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Source of Self-Efficacy for First-Year College Students Based on Gender and Prior Knowledge

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Abstract. Self-efficacy has important role in determining the success and adjustment of first-year college students, including college students in study programs of mathematics education. The purpose of this study is to analyze the source of self-efficacy of first-year college students based on gender and prior knowledge. The research method used is descriptive. The study sample consisted of 68 students enrolled in calculus lectures and 58 students enrolled in algebra lectures. Other researchers have tested instrument of self-efficacy for these students. This study finds that a source of self-efficacy of first-year college students, namely vicarious experience and mastery experience affects more male and female students. Vicarious experience is the most dominant source of self-efficacy for each category of prior knowledge.

1. Introduction

First-year college students often find obstacles at the beginning of the lecture as a form of transition from high school to college. This is due to the difference in learning methods between schools and lectures as well as different living environments and families. The lecture process requires students to be more active and independent looking for learning material, lecturers only direct and determine the targets to be achieved by students to pass the course. The atmosphere of the new residential environment with cultural differences also causes students to adapt well. Especially when they have to live alone, away from parents and relatives and have not found friends to share joys and sorrows, resulting in the success of learning in the first year of lecture is something that is difficult to achieve.

Academically, cognitive and affective aspects can influence the learning success of mathematics students in the first year of study. Cognitive aspects can be problem solving abilities [1], critical thinking and creative thinking abilities. Affective aspects can be in the form of attitudes and actions of students during lectures. Self-efficacy is one of the affective aspects that can determine the success of students in their department [2, 3, 4]. Meanwhile, self-efficacy has a role in determining the success and adjustment of first-year students [5].

Self-efficacy related to one's belief in their abilities in overcoming various situations. Self-efficacy is one aspect of self-knowledge or self-knowledge that is most influential in everyday human life because self-efficacy influences individuals in determining the actions to achieve a goal, including estimates of the various events that will be faced [6]. Self-efficacy is a belief about what someone can do, not the same as knowing what to do [7].

Self-efficacy comes from four sources of information, namely mastery experience, vicarious experience, social persuasion, and emotional and physiological states [6]. Mastery experiences are past



successes and failures that affect self-efficacy [8]. Mastery experience has been said to be the most powerful source, because judgments about one's competence are based on successful past performance [9, 10, 11]. In addition, students can measure their abilities by comparing them with vicarious experiences such as peers and adults when they make judgments about their own academic abilities [12]. The message conveyed through persuasion can function to increase the efforts and confidence of students, especially when accompanied by conditions and instructions that help bring success [6, 13]. Emotional and physiological states such as anxiety, stress, fatigue, and mood are also examples of information sources of self-efficacy [6].

Gender and prior knowledge can influence self-efficacy [2, 14]. In college, male students' mathematical self-efficacy is significantly higher than female students [4]. Self-efficacy of male students in science-based majors is better than female students, although the difference is relatively small because Japanese female students prefer to study arts and based majors rather than science [15]. Based on prior knowledge, someone who has prior experience in mathematics has a significant correlation and direct influence on self-efficacy [14].

Many studies discuss the relationship between gender, prior knowledge and self-efficacy. However, there have been no studies analyzing gender, prior knowledge and self-efficacy in mathematics college students in the first year of study.

Mathematics students in the first year of study, only get a few math courses. This is due to the existence of courses that characterize universities, faculty courses and educational subjects. In general, students take courses related to calculus and algebra in the first year of study.

Based on the explanation above, the purpose of this study is to analyze the sources of self-efficacy based on gender and prior knowledge in the first-year students majoring in mathematics education, who enrolled in Calculus and Algebra.

2. Method

The research approach used is descriptive research. The study sample consisted of 68 calculus students and 58 algebra students enrolled in one of the State Islamic Colleges in Batusangkar. The source instrument of self-efficacy used is an instrument adapted from [8] by changing the word "mathematics" with the words "calculus" or "algebra". Each component of the source of self-efficacy measured using six statements with level from one (definitely wrong) to six (definitely correct). Previous knowledge data obtained from the national exam value (N) for mathematics subjects with the criteria for achieving graduate competencies are very good ($85 < N < 100$), good ($70 < N \leq 85$), sufficient ($55 < N \leq 70$) and less ($0 < N \leq 55$) [16].

