The Effect of Learning Based on Technology Model and Assessment Technique toward Thermodynamic Learning Achievement

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Abstract: The purpose of this research is to find out the effect of learning model based on technology and assessment technique toward thermodynamic achievement by controlling students intelligence. This research is an experimental research. The sample is taken through cluster random sampling with the total respondent of 80 students. The result of the research shows that the result of learning of thermodynamics of students who taught the learning model of environmental utilization is higher than the learning result of student thermodynamics taught by simulation animation, after controlling student intelligence. There is influence of student interaction, and the subject between models of technology-based learning with assessment technique to student learning result of Thermodynamics, after controlling student intelligence. Based on the finding in the lecture then should be used a thermodynamic model of the learning environment with the use of project assessment technique.

1. Introduction
Creating learning process in order to optimize learners’ learning outcomes is the task of an educator / lecturer. Teaching learning strategies is one important aspect of the consistently claimed promotion of self-regulated learning in classrooms [1]. One of the determinants of the achievement of learning outcomes is the ability of lecturers in designing (designing), applying teaching materials and organizing lectures. Learning is how to build and maintain productive professional relationships with the people in one’s care is no simple matter, yet many assume that this is a natural rather than learned capacity [2]. Teacher is always dissatisfied with the learning outcomes achieved by the learners, so the result of the assessment is always reviewed to seek new businesses and ways of teaching to obtain better learning outcomes of learners. Effective instructors commonly pride themselves on having positive student interactions in and out of the classroom, provide prompt feedback, and encourage teamwork amongst students [3].

Problem of learning in thermodynamics at the Department of Physics FMIPA UNIMA is that there is no laboratory for physical phenomena of the laws of thermodynamics. The learning process of thermodynamics is only emphasis on theory, not practicum. The model of environmental utilization learning (technology product) and simulation animation is a learning model / method that involves the students taking an active role. Environmental empowerment (technology product) is an approach / model of learning to increase the involvement of learners through the utilization of the environment (technology products) as a source of learning. This learning model assumes that learning activities will attract the attention of learners if what is learned is removed from the environment [4].

The model of thermodynamic with the utilization of the environment is intended: to provide an opportunity for students to observe the existing symptoms in the surrounding environment related
to the concept of the laws of Thermodynamics. The model with the student technology-based learning model involved two stages of the learning process are: learning in the classroom and learning outside the classroom (service garage, in PLTP, etc) supported by the lecture activities.

The quality of the assessment system in learning process cannot be separated from the use of assessment techniques, because the use of inappropriate assessment techniques will greatly affect learners, both in terms of learning motivation, or interest in learning that will ultimately affect the learning outcomes for the coming students. Assessment can help learning is not new, but what is new is a growing body of evidence that suggests that attention to what is sometimes called formative assessment, or assessment for learning, is one of the most powerful ways of improving student achievement [5][6]. Clearly stated learning intentions are an essential component of formative assessment strategy. They help teachers to be mindful of what their goals are to effectively plan and deliver lessons and they facilitate student learning by communicating expectations about the desired outcomes for each lesson [7]. Environmental Impact Assessment (EIA) is a process to assess the environmental consequences of any project and design proper mitigation plans to minimize the possible adverse impacts [8][9].

A portfolio is a collection or option file that can provide information for an assessment. Characteristics of student portfolio reflects important changes in a student's intellectual process. The portfolio is a systematic collection of one's work. In portfolio education refers to a systematic collection of student work [10]. Portfolio is a collection of student work that can show them (also for others) for their efforts, progress, and achievements in a particular field of study [11].

Factors of learning success in addition to learning models and assessment techniques. There are other factors that contribute to determine the success of learning from learners that is Intelligence. Intelligence is a mental ability that involves rational thought processes of learners or in other words intelligence is the capacity or skills of learners to be able to adjust his mind to the situation / situation faced by learners.

This study aims to determine the effect of technology-based learning model and assessment techniques on thermodynamic learning outcomes after controlling student intelligence, and the influence of their interaction on thermodynamic learning outcomes of third semester students Department of Physics FMIPA UNIMA.

2. Methods

Method used in this research is the experimental method with factorial design and dependent variable is the learning result of student thermodynamics.

| Assessment | Learning Model (A) |
|-------------|--------------------|
| Technique   | Environmental Utilization (Technology/ Product) (A1) | Animation Simulation (A2) |
| Project Assessment (B1) | (X,Y)_{11k} | (X,Y)_{21k} |
|              | k = 1, 2, 3, 4, 5 | k = 1, 2, 3, 4, 5 |
|              | (A0B1)            | (A1B1)          |

Population in this research is Physics student of FMIPA UNIMA academic year 2011/2012 with the target of population is the third semester students of Physics education FMIPA UNIMA number of 4 classes. Sample of this research is 107 students. Sampling is done by cluster random sampling. Instrument for this research is validated through a panelist consisting of 17 items of the description made recommended 15 items based on the calculation of Aiken's validity index and obtained a reliability coefficient (Hyot) of 0.92. It given to 20 students who are not treated reliability coefficient (alpha Cronbach) of 0.95.

