



Analysis of Student Self-Efficacy Profile in Chemistry Education Study Program at Universitas Riau

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Abstract. Research, examination, and intervention on self-efficacy in students is expected to benefit from the development of a measure of self-efficacy. Self-efficacy is defined as a person's confidence in themselves in facing or completing a task, achieving goals, overcoming obstacles, and achieving a goal. The study's subjects were 252 participants, 234 of whom were female and 18 of whom were male, all of whom were not married, and they were between the ages of 18 and 19. The self-efficacy scale of students has good validity and reliability, namely α , based on the results of psychometric analysis and tests carried out through internal consistency tests. Based on the results of psychometric analysis, internal consistency tests, and construct validity and reliability of the student self-efficacy scale, it has good validity and reliability, with $\alpha = 0.879$ (87.9%). The self-efficacy scale presented in this study can be used to measure self-efficacy in psychological research and intervention, especially developmental psychology and social psychology. Of the 40 items created, only 30 were accepted after validity and reliability tests, and 10 were dropped. It is based on good psychometric standards. This result explains that the three categories of self-efficacy explain learning outcomes by 20.7%.

Keywords: Self Efficacy, Student Profile, Chemistry Education.

1 Introduction

One of the factors that can influence the success of students in carrying out the learning process in their studies is self-efficacy^{1,2}. Self-efficacy is a person's belief in their ability to exercise a form of control over the person's own functions and events in the environment³⁻⁵. Self-efficacy can be interpreted as self-confidence to the extent to which individuals estimate their ability to carry out tasks or actions needed to achieve them. Based on these definitions, it can be concluded that self-efficacy is a form of belief possessed by individuals to be able to complete tasks or overcome problems independently³⁻⁵. The belief that a person has about their ability to complete a task is very

necessary to achieve the desired results. Self-efficacy is the belief that a person can master the situation and get positive results. Therefore, behavior can be influenced by a person's self-efficacy^{1,2,6,7}. For example, a student who has low self-efficacy tends not to want to try to complete assignments or exam questions, because they do not believe that studying can complete assignments or can fill in exam questions.

Analysis of the self-efficacy of chemistry students is very important in the context of education. This is because the analysis of chemistry students' self-efficacy can provide a deeper understanding of students' abilities in learning and mastering chemistry material⁵. By analyzing self-efficacy, chemistry students can identify their strengths and weaknesses in learning chemistry, so that they can make appropriate improvements and self-development^{8–10}. Self-efficacy analysis can also help chemistry students overcome feelings of self-doubt and anxiety in learning chemistry. In the context of education, the analysis of chemistry students' self-efficacy is very important. This is because the analysis of chemistry students' self-efficacy can provide a deeper understanding of students' abilities in learning and mastering chemistry material¹¹. By analyzing self-efficacy, chemistry students can identify their strengths and weaknesses in learning chemistry, so that they can make appropriate improvements and self-development.

Self-efficacy analysis can also help chemistry students overcome feelings of self-doubt and anxiety in learning chemistry. With a deep understanding of self-efficacy, chemistry students can be directed to increase learning motivation and develop more effective learning strategies. In addition, self-efficacy analysis is also important in evaluating chemistry education programs to improve the quality of learning. Self-efficacy analysis also provides valuable information for educational institutions and chemistry teachers. By knowing the level of self-efficacy of students, educational institutions can develop learning programs that are more suited to students' needs and improve the support provided to them¹². In the context of this study, it would be interesting to dig deeper into effective self-efficacy analysis methods and conduct a comparative study between various approaches to self-efficacy analysis on chemistry students' academic achievement¹³. In a more in-depth study, a comparison between various self-efficacy analysis methods could help in determining the most effective approach. Thus, educational institutions can adopt the best evaluation strategy to improve students' self-efficacy and their academic results^{14–16}.

This study can also provide valuable contributions to the academic world by providing new insights into the factors that influence chemistry students' self-efficacy¹⁷. The information obtained from the study can be used as a basis for developing better educational programs and providing more effective support to chemistry students in the future¹⁸. Thus, research on the analysis of self-efficacy of chemistry students is not only beneficial for the students themselves, but also for educational institutions, teachers, and researchers in the field of chemistry education^{19,20}. After seeing the urgency and potential contribution of research on the analysis of self-efficacy of chemistry students, the next step is to formulate the research framework and methodology to be used. Choosing the right research method will ensure the validity and reliability of the results of the study to be conducted⁴. Therefore, it is necessary to conduct a comprehensive literature review to evaluate the methods of self-efficacy analysis that have been used

previously and find the approach that best suits the research objectives. In addition, this study can also utilize the quantitative and qualitative data collected. With careful research planning and implementation of the right methodology, it is hoped that this research can make a significant contribution to our understanding of the self-efficacy of chemistry students and provide a strong foundation for the development of better educational programs in the future.

