

IS GROUP WORK EFFECTIVE FOR LABORATORY WORK? (STUDY ON STUDENTS IN THE CIVIL ENGINEERING LABORATORY)

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ABSTRACT

The laboratory is a place for student learning other than in the classroom. Students who study in the laboratory are usually divided into groups to complete the work according to the target. The division of groups with a certain number of members, adjusted to the needs of work targets, as well as the nature of the work to be completed. If the work is labor-intensive, it will be more effective if the laboratory activities are completed by group work with a relatively large number of members. Supported by the results of this study, that of the four laboratories that were used as objects of observation, laboratories whose work was labor-intensive in nature, the work was completed faster by groups with a larger number of members. In essence, the results of this study confirm that activities in the laboratory, by forming groups of students, provide learning for students to think critically, improve problem-solving skills, and provide collaborative learning experiences, according to current working conditions, regarding the need to complete targets by working together, not working alone.

Keywords: Laboratory activities, group work, size of group, collaborative learning.

INTRODUCTION

Learning in tertiary institutions is generally held in class and in the laboratory (Itzek-Greulich et al., 2015). While learning in the laboratory provides cognitive, affective, and psychomotor experiences and increases interest in science, it also offers students the opportunity to explore new topics in a complete learning environment where hands-on activities and experiments can be easily practiced by the students themselves (Tal, 2012). Activities in the laboratory provide learning experiences for students to practice the material obtained by direct observation and experience in practicing it (Shaby, Assaraf, & Koch, 2023), and activities in the laboratory are more effective for providing learning motivation to students (Feinstein, Allen, & Jenkins, 2013).

Activities in the laboratory are often carried out in groups. In the laboratory, students usually work in teams to explore learning materials that are practiced according to work instructions (Hazari et al., 2013). Team work can improve scientific skills and cognitive abilities for collaborative work. Activities carried out in the laboratory in groups are problem-based learning (Shaby, Assaraf, & Koch, 2023). Based on several previous studies, that most students working in the laboratory in groups produced more positive results, and this study wanted to prove whether students prefer to work in groups or individually when learning in the laboratory. As well as showing the importance of laboratory effectiveness in honing students' soft skills, which are very necessary when they face the real world of work.

Group work is collaborative learning (Rezai A. R., 2018). However, it is still a matter of debate to what extent group work is declared effective for learning. Many instructors use group work as a teaching strategy, but another group of instructors rejects it assign group work to students. For laboratory learning, most apply group work. However, assignments with large or small groups still need to be analyzed to measure which is more effective.

LITERATURE REVIEW

Laboratory Activities

Laboratory is an academic support unit in educational institutions, either in closed or open, permanent or mobile form, the management system and its utilization are local in the context of providing education, research, and community service, using tools and materials based on certain scientific methods to test, calibrate, or produce on a limited scale. Laboratory activities as learning experiences in which students interact with materials and/or with models to observe and understand the natural world (Hofstein & Lunetta, 2004). The aim of laboratory activities is to help students turn ideas into real objects (Millar, Tiberghien, & Le Marechal, 2002).

Activities in the laboratory are problem solving activities that give students the opportunity to develop personal knowledge, gain authentic experience, form skills and behavior that can be used when they become employees, and motivate students to like science and study it (Leite & Dourado, 2013). Laboratory activities study material that can be observed, is useful and relevant to current developments. Laboratory activities teaches students to dare to take risks, act carefully and accurately, cut procedures that might be complicated, as a strategic step to achieve targets (Smith et al., 2011).

Group Work

Group work is an instructional approach where students work together in large or small groups to achieve learning goals (Rezai, 2015). Not all students like working in groups. There are some students who feel confident in being able to work alone, and feel that working with a group will be a hassle because there are some students who are not serious, depend on their friends, and cannot work together well. "I hate group work," some students said (Belanger, 2016). Working in groups makes the workload uneven, with one student doing more and the other not working at all (Wheelan, 2009). Group size also has an influence on work results (Wheelan, 2009); (Mueller, 2012). Groups with a large number of members have many resources available to complete the task. However, large groups mean that each individual gets a small amount of work (Rezai, 2018), and often large groups have difficulty reaching agreements and good relationships with fellow group members (Cummings et al., 2013).

Group work gives students motivation, the opportunity to learn to lead and supervise, provides the opportunity to see problems from various perspectives, and helps them to be creative (Smith et al., 2011). Group work for students is not an assignment, but gives them the freedom to interact on a wider scale, learn to collaborate, express opinions, and how to reach agreement to achieve group goals (Mueller, 2012). Group work teaches students to be unselfish (Hofstein & Lunetta, 2004), respect agreements, take an attitude not for themselves, not individual image (Belanger, 2016), and success is a collective success (Leite & Dourado, 2013).

METHODOLOGY

The type of research used is action research, which is research into things that happen in society or target groups and the results can be directly applied to society. This action research was carried out for provide a good essence to the community or organization so that it can improve quality. In research using the Kemmis and McTaggart models (Al-Obaydi, Nashruddin, & Suherman, 2021), where the stages of this research the theory is: planning, implementation and observation, then reflection. This stage is repeated until the goal is achieved.

