



Development of teaching modules using the Gasing method to improve student learning outcomes in independent curriculum learning in elementary schools

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Abstract

This study aims to develop a mathematical teaching module with the gasing method in order to improve student learning outcomes in learning the independent curriculum in elementary school. This research is R&D (Research and Development) research using the ADDIE design. The formulation of the problem of this research includes the steps of making modules, module validity, module practicality, and module effectiveness. This product test includes small-scale tests and large-scale tests. In small-scale testing practical tests are carried out for students and teachers, and large-scale testing, the design of one group pretest posttest is used. The instruments used include expert validity questionnaires, student response questionnaires, summative test questions/assessment for effectiveness testing. The results showed that the validation value of material experts, teaching modules, and design showed the classification "very decent". In addition to the practicality of the teaching module through the teacher and student response questionnaire, the total results of the total assessment of aspects with the "very practical" classification. The results show that there is an increase in student learning outcomes after learning to use modules. The results of N-Gain calculations, increasing the ability of learning outcomes in "high" criteria. Thus, the teaching module is very feasible to be used in learning the free curriculum in elementary schools.

Keywords: Teaching modules, Gasing method, learning outcomes, independent curriculum

Introduction

Based on the fact that the world is currently experiencing very rapid and complex changes, which demand changes in the way we teach and learn. Technology, globalization, rapidly changing social and economic dynamics require a more adaptive and responsive educational approach.

21st century education offers a framework for teaching core skills such as problem solving, collaboration, critical thinking, creativity, and communication that are needed in today's world of work. The National Education Standards Agency (BSNP) describes the 21st century as an era of knowledge characterized by the wide dissemination of information and rapid technological progress. According to Karin and Daryanto (2017), one of the characteristics of the 21st century is the increasingly close relationship between different scientific disciplines, which results in faster synergy. So in response to this, both teachers and students must be able to improve their quality.

Realizing this phenomenon, the Ministry of Education and Culture has prepared new regulations for the world of education through efforts to improve the curriculum. Comprehensive curriculum refers to an understanding that includes all aspects of activities carried out by students and educators in the learning context. The concept of an independent curriculum allows teachers and students to develop themselves according to their characteristics. Implementation of the independent learning policy demands an important role for teachers in the curriculum development process and learning activities. Apart from being a learning resource, in the independent learning approach, the teacher's role is as a learning facilitator. Teachers play an important role in supporting the student

learning process by having professional, pedagogical, personality and social competencies. By having these competencies, teachers can carry out and achieve the goals of implementing the independent learning policy (Pendi: 2020).

Learning Mathematics is a subject that must be taught in elementary, middle and high school/Madrasah. According to Bruner, mathematics learning focuses on understanding the mathematical concepts and structures contained in the material being studied, as well as looking for relationships between mathematical concepts and structures (Hudoyo: 2000). According to Cobb in (Suherman: 2003), learning mathematics involves students actively in building mathematical knowledge. Basically mathematics does not only involve knowledge of numbers, but is more about students' thinking patterns, thus training students to solve problems in life.

In Permendikbud No. 033 of 2022 explains that mathematics is an essential field of knowledge in human life, which involves learning and logical thinking. Mathematics has an important role in the development of modern technology and contributes to various scientific disciplines. Apart from that, mathematics also has an important function in developing human thinking abilities. Mathematics is not only seen as learning material, but also as a tool to build and develop conceptual understanding and train the thinking skills needed to solve problems in everyday life. Learning mathematics can improve students' abilities in thinking logically, analytically, systematically, critically and creatively. These abilities are very important for students to be able to manage information, adapt to

change, deal with uncertainty, and compete in a competitive environment.

So the author concludes that mathematics is not just calculating numbers, but is more comprehensive and aims to hone students' thinking patterns so that they can achieve holistic intelligence. However, from another point of view, mathematics is considered to be a frightening specter not only for students but also for teachers. This is based on the results of observations and interviews in various regions of Indonesia before teaching mathematics. The teacher felt it was difficult because he admitted that he had tried his best to teach, but it turned out that the students' test results were low and did not reach the predetermined KKM. Meanwhile, students admitted that it was difficult to understand the material because mathematics was already considered the most difficult subject. This has influenced how teachers and students think about mathematics, because before working on questions or before teaching, both teachers and students are pessimistic, which affects the final results they get.

