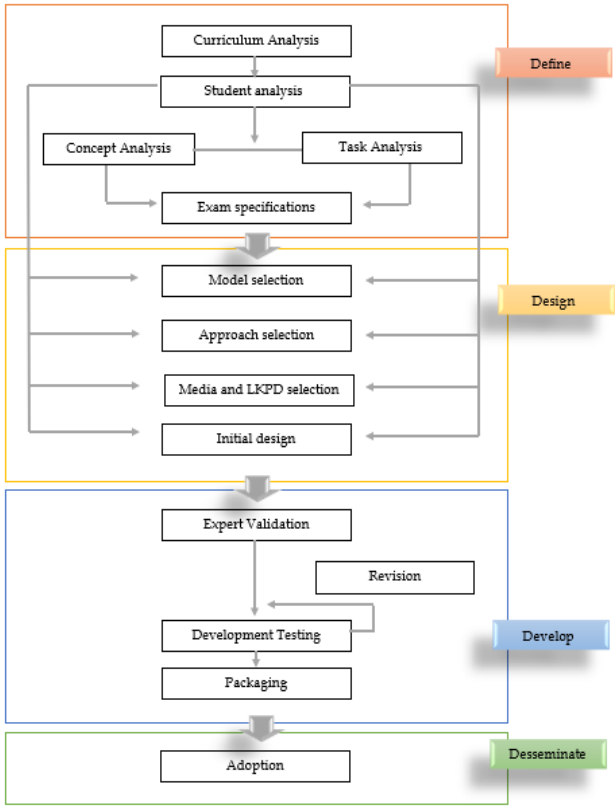


Figure 1. Procedure for developing learning design GI based on gamification with 4-D development model

Result and Discussion

Validity of Learning Devices

This study developed a product that is expected to overcome learning that is considered too monotonous with conventional learning models and methods so that it does not provide meaningful experiences for students. The product developed in this study is a learning device that integrates the Group Investigation learning model with the Gamification approach. Investigation with systematic and scientific learning stages combined with a gamification approach that includes game features into learning is believed to be able to provide a fun experience for students in learning. The learning device that has been developed through a validation process by validators who are considered to have expertise in accordance with the knowledge needed. The validators selected were two people, namely an elementary school learning expert and an elementary school curriculum expert. Suggestions, criticisms and input were obtained during the validation process which were certainly very useful for improving the quality of the learning device developed. The validation results by the validators can be seen in Table 1.

Table 1. Science module validation results

Aspects reviewed	Values given by Validator		Average
	I	II	
Content Eligibility	4	4	3
Coverage and depth of the main material according to CP and TP	4	4	4
Content accuracy (facts, concepts, theories, and principles/laws)	3	3	3
The contents of the teaching module are in accordance with curriculum demands and are in line with developments in knowledge and technology	4	3	4
The selected models, approaches, methods and strategies are appropriate and in accordance with the material	3	3	3
The designed assessment is able to measure the conditions and abilities of students according to learning objectives	4	4	3
LKPD is able to direct students according to the learning model	4	4	4
Reading materials contain complete information related to the material	4	4	3
Average	3.57	3.42	3.49
Presentation	4	4	4
Systematic presentation of teaching module content	4	4	3
Balance of each component of the teaching module (General information, core components and attachments)	4	3	3
Presentation of each aspect in the teaching module	4	4	4
Accuracy of the use of attractive letters	4	4	4
LKPD and Teaching Material Design	4	4	4
Average	3.80	3.60	3.70
Language and Readability	4	4	4
The language used is in accordance with the rules and easy to understand	4	4	4
The material in the LKPD and reading materials are presented in an interesting language	4	4	4
The language used can motivate students to learn	4	4	4
The terms used are appropriate and in accordance with the intended meaning	4	4	4
The arrangement, size and type of letters used allow for good reading	4	4	4
Average	4	4	4

Table 2. Results before and after improving the teaching module with the gamification-based GI model

Before Repair	After Repair
Initial competencies need to be simplified again	Initial competencies are the abilities to support the achievement of learning objectives.
Student targets are more refined	The target of students has been sharpened and is directed towards the implementation of differentiated learning.
The learning steps are more detailed and in accordance with the gamification syntax and approach	Each step is detailed with activities that support the investigation and is wrapped in game features.

The Appeal of Science Modules Based on Local Culture

The appeal of a product is certainly a very important aspect, including for learning devices in this case teaching modules, especially in the LKPD components and reading materials that will be a guide for students to help them in carrying out the learning process. Appeal is believed to be able to increase

enthusiasm and motivation in using products to help achieve the goals of the learning process. To find out the appeal of the Teaching Module including LKPD and Reading Materials accommodated in it, data collection was carried out on the responses of elementary school teachers and students through a questionnaire related to the appeal of the module. The results of the appeal are shown in Table 3.

