Development Of Physics-Two Tier Test Based On Jumanji Game To Measure Conceptual Understanding Of Work And Energy

Tutik Yuliatun, Jumadi, Edi Istiyono, Suyanta, Himawan Putranta

Abstract: This study aims to develop a physics-two tier test based on the Jumanji game to measure conceptual understanding of work and energy. In addition, this study also aims to determine the conceptual understanding of high school students about work and energy. The research method used is a quantitative method with a modification of the development model. The measurement instrument developed in this study is a physics-two tier test or a reasonable multiple-choice test for work and energy. The research instrument that was developed was tested on 261 students from four high schools in Sleman Regency, Yogyakarta. The results of this study indicate that a measuring instrument has been produced in the form of a physics-two tier test based on the Jumanji Game that can measure students' conceptual understanding of work and energy that is valid and reliable. These results are proven by the validity and reliability values of the physics-two tier test, each of which are 0.83 and 0.53. Meanwhile, the students' conceptual understanding of related to work and energy is 54% which is in the high category. The conceptual understanding of students measured using the physics-two tier test is high because it exceeds the minimum criteria that have been determined.

Index Terms: physics-two tier test, Jumanji game, conceptual understanding, work and energy.

1 INTRODUCTION

Physics is a branch of natural science that studies natural phenomena and their order [1]. Therefore, students need to prepare themselves in studying natural science, especially physics. In line with this statement, the things that need to be prepared by students in physics learning are preparing basic science process skills to solve various problems that occur in everyday life that are in accordance with aspects of physics [2]. However, this seems to be incompatible with what happened at school. Many students still find it difficult to deal with physics problems using basic science process skills and also teachers still teach their students little about these skills [3]. Therefore, this causes a lack of students' conceptual understanding of physics and also their weak ability to solve various physics problems that occur in daily life. In line with the previous statement, [4] who suggested that physics was one of the subjects considered difficult by the majority of high school students. Of course, this affects the conceptual understanding of high school students. In theory, physics can be considered difficult by most students because it is influenced by several things, such as the lack of proper delivery of physics material to students, the lack of variation in models and learning media applied by teachers, and the existence of deep-rooted misconceptions in students [5].

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Problems conceptual understanding or misconceptions, in general, can't occur if the delivery of physics material to students is associated with something that is often experienced by students directly in their daily lives [6]. Physics events in daily life that are often natural students are actually found in all the activities they do, such as when they play, walk, or do cultural activities. Play activity is one of the activities that are liked and often done by students both at school or at home. In the play activities carried out by these students, there are essentially a lot of physics concepts contained in them, as in the Jumanji game which contains the concepts of work and energy. Jumanji games are board-based games such as snakes and ladders games played by more than one child [7]. Jumanji games can be used as physics learning media, so Jumanji games can be used by students to improve their understanding of physics concepts. In addition, the Jumanji game is able to accommodate the ability of teachers and students in understanding the concepts of physics and various problems that occur in everyday life. In the modification of the Jumanji game with the concept of physics, players will find magical and dangerous games in the form of physics problems that must be solved by students of various difficulty levels [8]. Although this game basically throws the dice like a snake and ladder game, this game gives a command to the player to move to the middle area of the board [9]. In addition, the movement of these players allows students or players to be able to use the understanding they already have to solve any physics problems they face. Therefore, through this Jumanji game, understanding students' physics concepts, especially in the work and energy chapter, can be clearly known. However, the ability of students to understand the concepts of physics between one and the other is not the same [10]. There are students who can easily understand every concept of physics they learn and are able to solve every physics problem that occurs in life. There are also students who are less able to understand and apply the concepts of physics that they have learned. Conceptual understanding possessed by each individual, especially students, has a major role in developing abilities that are higher than understanding [11]. Therefore, if students have

