Senior high school students’ self-efficacy on learning acid-base

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Abstract. In learning chemistry such as acid-base students’ self-efficacy is important. The aim of this research was to describe the senior high school students’ self-efficacy in learning acid-base using descriptive method. There were 109 senior high school students in Yogyakarta, Indonesia who participated in this research. Questionnaire sheet was used to obtain the data of students’ self-efficacy by 32 item statements. This questionnaire sheet was contained five aspects of self-efficacy, there were task orientation, effort, persistence, beliefs, and performance. The analysis of students’ self-efficacy data was conducted quantitatively, then categorized from self-efficacy score into ideal rating category. The result of this research showed that 2 students had very good category, 57 students had good category, and 50 students had fair category. It indicated that the average senior high school students in Yogyakarta, Indonesia had enough until good category of self-efficacy in learning acid-base.

1. Introduction

There are many factors which may affect the students’ academic achievement, one of them is self-efficacy. Self-efficacy is defined as an individual belief in the capacity to perform a specific action successfully [1]. The theory of self-efficacy is based on cognitive frameworks [2]. In line with [3] the self-efficacy concept is related with belief that students should have to evaluate their capabilities to accomplish specific tasks. This concept has a strong effect on the approach to the task, persistence to achieve something, as well as the level of effort. Self-efficacy determines how individuals perceive, think, motivate themselves, and behave.

One research suggest that self-efficacy is important to achieve high success in mastering the chemistry matter [4]. At this time, most of teachers are still not aware about the importance of monitoring students’ self-efficacy during the learning process. Whereas, students with high levels of self-efficacy tend to be more motivated, use many strategies, have high achievements, and relieve stress or anxiety [5].

There are some good strategies for improving students' self-efficacy. The first is a specific teaching strategies. This strategy teaches students to describe and conclude the task given by the teacher, so students can improve their ability to focus on their tasks. Second is teacher guide students to set a goals (short-term or long-term). The third is consider mastery, teacher can give students a reward when show good performance in completing a task. Fourth is combine strategy training with goals. The combination between strategy training and goal setting can improve the students’ self-efficacy through skill development. It is able to provide students with feedback on how to study strategies that are appropriate to the performance of learners. The last is provide students with support. Teachers, parents, and peers can give some positive support to students [6].
2. Methods
The type of this research is a descriptive with quantitative approach. This research aims to describe the senior high school students’ self-efficacy in learning acid-base. One-hundred and nine students were participated in this research. Of all the participants, 40 were male (37%) and 69 were female (63%) aged between 16-18 years old. All participants were from four science classes at one senior high school in Yogyakarta Indonesia. Participants in this research were selected by convenient sampling technique.

The students’ self-efficacy were measured by questionnaire using Likert scale with five scales from very poor to very good. Students were asked to answer the questionnaire that consist of 32 statements (16 positive statements and 16 negative statements). In self-efficacy questionnaire, there were five aspects that synthesized from low and high criteria of self-efficacy \[1,4,7,8,9\]. These aspects were task orientation, effort, persistence, beliefs, strategy use, and performance. Before used, this questionnaire needs to be validated theoretically and empirically. Theoretical validity was done by consult with expert judgment. Furthermore, 160 students were asked to answer self-efficacy questionnaire to fulfill the empirical validity.

The self-efficacy score of each students from questionnaire sheet were analyzed using quantitative descriptive method. Firstly, self-efficacy score were converted into interval data scale then were categorized based on ideal rating category with very good, good, fair, poor, and very poor category which can be seen in Table 1.

### Table 1. Ideal Rating Category

| Score Range                                      | Category       |
|-------------------------------------------------|----------------|
| \( X > \bar{X}_i + 1.8 \times sb_i \)          | Very Good      |
| \( \bar{X}_i + 0.6 \times sb_i < X \leq \bar{X}_i + 1.8 \times sb_i \) | Good           |
| \( \bar{X}_i - 0.6 \times sb_i < X \leq \bar{X}_i + 0.6 \times sb_i \) | Fair           |
| \( \bar{X}_i - 1.8 \times sb_i < X \leq \bar{X}_i - 0.6 \times sb_i \) | Poor           |
| \( X \leq \bar{X}_i - 1.8 \times sb_i \)       | Very Poor      |

Note: \( \bar{X}_i = 1/2 \) (ideal max score + ideal min score); \( sb_i = 1/6 \) (ideal max score – ideal min score); \( X \) = average score of students’ self-efficacy \[10\].