It can be seen from the average national numeracy value which is still low, namely 1.55, for North Sulawesi it is still below the minimum competency set, namely 1.47, likewise for Bitung City it is still below the national average, namely 1.51. This is certainly an evaluation material for all parties. Including for the Bitung City Government. The education sector is an important domain for the formation of quality human resources. So, through the Bitung City Education and Culture Service, they are implementing a program to improve Bitung City's numeracy skills in collaboration with the Indonesia Jaya Education Foundation, namely Gasing Mathematics Method Training.

Gasing Method, is an acronym for easy, fun and enjoyable, namely a mathematical method initiated and developed by Professor Yohanes Surya to reach educators and children in all corners of Indonesia. This method not only emphasizes learning outcomes, but also easy mathematical concepts, the learning process is fun because it is packed with games and student activities, and is fun because it is accompanied by movement and singing related to the material.

This activity was carried out in two stages and was attended by 330 teachers and 930 students in various Bitung city schools. In fact, this activity was recorded in the Indonesian Museum of Records (MURI) as the largest mathematics training activity. This activity is the hope of many parties to increase numeracy in the city of Bitung. After carrying out this activity, it is hoped that each teacher who has been trained will be able to carry out the impact at their home school, however, based on the author's observations as the assistant trainer coordinator for Gasing, Bitung City who was assigned to coordinate the implementation of the impact, many teachers are still having difficulties, the current obstacle is firstly, the implementation of the gasing method and its stages has not been included in the administration of intracurricular learning, secondly, the teachers who have taken part in the training admit that they no longer remember all the material provided in the gasing method stages, these three methods are still taught outside of study hours. Bearing in mind that the aim of implementing this method is to increase the numeracy scores of students in Bitung City, it is very necessary to have teaching tools that are able to accommodate the application of the gasing method in the concept of an independent curriculum so as to maximize the process of imparting gasing teachers to all students in Bitung City.

Thus, it is very necessary to create teaching products/modules that can be used to help teachers in teaching mathematics using the gasing method and to improve student learning outcomes, so that teachers have guidance to be able to teach mathematics concepts using the gasing method correctly and lead to increasing student numeracy. This research aims to determine the steps for preparing teaching modules using the gasing method to improve student learning outcomes in independent curriculum learning in elementary schools, to describe the validity of using teaching modules using the gasing method to improve student learning outcomes in independent curriculum learning in elementary schools, to describe the practicality of using modules teaching using the gasing method to improve student learning outcomes in independent curriculum learning in elementary schools, and to describe the effectiveness of using teaching modules using the gasing method to improve student learning outcomes in independent curriculum learning in elementary schools.

Method

This research uses research and development methods which aim to produce certain products and test their effectiveness (Sugiyono: 2011). The model used in this research is the ADDIE model (Figure 1).

According to Mulyatiningsih (2011), the steps for developing teaching modules using the ADDIE development model are:

1. Analysis, at the analysis stage there are four things that are carried out, including needs analysis, curriculum analysis, material analysis and student analysis.
2. Design, at this stage, researchers design the materials and design of the teaching modules that will be developed.
3. Development, after the product has been designed, the development stage is the realization of the design process that has been carried out.
4. Implementation, in this stage the teaching module using the top method has gone through the revision and validation stages.
5. Evaluation, the evaluation stage is an improvement step taken after the implementation stage and is related to small and large scale tests.

