Students' Self-Efficacy in Science Learning based on Gender

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Abstract: This study aims to determine students' self-efficacy in Science learning. In addition, this study also aims to determine whether there is a difference of students' self-efficacy in Science learning according to gender. The research subjects were 34 students SMP Negeri 14 Yogyakarta consisting of 14 female students and 20 male students. The research instrument used is a questionnaire containing four indicators of self-efficacy in Science learning and 13 sub-indicators. The research analysis used is descriptive statistics and T-test. The results showed that the students' self-efficacy in Science learning is at a moderate level with a mean of 3.66. The mean in the female group is 3.68 (moderate) and the male group is 3.65 (moderate). The results of the T-test analysis showed that there is no difference in students' self-efficacy in Science learning between groups of female and male students. The results of this study only contain a small sample, therefore it is hoped that there will be further research using a wider sample.

Keywords: Gender; Science Learning; Self-efficacy

Introduction

Self-efficacy is an assessment of a person's ability to manage and solve various kinds of challenges (Bandura, 1997). Self-efficacy is the belief that each student has in the learning process where students who have a higher level of self-efficacy will be able to follow the learning process and carry out the tasks given (Toharudin et al., 2019). Self-efficacy means that an individual believes that they have the ability to succeed in a task or succeed in achieving a goal, so the individual will be more likely to try harder and less likely to give up, which in turn drives increased performance and marketing. An important aspect of this theory is about one's perception of one's own abilities (Webb-Williams, 2017). Thus, self-efficacy in Science learning is the ability of students to assess their own potential to succeed in Science learning based on their previous experiences in science class (Hushman & Marley, 2015).

The 2018 PISA results show that the self-efficacy of Indonesian students is generally good and even surpasses the OECD average self-efficacy. The average self-efficacy of Indonesian students in general is 82.6% (OECD, 2019). Meanwhile, Hasanah et al. (2021) showed that many junior high school students in both public and international schools have a moderate level of self-efficacy. This shows that both students in public schools and international schools think that they cannot complete assignments properly and tend to reject assignments from teachers. Student self-efficacy needs to be developed because self-efficacy can affect student performance, career goals, persistence, and motivation (Marshman et al., 2018; Öqvist & Malmström, 2017). Regardless of age, gender, domain, discipline, and country, a learner with a higher sense of self-efficacy will achieve better academic performance (Loo & Choy, 2013).

Several factors that affect students' self-efficacy both are external and internal factor, one of them is gender (Ernawati et al., 2021a). Gender is very familiar with one's identity, both for men and women which refer to masculinity and femininity (Ernawati et al., 2021a). Conventional social norms circulating in society make women and men grow up with different conceptions,

ideas, and expectations about their lives (Fraile & Gomez, 2017). Therefore, it is necessary to know whether gender can affect students' self-efficacy in Science learning.

Students' self-efficacy in Science learning should be assessed and known because science self-efficacy is the critical predictor of students' achievement in Science learning. Student who has higher science self-efficacy tends to achieve higher science achievements (Burns et al., 2021). In the realm of science, students who possess a strong sense of confidence in their ability to succeed in science-related tasks and endeavors are more inclined to choose such activities, work diligently to complete them with success, persist through obstacles, and rely on physiological indicators that boost their confidence levels. Conversely, those students who lack the belief that they can excel in science-based activities will avoid them whenever possible and put forth minimal effort if they are unable to avoid them. In the face of typical challenges encountered in science, such students are more prone to giving up and experiencing stress and anxiety that will ultimately undermine their efforts (Britner & Pajares, 2006). Science teachers and educators are strongly advised to intentionally evaluate students' self-efficacy levels regarding their ability to perform scientific tasks in the classroom. If low levels of self-efficacy are identified, appropriate measures should be taken to increase students' self-efficacy levels in Science learning, which can be accomplished through methods such as vicarious learning, metacognitive prompting, self-regulated learning, and goal setting, among others (Aurah, 2017).

