Effectiveness of learning support of asset (assessment simulation test) for reconstruction physics conception

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Abstract. This researech to aims the effectiveness of ASSET (Assessment Simulation Test) to reconstruction physics conception and identification of student misconception. The study focused on the results of the concept of Optic concept and the quantity of misconceptions of students on the use of ASSET of one of University in Serang City, Banten, Indonesia. The data collected of research of the provision of understanding of the concept of using Four Tier test conducted after the implementation of learning. The method of research to Quasi Experiment. The subject of this research involves one group's experimental group using "ASSET". The highest level of comprehension is 76,67% Understanding Part 15,56% Understanding 5,56% Understanding level 2.22% and the lowest level of understanding at the No Answer level of 0%. It can be concluded that the significant effect uses of ASSET for reconstruction conception data from both groups indicate the improvement of the quantity of misconception of reconstruction physics conception.

1. Introduction

The main indicators used to assess the quality of learning and the graduation of students from an educational institution, often built on student learning outcomes are listed on the test results of study

[1]. Indeed it is very necessary to know the quality and character of the assessment tools given to the students, considering it is an integral part of the learning process. Traditionally the grains of test questions are in the form of paper and pencil. In the implementation, not infrequently the students are wrong in answering the problem due to lack of understanding the purpose of the problem, or misinterpretation of the matter. Of course this can't happen because it is very harmful and not in accordance with the implementation of the test itself. The development of information and communication technology (ICT) is based on alternative computer technology alternatives from an assessment format [2].

One of the advantages of computer technology is the ability to animate an object to produce a motion image. With this capability allows static images in paper and pencil test format can be converted into dynamic images in animated matter format. There are indications that for issues related to dynamic phenomena such as the motion of objects, the test items would be very advantageous if they were packaged in motion animation as would be designed in ASSET which is an acronym of Assessment Animation Format [3]. Learning is only through the listening process (lecture) then give a share in the mastery of the concept only by 5%. If followed by reading, then contributing to the mastery of the concept by 10% and when learning with the help of audio-visual, it will contribute to the mastery of the concept by 30% [4].

There is strong evidence to show that in order to understand the phenomena associated with the motion of an object, students need relevant animation assistance [5]. Even a study of the use of animated questions to evaluate the understanding of physics concepts successfully. They use this test format to evaluate the understanding of the concept of force and motion. The results of his study show that with the items that are packaged in the form of animation, the concept of motion understanding can be improved from before.

Researchers choose the concept of Optics, because this concept has many abstract concepts for high school students, for example: the concept of drawing the rays on the process of forming shadows for mirrors and lenses. Many students have a misconception about the second Optical reflection law. Misconceptions can also occur in the Optics section of refraction which illustrates the optical propagation behaviour between before and after passing through the boundary plane of two mediums having different optical density (refractive index) which is a dynamic phenomenon of Optics. In paper and pencil test formats, Optical propagation is usually depicted with trajectory paths of static lines. It seems likely that it would be more advantageous if the images of Optical refraction events in the Optical concept comprehension test items are packaged in animation according to actual phenomena as would be represented in "ASSET". Thus it can clarify the intent of the problem and minimize misinterpretation which creates misconceptions. The formulation of the problem in this study can be formulated in the form of question as follows: "How is the effect of ASSET items for the construction and reconstruction of high school students' conceptions on Optical concept?"

1.1. Simulation for physics learning

The development of various visualization media of physical phenomena which is abstract and microscopic until now has been done for physics learning, such as; Simulations of Newton's laws of motion by [6,7,9,12,13,14,15,16,17]. So that if the computer can be programmed to be utilized in teaching potential. In this case the program requires the computer to act as a tutor who leads the students through the concept order they expect to be the subject of understanding. The computer can locate the scope of each student's difficulties, then explain the opinions the student finds, use appropriate examples and exercises and test students at each step to check how students have understood well.

The second form of teaching with a computer is to simulate in a special circumstance, or a system in which students can interact. Students can call the information, so that it can arrive at the answer, because they think healthy, try to interpret its interpretation of the predetermined principles. The computer will tell the students what the impact of the decision, especially about the reaction of criticism or opinion.