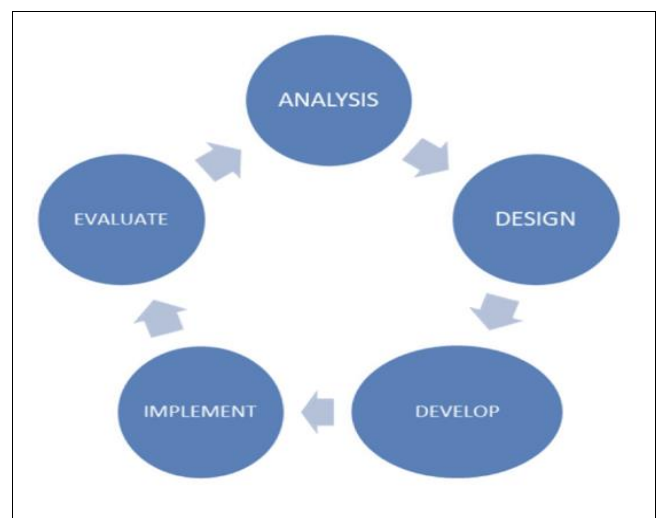


Fig 1: ADDIE Development Model Design

Results and Discussion

Results

The steps in preparing learning module products according to the ADDIE method are as follows:

1. Analysis Stage

The first stage in this research is analysis, namely needs analysis and curriculum analysis. Needs analysis also consists of teacher needs analysis and student needs analysis. Data from observations from the author in the field related to the analysis of teacher and student needs found the fact that:

- a. There are no teaching modules that use the top method
- b. The existing teaching modules do not contain learning that is easy and enjoyable, especially regarding the addition of whole numbers.
- c. Learning activities are rarely filled with games or songs so they seem monotonous
- d. Student learning outcomes are still below the KKTP
- e. Students still feel that mathematics is a difficult subject so they are afraid to study mathematics

The author also analyzes the curriculum. The curriculum currently implemented is an independent curriculum. So at the curriculum analysis stage the author starts by analyzing

the Learning Achievements in phase B class IV, which includes material on adding whole numbers. From the learning outcomes that have been analyzed, the competencies and content are reduced to learning objectives. From the learning objectives, criteria for achieving learning objectives are determined which will be used in preparing teaching modules according to the stages of the independent curriculum.

2. Design Stage

After the analysis, the next step is to design a product, namely a teaching module using the top method to improve learning outcomes in independent curriculum learning in elementary schools. Modules are arranged with a structure that includes cover, module description, learning outcomes, learning objectives, flow of learning objectives, time allocation, learning steps, LKPD, Pancasila student profile, formative assessment, KKTP, summative assessment, reflection (Figure 2).

The preparation of this design was carried out in the Canva for Education application using the teacher's ID belajar.id provided by the Ministry of Education and Culture to be able to access Canva Pro. In the Canva application, the template and color design used in each learning activity are determined.



Fig 2: (a) Teaching Module Cover, (b) Module Description, (c) Curriculum Structure, (d) Pancasila Student Profile Dimensions, (e) Initial Assessment/Diagnostic Assessment, (f) Learning Activities, (g) Teaching Materials, (h) Student Worksheets, (i) Formative Assessment, (j) Summative Assessment, (k) Reflection

3. Development Stage

After completing the design stage, the next step is development. In this context, development refers to the process of printing products/converting products to PDF files which are then ready to undergo the validation process. Validation of teaching module products using the top method to improve student learning outcomes in independent curriculum learning in elementary schools was carried out by four experts. The expert group consists of one material and method expert, one teaching module expert, one media (design) expert, and one instrument expert. The subjects selected as experts have sufficient experience and competence in their respective fields. The assessment uses a Likert scale with four scale levels.

Expert validation is used to provide an assessment of the modules developed and learning outcome instruments. The experts who carried out the validation process consisted of 1 expert who was a postgraduate lecturer in Primary School

Teacher Education, Manado State University, 1 expert who was the initiator or originator of the gasing method, and 2 experts who came from outside Manado State University. The material expert as well as the gasing mathematical method expert is the initiator or originator of the top method, namely Prof. Yohanes Surya, Ph.D. The material expert's validation or feasibility assessment shows that the module developed is feasible or valid to be developed. The teaching module experts are one of the national teaching module drafting teams and now act as teaching module reviewers from the Ministry of Education and Culture, Directorate of Primary Schools. And the design experts are the staff of the Coordinating Ministry for Maritime Affairs and Fisheries in the field of design. Based on the results of the feasibility assessment or module validation data by module experts, it shows that the module is feasible or valid for use in the "very feasible" category. From the results of expert validation of the independent curriculum teaching

module and design, the module has been declared in accordance with the criteria. The teaching module is then ready to be tested.