experienced problems in conceptual understanding of physics or experience physics misconceptions, it is certain that they will experience errors in using higher-level abilities and in solving any physics problems that occur [12]. Thus, it is necessary to optimize the ability to understand the concepts of physics for students, besides being a basic ability it is also a breaker for the occurrence of physics misconceptions. Meanwhile, in the cognitive domain of Bloom's taxonomy, the aspect of understanding or comprehension is one of the aspects that lie at the basic level [13]. Therefore, this aspect of physics conceptual understanding is very important to be mastered by students correctly. However, what happens to almost more than 50% of students in high school tends to be unable to understand the concept of physics or experience a physics misconception of the physics material they are learning [14]. Of course, to overcome this we need an evaluation and improvement of learning from students and teachers, so that high school students have little or no experience of physics misconceptions, especially in the work and energy chapter. In line with the previous statement, to be able to detect or measure the level of students' conceptual understanding of physics in the work and energy chapters, an instrument of measurement is needed [15]. Measurement instruments used to measure the ability of students have many forms and types. With these various measurement instruments, it is necessary for the researcher's discretion to use the most appropriate measurement instruments that are adjusted to the allocation of time, background conditions of students, and the ability of students to be measured. Most of the measurements of the ability of students who consider the estimation of a short time, a large number of items, and a lot of students, then the form of measurement instruments is in the form of multiple-choice tests [16]. In line with this statement, multiple-choice tests are widely used because it is easier to measure students' conceptual understanding than other forms of testing [17]. In addition, multiple-choice tests were developed to measure students' conceptual understanding not only to choose one correct answer, but can also consist of multiple-choice tests containing at least two choices, namely the choice of answers and the choice of reasons [18]. It aims to encourage students to provide creative reasons in the answers they choose based on the physics concepts they understand. However, multiple-choice tests also have the disadvantage of allowing students to guess answers and the presence of substantial question bias [19]. Meanwhile, in physics, the concept of work and energy is one of the concepts of physics that is still a misconception in high school students [20]. In addition, the concepts of work and energy are included in the concept of the phenomenon which tends to be abstract because this energy concept cannot be observed with the naked eye [21]. This is in line with the statement which states that the concept of energy is considered simple even though it is actually a complex concept [22]. Furthermore, the majority of secondary school students tend to have many misconceptions related to work and energy, for example, students have difficulty connecting between work and energy conservation in real life [11]. More closely, [23] investigates students' understanding of the concept of energy and obtains the results that most students have difficulty interpreting conceptually the basic principles relating to energy. Thus, based on several results of research conducted by experts in conceptual understanding of work and energy, it can be concluded that work and energy are one part of abstract mechanics and are difficult for students to understand. Based on this description, then to measure students' conceptual understanding of the work and energy chapters associated with the Jumanji game, a physics-two tier test or multiple-choice method, where students need to choose the right answer and reason. Therefore, the goal achieved in this research is to develop a physics-two tier test based on the Jumanji game and measure the conceptual understanding of work and energy. Thus, the results of this study are expected to facilitate the development of physics-two tier test items on other physics concepts.