Based on the results of preliminary interviews, researchers found several problems experienced by students of class 2023/2024, including; 1) poor time management where many students cannot manage college time with their personal affairs so that lectures become neglected; 2) always procrastinating when working on lecture assignments; 3) low enthusiasm for learning which results in a disrupted learning process and affects student attendance and learning achievement which decreases; 3) too much thinking but no action is taken; 4) unable to socialize and adapt well; and 5) often following the advice of negative role models from their peers. As a result of these problems that cannot be handled, it ultimately results in the neglect of courses and a decrease in the academic performance index. Students at that level should have entered their final assignment, but currently they are still focusing on improving their academic performance index, both taking courses that were missed in previous semesters and repeating courses to improve the Grade Point Average (GPA) so that they can be considered worthy in the world of work when they graduate from college later.

Further research is needed regarding the profile of self-efficacy in students, especially in the Chemistry Education Study Program at Riau University. This is because no research has been done so that mapping of student abilities can be done and maximize the potential possessed by students. Based on the exposure of these problems, the researcher is interested in **“analyzing the self-efficacy profile of students in the chemical education study program”**.

2 Methods

This research is using qualitative method. Qualitative analysis is done by looking at the content and form of reading comprehension items. Sampling was carried out using the purposive sampling technique. The sample included 252 participants. The participants in the study were first-year to third-year students. This selection is based on the fact that students in this range are still active in face-to-face lectures in the classroom. therefore it is considered that checking this self-efficacy is able to guide them further.

Data sources used as data collection tools in this study, namely: Primary Data, including; validation sheets used to determine validity criteria, user response questionnaires used to determine student and lecturer response criteria, chemical literacy tests and chemical science attitudes. Secondary Data, including; syllabus, lesson plan, books, and related articles.

The data collection techniques used in this studies include documentation study that data collection technique carried out to obtain information about instruments that can be used to analyze student self-efficacy profiles. Questionnaires are used in the initial study (exploration) related to self-efficacy. The test instrument developed will go

through the stages of testing on 60 respondents and analyzing the items (validity test, reliability, difficulty level, differentiating power and the role of examiners. Item analysis with Rasch Model using Winstep 4.5.2 software. Based on the results of psychometric analysis, internal consistency tests, and construct validity and reliability of the student self-efficacy scale, it has good validity and reliability, with $\alpha = 0.879$ (87.9%). Questions that have been valid and reliable with a Cronbach alpha value > 0.7 will be distributed to respondents to determine self efficacy.

Table 1. Self-Efficacy Behavior Indicators

No	Dimensions	Indicator	Amount Item Question
1	Confidence in ability	Desire try something new	3
		No indecisive in take decision	3
		Evaluate self in a way positive	3
		Optimistic	3
2	High aspirations	Hope will time more front bright	3
		Desire finish education appropriate time	3
		Hope to achieve performance	3
3	Persistence	Persistent	3
		Finish task appropriate time	3
		Making time time For Study	3
Total			30

Table 2. Descriptive Quantitative Data Analysis Categorization Guidelines

Group	Score	Category
1	3,50 – 4,00	Very High
2	2,50 – 3,49	High
3	1,50 – 2,49	Average
4	1,00 – 1,49	Low

3 Results and Discussion

3.1 Results

One of the factors that can influence the success of students in carrying out the learning process in their studies is self-efficacy (1,2). Self-efficacy is a person's belief in their ability to exercise a form of control over the person's own functions and events in the environment (3,4). Self-efficacy can be interpreted as self-confidence to the extent to which individuals estimate their ability to carry out tasks or actions needed to achieve them. Based on these definitions, it can be concluded that self-efficacy is a form of belief possessed by individuals to be able to complete tasks or overcome problems independently (3-5). The belief that a person has about their ability to complete a task is very necessary to achieve the desired results. Self-efficacy is the belief that a person

can master the situation and get positive results. Therefore, behavior can be influenced by a person's self-efficacy (1,2,6,7). For example, a student who has low self-efficacy tends not to want to try to complete assignments or exam questions, because they do not believe that studying can complete assignments or can fill in exam questions.