Based on Table 3, it is known that the aspect of the letters used in the Teaching Module is interesting and easy to read, the combination of colors of the cover design and the contents of the Teaching Module is interesting, the design of LKPD and Reading Materials in the Teaching Module uses modern graphics, the layout of the writing and images has been designed neatly and precisely, the illustrations or images in the Teaching Module are easy to understand and emphasize the description, and the shape, color, size and proportion of the image object are designed according to reality. The final average score that stated it was interesting was 93.2, while those that stated it was not interesting were 6.8. With this average score, it can be concluded that the GI Learning Module based on gamification is stated to be interesting.

Table 3. The appeal of science modules based on local culture

Questions	Choice	Amount	Percentage (%)
The font used in the teaching module	Interesting	32	100
	Not attractive	0	0
The combination of colors of the cover design and the contents of the teaching module	Interesting	25	78.10
	Not attractive	7	21.90
The design of the LKPD and reading materials uses modern graphics	Interesting	28	87.50
	Not attractive	4	12.50
The layout of the writing and images has been designed neatly and precisely	Interesting	32	100
The illustrations or images in the teaching module are easy to understand and emphasize the description	Not attractive	0	0
The shape, color, size and proportion of the image objects are designed according to reality	Interesting	30	93.75
	Not attractive	2	6.25

Practicality of Science Module Based on Local Culture

In addition to the validity test, the science learning module also needs to go through a practicality test stage by collecting information from users of the teaching module, namely teachers and students as learning subjects. Data collection on the practicality of using the GI Learning Module based on gamification was carried out by filling out a questionnaire after the trial learning process using the teaching module. The practicality indicators of module usage consist of efficiency of use, sequence of stages in the module and ease of use. The data from the results of filling out the practicality questionnaire/survey can be seen in the Table 4.

Table 4. Results of data processing the practicality of the local culture-based science module

Practical Aspects	Total score	Average (%)
Efficiency	40	80
Collapse	45	90
Convenience	38	76
Average		82

The results of filling in and processing the questionnaire data filled out by teachers and students illustrate the percentage of efficiency aspects of 80%, consistency aspects of 90%, and ease aspects of 76%. The average total percentage of the three aspects is 82%. With a total average of 82%, it can be stated that the gamification-based GI Teaching Module is practical for use in the learning process.

Discussion

The process of developing gamification-based GI learning devices in this study was carried out in four main stages, namely defining (Define), designing (Design), developing (Develop), and disseminating (Disseminate). The defining stage begins with an analysis of the curriculum (Habibi & Herayanti, 2017). Analysis of the curriculum that applies to educational units in Indonesia, especially at the elementary school level, was carried out to determine the guidelines for learning designs that will be developed by researchers. Learning in the independent curriculum emphasizes learning that is in favor of students, in this case accommodating the learning needs and differences in student potential according to their respective levels of development. The independent curriculum learning design is known as a teaching module (Hasibuan et al., 2023). An integrated learning design is needed that has continuity between each aspect of its composition.

The choice of models, methods, approaches and innovative strategies is inseparable from the learning design so that it is expected to provide meaningful experiences for students in the learning process. Meaningful and enjoyable learning for students certainly has a picture and characteristics that are oriented towards efforts to achieve learning goals. Characteristics of meaningful learning include: Information, materials and concepts learned by students in the learning process must be relevant to what they experience in everyday life, especially related to real problems experienced, Students as the center of learning, which means that the active role of students must be accommodated in the learning design made, The role of the teacher as a facilitator who strives for students to be able to carry out learning activities, for example by directing students to be involved in interactions and collaborative activities in any form with groups by providing introductory questions, Providing exercises that can lead students to evaluate what has been learned and implemented in the learning process, Availability of learning resources that can be used as references when students collect information and learn independently (Haleem et al., 2022; Najib & Elhefni, 2016).

In addition to the analysis of the curriculum, analysis was also carried out on the characteristics of students. Researchers through observation and exploration of sources and previous studies found that students, especially at the elementary school level, have not been maximally trained and accustomed to developing the abilities and competencies that are important to have in facing challenges and competition in the future, such as communication, cooperation, creativity and critical thinking skills or what is often called 21st century intelligence (Nabilah & Jumadi, 2022). This problem is a problem experienced by almost all students at every level of education, one of which is at the elementary school level which acts as a foundation for the next level of education. Special attention and strategies are needed to reduce problems, one of which is by presenting innovative learning that needs to be prepared as much as possible, especially starting from the design of the learning devices made. Other analyzes carried out by researchers include concept analysis and assignments.

