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Validity of Science Teaching Module Integrated with "Engklek" Games to Improve Critical Thinking Skills

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Abstract

The independent curriculum teaching module is a systematically arranged learning equipment, containing the components of the teaching module and the dimensions of the Pancasila Student Profile. The purpose of this study was to test the feasibility of the science teaching module of the critical reasoning dimension with the project-based learning (PjBL) model through differentiated learning integrated with the Engklek game. This research uses a quantitative descriptive approach and the module tested for feasibility has been prepared using the 4D (four D) research and development model. The feasibility test consists of validity testing by learning expert lecturers, media expert lecturers, practicality by science educators, and readability by class VIII students at SMP Negeri 3 Ungaran. The results of the study showed that the average validity of the teaching module was 91%, which means it is in a very valid category and the reliability of the validation instrument was 95% based on Percentage of Agreement, which means it is in a very good category. Thus, the science teaching module of Critical Reasoning Dimension through Differentiated Learning Integrated with Engklek Game which focuses on the material of Work, Energy, and Simple Machinery is feasible to be implemented.

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1. INTRODUCTION

Curriculum is an important issue in the purpose of organizing and improving the quality of education (Yuniar & Umami, 2023). Currently, the curriculum that has just been created by the Ministry of Education and Culture, namely the independent curriculum (Salsabilla et al., 2023). This curriculum aims to improve students' skills by developing the realness of the material, formation of the Pancasila student profile, and the ability of students (Maulida, 2022). In the implementation of the independent curriculum, there are dimensions or values of character building that must be included using the project-based learning model (PjBL) to produce outcomes in the form of projects (Dewi et al., 2023). Pancasila values are included as one of the implementations of the Pancasila Student Profile. The Merdeka Curriculum and the Pancasila Student Profile Strengthening Project (P5) are now an inseparable entity.

The Pancasila Student Profile aims to improve the quality of education in Indonesia through character building (Rachmawati et al., 2022). One of the six dimensions of the Pancasila Student Profile that cannot be ignored in this junior high school science subject is critical reasoning skills. When students are faced with a problem that is so large and complex, students must be able to critically analyze, assess, and represent it (Lilihata et al., 2023). In realizing each dimension of the Pancasila student profile, especially the critical reasoning dimension in science subjects, educators cannot generalize each student's ability to process. Each student has different characteristics so they cannot be treated the same (Siagian et al., 2022).

In addressing this diversity, educators can implement one learning approach, namely through differentiated learning. Differentiation is a complex set of principles designed to maximize the learning opportunities of each student. The characteristics of differentiated science learning are familiarization and understanding of scientific process knowledge and skills (Mahdiannur et al., 2022). Three types of differences that must be considered when implementing differentiated learning are content differentiation, process differentiation, and product differentiation (Saputra & Marlina, 2020; Fauzia & Ramadan, 2023). In the curriculum there is a requirement for the minimum fulfillment of Learning Outcomes (CP), this is a problem related to whether or not educators can determine the variety of differentiation that suits the needs of students (Bondie et al., 2019; Mahdiannur et al., 2022). Therefore, a learning plan is needed that can accommodate the needs of students. One of the learning tools that can be used is teaching modules (Syamsussabri et al., 2019).

Teaching modules are equipment or support for learning planning based on an independent curriculum to achieve predetermined competency standards (Maulida, 2022; Nesri & Kristanto, 2020). Independent curriculum teaching modules are substitutes for lesson plans that contain material, teaching methods, interpretation, and evaluation techniques and are systematically arranged to achieve the expected indicators of success (Maulida, 2022). Educators can prepare teaching modules to increase innovation and thinking skills in them (Sary et al., 2023). Science teaching modules in each educational institution should be structured in an interactive, fun way, generate enthusiasm for active participation, and provide opportunities for critical and creative thinking for students (Ardhini & Hamimi, 2023). The traditional game method can be applied in the preparation of science teaching modules in junior high school as one of the implementations of the realization of a fun learning style (Winatha & Ariningsih, 2020).

Traditional games are one of Indonesia's unique cultures (Latif & Amelia, 2022). In this era, many students do not recognize the types of traditional games in Indonesia. There is work to preserve the culture owned by Indonesia, one of which is by reintroducing traditional games to students (Annisa et al., 2020). One type of traditional Indonesian game is the Engklek (Sunda Manda) game. In the Engklek game, there are several benefits such as being able to increase kinesthetic intelligence, interpersonal intelligence, intrapersonal intelligence, and naturalistic intelligence (Fauziah et al., 2020). This game can be used as a science learning media for students that is packaged in modified interactive and fun learning activities.

