

LITERATURE REVIEW : STUDY OF LEARNING INDEPENDENCE IN REACTION RATE MATERIAL

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Abstract: This study aims to examine and analyze the influence of learning autonomy on students' academic achievement in the topic of reaction rate through a literature review approach. Learning autonomy refers to students' ability to manage their own learning processes independently, without relying on others—particularly in understanding abstract and complex chemistry topics such as reaction rates. The review is based on ten peer-reviewed scientific articles published between 2019 and 2024, analyzed using a narrative synthesis method to interpret previous research findings. The results indicate that learning autonomy has a positive and significant relationship with students' academic achievement. Students with a high level of autonomy tend to be more active, show greater initiative, manage their time and learning strategies effectively, and achieve better academic outcomes. Therefore, fostering autonomous learning should be a central focus in instructional practices to enhance students' understanding and academic performance, especially in learning chemistry concepts like reaction rates.

Keywords: learning independence, learning outcomes, reaction rate, chemistry, literature review

Abstrak: Penelitian ini bertujuan untuk menguji dan menganalisis pengaruh kemandirian belajar terhadap prestasi akademik siswa pada topik laju reaksi melalui pendekatan studi literatur. Kemandirian belajar mengacu pada kemampuan siswa untuk mengelola proses belajar mereka sendiri secara mandiri, tanpa bergantung pada orang lain—terutama dalam memahami topik kimia yang abstrak dan kompleks seperti laju reaksi. Tinjauan ini didasarkan pada sepuluh artikel ilmiah yang ditinjau oleh rekan sejawat yang diterbitkan antara tahun 2019 dan 2024, dianalisis menggunakan metode sintesis naratif untuk menginterpretasikan temuan penelitian sebelumnya. Hasil penelitian menunjukkan bahwa kemandirian belajar memiliki hubungan yang positif dan signifikan dengan prestasi akademik siswa. Siswa dengan tingkat otonomi yang tinggi cenderung lebih aktif, menunjukkan inisiatif yang lebih besar, mengatur waktu dan strategi belajar secara efektif, dan mencapai hasil akademik yang lebih baik. Oleh karena itu, menumbuhkan kemandirian belajar harus menjadi fokus utama dalam praktik instruksional untuk meningkatkan pemahaman dan prestasi akademik siswa, terutama dalam mempelajari konsep-konsep kimia seperti laju reaksi.

Kata Kunci: kemandirian belajar, hasil belajar, laju reaksi, kimia, kajian pustaka

INTRODUCTION

Education serves as a fundamental pillar in supporting human resource development [1]. In the era of globalization, innovative, intelligent, and competitive human resources can be cultivated through education [2]. Indonesia has introduced the Merdeka Curriculum as a strategic initiative to enhance the quality of learning [3]. The success of the educational process is commonly measured by the level of students' learning outcomes [2]. However, a key challenge faced by the education system is the low quality of learning, which may stem from a lack of learning autonomy among individuals [4].

Learning autonomy refers to an individual's mindset when actively engaging in the educational process to achieve learning goals [5]. Therefore, it is essential for students to develop a self-directed learning attitude, not driven by external pressure [6]. Learners with a high degree of autonomy typically exhibit characteristics such as initiative, responsibility, creativity, discipline, and the ability to view challenges as opportunities for growth [7]. As a result, they tend to excel in specific subjects or skill areas [8].

Students with a high level of learning autonomy generally possess adequate competencies to comprehend instructional materials effectively [9]. Learning autonomy is essential in studying chemistry, as it encourages students to develop problem-solving skills [10]. Chemistry is a subject that involves abstract and relatively complex concepts [11]. One of the most challenging topics in chemistry for students to learn is the reaction rate [12].

The reaction rate is a chemistry topic that requires a deep understanding of concepts as well as the ability to interpret macroscopic, submicroscopic, and symbolic representations [13]. Therefore, it is crucial for students to possess learning autonomy in chemistry, as it fosters self-directed learning and the ability to evaluate learning outcomes for the advancement of scientific knowledge [10].

Based on the discussion above, it can be concluded that learning autonomy is essential in the chemistry learning process, as several studies have demonstrated a positive relationship between the level of learning autonomy and students' academic achievement. Therefore, strengthening learning autonomy should be a primary focus in education, particularly in teaching chemistry topics such as reaction rates, which require active student engagement and critical thinking skills. The purpose of this literature review is to examine and analyze learning autonomy in the context of reaction rate material, which can serve as a reference for designing more effective and student-centered instructional strategies.

METHOD

This study employs a literature review approach. The review is based on ten scientific articles published between 2019-2024, using a narrative synthesis method by categorizing data from previous studies related to students' learning autonomy, which were analyzed to address the research objectives. This approach was employed to gain a comprehensive understanding of the contribution of learning autonomy to students' achievement in chemistry, particularly in the topic of reaction rates. The reviewed journals were selected based on specific criteria, including empirical research articles published in both English and Indonesian.

RESULT AND DISCUSSION

The analysis of the 10 articles describing the study of learning independence is shown in Table 1.