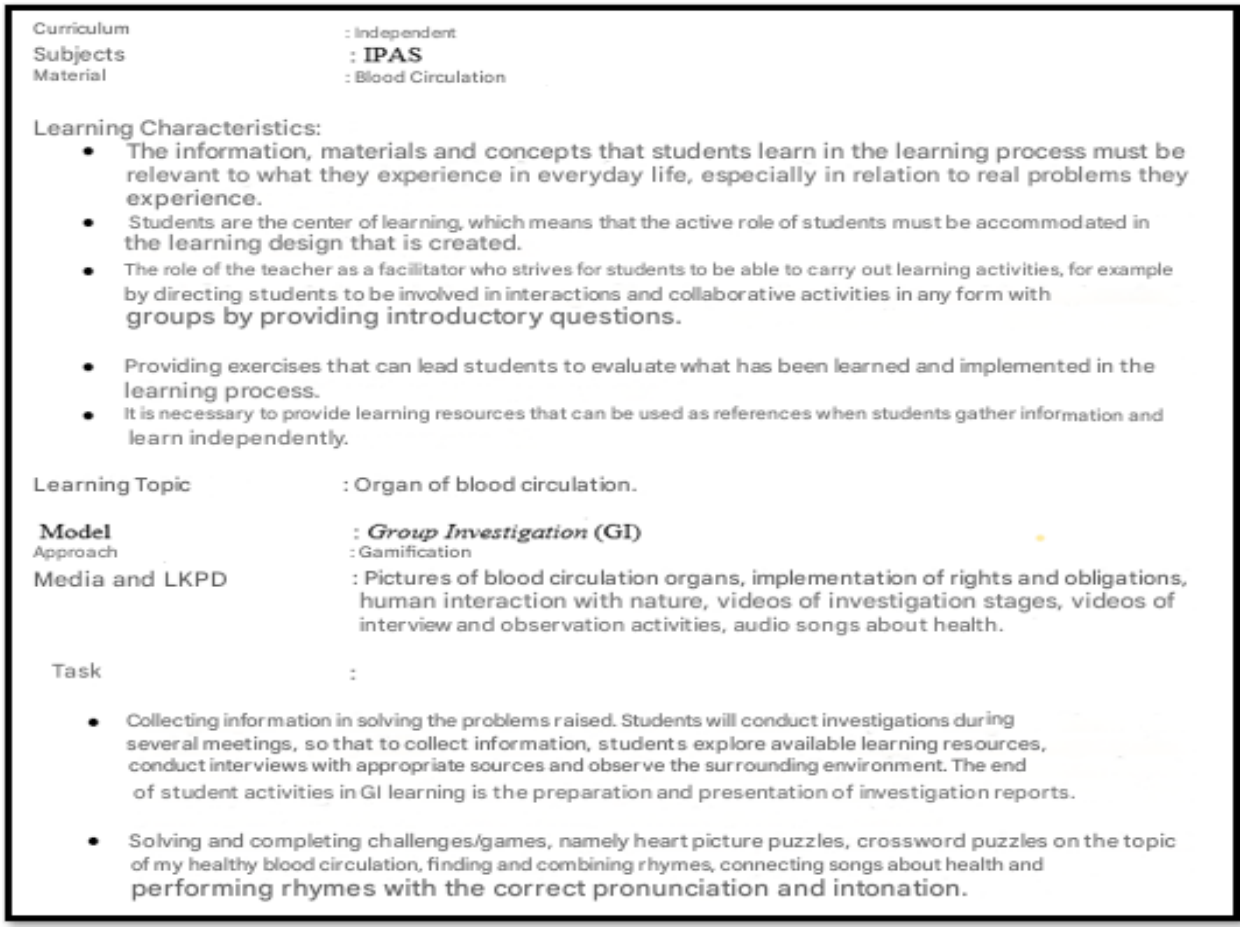
The learning design prepared by the teacher certainly needs to be adjusted to the right concept and material to be taught, because one of the important things that teachers need to consider in designing learning tools is the suitability of the design and strategy taken with the material being taught and the expected competencies. The material "Human Blood Circulation" was chosen as the research material with the main topic being the circulatory organs, rights and obligations, human interaction with nature, pantu and musical scales. It was found that there were still many students who did not understand and master the material and concept of circulation well, even though this topic is very important because it is relevant to the lifestyle of students. This material was chosen because so many health problems and issues still occur due to behavior that does not pay attention to healthy lifestyles, especially those that are still bad habits of students today.