2 METHOD

2.1 General Background

In accordance with the objectives in this study to obtain data about the feasibility (validity and reliability) of a physics-two tier test based on the Jumanji game and the level of students' conceptual understanding of work and energy, the research method used is a quantitative research method as a basis for discussing the results this research. The quantitative research method itself is a research method based on the philosophy of positivism, which is used to test populations or specific samples, collecting data using research instruments, analyzing quantitative or statistical data, with the aim of testing established hypotheses [24]. This study first made direct observations to senior high schools to find out the problems that occur in physics learning in high schools. The results obtained from the observation stage are found the majority of students who are still lacking in conceptual understanding of physics material, especially work materials and energy or the majority of students experiencing misconceptions about the material. Based on the results of the field observations, the researchers then conducted a theoretical study first by combining the problems that occur in physics learning at high school to find solutions to overcome misconceptions or poor of students' conceptual understanding of work and energy chapters. Finally, the researchers concluded to make variations on the physics learning media used in the form of Jumanji games in the work and energy chapter. In addition, the researcher also developed an assessment instrument in the form of a physics-two tier test or a reasonable multiple-choice test to measure students' conceptual understanding of the work and energy chapters after they learn the chapter using the help of the Jumanji game. Furthermore, in the development of physics assessment instruments in the form of reasoned multiple-choice tests or physics-two tier test, this was developed by integrating the Jumanji game into the physics learning work and energy chapter. After the assessment instrument has been developed, the next step is to conduct a validity test conducted by two expert validators. After the validation results meet or it can be said that the physics-two tier test is valid and reliable, the next step is to measure students' conceptual understanding using these instruments. However, in these measurements, the researchers first conveyed the physics material of work and energy chapters with the help of instructional media in the form of Jumanji games to high school students. Next, provide a physics-two tier test that has been developed for students in secondary schools to get data on conceptual understanding of work and energy chapters. The next step, which is the analysis of achievement or analysis of the level of high school students'

conceptual understanding of work and energy chapters. This research was conducted at the end of the even semester when students had finished attending physics learning for the final discussion of the material because it was deemed necessary to investigate how much conceptual understanding that students had. The results of this study can be used as a reference for teachers, researchers, or lecturers in minimizing students' misconceptions in the work and energy chapters, and can also provide new experiences to students that in physics learning can be linked to a variety of daily events one of them through Jumanji game.

2.2 Research Sample

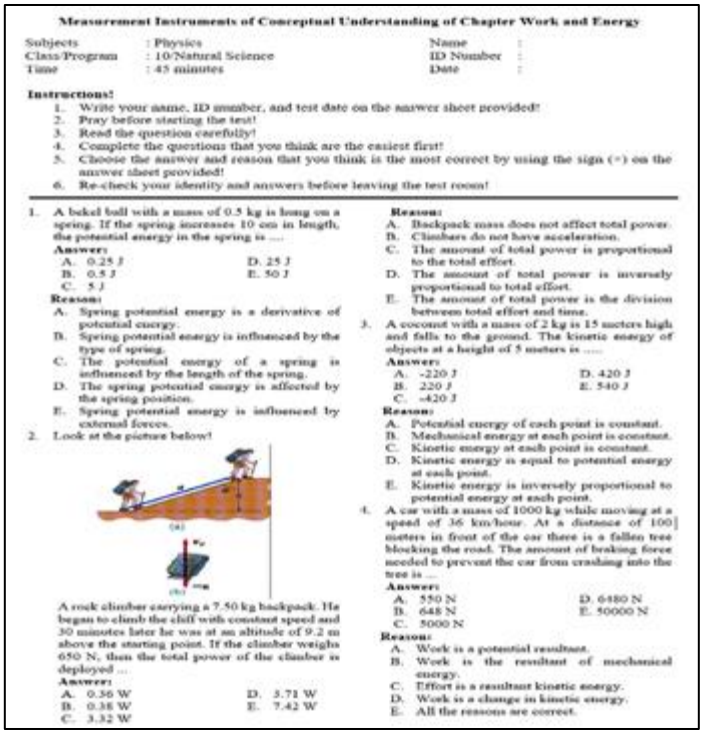
The samples used in this study were 261 10th grade MIPA students from four high schools in Sleman, Yogyakarta, Indonesia, namely SMA N 1 Depok, SMA N 1 Godean, SMA N 1 Seyegan, and SMA N 1 Minggir in the 2016/2017 academic year. SMA itself stands for public high school and MIPA is mathematics and natural sciences under the responsibility of the ministry of education and culture of the Republic of Indonesia. Meanwhile, the sampling technique used to determine the sample in this study is to use a convenience sampling technique. Convenience sampling technique is one of the non-probability sampling methods in which the study population is ready and feasible to be used by researchers [25]. In this study, there were no students who refused to participate as a research sample. Therefore, all samples used in this study which amounted to 261 students provided valid information. Meanwhile, data collection techniques students' conceptual understanding of work and energy chapters are carried out using a reasonable multiple-choice physics test or a physics-two tier test that has been developed by the researcher.