Table 1. Literature Synthesis Analysis

No	Researcher and Year	Research Title	Research Methods	Research Results
1	Setyaningsih dkk., (2023)	The Effect of Learning Environment and Students Independent Learning on Students Learning Outcomes	Descriptive quantitative	The effect of learning independence on learning outcomes is positive and strong. This means that learning independence can improve student learning outcomes
2	Novantri dkk., (2020)	Are Discovery Learning and Independent Learning Effective in	Pseudo-experiment	Students with high learning outcomes have high learning independence

		Improving Students' Cognitive Skills		
3	Ma, (2022)	Influence Study of Learners' Independent Learning Ability on Learning Performance in Online Learning	Quantitative	Self-learning ability can affect teaching performance
4	Darmana dkk., (2024)	The Correlation Between Chemistry Learning Outcomes and Independent Character in the 2022 Class Student of Faculty of Mathematics and Natural Sciences (FMIPA) UNIMED	Quantitative	There is a high correlation between learning outcomes and students' independent character with a scientific approach.
5	Putri dkk., (2024)	Method the Influence of Self-Efficacy and Learning Independence of Students on Chemistry Learning Achievement Case Study State of 10 th Grade Senior High School in Public School 15 Pekanbaru	Quantitative survey approach	There is a significant positive relationship between learning independence and self-efficacy on students' chemistry learning achievement.
6	Fadilah dkk., (2022)	The relationship between Self-Efficacy and Learning Independence on Chemistry Learning Outcomes of Hydrocarbon and Petroleum Compound Materials for Class XI Students of Al-Islam 1 Surakarta High School 2020/2021 Academic Year	Correlational approach	Learning independence has a positive effect on improving student learning outcomes
7	Heni Astuti, (2022)	Relationship between Learning Independence and Chemistry Learning Outcomes of Class X Students of SMAN 7 Purworejo	Quantitative descriptive that is Ex-Post Facto in nature	Learning independence has a positive effect on improving student chemistry learning outcomes
8	Hasan dkk., (2024)	The Relationship between Learning Independence, Attitude and Motivation with Biology Learning Outcomes of Class XI IPA SMA	Quantitative, correlational	Learning independence plays an important role in determining students' success in understanding and mastering the material.

9	Rizal Kidjab dkk., (2019)	Description of Learning Independence in Junior High School Mathematics Learning	Descriptive qualitative	Students who have high learning independence can affect optimal learning outcomes.
10	Dewi dkk., (2020)	The Effect of Learning Independence on Mathematics Learning Outcomes	Correlational	Students who used the self-study approach showed improved achievement compared to students who did not use this approach.

(Source: Primary Data, Year 2025)

Research on learning autonomy is conducted to evaluate the extent to which students are able to manage their own learning processes independently, which can influence their academic achievement. Moreover, chemistry learning requires higher-order understanding and active student engagement. To provide a more comprehensive overview of the relationship among variables in this study, Figure 1 presents a conceptual framework illustrating the role of independent learning in influencing academic achievement.

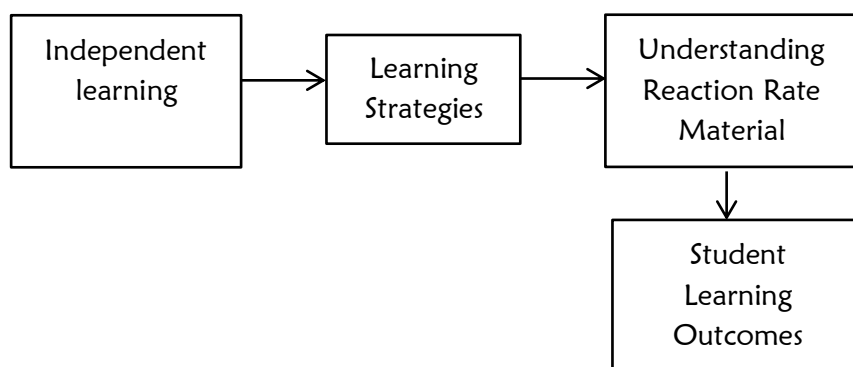


Figure 1. Conceptual Framework

A study conducted by [14] states that students' learning autonomy significantly influences academic achievement. Autonomous learners tend to manage their time effectively, possess high intrinsic motivation, and are able to choose effective learning methods. A similar study by [15] supports this finding, suggesting that student success in learning is determined by both the instructional model implemented by the teacher and the level of learning autonomy possessed by the students.

The findings of [16] reveal that self-directed learning ability can influence learning performance. Clearly defined learning performance is affected by four aspects of self-directed learning ability: technological readiness and goal planning, utilization of learning materials, regulation of the learning process, and evaluation of learning outcomes. The findings of [17] concluded that there is a strong correlation between learning achievement and autonomous character. The higher the level of learning achievement, the stronger the autonomous character exhibited by students.