One of the junior high school science subject matter is Work, Energy, and Simple machinery. In this material, students still find it difficult to understand abstract perceptions and need examples of real problems (Ardhini & Hamimi, 2023).In phase D there is a CP, namely, students are expected to be able to connect the concepts of Work, Energy, and Simple machinery and their application in everyday life. In that case, the Engklek game can be used as an example of applying the material of Work, Energy, and Simple machinery in life directly. When playing, students will make work and unconsciously there is a change in energy released by the body. Engklek game also applies a simple machinery principle, namely lever type II and lever type III, related to human skeletal motion. Learning that is packaged through games can foster students' enthusiasm for learning (Winatha & Ariningsih, 2020). In addition, students must also have an attitude of critical reasoning and creative thinking to achieve learning objectives.

On the other hand, based on the results of interviews conducted during the research with science educators in junior high schools in Semarang City, explained that the concept of differentiated learning is still not widely known by educators. The majority of science educators in junior high schools in Semarang City are not very familiar with the application of differentiated learning in teaching modules. Many previous studies have developed a teaching module. Such as research that has been conducted by Syamsussabri et al. (2019), an environmental pollution teaching

module based on environmental worldview and environmental attitudes, which is prepared using the Problem-Based Learning (PBL) model approach. On the other hand, the independent curriculum demands that there are projects that must be done and produced by students as a form of creativity and innovation in learning. The same research was conducted by Nuriyah & Hayati (2023), about teaching modules. The independent curriculum is project-based. There is also research that has been conducted by Maulida (2022); and Nesri & Kristanto (2020), on the development of teaching modules based on the independent curriculum. The research has not yet implemented the Pancasila Student Profile in the teaching module it developed. As with the research conducted by Mahdiannur et al. (2022)that focuses more on ESD orientation.

Another result conducted during the Focus Group Discussion (FGD), explained that most teachers still have difficulties if they include the application of P3 in science lessons if it is not combined with other subjects such as Javanese Language, Civic Education, or Crafts. The teaching module must contain the components of the teaching module and include the dimensions of the Pancasila student profile in differentiated learning. Science teaching modules as supporting learning equipment contain learning scenarios and student activities that focus on improving critical reasoning skills. This certainly cannot be separated from the inculcation of the Pancasila Student Profile value as an implementation of character building and meeting the needs of differentiated students.

Based on the problems that have been described, a study was conducted to analyze the feasibility of a science teaching module on the dimensions of critical reasoning through differentiated learning integrated with the Engklek game. This science teaching module was developed with a project-based learning (PjBL) model with a Differentiated Learning Approach.

2. METHOD

This research is a quantitative descriptive approach that aims to test the feasibility of the science teaching module of Critical Reasoning Dimensions through Differentiated Learning Integrated with the Engklek Game. The module that was tested for feasibility was a module that had been prepared using Thiagarajan's 4D research and development model (Yunika et al., 2020). The 4D (four D), namely define (defining), design (planning), development (development), and dissemination (dissemination) (Thiagarajan et al., 1974). This research is an early-stage design of Research and Development (R&D) activities.

This research was conducted at SMP Negeri 3 Ungaran. The period of this research is from June 2023 to January 2024. The subjects of this research are science subject educators who have implemented the independent curriculum and students of class VIII phase D at SMP Negeri 3 Ungaran. The qualifications of validators and practitioners in the study to test the feasibility of this teaching module consisted of two lecturers as learning experts, two lecturers as media experts, two teachers as practitioners, and a readability test for 12 students. The instruments used in this study are assessment sheets consisting of learning expert validation sheets, media expert validation sheets, practicality sheets, and readability sheets that have been prepared and modified according to the research context.

The procedure of this research is presented in Figure 1.