The action research method can be characterized as a process in which participants analyze themselves using various research approaches. Usually based on the following assumptions (Al-Obaydi, Nashruddin, & Suherman, 2021): (1) Determination of the problem; (2) Find ways to improve pathways; (3) Collaborate; (4) Analyze data. The method in this research uses descriptions that can be seen from the results of the questionnaire given to respondents on the basis of TAM theory. So that it can answer the purpose of this research.

This research was conducted in a civil engineering laboratory at one of the state universities in Indonesia. Observations were made on student practice activities in four laboratories, including the Wood and Finishing Laboratory, Utilities and Plumbing Laboratory, Stone and Concrete Laboratory, and Steel Construction Laboratory. Students practice all by working in groups, with each group consisting of four, five or six students. Students are required to form groups, because this practice requires teamwork to complete it.

RESULTS AND DISCUSSION

Research by observing student activities based on group work. In the four laboratories, the treatment was the same, with a total of 8 groups, with 3 groups consisting of 4 students, 3 groups consisting of 5 students and 2 groups consisting of 6 students, with observations for seven weeks, and in the eighth week each group was asked to collect work. The following results are obtained:

Table 1. Results of students group work

Students Group	Finishing the Target (Percentage/%)			
	Wood and Finishing Laboratory	Utilities and Plumbing Laboratory	Stone and Concrete Laboratory	Steel Construction Laboratory
1 (4 students)	80	90	70	75
2 (4 students)	90	80	70	75
3 (4 students)	75	75	70	70
4 (5 students)	75	80	80	85
5 (5 students)	85	80	80	85
6 (5 students)	90	80	80	85
7 (6 students)	75	80	90	90
8 (6 students)	80	75	90	90

Based on table 1 above, it is known that all groups can complete their work more than 70%. This means that group work is effectively applied to complete student work in the laboratory. Activities in the laboratory are indeed better done in groups (Belanger, 2016), because they provide experience to students not only about delivering course material, but also honing students' soft skills.

Students learn to understand each other's character, learn formal communication with teachers and colleagues, learn to think critically, and complete work professionally. Group work in the laboratory complements students' knowledge apart from getting material in class (Wheelan, 2009).

Based on observations, it turns out that the number of group members also has an impact on the completion of student work. In this research, group work in the Wood and Finishing Laboratory can be completed well regardless of the number of group members. Groups consisting of 4, 5 or 6 people all have work achievements that are no different. The type of work of each group member is not heavy and can be relatively completed according to the predetermined targets. Activities in the Wood and Finishing Laboratory are carried out after

students have completed the required courses so that they understand during practice and can complete group work targets because each member understands the part of the work that must be completed.

The results as above are the same as what happened in the Utilities and Plumbing Laboratory. As a result, there was no difference in completing work targets in groups with 4, 5 or 6 members. Group work in the Utilities and Plumbing Laboratory is held after students receive theoretical material in the previous semester, so that when they practice in the laboratory, students just practice the material they have previously received, and the difference is that during practice they encounter real tools related to utility and plumbing activities. How to use the equipment correctly by reading the instructions for use, and understanding work safety in the laboratory.

In two other laboratories, that are Stone and Concrete Laboratory and Steel Construction Laboratory, found the same results. These two laboratories are labor intensive, so groups with a larger number of members are able to complete the work more quickly. Stone and Concrete Laboratory and Steel Construction Laboratory, there are more activities, so if it is done by a group of 4 students, each member will get a heavier workload, and most likely will not be able to complete the target. Actually it can be done over time, but the rules for using the laboratory every day end at 5 pm, and work cannot be done at home, because all work activities involve the use of equipment in the laboratory. This result ultimately becomes an evaluation for the teacher, to provide additional time for groups of 4 and 5 students, according to the balance of each individual's workload.

Even though there are differences in results depending on the size of the members in each group, in general group work teaches students to have the courage to express opinions and express ideas. These results were obtained from students' opinions through direct interviews with students about how they felt when working in the laboratory. Group work in the laboratory provides space for them to actualize themselves, communicate freely with the teacher, unlike in class. If in the classroom it seems that there is a barrier between the teacher and students, this is not the case when learning in the laboratory. Teachers are like their supervisors, part of a group that works together to achieve targets. There is communication, collaboration, and a work success that must be achieved together. Providing motivation and enthusiasm to students like the atmosphere in a real workplace. Although initially there were some students who did not like working in groups, the relatively long duration of practice in the laboratory gave them the understanding that there are times when work must be done independently and there are times when it must be done in groups.

CONCLUSIONS

This research was conducted in four laboratories at the engineering faculty, that are Wood and Finishing Laboratory, Utilities and Plumbing Laboratory, Stone and Concrete Laboratory and Steel Construction Laboratory. The research involved students who were practicing in the laboratory to take practical courses. The purpose of the study was to see how effectively laboratory activities were completed by group work. The results showed that group work was the best choice for students' practical activities in the laboratory. Meanwhile, the size of the group members depends on the nature of the work. If it is labor intensive, a large number of group members is more effective, and if not, there is no difference in work results between groups with a small or large number of members.

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