2.3 Instruments and Procedures

The first step taken in this study was to develop an instrument used to measure students' conceptual understanding of work and energy in the form of a valid and reliable physics-two tier test. Researchers prefer to develop new instruments to ensure that the measurement instruments developed are relevant to student conditions, student characteristics, and physics curricula in secondary schools in Indonesia. Meanwhile, a literature review of conceptual understanding was carried out before designing the measurement instrument, which obtained 3 indicators that reflect students' conceptual understanding, i.e. remembering, understanding, and applying [26,27]. In this study, the measurement instrument used to measure conceptual understanding of work and energy variables was validated by 2 expert validators before being distributed to 261 high school students randomly selected from four secondary schools in Sleman, Yogyakarta. Meanwhile, the instrument used to measure students' conceptual understanding of work and energy chapters in secondary school is a physics-two tier test consisting of 20 reasonable multiple-choice questions which can be shown in Figure 1. Based on the measurement instruments that have been developed as in Figure 1, the scoring criteria are as follows. Score 1 is obtained, if the answer and reason are wrong, score 2, is obtained if the answer is correct and the reason is wrong. A score of 3 is obtained if the answer is wrong and the reason is correct. Meanwhile, a score of 4 is obtained, if the answer and reason are correct. Furthermore, the physics-two tier test is firstly tested for validity and reliability conducted by 2 expert validators with the aim to determine the validity and reliability. After the physics-two tier test questions are tested for validity and reliability, then the validity is analyzed using the Aiken'sV equation like equation 1 below.

$$V = \sum \frac{r - l_0}{n(c-1)} \quad (1)$$

where V is the validity value, r is the number given by the nth validator, $l\,o$ is the lowest validity rating number, n is the number of validators, and c is the highest validity assessment number. After the coefficient V is obtained, then the coefficient V is compared with the Aiken table. An item is said to be valid if the Aiken coefficient value is greater or equal to the minimum value listed in the Aiken table [28]. Meanwhile, the reliability of the physics-two tier test questions was tested using the item separation index (item estimate) and the person separation index (case estimate) through the Quest program [29]. If the greater the test item separation index value, the greater the overall accuracy of the test items with the model used, namely PCM. In addition, the higher the value of the person separation index, the higher the consistency of each item in measuring the ability of people [29]. The item estimate and case estimate criteria can be shown in Table 1 [30].



Measurement Instruments of Conceptual Understanding of Chapter Work and Energy

Subjects : Physics
Class/Program : 10/Natural Science
Time : 45 minutes
Name :
ID Number :
Date :

Instructions!

1. Write your name, ID number, and test date on the answer sheet provided!
2. Pray before starting the test!
3. Read the question carefully!
4. Complete the questions that you think are the easiest first!
5. Choose the answer and reason that you think is the most correct by using the sign (×) on the answer sheet provided!
6. Re-check your identity and answers before leaving the test room!

1. A baked ball with a mass of 0.5 kg is hung on a spring. If the spring increases 10 cm in length, the potential energy in the spring is ....
   Answer:
   A. 0.25 J
   B. 0.5 J
   C. 5 J
   D. 25 J
   E. 50 J
   Reason:
   A. Spring potential energy is a derivative of potential energy.
   B. Spring potential energy is influenced by the type of spring.
   C. The potential energy of a spring is influenced by the length of the spring.
   D. The spring potential energy is affected by the spring position.
   E. Spring potential energy is influenced by external forces.
2. Look at the picture below!