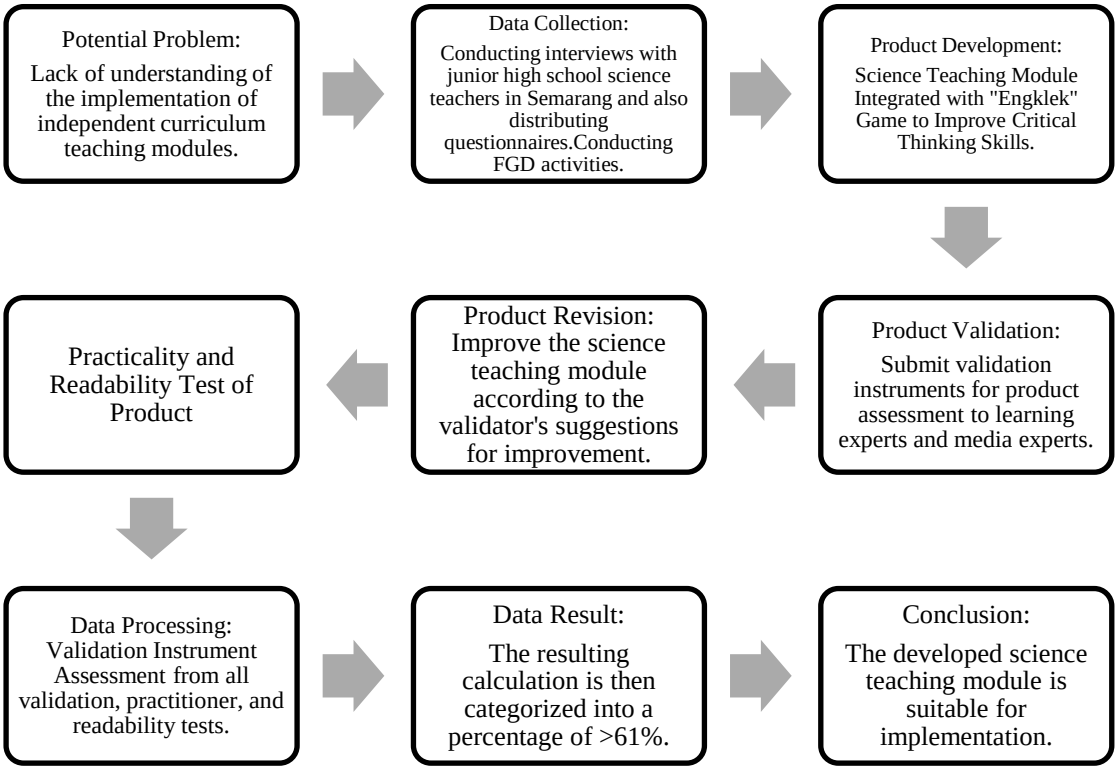

Figure 1. Research Procedure.

The description of the learning expert validation instrument grid is presented in Table 1.

Table1. Learning Expert Validation Instrument Lattice

No	Terms	Assessment Aspect	Indicator
1	Didactics	Assessment of student's learning outcomes	Measuring the ability of student's understanding of the Pancasila Student's Profile (critical thinking)
		Depth of concept	Connecting natural science concepts with the traditional game of Engklek
			The information presented follows the development of the independent curriculum
		Students activities	Invite students to be actively involved in the learning process.
			Facilitate differentiated learning for students.
			Encourage students to conclude concepts, laws, or facts and process information/ideas between natural science and a a traditional game of Engklek.
			Appropriateness of students' activities to the subject matter
			Gives students hands-on experience
		Applicability	Suitability between learning objectives and (student worksheet) LKPD
2	Construction	Clarity of sentences	Sentences do not cause double meanings
			The sentences use Dare to understand
		Linguistics	The language used is by EYD and communicative.
		Depth of concept	The depth of the materials by the Learning Outcomes (CP) and Flow of Learning Objectives (ATP)
			Suitability of material by CP and ATP
		Correctness of science concepts	The correctness of the concept of science material presented in the teaching module
			The correctness of the science formulas presented in the teaching module

No	Terms	Assessment Aspect	Indicator
		Enrichment	Optimally develop the knowledge potential of high-achieving students.
		Use of pictures/ illustrations	Appropriateness of the use of images/illustrations of science material
3	Technical	Physical appearance	The design (consistency, format) of the teaching module Is attractive
			Consistent use of font type and size
			Appropriateness of layout, spacing, and image settings
			Sufficient space for LKPD
		Correctness of the teaching module concept	Completeness of the arrangement of a teaching module components (General information, Core components, Appendix)

The description of the media expert assessment sheet instrument lattice is presented in Table 2.