Thus, with this learning activity, students will develop more love for themselves, sensitivity and awareness of the importance of health and positive thinking about the methods, solutions and actions that can be taken to maintain the health of the body, especially blood circulation. The steps designed in the teaching module that will be implemented are adjusted to the achievements and objectives of learning and the topics of discussion in the material. Assignments given in the learning process are designed according to the concepts to be taught and the goals to be achieved. The assignment design that is prepared leads to the formation of concepts and mastery of the material by students. In addition, the tasks that must be done by students also train them to develop their competencies such as communication, cooperation, creativity, critical thinking and problem solving. All competencies possessed by students can be trained and developed through activities to collect information, process and analyze it, and draw conclusions as a form of solution to solving problems according to the material.

The final step in the definition process is designing the objective specifications (Purwasi & Fitriyana, 2020). Objectives need to be formulated as a guideline for designing and implementing learning. The framework and learning steps must lead to achieving the learning objectives that have been formulated. The main objective in the learning tools designed in this study focuses on mastering the material and forming concepts, as well as accommodating the implementation of learning that provides meaningful experiences for students. After the definition stage is completed, the next stage is design (Asmiyunda et al., 2018). The design stage in this study includes the stages of selecting models, approaches, media and completing the initial design. The design stage which includes several steps is very important to always be guided by the initial analysis, namely that students get fun, meaningful learning and lead to the achievement of the expected competencies. To train students in developing their competencies, providing meaningful experiences for students and instilling concepts and learning materials can be done by taking several strategies, one of which is implementing a learning model.

The learning design in this teaching module is the Group Investigation model. This model was chosen because this model has been proven effective in improving the competencies expected to be possessed by students. The investigation which is the core activity in this model raises assignments that are the responsibility of students to collect information in solving the problems raised. Students will carry out investigations for several meetings, so that to collect information, students explore available learning resources, conduct interviews with appropriate sources and observe the surrounding environment the end of student activities in GI learning is in the form of compiling and presenting investigation reports (Nisa et al., 2020; Pedaste et al., 2015). The characteristics of student learning in elementary schools tend to prefer learning that is not tense but fun with a learning while playing system. Based on this fact, it is necessary to design innovative learning tools, one of which is by combining the GI model and the gamification approach so that students can explore and develop their competencies and be more enthusiastic and motivated to follow the learning process.

The presence of gamification can also be used as a form of activity that leads students to master concepts but seems more fun because it is wrapped in a game design but still related to the learning material. Based on the concept and material of "Human Blood Circulation", the form of gamification is in the form of challenges and games, namely heart picture puzzles, crossword puzzles on blood circulation material, and connecting pantuns about the benefits of blood circulation organs. In addition to the form of games and challenges, game features such as levels, points, badges and leaderboards are also presented. This game feature is given to the winner of the game and challenge given but also for certain aspects, for example the most orderly, compact, brave, disciplined and confident group. So that the learning atmosphere will be more enjoyable. After selecting the model and approach, the next step is to select media to increase the effectiveness of learning by implementing the learning tools that have been prepared. Learning media are adjusted to the steps and characteristics of the gamification-based GI learning model, for example, pictures of blood circulation organs, videos of investigation stages, videos of interview and observation activities, and audio songs about health.



Curriculum : Independent
Subjects : **IPAS**
Material : Blood Circulation

Learning Characteristics:

- The information, materials and concepts that students learn in the learning process must be relevant to what they experience in everyday life, especially in relation to real problems they experience.
- Students are the center of learning, which means that the active role of students must be accommodated in the learning design that is created.
- The role of the teacher as a facilitator who strives for students to be able to carry out learning activities, for example by directing students to be involved in interactions and collaborative activities in any form with groups by providing introductory questions.
- Providing exercises that can lead students to evaluate what has been learned and implemented in the learning process.
- It is necessary to provide learning resources that can be used as references when students gather information and learn independently.

Learning Topic : Organ of blood circulation.

Model : ***Group Investigation*** **(GI)**
Approach : Gamification
Media and LKPD : Pictures of blood circulation organs, implementation of rights and obligations, human interaction with nature, videos of investigation stages, videos of interview and observation activities, audio songs about health.