A rock climber carrying a 7.50 kg backpack. He began to climb the cliff with constant speed and 30 minutes later he was at an altitude of 9.2 m above the starting point. If the climber weighs 650 N, then the total power of the climber is deployed ...
Answer:
A. 0.36 W
B. 0.38 W
C. 3.32 W
D. 3.71 W
E. 7.42 W
Reason:
A. Backpack mass does not affect total power.
B. Climbers do not have acceleration.
C. The amount of total power is proportional to the total effort.
D. The amount of total power is inversely proportional to total effort.
E. The amount of total power is the division between total effort and time.
3. A coconut with a mass of 2 kg is 15 meters high and falls to the ground. The kinetic energy of objects at a height of 5 meters is .....
Answer:
A. -220 J
B. 220 J
C. -420 J
D. 420 J
E. 540 J
Reason:
A. Potential energy of each point is constant.
B. Mechanical energy at each point is constant.
C. Kinetic energy at each point is constant.
D. Kinetic energy is equal to potential energy at each point.
E. Kinetic energy is inversely proportional to potential energy at each point.
4. A car with a mass of 1000 kg while moving at a speed of 36 km/hour. At a distance of 100 meters in front of the car there is a fallen tree blocking the road. The amount of braking force needed to prevent the car from crashing into the tree is ...
Answer:
A. 550 N
B. 648 N
C. 5000 N
D. 6480 N
E. 50000 N
Reason:
A. Work is a potential resultant.
B. Work is the resultant of mechanical energy.
C. Effort is a resultant kinetic energy.
D. Work is a change in kinetic energy.
E. All the reasons are correct.

***Figure. 1**. Test Questions for Physics Conceptual Understanding Tests*

***Table 1**. Item and Case Estimate Value Criteria*

Value of Item and Case Estimate Reliability	*Criteria*
> 0.94	*Excellent*
0.91-0.94	*Very Good*
0.81-0.90	*Good*
0.67-0.80	*Moderate*
< 0.67	*Bad*

Meanwhile, the measurement of students' conceptual

understanding using these physics-two tier test questions is done by not only choosing the answer choices of a physics problem, but students are also required to choose their reasons. In conducting this research, the research design used was posttest-only design. Where students in the class used in this study were given treatment in the form of using learning media in the form of Jumanji games in physics learning work and energy chapters. This is used to find out whether the use of Jumani games in physics learning can have a good influence on students' conceptual understanding or not.

2.4 Data Analysis

The analysis used to determine the achievement or level students' conceptual understanding of the work and energy chapters is done using standardized standard equations with the help of the Ms.Excel program. The technique used is by entering the physics-two tier test results of students into the category of very low, low, medium, high, or very high through the ideal average equation (M_i) and standard deviation (SD_i). This analysis technique was carried out using each score obtained on the highest and lowest physics-two tier test [31]. The interval scores for the level of students' conceptual understanding can be shown in Table 2 below.

Table 2. *The Level of Students' Conceptual Understanding*

No.	Score Interval	Level
1	$M_i + 1.5\,SD_i < \theta$	Very High
2	$M_i + 0.5\,SD_i < \theta \leq M_i + 1.5\,SD_i$	High
3	$M_i - 0.5\,SD_i < \theta \leq M_i + 0.5\,SD_i$	Moderate
4	$M_i - 1.5\,SD_i < \theta \leq M_i - 0.5\,SD_i$	Low
5	$\theta < M_i - 1.5\,SD_i$	Very Low

Based on Table 2 it can be stated that θ is the level of students' conceptual understanding. In general, the process carried out in this study can be illustrated in Figure 2.