3. Results and Discussions

In Calculus, there were 13 male students and 54 female students, while in the Algebra there were 9 male students and 49 female students. Each student total score grouped based on the sources of self-efficacy for each lecture (Table 1).

Table 1. Total Score in Sources of Self-Efficacy

Source of self-efficacy	Calculus	Algebra
Mastery experience	1376	1198
Vicarious experience	1713	1427
Social persuasion	1210	1026
Emotional and physiological states	1307	927

Table 1 shows that overall, both in Calculus and Algebra lectures, the source of self-efficacy from students comes more from vicarious experience. This indicates that one's self-efficacy appears more after seeing the success of others in solving mathematical problems. Based on the questionnaire filled by students, the influence of adults (for example: parents, teachers, lecturers) on student self-efficacy

reached 79% in Calculus lectures and 76% in Algebra lectures, while the influence of friends on student self-efficacy reached 78% in Calculus lectures and 75% in Algebra lectures.

The results of this study are in line with previous research that stated that vicarious experience contribute to self-efficacy [15, 17]. However, the findings of this study conflict with findings [6, 8, 11] which state that the most important source of self-efficacy is mastery experience. Differences in methodology can cause inconsistencies in the results of the above research [11].

3.1. Source of self-efficacy by gender

Figure 1 shows the percentage of the total scores from the source of self-efficacy of students based on gender for each lecture. This result shows that the mastery experience in both lectures higher for male than female students. Meanwhile, the influence of vicarious experiences on the students learning abilities is lower for male than female, as seen in both lectures. In Calculus lectures, the effect of social persuasion on male students is almost the same as female students. In Algebra lectures, the effect of social persuasion for students is higher on male than female. The emotional and physiological state as the last source of self-efficacy also gives different results for the two lectures.

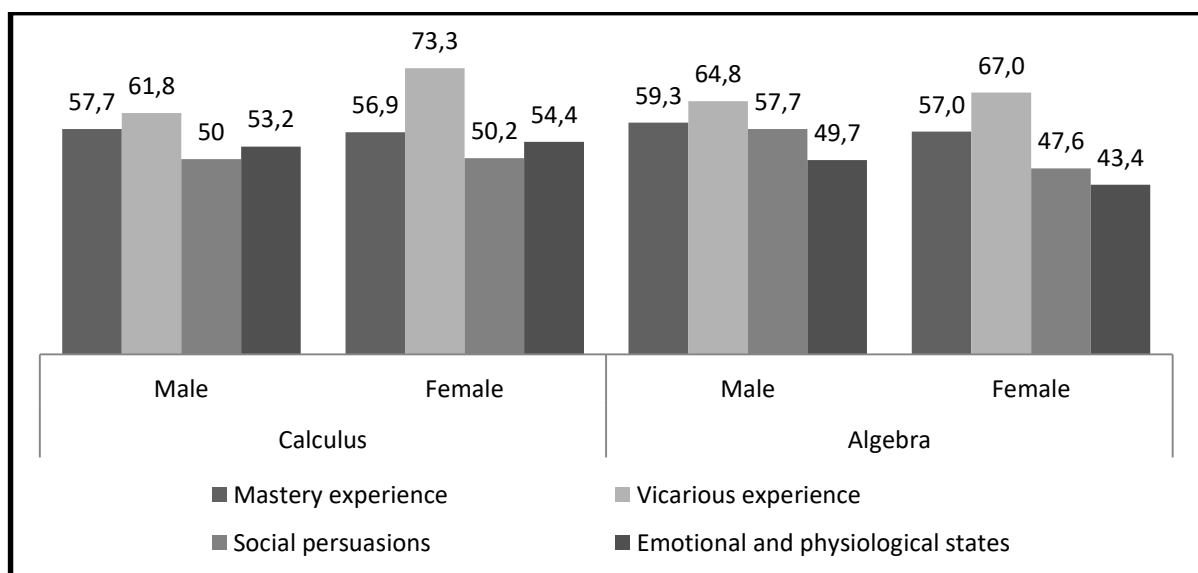


Figure 1. Percentage of Total Scores from Sources of Self-Efficacy Based on Gender

