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Validity of integrated calculus module two stay two stray learning model for use in communities independent learning groups

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Abstract. Calculus is one of the compulsory subjects at the Faculty of Computer Science, UPI YPTK Padang, with the percentage of students passing each semester around 40%. To overcome these problems an independent learning group community was formed at the initiative of students. To support the process of understanding calculus material in the community, an integrated caliber module was designed for Two Stay Two Stray learning models. The conclusion of the study shows that the calculus module developed is valid according to the expert and is ready to be used to support the tutorial process in the independent learning group community of FILKOM UPI YPTK Padang students.

1. Calculus learning in universities

Calculus is one of the topics in mathematics where algorithmic manipulation is learnt as a basic concept in learning [1]. Calculus courses become one of the compulsory subjects in the information system study program Universitas Putra Indonesia YPTK Padang. Calculus becomes a basic subject and has links with several subjects in the next semester. Every student must pass the calculus subject before continue to other subjects such as matrix and vector and algebraic spaces and algorithms.

Teaching experience shows that the concept of calculus learning is not clear enough for students [2]. Most students feel that calculus courses are too difficult to understand and the subjects are most feared at the beginning of each semester. Student learning outcomes show that only 40% of students who pass in calculus courses each semester. This condition is a threat that can reduce students' understanding and success in completing calculus subjects.

Calculus is a field of mathematics studies, plays a key role in shaping students' logical knowledge. But today, as in the past, many students have difficulty with calculus and become dissatisfied because they constantly face conceptual constraints and understanding [3]. Calculus learning at the tertiary level is currently dominated by traditional learning concepts. Learning is teacher-centered and causes passive acceptance of student knowledge and information. Potential problems that arise include: (a) lecturers dominate most of the learning activities and (b) learning acquisition can be very limited because it depends a lot on information by the lecturer. Ideally a good learning process places the lecturer as a manager and instructor of learning. Not only communicating knowledge to students, but also arranging and guiding them to achieve the successful learning [4].

The concept of learning in college has undergone changes from year to year. Active learning has become an important focus today. Research shows that students learn best when they are actively



involved, as well as employment opportunities that want graduates who have the ability to work in groups and have developed appropriate teamwork skills [5]. Learning in universities must adopt the concept of team collaboration in lecturing activities, especially in calculus learning which has a high level of learning difficulty according to students.

Innovation in calculus learning can be done with three things, namely learning by uncovering problems, based on experience, and teamwork [6]. Students who experience problems in learning can work in groups based on initiative and without instruction from the teacher / lecturer. This independent work group is a form of student effort in building solid teamwork to solve a problem faced in the lecture system. The limitations of lecture time, the lack of material delivery and the incomplete learning resources can be overcome by the initiative to form group work independently by students.

2. Independent learning group

The formation of a learning group requires several considerations, one of which is the formation of a discussion structure that is not rigid and monotonous so that it is possible for each active member in group work [7]. Learning in group also emphasizes the delivery of learning stimuli and enhances students' conceptual understanding. The activeness of each member is very depending on the path and scheme of a discussion in group learning.

Today there are some obstacles in group learning, and this phenomenon is known as Groupshate. Groupshate phenomenon is an individual's fear and anxiety in interacting with group members [5]. One way to overcome Groupshate is to create a discussion plot and scheme that allows for positive interaction by each group member.

Indications of success in group work are an increase in learning outcomes and increased knowledge [5]. In group learning independently, student knowledge will increase if there is a transfer of knowledge between one student to another. Important stages in group work that must be considered include: providing an understanding that students know their work in group work, know how to work together, arrange time, and delegate tasks.

The independent working group formed to overcome the difficulties of calculus learning at YPTK Padang UPI is a small group discussion category. Group members contain four to five people and are formed based on the wishes of the students themselves. In each caliber class that is taught, at least six to eight independent working groups can be formed outside calculus courses. This group routinely holds meetings twice a week to discuss problems faced by members in calculus subjects and work together in completing college assignments. Small group discussions are interactive, friendly, and bridge the gap between teachers and students [8]. Student communication skills can also be improved in discussions in this independent study group. Learning in small group discussions is felt by students to be more effective than traditional teaching methods.

The combination of lectures and self-study groups on a small scale is the right step in overcoming calculus learning problems. Through observation, it can be understood how effective the discussion is in student self-study groups [9]. The obstacle faced today is that there is no available calculus teaching material to bridge students in discussion activities in independent study groups. For that, we need a teaching material that can guide and direct students to study independently with groups outside the calculus course schedule.

3. Integrated module validation of two stay two stray learning models

The agenda of the independent study group discussion at the YPTK UPI was to discuss the problem of learning calculus courses and repetition of material or understanding of the material to be studied at the next meeting. For this reason, we need a teaching material that can accommodate students' learning independently in groups. Module making by the teacher / lecturer can be a solution in helping students learn in independent groups. Module content can be made more challenging to increase student active participation [10]. Student feedback about teaching practices and feedback on modules is considered to be a reliable variable and is important for measuring module effectiveness [11].

Creating student activity in group learning can be done by collaborating with the learning model in the module breakdown stage. Two Stay Two Stray is one model that is suitable for answering the concept of student activity in working in groups. Two stay two stray is proven to improve understanding, communication skills, increase students' knowledge and activeness in working in groups [12,13,14,15].

To answer the problems in the independent study group at the YPTK UPI, researchers have developed an integrated calculus module for the Two Stay Two Stray learning model. Validity analysis results are shown in table 1.

Table 1. Validity results' summary.

Number	Validator	Rating Result (%)
1	AMA	86
2	NS	75
3	SPS	92
Average		84,33 (Valid)

Based on the table, it can be concluded that the designed module is valid in the opinion of experts. Modules are said to be valid if the results of the average product evaluation pass the number 80. Modules that are already in the valid category can be used to improve learning outcomes because the testing of these products has been recognized by experts. To test the validity of the module, an initial test was also carried out by distributing modules to four independent study groups/groups of YPTK Padang UPI students. The results of the deployment show that the module has been effective in helping students learn, able to improve students' understanding and increase students' active participation.

The use of calculus modules that have been developed by researchers can help students to create a warm atmosphere of discussion and enable the transfer of knowledge between students. The basic concept offered by the Two Stay Two Stray model integrated calculus learning module is that each student has a separate role, can be as a guest or remain silent in a group. In group learning, calculus modules designed by researchers can change the pattern of discussion and learning at the college level which initially made passive students become active.

4. Conclusion

The percentage of student failure in calculus subjects can be overcome by group learning. The conditions encountered in group learning in discussion groups formed on the basis of student initiative are that there are no teaching materials that can guide and enhance student activity. Making integrated calculus modules Two Stay Two Stray learning models are the most appropriate solution to assist students in self-study groups. The module developed has been valid according to the expert and has been practically used according to students in independent study groups. Students are helped in understanding the material because the Two Stay Two Stray model syntax allows each student to act as the giver and recipient of information.

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