3. Result and Discussion
Self-efficacy is an important variable for students to monitor by teachers. Self-efficacy focuses attention on students’ beliefs about the effectiveness of their learning methods. The purpose of self-efficacy monitoring is to make students predicting their learning accurately \[11\]. This result can be used by teacher to recognize students learning characters more deeply for each aspect. The task orientation aspects of self-efficacy are presented in Figure 1.

![Figure 1. Percentage of Task Orientation Aspect](image-url)
Task orientation aspect describe the students’ ability in completing a challenging or difficult acid-base task given by teacher. As shown in Figure 1 for task orientation aspect, a total 41% of students have fair category. Moreover, there were 34% of students have good category, 22% have very good category, and 3% have poor category. There weren’t students who have very poor category. It means that average senior high school students have self-efficacy at fair and good category on task orientation aspect. Based on the result, most students believe they could solve every task in various difficulties. So, it can be concluded that students who have high self-efficacy will approach a challenging or difficult task eagerly, whereas students who have low self-efficacy might avoid attempting a task [4]. Furthermore, the percentage comparison of effort aspect are shown in Figure 2.

Figure 2. Percentage of Effort Aspect

Figure 2 shows the percentage comparison of students’ self-efficacy in effort aspect. This aspect is related with students’ effort which used to solve an acid-base task. It can be seen that there were total 53% of students who have good category, 37% have fair category, 9% have very good category, 1% have poor category, and not found students who have very poor category. The percentage of students who have low self-efficacy were small, so it means that dominant students have high self-efficacy (good category) in effort aspect. Almost all students expend high effort when facing a challenging or difficult tasks, while just one student expend low effort when faced with challenging tasks of acid-base [8]. In addition, many students will keep tried to solve problems until complete. The next aspect is persistence, the following data are presented in Figure 3.

Figure 3. Percentage of Persistence Aspect

The third self-efficacy aspect which presented in Figure 3 is persistence. Persistence aspect describe how much time that used for each student to do their homework and understand acid-base matter which has not been mastered. A recent study revealed that students with high level of self-efficacy tend spend more time doing homework or tasks then the students with low level of self-efficacy [12]. Based on Figure 3, a total 52% of students show fair category (57 students), 33% show good category (36...
students), 12% show poor category (13 students), and 3% show very good category (3 students). A few
students (that is 13 students) still founded who only spent a little time for doing an acid-base tasks. In
short, most senior high school students have persistence aspect in fair category. The fourth aspect which
obtained from self-efficacy questionnaire sheet is beliefs that can be seen in Figure 4.

![Figure 4. Percentage of Beliefs Aspect](image)

The percentage comparison which shown in Figure 4 is percentage of belief aspect. Based on the
Figure 4, there were total 62% of students who have good category, 26% have fair category, 12% have
very good category, 1% have poor category, and not found students who have very poor category. The
results show that the most dominant students have good category in beliefs aspect (62%). The students
with low self-efficacy level tend to focus on feelings of incompetence, experience anxiety and
depression when goals aren’t achieved, and believe they’re not in control of their environment. Besides
that, students with high self-efficacy level believe that they will succeed, can control stress and anxiety
when goals aren’t achieved, and believe they’re in control of their environment [8]. The last is
performance aspect of students’ self-efficacy can be seen in Figure 5.

