

Profile of students' self-efficacy in chemistry learning: Case study at senior high school

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Abstract. This study aims to analyse students' self-efficacy in chemistry learning. Descriptive quantitative method was used in this research. The research respondent was 77 senior high school student in Yogyakarta Indonesia. Data collection techniques was survey. Instruments used for collecting data was questionnaire sheet. The data analysis technique used was V'Aiken equation to analyse experts judgement in validation process and likert scale to analyse self-efficacy data. The results of this study were 1) 53% of student had higher criteria of self-efficacy and 47% had lower of it, 2) the factors affecting students' self-efficacy were motivation, personal experience, phsycology, emotional, and social environment. The more factors owned by student, the more students' self-efficacy rose otherwise their self-efficacy will decrease.

Keywords: *self-efficacy, chemistry, learning*

1. Introduction

Self-efficacy is people's belief with their ability to do something in accordance with the objectives to be achieved. The purpose of chemistry learning is to prepare students in solving the problems they face [1]. For instance, might be some difficults chemical materials considered by students namely redox and electrochemistry, the colligative nature, stoichiometry, molecular shape [2] and chemical bonds [3]. The confidence possessed will facilitate students in solving these problems [1]. The self-efficacy of students is also very closely related to the academic achievements they have achieved. The more self-efficacy of students, the more academic achievement also increases [4], [6]. Conversely, the low self-efficacy of students is commonly associated with the low effort of students, especially in solving a problem [7]. So the student's self-efficacy becomes an important factor in learning chemistry. This is because self-efficacy not only affects performance but also cognitive processes, motivation, and feelings [8].

Self-efficacy becomes a major determinant in measuring students' self-confidence related to perseverance in working on assignments and measuring the amount of effort expended [9]. There are 3 components that differentiate self-efficacy in each individual, namely magnitude, strength, and generality. Magnitude level is related to the degree of difficulty of the task when the individual is able to do it. Strength is related to the level of strength of an individual's faith in his abilities. Generality relates to how a person is able to generalize tasks and previous experiences to deal with something [10]. Thus, students who have strong beliefs will tend to choose tasks that are challenging [11]. The fact is the students' self-efficacy has not been maximized yet. It can be seen from the



average students who are not ready to accept assignments and feel burdened. Not a few of the students also collect assignments past the time limit specified by the teacher [12].

Putri and Prabawanto also stated that high school students' self-efficacy was very low. Participants who are considered to have high cognitive levels do not have confidence in solving problems given by the teacher [1]. Research of Getachew and Birhani [13] and Cheung [14] also explained the same thing. The two researchers focused their research to improve students' low self-efficacy. In this research, researcher will analyse what are the reasons for the low self-efficacy in students. The above question becomes pointed question that will be examined in this study.

2. Research method

This research was descriptive quantitative. The subject of this research was senior high school student with total respondent 77 students in Yogyakarta Indonesia. The technique used for collecting data was survey. Instrument used for collecting data was questionnaire sheet with 30 statements of self-efficacy that must be answered by the respondent and has been validated by experts. Self-efficacy indicators used in questionnaire and in this study are shown in table 1.

Table 1. Self-efficacy indicators.

No.	Dimension	Indicators
1	Magnitude	Complete the assignment in various difficulty levels Having faith in being able understanding chemical matter
2	Strength	Use hard work to complete tasks Complete the task and have maximum learning achievement Spend more time to complete task/problem encountered
3	Generality	Being able to finish problems in various situations Use effective strategy to achieve maximum results

The validation results were analyzed quantitatively using the V'Aiken equation to determine the value of content validity. The following is the V'Aiken equation [13]:

$$V = \frac{\sum s}{n(c-1)} \quad (1)$$

With V : the content validation coefficient of Aiken's V ; s : $r - l_0$; r : score given by the validator; c : the highest validity rating score; l_0 : the lowest validity rating score. Score obtained from the validation of learning media and test questions were then converted to a qualitative form with 4 criteria according to the range of V'Aiken index in table 2.

Table 2. Validity criteria.

Validity Result	Validity Criteria
$0.8 < V \leq 1$	Very Adequate
$0.6 < V \leq 0.8$	Adequate
$0.4 < V \leq 0.6$	Less Adequate
$0.2 < V \leq 0.4$	Inadequate

Questionnaire data was analyzed using a Likert scale with 5 scales by determining the categorization of ratings refer to table 3 [15].

Table 3. Students' self-efficacy categorization.