Science education relates to learning that involves students in inquiry-based investigations where students interact with teachers and classmates, builds relationships between existing science knowledge and understanding of science, applies science concepts to new questions, participates in problem solving, planning, reasoning from evidence, and group discussions, as well as having experience with active approaches to science learning. Science education has the main goal of forming scientific literacy (Contant et al., 2018). Thus, it is important to know students' self-efficacy in Science learning to help students' to become scientific literate people.

The results of the initial interview with the Science teacher at SMP Negeri 14 Yogyakarta show that students have less self-efficacy based on the results of observations made by the teacher in the classroom. However, these results are not enough because the teacher has not provided self-efficacy instruments to students. Also based on the passage above, it is important to know the self-efficacy of students in Science learning which is also analyzed from gender. State the objectives of the work and provide an adequate

background, avoiding a detailed literature survey or a summary of the results.

Method

This study aims to describe students' self-efficacy in science learning in terms of gender. This research is descriptive qualitative and does not test any hypothesis. This research was conducted at SMP Negeri 14 Yogyakarta. The sample in this study was class VIII C with a total of 34 students consisting of 14 female and 20 male. The sample selection was carried out based on the results of preliminary interviews with the Science teacher, then it was found that self-efficacy according to the Science teacher's observations is still low. Therefore, it is important to do a non-test with questionnaire to see students' self-efficacy. The procedure of this research shown in Figure 1.
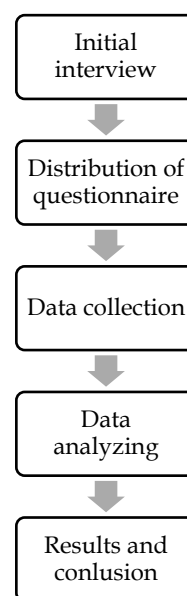

Figure 1. Research Procedure

The data collection technique used was through student self-efficacy questionnaires accessed through the Google Form. The statement items on the questionnaire consist of 13 statement items. Self-efficacy indicators in this study were synthesized from Bandura (1997), Rafiola et al. (2019), and Lin & Tsai (2013). These indicators are 1) Students' perceptions in completing assignments according to their own abilities; 2) Students' perception in solving problems based on their scientific content; 3) Students' perception in doing teamwork to complete assignments; and 4) Students' confidence to communicate and discuss. The four indicators are divided into 13 sub-indicators which then become statement items in the questionnaire. The 13 sub-indicators can be seen in Table 1.

Table 1. Indicators and Sub-Indicators of Self-efficacy Questionnaire

Indicator	Sub-indicator	Indicator	Sub-indicator
	Students work on individual assignments by relying on their own abilities	Students' perception in doing teamwork to complete assignments	Students feel unencumbered when working in teams
	Students do not ask their friends, if nothing is understood		Students believe that they can do group assignments
Students' perceptions in completing assignments according to their own abilities	Students do not ask other people to accompany them in doing assignments		Students believe that their friends entrust themselves to contribute to doing group assignments
	Students believe that they are able to complete the tasks given according to their abilities	Students' confidence to communicate and discuss	Students feel happy when discussing about science with their friends
	Students feel not burdened when given a problem		Students feel confident when discussing science with their friend
Students' perception in solving problems based on their scientific content	Students have the initiative to solve the problems given		Students have confidence when making presentations in the class
	Students believe that they can solve the problems given		

The questionnaire used was a Likert questionnaire with 5 scales. The questionnaire instrument is feasible, valid, and reliable enough to be given to research subjects.

Table 2. Criteria of Self-efficacy

Mean	Level
x ≤ 2.00	Very low
2.00 <x ≤ 3.00	Low
3.00 <x ≤ 4.00	Moderate
4.00 <x ≤ 4.50	High
4.50 <x ≤ 5.00	Very High

(Perdana et al., 2021)

The data analysis technique used in this research was descriptive statistical analysis technique and T-test. The data analysis technique used is to review the mean and test the T-test to find out the differences in self-efficacy between female and male students. Meanwhile, students' self-efficacy criteria are shown in Table 2.

