

Measurement of Student's Learning Interests in Fluid Mechanics Subject through Project Based Learning Model Using SCAMPER Strategies

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Abstract— Fluid mechanics is a course that focuses on observing and understanding natural phenomena that occur in the environment. This makes learning must be carried out actively and use strategy modifications in learning. There are several previous studies that tried to modify the learning strategy to create active learning. However, in its implementation, there are still some fundamental obstacles. Based on that, research is designed to measure students' learning interest through a combination of project-based learning models and SCAMPER strategies. The research method uses research and development models with instruments in the form of questionnaires. The research subjects were second-year students of S1 Mechanical Engineering Study Program Malang State University offering E1 and E2 2018/2019 in the Department of Mechanical Engineering, State University of Malang. The results showed that the application of a combination of project-based learning and SCAMPER strategy made 76% of students felt attention, 87% of students felt happy, 82% of students felt interested and 78% felt involved in learning.

Keywords— Active Learning, Fluid Mechanic Subject, Project Based Learning, SCAMPER Strategies, Student's Learning Interest

I. INTRODUCTION

Fluid mechanics is a course that focuses on observing and understanding natural phenomena that occur in the environment. Such conditions make lecturers have to innovate to create an active learning atmosphere. One method that is often used by lecturers is conventional methods or lectures. Lecture methods are widely used by lecturers for several reasons, one of which is because the material delivered is relatively large while the time to deliver the material itself is limited. With the lecture method, lecturers can convey information efficiently.

However, the lecture method has shortcomings where communication occurs only in one direction, learning is only centered on the lecturer. This makes students passive and many students who complain because learning tends to be boring. Based on this, strategy modifications need to be made in learning to create active learning. John W. Santrock [1] and [2] do combinations using audiovisual forms and a set of problems. The audiovisual format makes it easy to create and show slides and video recordings. Students are given problems and in audiovisual form and are asked to make decisions about what will happen or how to solve the problem. The disadvantage is that it takes a lot of time and money, and

requires less involvement of students because it is still confined to the classroom during learning.

In 2014, the reappearance of other fluid mechanics learning media that used the type Two Stay-Two Stray (TS-TS) cooperative learning model varied demonstrations. This model is designed by [3] with the aim of providing opportunities for students to convey work or information with other groups [4]. The existence of opinion sharing activities between groups can familiarize students to respect each other's opinions and learn to express opinions to others. However, students still feel confused in carrying out learning with group work, sharing opinions between groups, group reporting. In fact, it is not uncommon for only one or two active students to think in groups, the rest are passive.

In 2017, [5] created another fluid mechanics learning model by focusing its implementation in the laboratory. The aim is to make students more interested and enthusiastic because learning is done by experiments outside the classroom. In addition, it makes it easier for lecturers to convey abstract information because they can present real objects to students. However, the implementation of this model is quite difficult because not all learning units have fluid mechanics laboratories that can accommodate the needs of their students.

II. RESEARCH METHODOLOGY

Following are the stages of research for measuring student learning interest.

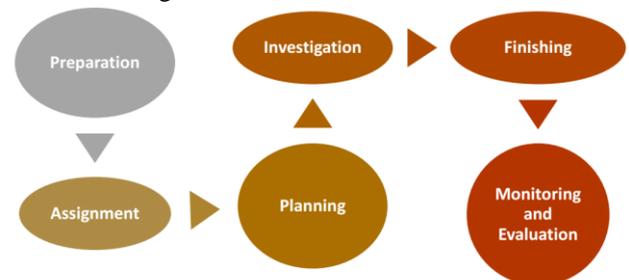


Figure 1. Stages of learning development

In each of these stages the students are triggered by their creativity in the C1-C6 cognitive domain with the Project Based Learning (PBL) model which is carried out based on the SCAMPER learning strategy (Substitute, Combine, Adapt, Magnify, Put to Other Use, Rearrange) to produce a product or life innovation in fluid mechanics. In the final stage, the students' interest is measured. This research was conducted in July-October 2018 odd

semester 2018/2019 in the UM Mechanical Engineering Department.

The research subjects were second-year students of S1 Mechanical Engineering Study Program Malang State University offering E1 and E2 2018/2019 in the Department of Mechanical Engineering, State University of Malang. The choice of this subject uses a purposive sampling technique because these two offerings have received conventional learning of fluid mechanics with lectures in the previous semester. The research instrument used to measure students' interest in learning was a questionnaire. The following is the questionnaire grid used.

Table 1. Grid of learning interest questionnaire instruments

No	Indicator	Statement Item Number	Number of questions
1.	Feeling happy	2, 6, 9, 12	4
2.	Attention	1, 7, 8	3
3.	Involvement	3, 4, 5, 10	4
4.	Interest	11, 13, 14	3

The data generated from the questionnaire will be analyzed descriptively by means of data reduction, data display, and drawing a conclusion.