![Figure 5. Percentage of Performance Aspect](image)

Students’ self-efficacy on performance aspect can be seen in Figure 5. Based on Figure 5 for
performance aspect, a total 62% of students have fair category. Furthermore, there were 28% of students
have good category, 7% have poor category, 2% have very good category, and 1% have very poor
category. In performance aspect, most senior high school students have fair category. It means that there
are a lot of students who perform higher than the low self-efficacy students of equal ability. In this case,
students who judge themselves efficacious tend to learn and achieve better than the low self-efficacy
students of the same ability. Students with high self-efficacy believe that they can do a task and acquire
better learning outcomes. So, students with high self-efficacy and students with low self-efficacy will
have different academic performance even though their ability is similar [13]. Generally, the percentage
comparison of each students’ self-efficacy profiles are shown in Figure 6.
Figure 6. Percentage of Students’ Self-Efficacy

Figure 6 shows the overall percentage comparison of students self-efficacy level in learning acid-base. A total 52% of students have good category (57 students), 46% show have fair category (50 students), and 2% have very good category (2 students). Generally, most senior high school students have good and fair level category. There not found students who have poor category and very poor category. This result show that mostly students have beliefs in their ability when learning acid-base.

Students’ beliefs is a key role in affecting behavior both directly and indirectly, it impacts personal determinants including aspirations and goals, outcome expectations, affective inclinations, and social insecurity and self-doubt [14]. So, it is important measuring and describing students’ self-efficacy to ensure that it is domain-specific [15]. Hence, more attention should be given by teacher to 50 students in fair category, so can be known the reasons/obstacles that students encountered in learning acid-base. Furthermore, 57 students in good and very good category also remains to be given attention. It will make students more motivated in learning acid-base. Students who fell confident to understand and doing task about acid-base matter will achieve better than students who not confident with their ability. One study stated that self-efficacy strongly influences students’ motivation to learn. For instance, students with high self-efficacy accept more challenging tasks, exert more effort, persist longer, and generally perform better if compared to students with low self-efficacy [1].

4. Conclusion
Based on the results and discussion it can be concluded that most all of senior high school students has a high level of self-efficacy (from fair to very good category) in learning acid-base. Every student’s belief that they can accept and complete a challenging task, exert more effort, persist longer, and generally perform better if compared to students with low self-efficacy.

5. References
[1] Bandura A 1997 Self-Efficacy: The Exercise of Control (New York: Freeman)
[2] Dai D Y and Sternberg R J 2004 Motivation, Emotion, and Cognition: Integrative Perspectives on Intellectual Functioning and Development (USA: Lawrence Erlbaum Associates Inc Publishers)
[3] Goulao M F 2014 Athens J. Edu. 1 237-246
[4] Schunk D H 2012 Learning Theories: An Educational Perspective Sixth Edition (Boston: Pearson Education Inc)
[5] Abdelrahem A 2014 J. Edu. Tech. 10 29-39
[6] Stipek D 2002 Motivation to Learn 4th ed (Boston: Allyn & Bacon)
[7] Santrock J W 2011 Educational Psychology 5th ed (New York: Mc Graw Hill)
[8] Eggen P and Kauchak D 2010 Educational Psychology: Windows on Classrooms Eighth Edition (New Jersey: Merrill)
[9] Ormrod J E 2003 *Educational Psychology: Developing Learners Fourth Edition* (New Jersey: Merrill Prentice Hall)
[10] Widoyoko S E P 2016 *Evaluasi Program Pembelajaran Panduan Praktis Bagi Pendidik dan Calon Pendidik* (Yogyakarta: Pustaka Belajar)
[11] Zimmerman B J, Bonner S and Kovach R 1996 *Developing Self-Regulated Learners: Beyond Achievement to Self-Efficacy* (Washington DC: American Psychological Association)
[12] Bassi M, Steca P, Fave A D and Caprara G V 2007 *J. Youth Adolesc.* **36** 301-312
[13] Uzuntiryaki E 2008 *Australian J. Teach. Edu.* **33** 12-28
[14] Bandura A 1995 *Self-efficacy in Changing Societies* (UK: Cambridge University Press)
[15] Ferrell B and Barbera J 2015 *Chem. Educ. Res. Pract.* **16** 318

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