Result and Discussion

Self-efficacy is a person's assessment of a person's ability to manage and solve various kinds of challenges (Bandura, 1997). Self-efficacy in Science learning is defined as the ability of students to assess themselves for their potential to succeed in learning science based on their experiences in previous science classes (Hushman & Marley, 2015). From the research that has been done, it can be explained descriptively by the statistics. The result of this study can be seen.

Figure 2 shows that female students have higher self-efficacy in Science learning on indicator of students' perceptions in completing assignments according to their own abilities and students' perception in solving problems based on their scientific content. While male students have higher self-efficacy in Science learning on indicator of students' perception in doing teamwork to complete assignments and students' confidence to communicate and discuss. Entirely, the highest average of indicator is students' perception in doing teamwork to complete assignments. Then, subsequently followed by students' perception in solving problem based on their scientific content, students' confidence to communicate and discuss, then the lowest average of indicator is students' perceptions in completing assignments according to their own abilities. Overall, the average self-efficacy of female and male students' can be seen in Figure 3.
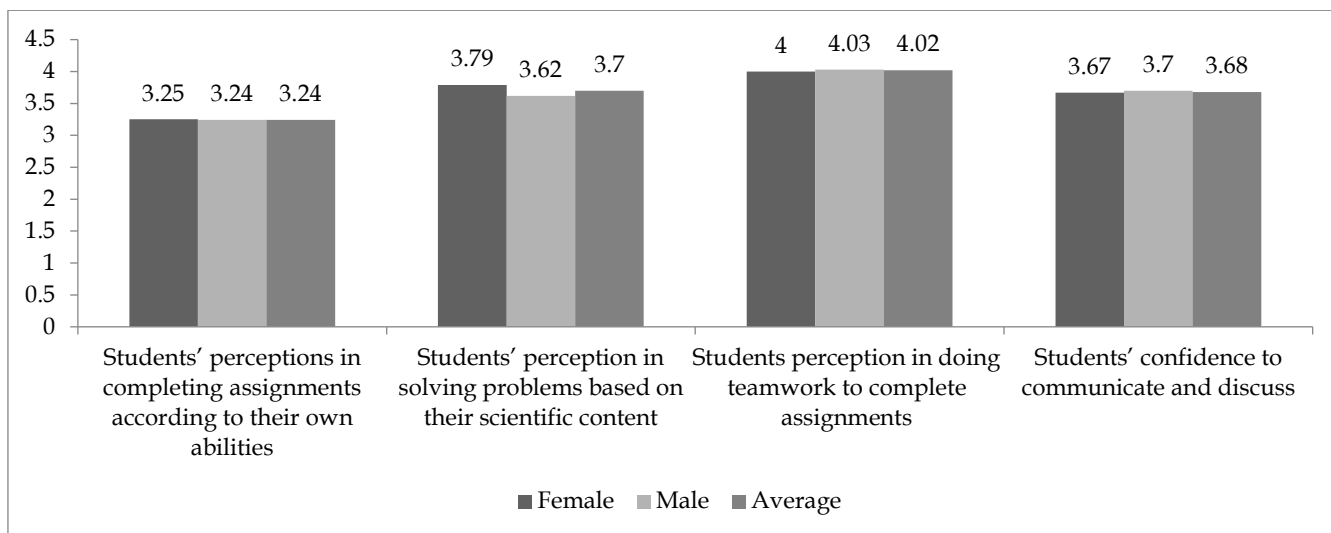
Figure 2. Students' Self-efficacy in Science learning Based on Indicators

Figure 3. Students' Self-efficacy in Science Learning

Figure 3 shows that female students have higher self-efficacy in Science learning, but both female and male students have self-efficacy in Science learning on moderate level. Overall, the average of students' self-efficacy in Science learning is on moderate level (3.66). Then, to know more details about the self-efficacy in science learning, Table 3 and Table 4 describe it.