The assessment of the validation of this instrument was carried out by an instrument expert, namely Dr. Widdy H.F Rorimpandey, S.TP, M.Pd. The learning outcomes test instrument consists of 15 items which are arranged based on predetermined indicators. The assessment scores obtained are the result of validation and then categorized based on the instrument feasibility assessment conversion table. Based on the results of research data on the feasibility of the instrument by instrument experts, it shows that the instrument is suitable or valid for use in measuring student learning outcomes.

Learning outcome instruments that have been validated by instrument experts are then also carried out in the field by instrument validation tests. Meanwhile, to see the reliability of the instrument, Cronbach's Alpha test was used. Based on the Pearson product moment test, 15 learning outcome test items were found to be valid or suitable for measuring student learning outcomes. Based on the reliability test using Cronbach's Alpha test, a reliable learning outcomes instrument was obtained.

Based on validity analysis, the module to improve learning outcomes is declared valid. With several validator input as material for product revision so that it is suitable for implementation. After designing the product and testing its validity with experts who have expertise in materials, teaching modules and instruments, the next step is to make improvements to the product (module) that has been developed based on feedback provided by the experts. After going through the validation process by experts in the field of materials and methods, several changes occurred and adjustments were made to the recommendations of the first validator and second validator.

4. Implementation Stage

a. Limited Trial

Limited trials were carried out to determine the practicality of using the product as a material for improving the next module. The samples taken for this limited trial were 24 class IV students and 4 class IV teachers. The teacher questionnaire used an assessment rating scale of 4,3,2 and 1. The results of the practicality assessment showed that the module product to improve student learning outcomes could be used or implemented in field trials.

In a limited trial to determine the practicality of the module using a student response questionnaire using a Likert scale of 4, 3, 2, and 1. The results of the practicality assessment based on student responses show that the module product to improve student learning outcomes can be used or implemented in a field trial.

b. Field Trials

Field trials were carried out after the revision phase II was completed. The trial was carried out on a larger scale. This large-scale trial involved 4 classes taken from 3 schools in Ranowulu District. This research uses one group pretest-posttest. On 24 – 28 July 2023, a large class test was held at GMIM Dua Sudara Elementary School and GMIM Danowudu Elementary School, each meeting 5 times and divided into a morning session and an afternoon session. And on 31 July – 4 August 2023, a large-scale test was

carried out in 2 classes (parallel classes) at SDN Inpres 3/77 Danowudu class IV (Fasse B).

On July 24 2023, a pretest was carried out at the beginning of the meeting using a cognitive question sheet. The aim is to measure students' abilities before starting learning with the module. The time given for the pretest is 15 minutes. The time assumption is that the problem can be done within 1 minute. This is in accordance with the top mathematical method. After carrying out the initial ability test (pretest), it is then continued with learning activities that follow the stages in the teaching module that has been prepared.

The posttest is carried out after students complete learning activities on one learning objective. The posttest aims to assess the increase in students' understanding of the material that has been presented or is also called a summative assessment. The posttest activity involves giving questions in various forms, totaling 15 questions in the same form as the pretest. From the steps above, it can be seen that there has been an increase in student learning outcomes using the module, as can be seen from the comparison of individual student pretest and posttest scores.

5. Evaluation Stage

a. Product Practicality Analysis

Practicality assessment by teachers is a product of teaching modules. The results of this practical analysis were carried out after carrying out field trials through elementary school mathematics learning about adding whole numbers using the module that had been developed. Practicality assessments were given by 6 teachers in the research class.

Practicality assessments are carried out by students to determine the level of practicality of the module product after use. This assessment was carried out by class IV students with a total of 32 students. The teaching modules studied can be used independently both at home and in the school environment. Thus, the overall practicality of the module product is in the very practical category in its use to improve elementary school student learning outcomes.

b. Product Effectiveness Analysis

The analysis of the module product effectiveness test aims to determine the effectiveness of the product after use to improve learning outcomes. Student learning outcomes were carried out through pre-tests in 3 elementary schools, namely on July 24 and August 31 2023, which aimed to determine students' initial critical numeracy abilities before learning activities were carried out. Meanwhile, the post-test was carried out on July 28 and August 4 2023 to find out student learning outcomes after learning activities. The results show that there is an increase in student learning outcomes after learning using the module. Based on the results of the N-Gain calculation, the increase in learning ability is 0.73 in the "high" criteria. It can be seen that there is an increase in learning outcomes before and after receiving learning using the module.