The word assessment which is the basic word of assessment comes from the word assurer (French language) which means to sit beside which is then clarified with the meaning of "to sit beside the learner and find out [2]. The definition is related to the teacher's effort to obtain information about the students' ability to achieve the predetermined learning objectives with microscopic virtual simulation [19] that

the assessment is defined as a collection of both quantitative and qualitative information obtained through various tests, observations and techniques others are used to determine the performance of individuals, groups or programs. The assessment is a strategic problem-solving process that uses measurement as a systematic way to collect and analyse information in order to make decisions about all aspects of learning [2].

Assessment documents the learning process in terms of how students achieve learning objectives by involving professional judgment based on measurement data, while measurements only include student outcomes or achievement of learning objectives in the form of scores, grades or grades. The descriptions of the definition of the above assessment implies that assessment is a process undertaken by the teacher to collect, interpret, and synthesize learning information with simulation at the beginning, process, and end of learning by using various techniques in an effort to improve the quality of learning [18] [20].

1.2. Reconstruction of conception or misconception

Misconceptions or misconceptions point to a concept that is inconsistent with the scientific notion or understanding received by the experts in that field. Some definitions of misconceptions are expressed by experts. Among them Fowler [11] views misconceptions as an inaccurate notion of concepts, the use of false concepts, the classification of false examples, the confusion of different concepts, and the hierarchical relationships of incorrect concepts. The Misconception as an interpretation of concepts in an unacceptable statement.

Student conception is always different from the conception of physicist. The conception of physicists in general will be more sophisticated, more complex, involving more relationship between concepts than student conceptions. If the student's conception is the same as the simplified conception of physicist, the student's conception can't be called wrong. But if the student's conception is at odds with the conception of physicists, we use the term misconception. Based on the above three understandings, then misconception can be interpreted as a student conception that is not in accordance with the conception of the simplified physicist. The states that from the literature the characteristics of misconception can be summarized as follows: 1). Misconceptions are very difficult to fix; 2). Often the "remnants" misconceptions continue to interfere. Simple problems can be done, but with a slightly more difficult problem, misconceptions arise again; 3). Regression often occurs, i.e. students who have never overcome misconception, a few months later wrong again; 4). With good lectures, misconceptions can't be eliminated or avoided.

Meanwhile, through a brief statement, the misconceptions are purposive, stable, and resistant to change. The misconceptions enter into the cognitive structure of students then these misconceptions will be sustainable. This will be more dangerous if the teacher misconception, because he will transfer the misconception he experienced to the students, so that more students will experience misconception.

2. Methods

2.1. Research Design

The purpose of the present study is to effectiveness of ASSET (Assessment Simulation Test) to reconstruction physics conception and identification of student misconception. Quantitative study design used is one-group pre-test and post-test design with a scheme according to [8]. Tests of understanding the concept of the experimental class applied using one group post-test only design as shown in Figure 1.

Figure 1. Design One Group Post-test Only

Information:
O: The test conceptual understanding of physics of microscopic phenomena
X: Treatment in the form of ASSET (Assessment Simulation Test) to reconstruction physics conception and identification of student misconception experimental group.

2.2. Study Participants

A total of 52 student-respondents in their eleventh grade, age ranges from 17 to 20 years. The sample was randomly selected from second year student teachers undertaking an introductory physics course. A few parts of these students have already studied optic concept in their physics courses at physics education, Universitas Sultan Ageng Tirtayasa, Serang City, Banten, Indonesia.

The data obtained in the form of concept comprehension score and quantity of student misconception on Optical concept for control class is given objective test of 18 questions with four answer choices in paper and pencil test, and for data in the form of concept comprehension score and quantity of misconception student control class is given objective test of 18 questions with four choices of answers in the form of animation. The test is given after the learning process is carried out. The steps performed are shown in Figure 2.