Table 3. shows the sub-indicator with the highest mean is "Students believe that they can do group assignments" with an overall average of 4.36 (high). The average in the female group is 4.21 (high) and in the male group is 4.50 (high). Meanwhile, the sub-indicator with the lowest mean is "Students do not ask their friends, if nothing is understood" with an average of 1.87 (very low). The average for the female group is 1.93 (very low) and the average for the male group is 1.80 (very low).

The results of the T-test show that the value of Sig. (2-tailed) > 0.05. This means that there is no difference in student' self-efficacy in Science learning between the female and male groups.

Based on the results of data analysis with descriptive statistics, it is shown that students' self-efficacy in class VIII C is in the moderate category with a mean of 3.66. Therefore, students' self-efficacy in Science learning still needs to be developed. Self-efficacy needs to be developed because self-efficacy can influence students' career goals, performance, persistence, and motivation (Marshman et al., 2018; Öqvist & Malmström, 2017).

The indicator with the highest mean is obtained by the indicator "Students' perception in doing teamwork to complete assignments" with an overall mean of 4.02 (high). The mean in the female group is 4.00 (moderate) and the male group is 4.03 (high).

The sub-indicator with the highest mean on this indicator is "Students believe that they can do group assignments" with an overall mean of 4.36 (high). The mean in the female group is 4.21 (high) and the male group is 4.50 (high). This shows that students in both female group and male group have a perception of themselves that they are capable of doing teamwork.

Then, the second highest sub-indicator is "Students believe that their friends entrust themselves to contribute to doing group assignments" with an overall mean of 4.00 (moderate). The mean in the female group is 4.14 (high) and in the male group is 3.85 (moderate). This shows that students in both female and male groups believe that their friends trust them to work together in doing group assignments.

Table 3. Students' Self-efficacy Based on Sub-indicators

Sub-indicator	F	Mean M	Mean (all)
Students work on individual assignments by relying on their own abilities	4.00	4.15	4.08
Students do not ask their friends, if nothing is understood	1.93	1.80	1.87
Students do not ask other people to accompany them in doing assignments	2.79	2.80	2.80
Students believe that they are able to complete the tasks given according to their abilities	4.29	4.20	4.25
Students feel not burdened when given a problem	3.79	3.55	3.67
Students have the initiative to solve the problems given	4.07	4.00	4.04
Students believe that they can solve the problems given	3.50	3.30	3.40
Students feel unencumbered when working in teams	3.64	3.75	3.70
Students believe that they can do group assignments	4.21	4.50	4.36
Students believe that their friends entrust themselves to contribute to doing group assignments	4.14	3.85	4.00
Students feel happy when discussing about science with their friends	4.14	4.05	4.10
Students feel confident when discussing science with their friend	3.71	3.85	3.78
Students have confidence when making presentations in the class	3.14	3.20	3.17

Table 4. T-test Result

Gender	N	Mean	Sig. (2-tailed)
F	14	3.68	0.876
M	20	3.65	

The sub-indicator with the lowest mean on this indicator is obtained by "Students feel unencumbered when working in teams" with an overall mean of 3.70 (moderate). The mean in the female group is 3.64 (moderate) and in the male group is 3.75 (moderate). This shows that students in both female and male groups do not feel reluctant to work together in teams. Students must have good teamwork because future job seekers will not only look at the scientific content possessed by individuals, but also teamwork to work with others. Students who have good teamwork are students who are able to work effectively with people of all ages, gender, race, religion, identify strengths of team members, acknowledge one's own strengths and limitations, understand the roles of team members and perform tasks, able to lead, train, guide and motivate others, give and receive constructive feedback and resolve disagreements. Teamwork can be developed from an early age by involving students to work in teams (Wrahatnolo & Munoto, 2018).

The indicator with the second highest mean is "Students' perceptions of solving problems based on their scientific content" with an overall mean of 3.70 (moderate). The mean in the female group is 3.79 (moderate) and the male group is 3.62 (moderate). The highest mean sub-indicator in this indicator is "Students have the initiative to solve the problems given" with an overall mean of 4.04 (high). The mean in the female group is 4.07 (high) and the male group is 4.00 (moderate). This shows that students in both female and male groups have a perception that they have the initiative to solve the problems given in Science learning.