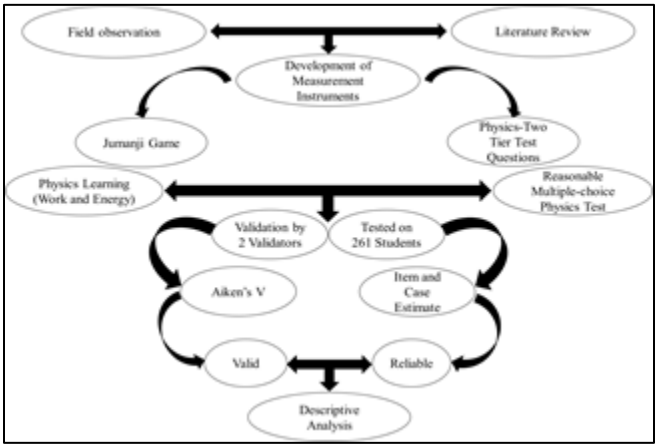


Figure 2*. Process in Research Activities*

3 RESULTS

3.1 Results of Validity and Reliability of Measurement Instruments

Before presenting the results about the level of achievement of students' conceptual understanding in the physics learning work and energy chapter, we first present the results about the appropriateness of the measurement instruments that we have developed. The eligibility data of this measurement instrument includes the validity and reliability data of the measurement instrument in the form of a physics-two tier test item. The results of the first analysis of this measurement instrument are the results of the analysis of the validity of the physics concept comprehension test questions that are analyzed using the Aiken V equation as shown in equation 1. The results of the validity of the physics concept comprehension test questions used in this study can be shown in Table 3 below.

Table 3. *The Validity of Conceptual Understanding Test*

Conceptual Understanding Aspects	Number of Items	Aiken's Validity Value	Information
Remembering	7	0,911	Valid
Understanding	7	0,897	Valid
Applying	6	0,975	Valid
Validity Value of Conceptual Understanding Tests		0,93	Valid

There were 2 validator validators who validated the physics concept comprehension test questions. Therefore, the error level in the Aiken V table used is 1% (p <0.01) and the items on the physics concept understanding test are said to be valid if the Aiken coefficient (V≥0.89) [28]. Based on Table 3, the results are obtained that the physics conceptual understanding test questions are valid because the Aiken's validity value is greater than 0.89 (V≥0.89), which is 0.93. Based on the results of the validity, it can be stated that the physics conceptual understanding test questions are valid and appropriate to measure the high school students' conceptual understanding in physics learning, especially the work and energy chapter. After the validity understanding test of physics, concepts are analyzed using the Aiken V equation, the next step is to analyze the reliability. The reliability results are also used as a reference in determining the feasibility of the physics concept understanding test questions that have been developed by researchers. The reliability results of the physics concept understanding test questions can be presented in Table 4 below.

Table 4. *Reliability of Conceptual Understanding Test*

Reliability	Reliability Coefficient	Category
Summary of item estimate	0,79	Reliable
Summary of case estimate	0,90	Reliable

Based on Table 4, it can be observed that the reliability coefficient for measuring instruments in the form of physics conceptual understanding tests obtained the value of summary item of estimate and summary case of estimate which is more than 0.7 which is included in the reliable category Meanwhile, the value of summary of item estimate and summary of Case estimate obtained in the matter of physics conceptual understanding shows that the matter of physics conceptual understanding that is developed is included in good criteria. Furthermore, these physics conceptual understanding test items show the correct consistency of the students' choices. In other words, each item about the physics conceptual understanding shows the same score, when assessed by different students. So, based on the

validity and reliability data that have been obtained as shown in Table 3 and Table 4, it can be stated that the measurement instruments developed are feasible to be used in measuring the high school students' conceptual understanding in physics learning especially in the work and energy chapter.

3.2 Level of Students' Conceptual Understanding of Work and Energy Chapters Based on Jumanji Games

After obtaining the results of the validity and reliability of measurement instruments for physics conceptual understanding in high school physics students in the form of physics-two tier test that are classified as good, then we present the results of the level of high school students' conceptual understanding in physics learning, especially in the work and energy chapter. The level of high school students' conceptual understanding in work and energy chapters that are mixed with the Jumanji game media can be stated in Table 5.