Table 2. Media Expert Validation Instrument Grid

No	Terms	Assessment Aspect	Indicator
1	Didactics	Assessment of students learning outcomes	Measuring the ability of student's understanding of the Pancasila Student's Profile (critical thinking)
		Material Suitability	The material presented is related to everyday life.
			The material presented can motivate
2	Construction	Clarity of sentences	Sentences do not cause double meanings.
			The sentences used are easy to understand
			Use of words by EYD
		Linguistics	The language used is by EYD and communicative.
			Accuracy of terms in the module
		Suitability of LKPD	Suitability of learning objectives with activities in LKPD
			Clarity of LKPD work instructions
			The level of difficulty of the problems presented in the LKPD is on the ability of students
		Picture/illustration	Use of supporting images/illustrations
			Clarity of information on the images presented
3	Technical	Module size	Appropriateness of margin and paper size in the module
		Module Skin Design (Cover)	Do not use any typeface combinations
			The module title color contrasts with the background color.
			The proportion of the font size of the title, subtitles, and supporting text of the module is more dominant and professional.
		Display of module content	Suitability of module material with learning objectives
			The use of font variations is not excessive.
			Image suitability with text message (material)
			Suitability of formulas with material
			Spacing between lines in normal text
			Spacing between letters is normal.
			Proportion of image size to text
			Color clarity
			Accuracy or harmony of background color
			Overall attractiveness of the teaching module
		Physical appearance	The design (consistency, format) of the teaching module is attractive
			Consistent use of font type and size
			Appropriateness of layout, space, and image settings
			Sufficient space for LKPD
		Correctness of the teaching module concept	Completeness of the arrangement of a teaching module Components (General information, Core components, Appendix)

The feasibility of the science teaching module of Critical Reasoning Dimensions through Differentiated Learning Integrated with Engklek Game is measured based on the results of the learning expert validity test, media expert validity, practicality, and readability. Each test was analyzed using the Percentage of Agreement technique to determine the criteria for the validation assessment instrument of the teaching module. The percentage of agreement is used to measure agreement between validators (reliability rate). The validation instrument can be said to be reliable if the percentage is > 61%. Teaching modules as learning materials are said to be suitable for use if the results of the analysis meet the criteria of validity and high reliability. The formula used is as follows.

$$Percentage\ Validity = \frac{Total\ Score\ on\ Instrumenting}{Total\ Score}\ x\ 100\% \quad \text{.....(1)}$$

The percentage of validity assessment is shown in Table 3.

Table 3. Validity Assessment Percentage

Assessment Percentage	Criteria
24% ≤ X ≤ 43%	Not Valid
43% ≤ X ≤ 62%	Fairly Valid
62% ≤ X ≤ 81%	Valid
81% ≤ X ≤ 100%	Very Valid

(Sary et al., 2023)

The teaching module that has been validated is ensured to reach the fulfillment of valid/very valid criteria, and then after that, the practicality and readability tests are carried out on the teaching module. In this study, the product test at the practicality test stage was carried out by science educators as practitioners using a similar scale of 4, 3, 2, 1. Then the readability test was conducted on 12 VIII grade students using the "Yes" and "No" ratings. The test by practitioners aims to evaluate the level of practicality of the module that has been prepared (Sary et al., 2023). Data results were obtained by analyzing the assessment instruments filled out by science educators and 12 students.

3. RESULTS AND DISCUSSION

The results of this study include an analysis of the feasibility of the Science teaching module Dimensions of a Critical Reasoning Through Differentiated Learning Integrated with Engklek Games which focuses on the material of Work, Energy, and Simple machinery. This module is designed as a guide for educators in teaching class VIII phase D students. This research aims to produce a science teaching module with a critical reasoning dimension through differentiated learning integrated with the Engklek game that meets the criteria of validity, practicality, and reliability.

The research began with observations to find potential problems that would serve as research objectives. Observations were conducted at junior high schools in Semarang City, and then interviews, questionnaires, and FGDs were conducted to collect research data. The research sample was taken from a school that has implemented an independent curriculum, namely SMP Negeri 3 Ungaran. The teaching module is a form of application of the CP developed into an ATP with the target profile of Pancasila Students (Hutahean & Gafari, 2023). In the education unit, an educator is given the freedom to develop teaching modules according to the environment and learning needs of students. From the data obtained, most educators have not mastered the application of differentiation in teaching modules. Therefore, educators' understanding of the teaching module concept is needed so that learning will be more interactive. This teaching module is compiled with components that form the basis of its composition by the independent curriculum. These components include general information, core components, and attachments tailored to the material and the needs of educators and students.