The second highest mean sub-indicator in this indicator is "Students feel not burdened when given a problem" with an overall mean of 3.67 (moderate). The mean in the female group is 3.79 (moderate) and the male group is 3.55 (moderate). This shows that students in both female and male groups do not feel reluctant when given problems in Science learning.

The lowest mean sub-indicator in this indicator is "Students believe that they can solve the problems given" with an overall mean of 3.40 (moderate). The mean in the female group is 3.50 (moderate) and the male group is 3.30 (moderate). This shows that students in both female and male groups feel confident enough in themselves that they can solve the problems presented in Science learning. The indicator "Students' perceptions of solving problems based on their scientific content" has a strong relationship with the Science learning approach, namely Deep Strategy (students' adoption of meaningful learning strategies when studying material in Science learning). This is shown by making connections and summarizing important ideas (Lin & Tsai, 2013). Thus, students have iitiatives and solutions to solve problems given by teachers when in Science learning class.

The indicator with the third highest mean is "Students' confidence to communicate and discuss" with an overall mean of 3.68 (moderate). The mean in the female group is 3.67 (moderate) and the male group is 3.70 (moderate). The highest mean sub-indicator on this indicator is "Students feel happy when discussing about science with their friends" with an overall mean of 4.10 (high). The mean in the female group is 4.14 (high) and in the male group is 4.05 (high). This shows that students in both female and male groups feel happy when they discuss science content with their friends.

The sub-indicator with the second highest mean on this indicator is "Students feel confident when discussing science with their friend" with an overall

mean of 3.78 (moderate). The mean in the female group is 3.71 (moderate) and the male group is 3.85 (moderate). This shows that students in both female and male groups have confidence in themselves that they have sufficient scientific content to discuss with their friends.

The sub-indicator with the lowest mean on this indicator is "Students have confidence when making presentations in the class" with an overall mean of 3.17 (moderate). The mean in the female group is 3.14 (moderate) and the male group is 3.20 (moderate). This shows that students in both female and male groups have a perception in themselves that they have self-confidence when making presentations during Science learning. Overall, the indicator "Students' confidence to communicate and discuss" shows that students are confident and don't mind discussing with their friends. This can happen because students master the content being discussed or presented, know their strengths and weaknesses, and are not afraid if their friends make fun of them during discussions or presentations (Sagita et al., 2019).

The indicator with the lowest mean is "Students' perceptions in completing assignments according to their own abilities" with a mean of 3.24 (moderate). The mean for female group is 3.25 (moderate) and for male group is 3.24 (moderate).

The lowest mean sub-indicator in this indicator is "Students do not ask their friends, if nothing is understood", with an overall mean of 1.87 (very low). The mean in the female group is 1.93 (very low) and in the male group is 1.80 (very low). This shows that students in both female and male groups have a tendency to complete individual assignments with the help of others.

Furthermore, the second lowest mean sub-indicator in this indicator is "Students do not ask other people to accompany them in doing assignments" with an overall mean of 2.80 (low). The mean in the female group is 2.79 (low) and in the male group is 2.80 (low). This shows that students in both female and male group doing individual assignments require the presence of other people nearby. This can happen because students lack of confidence in doing individual assignments.

Then, the second highest sub-indicator in this indicator is "Students work on individual assignments by relying on their own abilities" with an overall mean of 4.08 (high). The mean in the female group is 4.00 (moderate) and the male group is 4.15 (high). This shows that students in both female and male group have perception that they can carry out individual assignments with their own abilities.

The highest sub-indicator is obtained by "Students believe that they are able to complete the tasks given according to their abilities" with an overall mean of 4.25 (high). The mean in the female group is 4.29 (high) and

in the male group is 4.20 (high). This shows that students in both female and male groups have a sense of confidence that they can do it to the best of their ability.