Measurement of student intelligence was conducted by Department of Psychology UNIMA with CIFT (Culture Fair Intelligence Test) scale 3A and B with permission no. 144 / BKIN / PP / 2006. Data analysis techniques consists of: descriptive analysis, prerequisite test analysis (including: normality test, homogeneity test, linearity test, significance test, line alignment test), inferential analysis for hypothesis test is covariance analysis (ANKOVA).
3. Result and discussion

3.1. Result

Score of learning outcomes of thermodynamics of students taught by model of environmental utilization learning as follows with Number of respondents 40 as follows: minimum score 85 and maximum score 146 so the data range 146 - 85 = 61, average 122.1, standard deviation 14.55. Further data are presented in the form of frequency distribution tables with many classes using Sturgess in can 7, interval class length 10. These results are presented in the form of a histogram graph (Figure 1).

![Figure 1. Histogram Score of Thermodynamics Learning Outcomes Students Taught Learning Model Environmental Utilization](image1)

Score of learning result of thermodynamic student taught by simulation animation learning model with number of respondent 40 as follows: minimum score 80 and maximum score 135 so the data range 135 - 80 = 55, average score 114.55, standard deviation 12.35. Further data is presented in the form of frequency distribution table with many classes 7, interval class length 9. Results are presented in Histogram (Figure 2).

![Figure 2. Histogram Score of Thermodynamics Learning Outcomes Students Taught by Simulated Learning Animation Model](image2)

Score of learning outcomes of thermodynamics of students who were given project assessment with the number of respondents 40 as follows: minimum score 80 and maximum score 146 so the data range 146 - 80 = 66, average score 121.15, standard deviation 14.93. Furthermore, data is presented in the form of frequency distribution table with many classes 7, interval class length 11 (Figure 3).
Scores of student learning outcomes Thermodynamics are taught by model of environmental utilization learning with project assessment (A1B1). with the number of respondents 20 as follows: minimum score 96 and maximum score 146 so the data range 146 - 96 = 50, average score 128.4, standard deviation 12.68. The data are then presented in the form of frequency distribution tables with many classes of 6, the interval class length 10 (Figure 4).

3.2 Discussion
The results showed that the learning outcomes of thermodynamics between students taught by the model of learning environment utilization is higher than the learning result of students' thermodynamics taught by simulation animation learning model, after controlling student intelligence.

In the thermodynamic lecture model of environmental utilization model is very helpful for students in understanding the concept and physical principles. Lecture activities with the utilization of the environment can serve as a medium of learning but also as an object of study. Some objects in our environment can be utilized as learning resources, whether used directly or designed first.
Indispensable creativity and innovation of lecturers so as to utilize the environment as a source of learning, because learning is essentially an interaction between individuals and the environment. The environment provides stimulus (individual stimulus) and the individual responds to the environment. In the interaction process it can happen changes in the individual in the form of behavior change, where learners get information based on direct experience, therefore teaching will become more meaningful and interesting and become more concrete.

Model of learning with the utilization of the environment, the application of science in daily life becomes easier and in accordance with the problems faced by learners, because the environment around us are able to demonstrate the concept and principles of Physics and can involve students develop motivation and the principle of "learning how to learn "Based on the scientific method and the development of process skills that require an understanding born from direct observation of the phenomena or thermodynamic phenomena present in the environment.

The result of the research shows that students' thermodynamic learning outcomes assessed by project assessment have high scores, after controlling student intelligence. Assessment of the project as one of the class assessment, which has a scientific procedure that essentially is observation, collection of information or data from what is observed, analyzing data, and concluding. These stages are very relevant to the procedure in understanding the concepts of thermodynamics, so it will greatly help the process of discovery or construction of knowledge and understanding of the concepts. The results of the research analysis showed that the students' learning achievement of the thermodynamic class of students who taught the model of environmental utilization learning with the project assessment technique has a high result.

Learning Thermodynamics has material characteristics that contain phenomena or phenomena that are closely related to events related to the natural environment, therefore as a good lecturer should choose the model of learning and assessment techniques in accordance with the characteristics of the material and characteristics of learners. The combination of learning model of environmental utilization with project assessment technique was very influential on student learning outcomes in the learning of thermodynamics. Learning of the use of the environment enriches the insight and knowledge of learners because the environment is a learning resource that can be used as a natural laboratory that can demonstrate the concept and principles of thermodynamic physics, while the project assessment techniques are very appropriate where students are trained to think scientifically in carrying out tasks in the form of projects, and the formation of skills in students about knowledge, attitude and skills.

4. Conclusion
The result of learning of thermodynamics of students who taught the learning model of environmental utilization is higher than the learning result of student thermodynamics taught by simulation animation, after controlling student intelligence. There is influence of student interaction, and the subject between models of technology-based learning with assessment technique to student learning result of Thermodynamics, after controlling student intelligence. This shows that between learning model and assessment technique is very influential to each other and cannot be separated in the learning process. This means that in choosing the learning model should be tailored to the appropriate assessment techniques by looking at the characteristics to be taught. Students 'thermodynamic learning outcomes given the project assessment techniques have high results, as well as in the group of students who were given the project assessment techniques, the students' thermodynamic learning outcomes that were taught the environmental utilization learning model (A1B1).

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