Overall the source of male students' self-efficacy is the same as female students. The source of self-efficacy of male and female students is more influenced by vicarious experience and mastery experience. Vicarious experience who have more encourage male students' self-efficacy in Algebra lectures is adults (70%), while in female students are adults (77%) and friends (77%). Meanwhile, in Calculus lectures, male students were more dominant in competing with themselves (68%), while female students made adults (82%) and friends (82%) as a driving force for self-efficacy. Mastery experience is better when students are able to do the task well. In Calculus lectures, male students gave 64% opinions and female students argued 72%, while in Algebra lectures male students found 65% and female students argued 69%.

This finding is slightly different from the results of the study [11], namely mastery experience and social persuasion predict the academic self-efficacy of girls, while mastery experience and vicarious experience predict self-efficacy for boys. Other studies support the above findings, namely the influence of vicarious experiences and social persuasion on students female is stronger than male [18].

3.2. Source of self-efficacy by prior knowledge

The percentage of total student self-efficacy scores based on prior knowledge for each lecture can see in Figure 2 and Figure 3. From Figure 2, information is obtained that, in Calculus lectures, the source of self-efficacy comes more from the vicarious experience for each category of prior knowledge. Self-efficacy derived from mastery experience has a smaller percentage score than vicarious experiences. For the source of self-efficacy in the form of social persuasion and emotional and physiological states, the percentage score is different for each prior knowledge category. Emotional and physiological state for prior knowledge with very good categories give the lowest score percentage.

Meanwhile, in Algebra lectures, the source of self-efficacy also comes more from the vicarious experience for each category of prior knowledge, after which it is followed by mastery experience, social persuasion and emotional and physiological states (see Figure 3). This indicates that there are consistent sources that affect student self-efficacy based on prior knowledge in Algebra lectures.

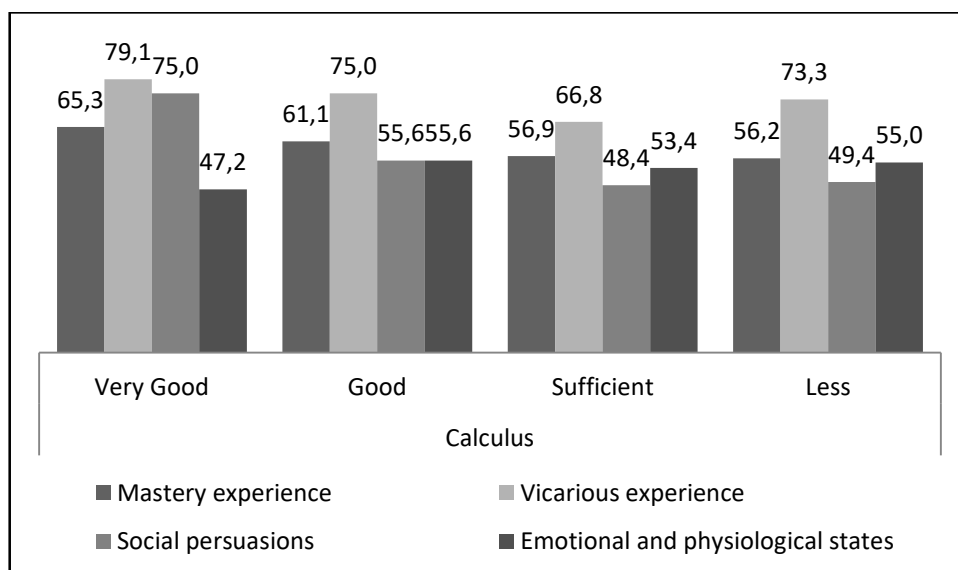


Figure2. Percentage of Total Sources of Self-Efficacy Scores Based on Prior Knowledge in Calculus