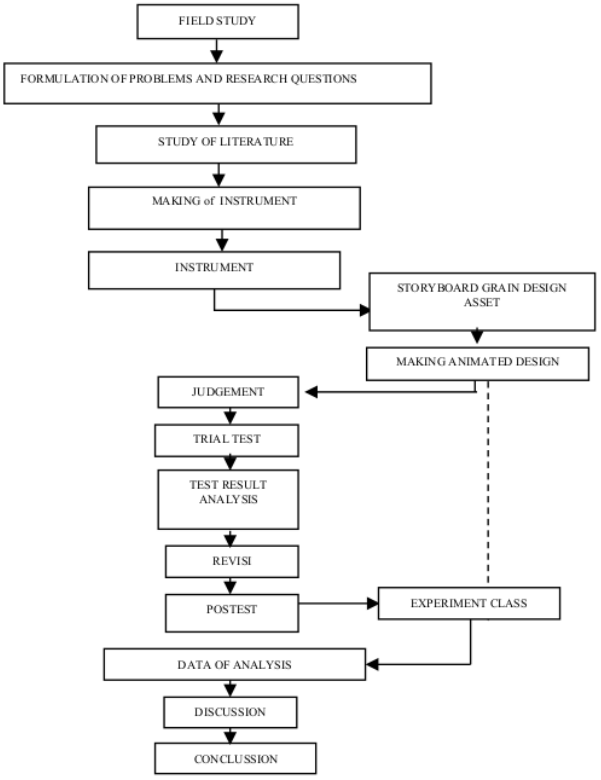

Figure 2. Research Design.

Based on Figure 2. the information about ASSET development was obtained from the study field, then the formulation of problems and research questions study of literature and study of literature. Next step, the development of story boss ASSETs, judgment by experts, and ASSET testing and ASSET revision. After the collected data is analysed then discussed and drawn conclusions.

3. Result and Discussion

3.1. Assessment Results on Small Group Evaluation

This trial data includes the average of the results of the students 'assessment / responses to the product test obtained from the student response questionnaire and the effectiveness test showing the students' assessment of the concept of optical physics. Recapitulation of student response result can be seen in Small Group Evaluation from 10 students. In the ASSET test on small group trials there are notes and suggestions provided by students used for revision. These notes and suggestions are summarized in Table 1.

Table 1. Notes and Suggestions from small group evaluation

Source Notes / Advice	Types of Notes / Suggestions
ASSET test by students	1. Background and colour animated images are customized. 2. The candle flame is less bright

From the notes and suggestions given by the students, useful remedies for product perfection are summarized in Table 2.

Table 2. Improvement of ASSET derived from small group evaluation

Source Notes / Advice	Type of Improvement
ASSET test by students	1. Background and colour animated images are customized. 2. The candle flame is less bright

Microscopic simulation products that have been further developed are consulted to be validated by physicists and media experts. Validation is done by looking at three aspects: (1) conformity of virtual simulation media with Optical concept, (2) virtual simulation media display and (3) interactivity of virtual simulation media. Improved media views on expert suggestions and judgments will be presented in the discussion. Here is a picture of ASSET that shows before it is repaired and after getting the notes and suggestions used for the revision of the validator.

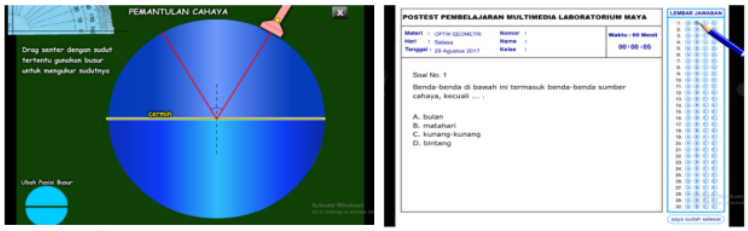

Figure 3. Change of "ASSET" after one-on-one testing, small group trial and judgment result by validator

3.2. Implementation Test Simulation

The virtual microscopic experiment simulated the concept of dynamic Optics was carried out to 15 students using conception construction learning model. The simulation test that has been developed is intended to test the efficacy and reliability of the simulation in building an understanding of students' scientific concepts on dynamic Optical concepts. The following description describes the research data obtained in detail. The Quantity Data of Optical Concept Student's Level of Understanding.

The quantity of students' understanding data obtained from the post test results measured using the comprehension test instrument on the dynamic Optical concept is an open urinal issue. Calculates percentage of the number of students for each level of understanding by using categorization guidelines. Output The level of understanding and characteristic of the level of understanding is presented in Table 3.