No.	Students' Score	Self-Efficacy Category
1.	$X \geq \bar{X} + 1.SBx$	Very High
2.	$\bar{X} + 1.SBx > X \geq \bar{X}$	High
3.	$\bar{X} > X \geq \bar{X} - 1.SBx$	Low
4.	$X < \bar{X} - 1.SBx$	Very Low

with SBx: the standard deviation of the overall score of students; \bar{X} : the average overall score of students; X: score achieved by students.

3. Results and Discussion

V'Aiken calculation results stated that the questionnaire sheet was valid. The validity levels of it fell into the high category as shown in table 4.

Table 4. Results of data collection instrument validity.

Data Collection Instruments	V'Aiken Coefficient	Explanation
Assessment of questionnaire sheet	1	Valid (Very Adequate)

Questionnaire sheets that were declared valid were then used to assess students' self-efficacy. There are three level or indicator of self-efficacy namely magnitude, strength, and generality. The response of students to the level of magnitude is shown in figure 1.

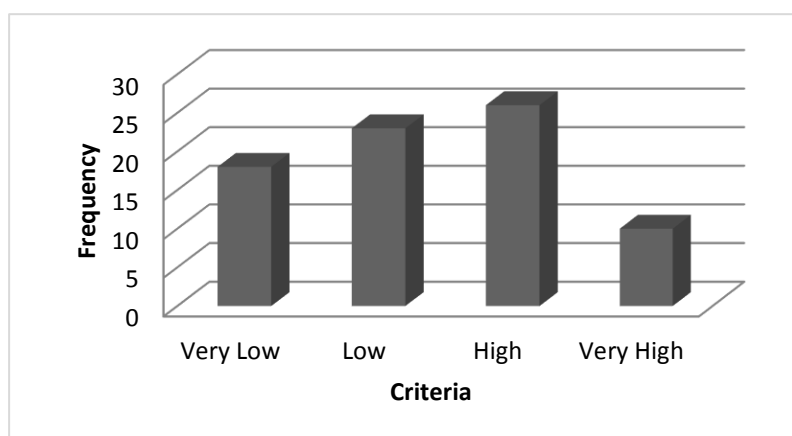


Figure 1. Frequency distribution of students' self efficacy in magnitude level.

Figure 1 shows about the frequency of the ability of learners in completing the task of chemistry at various levels of difficulty. 34% of students have self-efficacy at high magnitude levels, 30% are low, 23% are very low, and 13% students are very high. The percentage owned by students on each criterion was influenced by several factors including motivation, experience, and social environment. Students who have high motivation and experience tend to have high beliefs about what students can do, anticipate the possibilities that can occur through actions and set goals and plan programs for the future [10]. Furthermore, the response of students to the persistence of the effort and confidence is shown in figure 2.

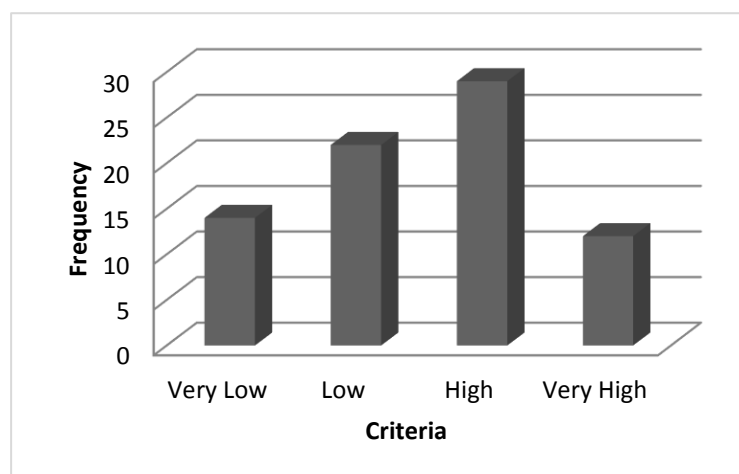


Figure 2. Frequency distribution of student's self efficacy in strength level.

Figure 2 shows the frequency of student's self-efficacy at the level of strength. This level is related to one's efforts in solving a chemical problem or task. The higher the level of difficulty of the chemical task obtained, the stronger the confidence felt to complete it [10]. Figure 2 also represents that 38% of students have high persistence (29 students), 29% are low (22 students), 18% are very low (14 students), and 16% are very high (12 students). Approximately 50% of students have low persistence and effort in dealing with a problem or something challenging. This cases are commonly experienced by students who often avoid challenging assignments. They tend to give up before trying to do it. Ultimately, the failure experienced causes a loss of their self confidence [10], [16]. While the high persistence of someone is directly proportional to the many challenges they face. Persistence is increasing when a person can face a challenge with limited assistance [10]. The next level is the level of generality, the following self-efficacy data are presented in figure 3.