Based on these results, it can be said that overall both female and male groups have confidence that they can carry out tasks relying on their own abilities, even though students still need assistance and ask others in carrying out individual assignments. Students may have cognitive anxiety where students feel worried, have negative thoughts about doing the tasks they are doing, feel out of control, and feel overwhelmed with the assignments given (Duda, 1998). Individuals who have cognitive anxiety will feel insecure, then need the presence of other people and help from others when doing individual tasks. The results of research by Hong et al. (2017), show that the more cognitive anxiety increases, the lower the self-confidence possessed by individuals.

The results of the descriptive statistical analysis show that the female group has a higher mean self-efficacy than the male group. However, the results of the T-Test showed that there is no difference in the students' self-efficacy in the female and male groups. This is shown by Sig. 2-tailed > 0.05, which is 0.876. The results of this study differ from studies which state that there are differences in students' self-efficacy in Science learning in the female and male groups (Ernawati et al., 2021a; Retni et al., 2021; Aurah, 2017). In addition, the results of research by Ernawati et al. (2021b), show that the male group has higher self-efficacy in Science learning than the female group. While, the results of research by Aurah (2017) show that female group has higher self-efficacy in Science learning.

Nonetheless, several studies have found that self-efficacy in groups of female and male has no difference. According to research by Kıran & Sungur (2012), there is no difference in self-efficacy in Science learning in groups of female and male because male and female have similar levels of learning achievement in Science learning, similar levels of experience in carrying out activities Science learning, so that they receive the same level of verbal or nonverbal judgment about their abilities, and send similar positive messages to themselves. Research by Musisi et al. (2021) shows that there is no difference in self-efficacy in groups of female and male in Science learning (Biology, Chemistry, and Laboratory) because currently there is a lot of public attention to female who work in the field of Science, so this increases female's self-efficacy in Science learning.

Self-efficacy in Science learning is influenced by several factors, they are the influence of parents and family, classroom environment and teachers, science learning approaches, meta-conceptual awareness, meta-conceptual regulation, and affective regulation (Lin & Tsai, 2013; Sha et al., 2015; Dorfman & Fortus, 2019;

Kirbulut & Uzuntiryaki-Kondakci, 2019). Parents who encourage their children with verbal messages and appreciate the efforts made by their children can influence their children's self-efficacy in Science learning (Dorfman & Fortus, 2019). Family support in Science learning experienced by children has a major impact on children's self-efficacy in Science learning. Family involvement in children's learning processes can strengthen their feelings of connection with family members. This can strengthen their confidence in their abilities and interest in exploring their surroundings. Thus, interpersonal relationships are the key to fostering self-efficacy (Sha et al., 2015).

The classroom environment can also have many potential influences on self-efficacy, for example the characteristic of tasks, the amount and type of teacher attention, and differences in social strata (Pajares & Urdan, 2006). Teachers can influence students' self-efficacy because teachers play a major role in shaping the classroom atmosphere and provide knowledge of efficacy through social persuasion (formal and non-formal evaluation and feedback), mastery experiences (activities that have been planned and how they define success in these activities), and experience (Dorfman & Fortus, 2019). Thus, teachers must make several changes in Science learning so that students' self-efficacy in Science learning can increase.

Conclusion

The research result shows that students' self-efficacy in Science learning is at a moderate level with a mean of 3.66. The mean in the female group is 3.68 (moderate) and male group is 3.65 (moderate). The result of the T-test analysis shows that there is no difference in self-efficacy in Science learning between female and male group. Student self-efficacy in Science learning can be increased through the role of the family and teacher in the classroom. The results of this study contain only a small sample, therefore it is hoped that there will be further research using a wider sample.

Author Contributions
Amalia Rahmadani; conceptualization, data curation, formal analysis, methodology, investigation, writing-original draft, Adilah Afikah; conceptualization, validation, project administration, Insih Wilujeng; validation, writing-review&editing, Suyanta; writing-review&editing, Jumadi; supervision.

Conflicts of Interest
The authors declare no conflict of interest.

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