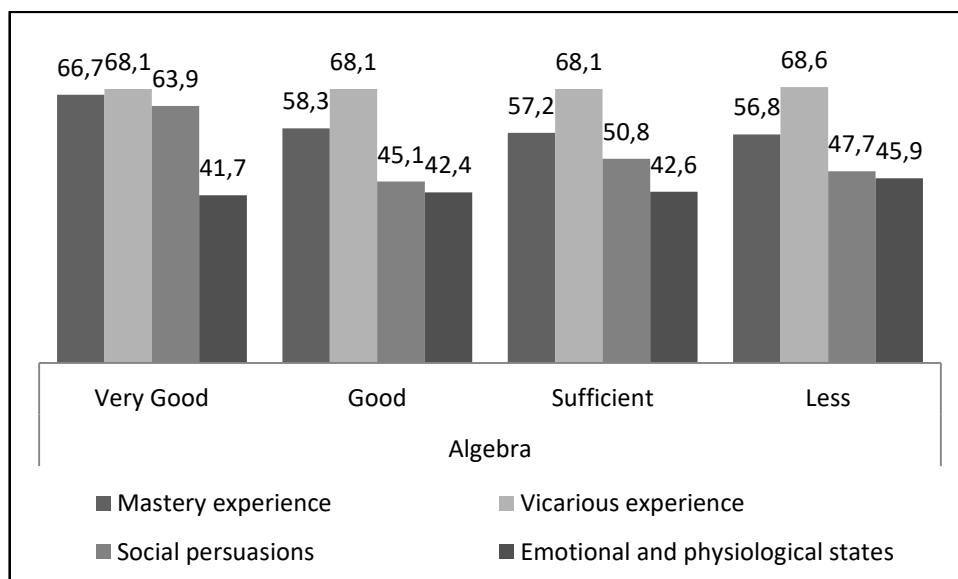


Figure3. Percentage of Total Sources of Self-Efficacy Scores Based on Prior Knowledge in Algebra

Overall, the source of self-efficacy comes mostly from the vicarious experiences for each category of prior knowledge. When the researcher detailed the results of the sources of self-efficacy from the vicarious experience, the researchers finds that students who have prior knowledge with a very good category, competing with themselves to be able to master calculus (91.7%) was greater than the influence of adults (83%). While, still in Calculus lectures, the experiences of others most triggered the self-efficacy of students who had prior knowledge with good, sufficient and less categories respectively 92% of adults, 73% of adults and friends, and 81% of adults and friends. Meanwhile, in Algebra lecture, the self-efficacy of students who have prior knowledge is very good from adults (75%) and self (75%). For students who have prior knowledge in the categories of good, sufficient and less, their most dominant self-efficacy comes from adults and friends.

It means that students with prior knowledge are very good at having self-efficacy sources that come from themselves and adults. Students with prior knowledge are good, sufficient and less the source of self-efficacy that comes from successful vicarious experience, namely adults and peers.

This condition also occurs in students with prior knowledge of good, sufficient and less. Not believing in your self can cause this situation [19]. The success achieved by others indicates that they themselves can do the same task, while failures obtained by others may make them not do the task [19].

4. Conclusion

This study finds that, in Calculus and Algebra lectures, the source of student self-efficacy was more from vicarious experience. The source of self-efficacy of male students is similar to female students, which is more influenced by vicarious experience and mastery experience. Based on prior knowledge, most sources of self-efficacy come from vicarious experience. Students with prior knowledge are very good at having sources of self-efficacy that come from themselves and adults. Students with prior knowledge are good, sufficient and less, have a source of self-efficacy that comes from the successful vicarious experience, namely adults and friends.

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