***Table 5**. The Level of Students' Conceptual Understanding in* Physics Learning

Number of Students	*Percentage (%)*	*Level of Students' Conceptual Understanding*
0	*0*	*Very High*
134	*51*	*High*
127	*49*	*Moderate*
0	*0*	*Low*
0	*0*	*Very Low*

Based on Table 5 it can be shown that the level of high school students' conceptual understanding in the physics learning work and energy chapters assisted by the Jumanji media is at two levels. In addition, the results of students' conceptual understanding shown in Table 5 can also be expressed using graphs as shown in Figure 3 below.

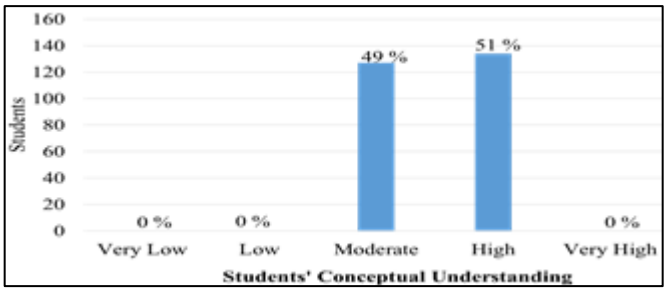


***Figure 3.** Level of Students' Conceptual Understanding*

Based on Table 5 and Figure 3 it can be stated that the level of high school students' conceptual understanding in physics learning work chapters and energy-assisted by the Jumanji game, the majority are at a high level with a percentage of 51% or equivalent to 134 students. These results indicate that the level of high school students' u conceptual understanding in Indonesia in physics learning, work and energy chapters is still not satisfactory because the data obtained in Table 5 and Figure 2 show that there are no students who have a very high level of conceptual understanding. In other words, the maximum level of students' conceptual understanding is at a high level with a percentage of 51% or equivalent to 134 students. These results indicate the need for more appropriate treatment in physics learning by teachers, both in the delivery of material or the use of various media in physics learning that is being liked and is often used by students.

4 DISCUSSION

The purpose of this research is to develop a physics-two tier test based on the Jumanji game and find out of high school students' conceptual understanding of work material and energy. Therefore, the results of the development of physics measurement instruments in the form of physics-two tier test questions that are used are very feasible to measure high school students' conceptual understanding in physics subjects' work and energy chapters. These results can be proven in Tables 3 and 4, where the measurement instruments in the form of physics-two tier test questions are valid and reliable to be used in measuring high school students' conceptual understanding in physics subjects' work and energy chapters. Meanwhile, the results of research on the level of high school students' conceptual understanding in the physics learning work chapter and the majority of energy are at a high level but need to be given a certain treatment in the learning process so that their conceptual understanding of physics can be increased. One effort that has been made by researchers to optimize students' conceptual understanding in physics learning in this study is to do physics learning in the work and energy chapters with the help of the Jumanji game. The Jumanji game was chosen as a learning medium because this game presents a variety of different challenges to each game or student [32]. The challenges in this Jumanji game are modified by giving problems related to work and energy chapters with varying degrees of difficulty and each player or student is asked to be able to solve any challenges they face based on the physics concepts of work chapters and energy they already know. In addition, there needs to be a considerable allocation of time to optimize students' conceptual understanding in physics learning [33]. Training on students' conceptual understanding can be done by utilizing media or something that is often used and is being liked by students, such as games. The use of learning media in the form of games such as the Jumanji game can be used to assist in solving various physics problems that require an understanding of the physics chapter concepts with varying degrees of difficulty. This is in line with what was found by [34] who explored strategies in improving students' conceptual understanding (for example, understanding a physics concept and applying it in solving various physics problems by integrating every event or activity that is often done by students in their daily lives). The findings of the study revealed that students in high school in the physics learning work and energy chapters had a high level of conceptual understanding with a percentage of students as much as 51% or equivalent to 134 students. Meanwhile, there are no students who have a very high level of conceptual understanding of work and energy chapters, but there are only 49% of students who reach a moderate level or 127 students. These results certainly depend on each student's conceptual understanding ability in identifying the physics concepts of work and energy chapters and the ability to apply the work and energy concepts they have learned in solving any physics problems that arise, and are able to find the best solutions to solve chapter physics problems the work and energy they face. In addition, the test patterns also affect the results of high school students' conceptual understanding obtained, for example, there are