Task :

- Collecting information in solving the problems raised. Students will conduct investigations during several meetings, so that to collect information, students explore available learning resources, conduct interviews with appropriate sources and observe the surrounding environment. The end of student activities in GI learning is the preparation and presentation of investigation reports.
- Solving and completing challenges/games, namely heart picture puzzles, crossword puzzles on the topic of my healthy blood circulation, finding and combining rhymes, connecting songs about health and performing rhymes with the correct pronunciation and intonation.

Figure 2. Initial design of learning implementation

The presence of student worksheets (LKPD) is very important as a guide for students in the learning process and as a guide for implementing activities that must be carried out by students (Ramayani et al., 2024; Chalsum et al., 2023). By using and following the directions in the LKPD, students can learn independently with various resources available around them. LKPD is also prepared based on learning achievements and objectives, as well as learning steps with the gamification-based GI model with the aim that the contents of the LKPD and the activities in it are in sync with the learning design that has been made. The stages that have been passed, namely starting from the definition stage (curriculum analysis, students, concepts and assignments) to design (selection of models, approaches, media and LKPD) will be combined into a unified learning design so that learning conditions will be very optimal and systematically arranged. The initial learning design has described the activities and each stage and various devices that support the implementation of the learning process. The initial learning design with the GI model based on gamification is shown in Figure 2.

After the initial design of the learning process has been completed, it is continued with the development stage (Tegeh et al., 2019; Harjanto et al., 2023). At this development stage, the product in the form of a learning design goes through the Expert Validation, Development Test and Packaging stages. Expert validity is carried out by submitting the developed product to the validator. Validators are selected based on their expertise and field of expertise as well as their willingness to carry out the validation process. Two validators were selected, namely an elementary school learning expert and an elementary school curriculum expert. There are three aspects that are assessed, namely the feasibility of the content obtained an average score of 3.49 with a very good category, the presentation obtained an average of 3.7 with a very good category, and the language and readability obtained an average of 4 with a very good category. Based on these results, it can be said that the GI learning device (teaching module) based on gamification is declared feasible with minor revisions according to the improvement notes that have been given. Some examples of notes and input received as revision materials are that initial competencies need to be simplified again, student targets are sharpened, and learning steps are more detailed and in accordance with the syntax and gamification approach. The teaching module that has been revised and declared valid by the validator then goes through a development test, namely by testing and implementing the design of the learning device before it is actually used in the learning process (Utomo & Ratnawati, 2018; Fütterer et al., 2023).

The development trial was carried out at one of the schools in Kupang City, NTT Province. The basis for selecting the school was because of the high quality standards of the school with adequate teacher competence so that the researcher considered that there would be a lot of positive feedback on the quality of the learning device that had been developed. The learning device was tested in class V with 27 students. It was seen that all students could be stimulated to be active in the learning process through information gathering activities, investigation activities and solving challenges by students. This condition makes the classroom atmosphere fun because of the presence of game features and challenges that make students try to compete. In addition to being fun, mastery of the material according to the expectations and goals that were previously designed can also be achieved through the learning process. Learning devices also receive revisions, notes and improvements based on trial results according to real conditions in the field (Darling-Hammond et al., 2020; Zamiri & Esmaeili, 2024), such as the use of language adapted to elementary school students, allocation of learning time, rearrangement of LKPD, and planning and rearrangement of investigation and game activities, as well as assessment activities that need to be readjusted so that the forms of assessment can be realized properly. The development trial was carried out with the aim of finding and revising the shortcomings of the learning device design so that it is truly ready for use (Wynn & Clarkson, 2018; Dwivedi et al., 2023). The development of this learning device after going through trials and implementation ends with the packaging stage.

At this Packaging stage, the design of the teaching module has been declared truly ready for use. The module design is printed ready to be implemented. The development stage ends with the dissemination process, namely learning tools that have gone through the process of definition, design, and development and have been declared suitable for use can be adopted and implemented in the learning process to instill concepts or learning materials and train and develop the expected competencies in students, especially in learning in class V with the material "Human Blood Circulation".

Conclusion

Based on the development process and stages carried out, it can be concluded that the learning device developed by implementing the GI model based on gamification is valid, interesting, and practical and ready to be used in creating a meaningful and enjoyable learning process for students, which can be stated based on the validation results by validators who have expertise and expertise in their fields, namely Elementary School Learning and Curriculum experts.

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Conceptualization, A.N.K.; methodology, formal analysis, investigation, writing—review and editing and visualization, T.E.S.; resources, data curation, and writing—preparation of the original draft, G.J.L.K. All authors have read and approved the published version of the manuscript.

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The process of designing the study; collecting, analyzing, or interpreting data; writing the manuscript; and in the decision to publish the results of the collaboration and joint decision of the research team and authors.

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