A previous study by [18] stated that learning autonomy is a key factor in enhancing students' achievement in chemistry, and this competency must be developed by students. The study demonstrated a positive and significant effect of learning autonomy on students' performance in chemistry. The study conducted by [19] demonstrated that optimal learning outcomes can be achieved when students possess a high level of learning independence. These findings indicate that learning autonomy plays a significant role in enhancing students' academic achievement. In the study, the contribution of learning independence to academic performance was quantitatively analyzed, as reflected by the correlation coefficient values presented in Table 2 below.

Table 2. Correlation between Independent Learning and Learning Outcomes

		Independent Learning	Learning Outcomes
Independent Learning	Pearson Correlation	1	0.805
	Sig. (2-tailed)		0.000
	N	53	53
Learning Outcomes	Pearson Correlation	0.805	1
	Sig. (2-tailed)	0.000	
	N	53	53

Source: [19]

The data presented in Table 2, further supports the assertion that students' capacity to independently regulate their learning processes is a critical determinant of academic success, especially in highly complex subjects such as chemistry [19]. The findings of [20] revealed that learning autonomy plays a vital role in the learning process, particularly in chemistry subjects. This study identified a positive and significant relationship between learning autonomy and students' academic achievement. Table 3 shows the correlation coefficient values.

Table 3. results of Kendall's tau b correlation test

			Independent Learning	Learning Outcomes
Kendall's tau b	Independent Learning	Pearson Correlation	1.000	0.611
		Sig. (2-tailed)		0.000
		N	144	144
	Learning Outcomes	Pearson Correlation	0.611	1.000
		Sig. (2-tailed)	0.000	
		N	144	144

Source: [20]

Similarly, the results of a study conducted by [21] showed a strong correlation between learning autonomy and academic performance, with a correlation coefficient of 0.680. These findings suggest that learning autonomy plays an important role in determining students' success in understanding and mastering the subject matter.

A related study conducted by [7] found that students with a high level of learning autonomy can positively influence optimal learning outcomes. Indicators of learning autonomy in students include responsibility, discipline, the ability to work independently, initiative, and self-confidence. Similarly, the study by [5] revealed that learning autonomy has a positive effect on academic achievement. The contribution of learning autonomy to mathematics learning outcomes was found to be 24%, while the remaining 76% was influenced by other factors.

To strengthen the findings of the reviewed literature, Figure 1 presents a visual summary of the correlation coefficients between independent learning and academic achievement, based on an analysis of 10 scientific articles. The following is a summary graph of the correlation coefficient between learning independence and student learning outcomes based on the results of a literature review (2019–2024).

Based on Figure 1, the graph illustrates that all studies reported a positive relationship between independent learning and learning outcomes, with correlation values ranging from 0.61 to 0.80. This indicates that the higher the level of student independence in learning, the higher their academic achievement.

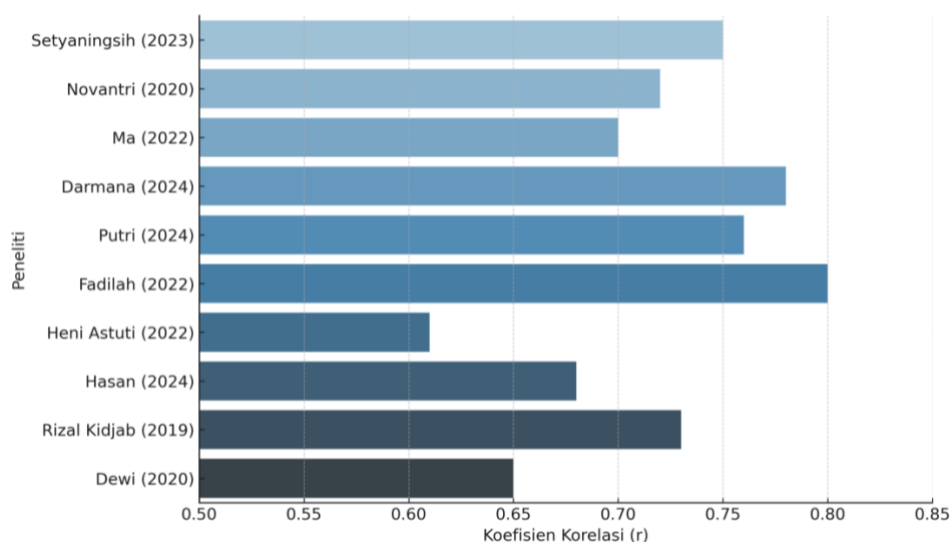


Figure 2. Correlation Chart between Learning Independence and Learning Outcomes

Based on Figure 1, the graph illustrates that all studies reported a positive relationship between independent learning and learning outcomes, with correlation values ranging from 0.61 to 0.80. This indicates that the higher the level of student independence in learning, the higher their academic achievement.

CONCLUSION

Based on the literature review conducted, it can be concluded that learning autonomy has a positive and significant influence on academic achievement, particularly in chemistry, specifically in the topic of reaction rates. Students with strong self-directed learning abilities tend to demonstrate active engagement, effective learning strategies, and strong motivation to achieve learning goals. Therefore, it is essential for educators to foster autonomous learning attitudes in the classroom to enhance students' conceptual understanding and optimize their academic performance.

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