Product effectiveness begins with testing assumptions. The assumption tests carried out are normality and homogeneity tests. The normality test of student learning outcomes in this study was carried out using the one-sample Kolmogorov-Smirnov test with the help of IBM SPSS Statistics 27 software. Based on the results of the normality test, the learning outcome data was declared to be normally distributed. The homogeneity test was carried out using IBM SPSS Ver 27. The data tested for homogeneity was

student learning outcomes data. Based on homogeneity test data, it shows that the significance of the pretest and posttest data on learning outcomes is homogeneous.

The paired sample t-test aims to find out whether there are differences in students' learning outcomes before and after taking part in learning using the module. The hypotheses tested in this research are:

H₀: There is no difference in learning outcomes for students before and after participating in learning using the module.

H_a: There are differences in learning outcomes for students before and after taking part in learning using the module.

Based on the results of the paired sample t-test in the table, the learning outcomes data has a significance value of <0.05, namely 0.001. Thus, H₀ is rejected and H_a is accepted, so it can be concluded that there are differences in learning outcomes for students before and after taking part in learning using the module. The module has proven to be effective in improving the learning outcomes of fourth grade elementary school students.

Discussion

1. Steps for Preparing Modules Using ADDIE Design

ADDIE design is a method that is often used by researchers in developing learning materials because it is known for its practical, simple and structured nature. According to Prawiradilaga (2015), the ADDIE model is a model that can adapt well in various situations, so this model is still relevant today. The level of flexibility of this model is high, which makes it suitable for addressing various challenges. Even though it is very flexible, the ADDIE model is still effective and is known by many people by the abbreviation ADDIE. In addition, the ADDIE model also provides a structured general framework for developing learning interventions and includes evaluation and revision at each stage.

Gustafson and Branch in Meilani Safitri (2022) [7] explain that in developing learning materials, the core of the ADDIE process is analyzing the background and needs of students, designing specifications for an effective, efficient and relevant learning environment, developing all learning materials, organizing these materials implementation of instructions that have been made, and formative and summative evaluation of development results.

The module underwent a series of revision stages including revision I, which involved validation by material and method experts, teaching module experts, design experts and instrument experts. Then continued with revision II on a large scale. The module developed includes the following components: Cover, module description, initial assessment, Pancasila Student Profile Dimensions, Learning Activities, LKPD, Teaching Materials, Formative Assessment, Summative Assessment, Reflection. The teaching module components are based on the Ministry of Education and Culture's module preparation guidelines and then developed according to teacher needs and student characteristics. In developing this teaching module, the teaching module can be said to be successful if it can be used by teachers and can improve student learning outcomes.

2. Validation

Validation is the initial stage in the development process. This validation is evaluated by experts who have expertise in materials and methods, teaching modules, media design and summative instruments. Validation is considered high

when the results are in accordance with the desired objectives, namely that they can be used as a guide for teachers and students in improving student learning outcomes. The module validation process involves several stages of validation by experts, as explained by Ginanjar (2010) [3].

Nuryadi (2019) [10] stated that the validation process can be carried out several times to ensure that the product produced is truly valid and suitable for use. In this research, validation was carried out twice by each validator or expert. This module was declared valid by the material and method validator because it contains material that is in accordance with the stages of learning the top mathematics method which are described in structured learning activities.

Likewise, teaching module validators validate teaching modules because they are in accordance with aspects of the independent curriculum teaching modules. In accordance with the views of Trisna and Rahmi (2016), a module is considered valid in the context of content if it meets criteria such as suitability to the curriculum, scientific structure, topicality and depth of material. In preparing the material, this module refers to the learning achievements set out in the curriculum.

Furthermore, validation from the media validator (design) also results in the conclusion that this module meets the module quality elements. Rahdiyanta (2016) states that an effective learning module must pay attention to elements such as format (columns, paper and icons), organization, visual appeal (including covers, contents and assignments designed to be as attractive as possible), type and font size (selection of letters that are easy to read, proportional ratio of letters, and use of appropriate letters), space (including spacing, margins, space between columns, transitions between paragraphs and chapters), and consistency. In designing the appearance of the product, this module has taken these aspects into account and is in accordance with the validation results by design experts.