Analysis of the self-efficacy of chemistry students is very important in the context of education. This is because the analysis of chemistry students' self-efficacy can provide a deeper understanding of students' abilities in learning and mastering chemistry materials (5). By analyzing self-efficacy, chemistry students can identify their strengths and weaknesses in learning chemistry, so that they can make appropriate improvements and self-development (8–10). Self-efficacy analysis can also help chemistry students overcome feelings of self-doubt and anxiety in learning chemistry. In the context of education, the analysis of chemistry students' self-efficacy is very important. This is because the analysis of chemistry students' self-efficacy can provide a deeper understanding of students' abilities in learning and mastering chemistry materials (11). By analyzing self-efficacy, chemistry students can identify their strengths and weaknesses in learning chemistry, so that they can make appropriate improvements and self-development. Self-efficacy analysis can also help chemistry students overcome feelings of self-doubt and anxiety in learning chemistry. With a deep understanding of self-efficacy, chemistry students can be directed to increase learning motivation and develop more effective learning strategies. In addition, self-efficacy analysis is also important in evaluating chemistry education programs to improve the quality of learning. The self-efficacy scale presented in this study can be used to measure self-efficacy in psychological research and intervention, especially developmental psychology and social psychology. Of the 40 items created, only 30 were accepted after validity and reliability tests, and 10 were dropped. It is based on good psychometric standards. The statements in the resulting questionnaire can be seen in Table 1.

Table 3. Standar deviation for each item statement

No	Statement	Std. Deviation
Desire to try new things		
1	I enjoy trying new things related to my studies.	0,734
2	I am not afraid to face new challenges in learning chemistry.	0,775
		0,820
3	I often look for additional information to deepen my knowledge in chemistry.	0,741
Don't be indecisive in making decisions		
4	I am confident in making decisions regarding my studies.	0,893
5	I rarely hesitate when making important decisions regarding my education.	0,994
6	I am confident in the decisions I make in solving academic problems.	0,876
Assess yourself positively		
7	I feel that I have sufficient ability to complete my studies well.	0,874
8	I see myself as a competent student in the field of chemistry.	0,774
9	I believe that I can achieve the things I target in my studies.	0,881
Optimistic		
10	I always look at the positive side of every academic situation I face.	0,878

11	I am confident that I can overcome any difficulties in my studies.	0,976
12	I am always optimistic about my academic future.	0,791
Hope for a brighter future		
13	I believe that chemistry education will give me a better future.	0,892
14	I believe that my efforts in this study will bring satisfactory results in the future.	0,902
15	I see my future as bright with the education I am pursuing.	0,878
Desire to complete education on time		
16	I have a strong desire to complete my studies on time.	0,708
17	I always try to follow the academic schedule well.	0,898
18	I feel it is important to graduate on time and prepare for my future.	0,734
Hope to achieve success		
19	I want to achieve high academic achievement in my studies.	0,782
20	I always try to improve my achievements in chemistry.	0,793
21	I feel proud if I can achieve good results in my studies.	0,912
Persistent		
22	I am always persistent in facing every academic challenge.	0,833
23	I try my best in every task given.	0,763
24	I have perseverance in learning difficult things in chemistry.	0,893
Complete tasks on time		
25	I always complete my assignments on time.	0,920
26	I manage my time well to complete all my academic assignments.	0,845
27	I rarely procrastinate in completing assigned tasks.	0,749
Taking time to learn		
28	I always make time to study every day.	0,777
29	I feel it is important to manage study time well.	0,982
30	I am consistent in maintaining my study schedule.	0,876

The respondents in this study were 252 undergraduate students of Chemistry Education, batches of 2022, 2023, and 2024. Based on the questionnaire, the results showed that the level of efficacy profile in chemistry education students at the University of Riau as a whole was included in the good category. The following shows the results of student self-efficacy in each category.

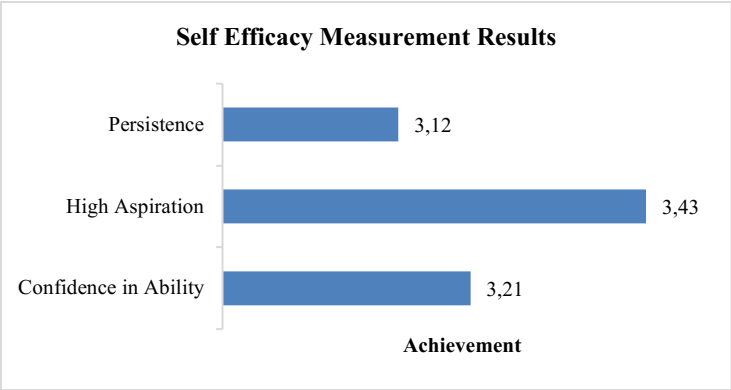


Fig. 1. Self efficacy results.