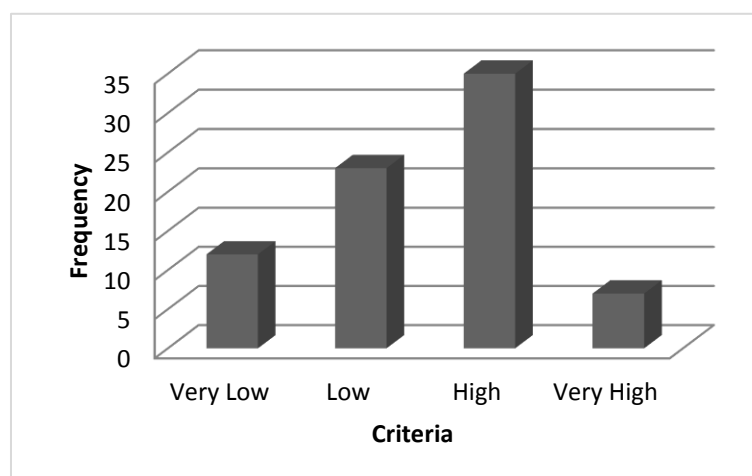


Figure 3. Frequency distribution of student's self-efficacy in generality level.

Figure 3 presents data on the generality level that is owned by students. This level describes how the students' ability to solve problems in various situations and how to achieve maximum results with effective strategies. The high ability possessed by students in determining the right strategy will facilitate them in solving a problem [10]. Figure 3 shows that 45% of students have high confidence in their abilities. 30% have low confidence, 16% are very low, and 9% are very high. Generally, self-learners efficacy profiles are presented in figure 4.

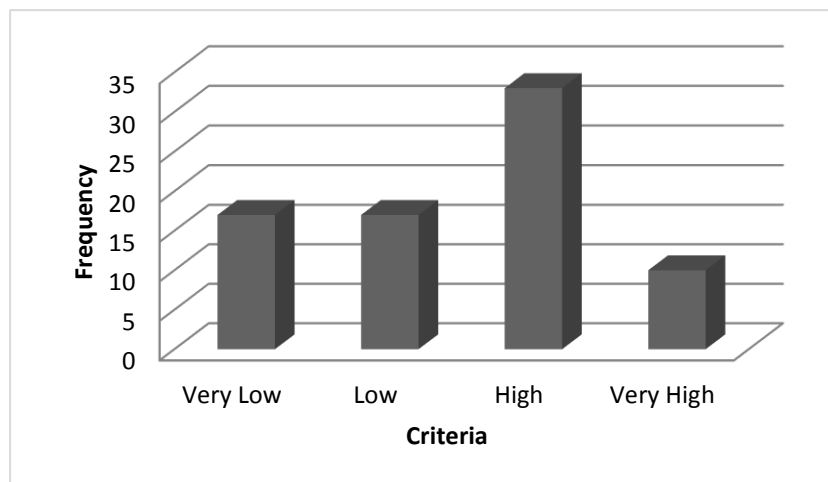


Figure 4. The frequency distribution of students' self-efficacy.

Figure 4 shows the overall self-efficacy profile that is owned by students. There are 33 students having high self-efficacy category and 10 with very high self-efficacy category. The percentage of the two criteria are 43% and 10% respectively. The high self-efficacy of students is supported by confidence in the mastery of chemical materials, in the ability to solve problems, in the execution of tasks that are challenging, in the persistence possessed, and in the strategies possessed to achieve maximum results. Meanwhile, 17 students had low self-efficacy and 17 with very low efficacy. The low self-efficacy of students has an impact on the tendency of students to be passive and reluctant to face a challenge. There are 4 factors that determine one's self-efficacy, namely 1) experience, 2) psychology, 3) verbal persuasion, and 4) emotional [10]. The most influential factor of the four factors is the experience factor which refers to the successes and failures that have been achieved. Success will increase one's self-efficacy and failure is the opposite. Motivation from self and the environment can be used as a treatment to improve the low self-efficacy of a person.

4. Conclusion

Taking everything into account, we can conclude that half of students have high self-efficacy and on the contrary. High and low self efficacy, especially in learning chemistry is influenced by motivation, experience, confidence in problem solving, psychology, emotional, and social environment.

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