The instruments used to measure student learning outcomes in the module have also been validated by instrument experts. The instrument in the module is in the form of a final summative TP. So, the validation process involves experts in materials and methods, media design, teaching modules and instruments to ensure these modules meet high validity criteria.

3. Practicality

The module that has been designed has successfully met the needs and expectations in the field. The success of the learning implementation was assessed by referring to the opinions and notes of four observers who observed the learning process directly in the field. The success of the module in guiding students to be actively involved and learn independently and the ease with which teachers can use the module in learning are considered the main indicators of practicality. Apart from that, the practicality of the module is assessed by the extent to which students utilize it. Murdiah (2015) [8] emphasized that learning with modules is considered successful if students are actively involved in interacting with fellow students and educators in solving problems or questions related to the learning material. The results of this research show high practicality based on the enthusiasm and active involvement of students during the learning process using the modules developed. The positive response and support provided by students and teachers also

strengthens the conclusion that this module is practical. Setiyadi (2017) ^[16] added that successful modules direct students to actively participate and interact with fellow students and discuss with educators in solving problems or questions related to the learning module material. Therefore, this learning module meets the practicality criteria.

This teaching module using the spinning top method to improve student learning outcomes in independent curriculum learning in elementary schools has been developed using the ADDIE research design which is known for its simple and structured nature. The ADDIE design is a design that is easy to learn and systematic, making it ideal for use by educators. One of the main roles of ADDIE design is to provide guidance in building training program tools and infrastructure that are effective, dynamic, and support the performance of the training itself. Addition material in mathematics subjects is material that is often considered difficult not only for students but also for teachers. Therefore, students need learning resources and learning designs from teachers that can motivate them to learn actively, creatively, and avoid boredom and even fear, such as learning modules that have been designed. Kurniati (2018), emphasized that the ADDIE design has been proven to be an effective design in developing teaching materials, including learning modules. The results of this research show that students find this module interesting and generate interest in learning during the learning process with the module. Therefore, the ADDIE design is a design that is very suitable for developing independent curriculum learning modules, both for mathematics subjects and other subjects.

4. Effectiveness

The effectiveness of the modules that have been prepared can be evaluated through student learning outcomes using test/summative question sheets. According to Arifin (2013), the effectiveness of a module can be measured through several aspects, one of which is the learning outcomes of students who are able to exceed the KKM (Minimum Completeness Criteria) set by the subject teacher. Improved learning outcomes can be seen from significant differences in student learning outcomes. Sumarni (2010) ^[18] also indicated that learning is considered effective when students are able to understand the learning concepts taught by educators, which can be observed after they use the module. The striking difference in score results between the pretest and posttest reflects an increase in understanding. This concept emphasizes that one of the advantages of learning using modules is students' ability to achieve learning outcomes appropriate to their level of ability.

Conclusion

1. The teaching module using the top method was developed following the ADDIE development model. The initial step involves needs analysis, then development design until it reaches a prototype form. The process continues with a development phase involving validation and small-scale testing (simulation). After that, the module is implemented by collecting data on a large scale, and finally going through the evaluation stage to the final product.
2. The validity of the learning module has been approved by material experts and method experts, because the material contained therein is in accordance with the

stages of the top method. The content of the teaching module is also in accordance with the material and aspects of the independent curriculum and has been validated by teaching module experts. Media/design experts assess the module as valid because it includes a design/template and other design aspects that have been fulfilled and support the module being attractive. Instrument/test experts have validated the instruments in the summative assessment in the module because they are in accordance with the curriculum and stages of the top method.

3. The module is also proven to be practical, seen from the results of the teacher questionnaire which observed that students were actively involved and enthusiastic in the learning process. Apart from that, there was also a positive response from the student questionnaire which showed the ease of using the module during learning.
4. The effectiveness of the module is proven by the increase in student learning outcomes, which can be seen from the difference in the average pretest and posttest scores in the large-scale test class.

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