Correlation coefficient of variables X and Y can be seen in Figure 2. This study looked at the reciprocal relationship between self-efficacy and learning outcomes. However, most of these relationships occurred in real-world learning contexts, which affected the level of self-efficacy and the magnitude of the effects of this self-efficacy. In addition, previous studies analyzed reciprocal trends without considering the baseline level of student performance and observing how this may uniquely affect self-efficacy and performance trajectories. Thus, the current study explores how specific reciprocal relationships between self-efficacy and learning outcomes, while exploring how this self-efficacy may affect learning outcomes.

Table 4. Correlation coefficient of variables X and Y

NO	X	Y	R	SE
1.	Persistence (X1)	Learning Outcomes	0,34	6,23%
2.	High Aspiration (X2)		0,34	7,71%
3.	Confidence in Ability (X3)		0,33	6,75%

Based on the calculation results above, the effective contribution to learning outcomes by the persistence variable is 6.23%, by the high aspiration variable is 7.71, and by the confident ability variable is 6.75%. Thus, the total effective contribution of the variables can be calculated as $SE_{x1} + SE_{x2} + SE_{x3} = 20.7\%$. This result explains that the three category of self-efficacy explain learning outcomes by 20.7%. To see the visualization of the contribution of learning styles to learning outcomes more clearly, it can be seen in Figure 2.

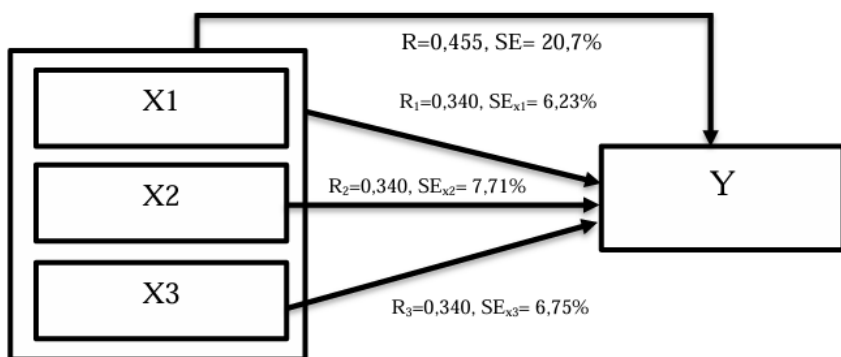


Fig. 2. Contribution of self-efficacy to learning outcomes

Expectancy beliefs have a direct and significant positive impact on student learning outcomes. These results indicate that expectancy-value beliefs (performance expectations, course grades, teacher process expectations, and expected course costs), assessed several weeks after the start of a course, influence students' course performance and

their abilities. The structural model tested shows that self-concept (a construct that assesses students' expectations of success) and has a direct and significant impact on student learning outcomes.

3.2 Discussion

Self-efficacy underlies a person's beliefs about their ability to perform certain tasks or produce what is desired, the underlying belief in an individual so that the individual is able to do what is targeted with confidence in his own ability to achieve what he expects. Measurement of self-efficacy of chemistry education students is based on three dimensions, namely confidence in ability, high aspirations. Where each dimension has several indicators. The question items given for each indicator are 3 statement items so that the total number of statement items is 30. This statement was obtained from the results of the research questionnaire test.

The dimension of confidence in ability has 4 indicators including the desire to try new things, not wishy-washy in making decisions, assessing themselves positively, and being optimistic. Figure 1 shows that the achievement in this dimension is 3.21. Based on the results obtained, students' self-efficacy in this dimension is classified in the high category.

The desire to try new things plays an important role because it encourages students to explore various learning approaches and strategies. Students who are open to new experiences tend to be more creative and innovative in solving problems, which ultimately improves concept understanding. Assertiveness in making decisions also has a big influence on learning. Students who are not wishy-washy are able to determine learning goals clearly and are consistent in pursuing their achievement, so that the learning process becomes more directed and effective.

In addition, the ability to assess oneself positively helps students recognize their strengths and weaknesses. With positive self-assessment, students will focus more on their potential and try to improve their shortcomings without feeling inferior. This encourages reflective and continuous learning. Finally, an optimistic attitude allows students to face learning challenges with a positive outlook. They believe that difficulties are part of the learning process and believe that with effort, success can be achieved. This optimism increases mental resilience, so students do not give up easily when facing obstacles. These four indicators are interrelated and contribute significantly to building an active, meaningful and goal-oriented learning process.