This teaching module feasibility analysis research was carried out through a series of testing stages to find clear research findings by the problem formulation and research objectives. This validation test was carried out using an assessment instrument sheet assessed by the validator. The validators include 2 learning expert lecturers, 2 media expert lecturers, and 2 educators as

practitioners. Then there are 12 students to analyze the results of the readability of the LKPD in the teaching module. This module validation instrument sheet consists of 3 requirements, namely didactic requirements, construction requirements, and technical requirements (Nuriyah & Hayati, 2023).

The learning expert validity test was carried out to know the suitability and validity of the content of the teaching module arrangement material with the basic competencies that students will achieve. Overall, the content validity test of teaching modules from learning experts has a percentage of 86.1% with a very good / very valid category. As for the instrument reliability test from the learning expert himself, the calculation result is 92.30%, which means it is in the very good category. In terms of content/material, the science module of the dimensions of critical reasoning through differentiated learning integrated with the Engklek game is by the scope of learning needed by students. This teaching module is good and feasible to use with improvements according to suggestions. There are suggestions for improvement from learning expert validators related to apperception activities and the appreciation section of the learning scenario.

In the assessment criteria presented, the results are obtained as shown in Table 4.

Table 4. Learning Expert Validity Test Results

No.	Aspects	V (%)	Criteria	PA (%)	Criteria
1	Didactic Requirements	85	Very Valid	92	Very good
2	Construction Requirements	86	Very Valid	92	Very good
3	Technical Requirements	87	Very Valid	93	Very good
Average		**86**	**Very Valid**	**92,3**	**Very good**

Description:
V (%) = Validity Value
PA (%) = *Percentage of Agreement* Value (Reliability)

The validity test of teaching module media experts aims to determine the validity and suitability of the module structure that will be used as an educator's guide in teaching students in class VIII phase D. Overall, the validation test by module media experts obtained a percentage of 91.3% with a very good / very valid category. As for the reliability test of the validation instrument from the media expert himself, the calculation result is 95.60%, which means it is in the very good category. These results indirectly explain that the design of the science teaching module is very good and feasible to use with revisions according to suggestions. There are suggestions for improvement from media expert validators, namely the color of the module title written on the cover to contrast with the background color.

In the assessment criteria presented, the results are obtained as shown in Table 5.

Table 5. Media Expert Validity Test Results

No.	Aspects	V (%)	Criteria	PA (%)	Criteria
1	Didactic Requirements	92	Very Valid	96	Very good
2	Construction Requirements	90	Very Valid	95	Very good
3	Technical Requirements	92	Very Valid	96	Very good
Average		**91,3**	**Very Valid**	**95,6**	**Very good**

Description:
V (%) = Validity Value
PA (%) = *Percentage of Agreement* Value (Reliability)

The practicality test of the teaching module aims to determine the practicality of the module used as an educator's guide in teaching and learning activities for students in class VIII phase D. Overall, the practicality test has a percentage of 94.1% with a very practical category. As for the reliability test of the validation instrument from the practitioner himself, the calculation result is 96.60%, which means it is in the very good category. In the assessment criteria presented, the results are obtained as shown in Table 6.

Table 6. Practitioner Validity Test Results

No.	Aspects	V (%)	Criteria	PA (%)	Criteria
1	Didactic Requirements	93	Very Valid	96	Very good
2	Construction Requirements	94	Very Valid	97	Very good
3	Technical Requirements	95	Very Valid	97	Very good
Average		**94**	**Very Valid**	**96,6**	**Very good**

Description:
V (%) = Validity Value
PA (%) = *Percentage of Agreement* Value (Reliability)