Table 3. Distribution of understanding levels each optical concept

Level of Understanding	Characteristics of Student Answers	Concept Label					
		1	2	3	4	5	6
		Σ %	Σ %	Σ %	Σ %	Σ %	Σ %
[4] Understanding (MSU)	Answer all the questions right on a question	13 (87)	13 (87)	12 (80)	12 (80)	11 (73)	10 (67)
[3] Understanding Partly (MSB)	Answer correctly some of the questions on a question	2 (13)	1 (7)	2 (13)	3 (20)	3 (20)	3 (20)
[2] Misunderstanding (MSK)	Answering with all the questions on a question but the answer is not clear or the answer is wrong	0 (0)	1 (7)	1 (7)	1 (7)	1 (7)	1 (7)
[1] Don't Understanding (TMH)	Answering all the questions on a question but the answer given is not appropriate (irrelevant) with the question	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (7)
[0] No Answer (TMJ)	Do not answer all the questions on a point	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Information:
Σ: Number of students experiencing level of understanding
%: Percentage of students experiencing level of understanding

Based on Table 3. it is found that the application of physics conception construction learning using ASSET at the highest level of MSU understanding on the concept of ohm law and Optical circuit is 87%. Discussion on students' level of understanding is explained in detail in the discussion. Figure 4. shows the average percentage of optical concept's level of understanding.

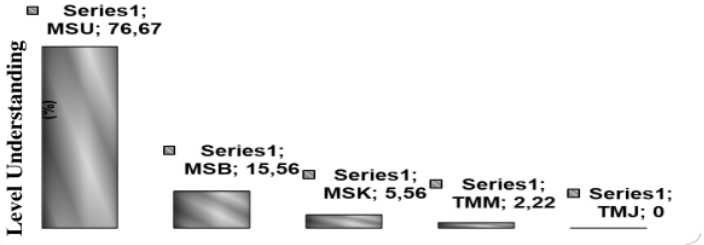

Figure 4. Percentage of average level of optical concept understanding

Based on Figure 4. it is found that successively average understanding level from high to low after the application of construct construction of physics conception by using virtual simulation of microscopic phenomena on Optical concept. The highest level of comprehension (MSU) is 76,67%, Understanding Part (MSB) 15,56%, Understanding (MSK) 5,56%, Understanding (TMH) level 2.22% and the lowest level of understanding at the No Answer level of (TMJ) 0%.

Based on the pattern of student answers in answering diagnostic tests of optic misconceptions in the form of FTT, in this study students can be grouped into four categories, namely scientific knowledge, lack of knowledge, error, and misconception. The following recapitulates the quantity of misconception students in pre-test and protest in Table 4.

Table 4. Student quantity misconception on pre-test and post-test on optic concept.

Misconception Label	Rata-rata Pre-test (%)	Rata-rata Post-test (%)	Students whose misconceptions are mediated (%)	Category
MI	41	2	86	High
MII	12	0	82	High
MIII	30	2	94	High
MIV	27	2	93	High

Based on Table 4. the overall decrease in the quantity of students experiencing misconceptions is in the high category. The entire misconception label can be well-reheated. The average quantity of students experiencing misconceptions at the time of pre-test is quite low in every misconception label.

The effectiveness of virtual simulation media developed in physics-oriented learning constructs students 'conceptions on Optical concepts, determined by the percentage of students' total quantities in the Optical Concept (MSU) Concept. Meanwhile, the effectiveness of the use of ASSET on construct-oriented physics learning conception in helping construct students' understanding on Optical concepts.

Table 5. Percentage of total optical comprehension quantity (MSU)

Concept Label	Quantity Understanding Intact (MSU) (%)	Category
KI	80,00	High
KII	80,00	High
KIII	80,00	High
KIV	80,00	High
KV	73,33	Medium
KVI	66,67	Medium
Average	76.67	High

Based on Table 5 it is found that the average percentage of the total quantity (MSU) of the Optical concept after the use of ASSET in conception-oriented physics-oriented learning is 77%. This percentage if adjusted to the criteria of effectiveness obtained "high" criteria. So it can be concluded that the development of ASSET developed on Optical concepts is "more effective" in the construction of students' understanding of Optical concepts.

4. Conclusion

This study result effectiveness of ASSET to reconstruction physics conception and identification of student misconception. The result of effectiveness' of ASSET to reconstruction physics conception and identification of student misconception. It can be concluded that the significant effect uses of ASSET for reconstruction conception data from both groups indicate the improvement of the quantity of misconception of conception reconstruction.

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