III. RESULTS AND DISCUSSIONS

The learning process in educational units is held interactively, inspirational, fun, challenging, motivating students to actively participate, and providing sufficient space for initiatives, creativity, and independence in accordance with the talents, interests, and physical and psychological development of students [6]. For this reason, each education unit conducts learning planning, implements the learning process and evaluates the learning process to improve the efficiency and effectiveness of the achievement of graduation competencies [7].

The above standard is the basis of the implementation of this research, where the standard parameters outlined in the effort are achieved by combining with implementing a project-based learning model. The implementation of this model was stimulated by the SCAMPER strategy to get a high percentage of interest, involvement, feelings of pleasure and concern for students. The following is the percentage data and the number of students in the realm of student attention.

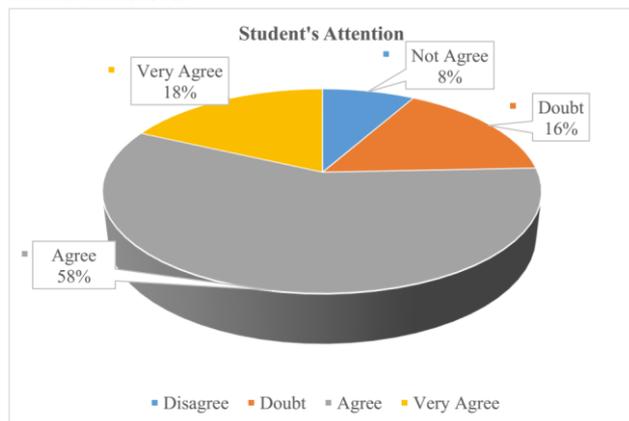


Figure 2. Percentage of attention after treatment

The chart above shows 76% of students agree that they feel concern with learning. This is due to the existence of modules and power points that really support them in implementing visual learning styles. Based on interviews conducted with several respondents, they stated that by reading the modules, they had gained half their understanding of the context of the lesson. Half of this understanding is complete when the teacher stimulates him by giving lectures using power points that are integrated with visual-visuals that are relevant to the learning material.

The correlation between the module and power point in the implementation of learning makes the brain of students indirectly combine textual things in modules with visual things contained in power point. It is from this combination that they begin to be skilled in rearranging their understanding of a material where this is the induction process which results in a cognitive increase in students. This is in line with the statement [8] that the media contribute to developing the cognitive abilities of students.

Some students also say that their attention to learning (reading modules and understanding power points) is also influenced by the existence of modules and power points themselves, so that students have clear direction and goals when learning, no need to look for other learning resources anymore. This is what is called the extrinsic factor that arises due to the complete learning facilities as a statement [9] one of the factors that can influence the interest of students in learning, namely extrinsic factors. Extrinsic factors are things and circumstances that come from outside that encourage students to carry out learning activities. This can include existing facilities in learning, one of which is learning media.

Basically, when using media, the teacher needs to pay attention to the suitability of the learning objectives, pay attention to the quality of the learning media in order to be able to motivate students and be able to improve concepts and expand knowledge, and can encourage the attention and accuracy of students. The variation in the existence of this learning media also makes the students feel happy. Here is the diagram.

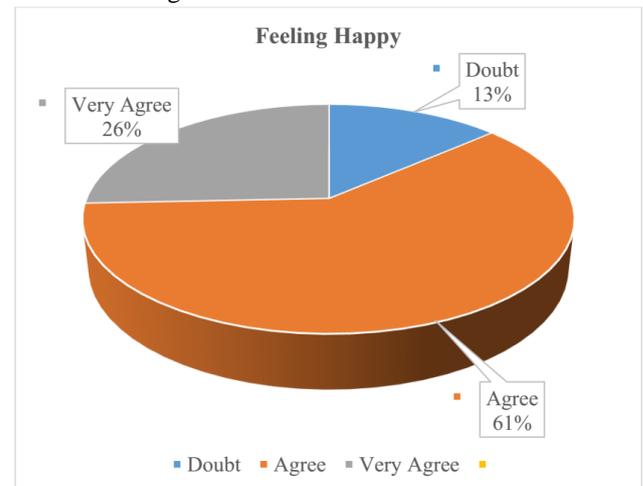


Figure 3. Percentage of pleasure after treatment

From the diagram above it can be seen that the percentage of students who feel happy when learning activities take place is 87%. This value proves that media

is quite feasible to be implemented. Representation of this feeling of pleasure can be seen when after a power point demonstration by the teacher, students actively carry out questions and discussions. Some students say that their intention to ask is to complete the understanding previously obtained from independent learning using modules. Such a phenomenon also answers the weaknesses of the Two Stay-Two Stray (TS-TS) media varied demonstrations developed by [3] where students feel confused in carrying out learning. Only a few active opinion in the group, the rest are passive in expressing their opinions.