The high aspiration dimension has 3 indicators including hope for a brighter future, the desire to complete education on time, and the hope of achieving achievements. Based on the results of the questionnaire obtained, in this dimension self-efficacy scored 3.43 and this is included in the high category. This is the highest among the three dimensions. This dimension is reflected through three key indicators: hope for a brighter future, the desire to complete education on time, and the hope of achieving achievements. Each of these indicators significantly contributes to shaping students' motivation, persistence, and learning strategies.

The indicators hope for a brighter future provides students with a clear sense of purpose and direction. When students envision a successful future, they become more motivated to engage in learning activities that will help them reach their long-term goals. This forward-looking mindset fosters resilience, enabling them to overcome academic challenges because they recognize that their current efforts are stepping stones toward future success. Indicators the desire to complete education on time encourages students to manage their time effectively, stay disciplined, and remain committed to their educational journey. This desire minimizes procrastination and helps students set realistic goals, ensuring that they stay on track with their academic responsibilities. The sense of urgency to graduate on time also promotes consistent effort, reducing the likelihood of academic delays that could affect motivation.

The last indicator is the hope of achieving achievements boosts students' self-confidence and determination. When students aspire to excel academically, they are more likely to participate actively in class, seek additional resources, and push themselves to perform better. This aspiration not only leads to higher academic achievement but also cultivates a growth mindset, where students believe that their abilities can improve through hard work and dedication. Collectively, these indicators of high aspiration create a powerful internal drive that fuels academic engagement and persistence. By fostering optimism, goal orientation, and achievement motivation, the high aspiration dimension ensures that students remain focused and resilient, ultimately leading to better learning outcomes and academic success.

The dimension of persistence has three indicators, namely being diligent, completing tasks on time, taking the time to study. The results show a score of 3.12 which is still in the high category. This dimension is the lowest dimension in measuring student self-efficacy. This is because students' ability to be persistent in learning is lacking. These indicators collectively contribute to the development of effective learning habits, sustained motivation, and the achievement of academic objectives.

Being diligent ensures that students devote continuous effort to their studies. Diligent learners engage deeply with learning materials, persist in understanding complex concepts, and consistently complete assignments. Research shows that diligence is closely associated with higher academic achievement because it reflects a strong work ethic and the ability to overcome academic obstacles (Duckworth et al., 2007). By demonstrating diligence, students build a comprehensive understanding of subject matter, which is essential for long-term academic success.

The ability to complete tasks on time is another crucial aspect of persistence. Timely task completion helps students adhere to course schedules, preventing the buildup of pending work that could lead to academic stress and reduced performance. It also cultivates responsibility and self-discipline—skills that are essential not only for academic success but also for future professional endeavors. Completing assignments by the deadline allows for timely feedback, which can be used to adjust and improve learning strategies (Zimmerman, 2002).

Additionally, taking the time to study emphasizes the role of deliberate and regular practice in academic achievement. Students who consistently allocate time for studying are more likely to retain knowledge, develop critical thinking skills, and achieve mastery of complex subjects. Regular study routines enhance students' ability to manage

academic workloads effectively and reduce exam-related anxiety. According to Schunk and Pajares (2002), consistent study practices improve self-regulation and contribute to academic resilience.

In conclusion, the dimension of persistence, through the indicators of diligence, timely task completion, and dedicated study time, fosters disciplined and structured learning approaches. These behaviors promote sustained academic engagement and resilience, enabling students to achieve their educational goals despite potential challenges.

4 Conclusion

Self-efficacy is essential for academic success, reflecting students' belief in their ability to achieve desired outcomes. For chemistry education students, it is measured through three dimensions: confidence in ability, high aspirations, and persistence. The confidence in ability dimension (score: 3.21) includes the desire to try new things, decisiveness, positive self-assessment, and optimism, fostering creativity, effective decision-making, and resilience. The high aspiration dimension (highest score: 3.43) covers hope for a brighter future, timely completion of education, and the pursuit of achievements, which drive motivation, time management, and a growth mindset. The persistence dimension (lowest score: 3.12) involves diligence, timely task completion, and regular study habits, all crucial for sustained academic engagement. Despite being the lowest, persistence is key to developing effective learning habits and overcoming challenges. Together, these three dimensions build a structured, goal-oriented learning approach that enhances academic performance and student success.

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