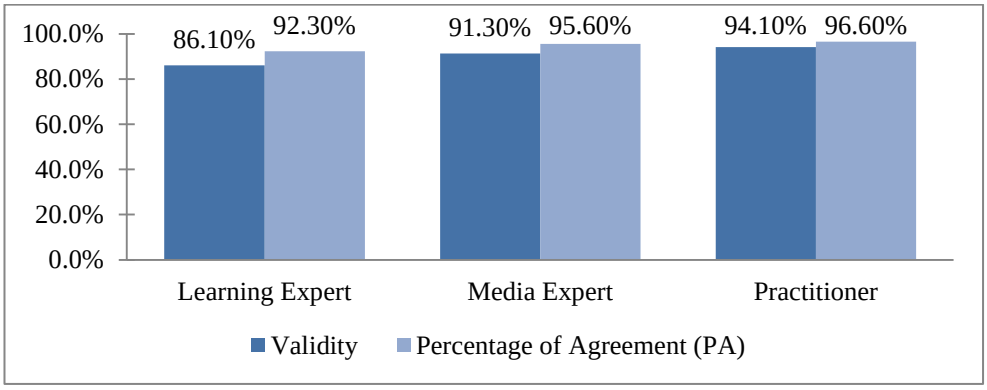

Figure 2. Percentage of Feasibility Test of Science Teaching Module

This teaching module invites students to recognize and recall various types of traditional games in Indonesia. In phase D there is a CP, namely, students are expected to be able to connect the concepts of work, energy, and simple machinery and their application in everyday life. This teaching module is prepared as a guide for educators in teaching students in grade VIII phase D of the independent curriculum. The target students include regular students and students who do not have significant obstacles (meaningful), on the physical, mental cognitive, or sensory side in participating in learning. The following is an overview of the module cover as shown in Figure 3.

Figure 3. Cover of the Science Teaching Module Integrated with "Engklek" Games to Improve Critical Thinking Skills

Work, energy, and simple machinery are class VIII semester materials that can be connected to the traditional game Engklek. At the end of learning, students are expected to be able to apply critical reasoning and creative thinking through the project given. When playing the traditional game Engklek, players throw 'crewing/back' and then jump with one foot to run the game. Players must move from the start pattern to the finish past one box to another without touching the edge of the box (Annisa et al., 2020). When playing Engklek, over time the body feels tired so that it no longer has the strength to play. This happens because some of the energy used in the body has been reduced.

The chemical energy stored in the body is converted into motion energy when doing an activity. So, it can be said that the energy contained in the body is not lost, but changes form into other energy (Ardhini & Hamimi, 2023).

Simple machinery is widely used in everyday life, but students often do not realize their direct use. By realizing the benefits of simple machinery, it can make it easier for students to carry out daily activities. Not only that, the application of simple machinery principles can be found when playing the traditional game Engklek. When a person plays the Engklek game, the movement of the hand throwing or swinging the 'kereweng/gacuk' is an application of a simple plane type III lever. When the hand throws or swings the 'kereweng/gacuk', the biceps muscle acts as a force that exerts a force on the forearm bone, the object in the hand acts as a load, and the joints at the elbow act as a fulcrum.

The teaching module contains complete teaching module components, namely general information, core components, and attachments. The development of this teaching module is tailored to the needs of students and as a support for differentiated learning planning for educators. This teaching module contains student worksheets (LKPD) that distinguish it from teaching modules that have been developed by previous researchers. There are three LKPD activities, which aim to improve the critical reasoning attitude of the Pancasila student profile dimension. Each LKPD, contains a problem that must be solved, instructions for working on LKPD, and supporting information containing material. LKPD 1 is to analyze a problem related to the application of work and energy in the Engklek game in groups. LKPD 2 is the relationship between work and energy in the Engklek game with a project assignment in the form of a modification of the Engklek game. LKPD 3 is the application and benefits of simple machinery in the traditional game of Engklek with a project to make comics.

The science teaching module that has been prepared can improve students' critical reasoning skills through the project assignments given. This can foster the formation of students' character values through the Pancasila Student Profile. The learning scenario contained in the teaching module is also able to make students actively involved in learning. Learning outcomes will be obtained with the modification of the learning style while playing which is carried out in a differentiated manner. Overall, the analysis of the data obtained shows that this science teaching module meets the category worthy of use.

4. CONCLUSION

Based on the results of the analysis, show that the percentage of the feasibility of the science teaching module of critical reasoning dimensions through differentiated learning integrated with Engklek games has an average percentage of the validity of the teaching module of 91%, and the percentage of reliability of the validation instrument of 95% with a very feasible category. So these results explain that the science teaching module Dimensions of Critical Reasoning Through Differentiated Learning Integrated Engklek Game which focuses on the material of Work, Energy, and Simple machinery, is very feasible to be implemented as an educator's guide in teaching junior high school class VIII phase D students.

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