Feelings of pleasure experienced by students also originate when giving project assignments to observe fluid flow in nature. In implementing this project, their kinesthetic learning styles are truly facilitated. Armed with the competencies of the modules and power points, they plunge into nature to observe, understand, appreciate, and utilize natural phenomena involving matter. The characteristics and learning objectives of fluid mechanics are capable of being fully accommodated by the media developed by [10] with the web learning media and interactive software media. The next parameter measured is attraction and involvement. The following is a presentation of the diagram in sequence.

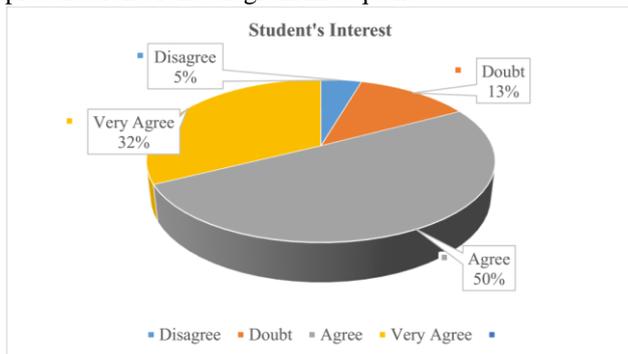


Figure 4. Percentage of interest after treatment

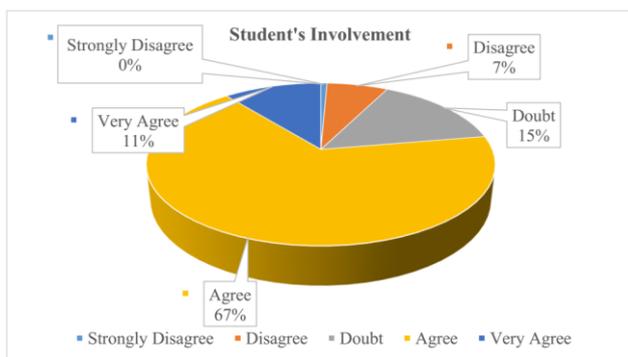


Figure 5. Percentage of involvement after treatment

The last two parameters measured are attraction and involvement. Can be seen in the diagram that the interest of students is 82% and the involvement of students is 78%. The interest of students can be seen when they are given project assignments in the form of learning videos. Students have been able to improve their cognitive abilities, this is what appears when they try their best to produce communicative learning videos. One of the

processes that most attracted them was when observing natural phenomena and reducing them to video material.

The real video material they have acquired is also combined with relevant visuals from the internet. This process makes them capable of putting learning media sources into other functions. This is what students want in every learning activity. This advantage can complement the weaknesses of the concept of laboratory-based learning developed by [5] where implementation is quite difficult because not all learning units have fluid mechanics laboratories that can accommodate the needs of all students. Videos made by students also have the ability to reduce the limitations of providing laboratory-scale demonstration tools.

The videos they produced also filled with dubbing to further clarify the information they conveyed. Whether we realize it or not, this process is proof that the level of understanding of students starts in the advanced category. This can be seen when students process, they tend to be open-ended and apply their knowledge in working on a project to produce a certain authentic product. This learning model is very well used to develop self-confidence, improve problem-solving skills, and familiarize students with using high-thinking skills [11].

The video making project directly fosters students' learning interests and motivations, because the video characters that overcome the limitations of distance and time, there are animation and demonstration demonstrations, with the presence of visual messages accompanied by audio making the video repeatable, messages delivered quickly and easily remembered can develop students' imagination, can develop students' minds, clarify things that are abstract and provide a more realistic picture [8]. The statement above is also in line with [12] and [13] which states that audio-visual media can increase students' interest in learning. Even [14] stated that audio-visual media can improve student learning outcomes.

The involvement of students in the combination of PBL and SCAMPER is also getting higher because the last project requires students to be creative in making learning prototypes. This is the highest level in the implementation of this learning. This last project requires students to further develop their cognitive, affective, and psychomotor aspects to communicate and solve problems in working on a project. In its implementation, this model provides broad opportunities for students to make decisions in having a topic, doing research, and completing a particular project, which makes students work really, as if in the real world that can produce products realistically.

IV. CONCLUSION

The results showed that the application of a combination of project-based learning and SCAMPER strategy made 76% of students feel attention, 87% of students felt happy, 82% of students felt interested and 78% felt involved in learning. The main finding obtained from the implementation of PBL collaboration and SCAMPER strategy is that students are able to develop their cognitive, affective, and psychomotor abilities

optimally in the implementation of fluid mechanics learning.

V. ACKNOWLEDGMENT

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