several groups of students who tend to find it more difficult to take physics tests in the form of reasoned multiple-choice or description tests [35,11]. In line with these findings, the results found in this study indicate that there are misconceptions that occur in the physics learning work and energy chapter, both in terms of the delivery of material by teachers or students who lack understanding of the work and energy concepts conveyed by the teacher. This certainly needs to be immediately improved and corrected, if the conceptual understanding of students in Indonesia increases and so that the PISA ranking of Indonesian students increases from year to year. In line with these findings, [36] stated that the high school students' low conceptual understanding in physics learning is due to the habits of students who are only demanded by teachers to be able to solve every physics problem contained in the physics textbooks. This is certainly not only beneficial for the conceptual understanding and abilities of other students at a higher level [37]. The treatment given by the teacher like that is less optimal in developing the ability of high school students because the ability to develop is limited to remembering and repeating, there is no sort of applying the concept of physics to solve physics problems that actually occur in daily life days of students. High school students' conceptual understanding in physics learning is much better if the supervision of teachers and parents are also involved in physics learning activities carried out by students in addition to combining with games or events that have been experienced by students. This is in line with the findings of [38] who found that the supervision of teachers and parents in physics learning will provide much better student learning outcomes because supervision given them to students can reduce the negative impacts arising from external factors. The results found in this study also show that students with higher conceptual understanding scores tend to actively engage in natural activities and often associate every physics concept they learn with every event or activity they have ever done. These results are also consistent with the findings of [39] who found that understanding students' physics concepts has a positive relationship with something they like and what they have done before, not least through the Jumanji game. The findings of this study indicate that physics learning needs to take serious attention regarding the role of the learning environment towards understanding physics concepts understood by students. In addition, physics learning activities should no longer use the teacher center method in delivering physics material to students, but the need for more diverse methods with shared learning media as well. In addition, physics learning conducted by teachers in high school mostly has not connected the concepts of physics with real physics problems that occur in daily life that lead to optimizing the students' conceptual understanding of physics. Teachers only transfer physics to students using unidirectional and textual methods. Thus, in general, our results provide evidence that the poor students' conceptual understanding of physics is not much influenced by the ability of each student, but much is influenced by the continuity of physics learning conducted by teachers, students, and parents.

5 CONCLUSIONS AND RECOMMENDATIONS

The measurement instrument developed in this study in the form of a physics-two tier test is suitable for measuring the high school students' conceptual understanding of the work and energy chapters. These results are proven by the results of validity and reliability that are valid and reliable. However, the level of high school students' conceptual understanding in physics learning work and energy chapters is still not satisfied with a percentage of 51%. However, the use of instructional media in the form of Jumanji games on physics learning in work and energy chapters has a positive influence on students' conceptual understanding of work and energy chapters. This finding has proven that the use of physics learning media in the form of Jumanji games have not had a great influence on the high school students' conceptual understanding in physics learning. Thus, special attention needs to be given by the teacher and also the parents of students in supervising physics learning conducted by students. It is also necessary for the teacher's participation to facilitate learning that leads to the achievement of students' conceptual understanding in physics learning so that students' conceptual understanding in physics learning is expected to increase and be in a better category. In other words, teachers need to apply variations of strategies and effective media for physics learning so that they can optimize the high school students' conceptual understanding. These variations include the use of various types of learning media that are often used by students in their daily lives. With reference to further research, researchers encourage to expand this research by adding research variables and students' gender.

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