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Analysis of Students Critical Thinking Skills in Conventional Learning

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Abstract
Student-centered learning significantly influences students' learning and thinking abilities. However, in practice, many teachers still use conventional teaching methods, such as lectures, to deliver material. Conventional teaching is often chosen because it can quickly convey information and is easy to implement in the learning process. Learning activities are a process for students to enhance their abilities and skills. One of the essential skills students need to develop is critical thinking. This skill can foster cognitive aspects and improve students' problem-solving abilities. Critical thinking skills can be trained during learning activities. This study aims to determine students' critical thinking skills in conventional learning on hydrocarbon combustion. The research employs a descriptive quantitative method with a test instrument in the form of essay questions. Ennis's critical thinking aspects measure students' critical thinking skills. Ennis's critical thinking aspects consist of 5 aspects encompassing 12 indicators. The results of the study show that students' critical thinking skills in conventional learning are categorized as low, with a percentage of 52.80%.

1. Introduction

Conventional learning is a teaching model that uses lectures to deliver material. This model tends to require students to memorize the material presented by the teacher. Moreover, this model is not contextual because it is not connected to the current situation (Amin & Sumendap, 2022). Therefore, conventional learning is more teacher-centred rather than student-centred. The teacher's activities in teaching students are crucial in conventional learning. This is because, in the conventional learning process, the source of information is symbolic, such as listening to the teacher's explanations or reading specific textbooks (Tiastra, 2022). Conventional learning has both advantages and disadvantages. The advantages of this learning model are that students can interact directly with the teacher, such as by asking questions, it has a systematic and orderly structure that helps students follow the lessons, and it uses

resources like textbooks and printed materials to support the learning process. The disadvantages of conventional learning are that it tends to be monotonous, students are not active during the lessons as they only listen to lectures, and the level of interaction between teachers and students is low (Kapoh & Komarudin, 2023). In conventional learning, teachers rely on textbooks to assist students in learning, making students passive recipients of the information. Students are also required to understand the material individually and independently without being involved in the teaching and learning process. Conventional learning also focuses solely on information absorption rather than enhancing critical skills (Kapoh & Komarudin, 2023).

Critical thinking skills are one of the essential skills that students must possess. According to Ennis, critical thinking is focused thinking to decide what to do (Ennis, 1985). Furthermore, critical thinking is also a process of analyzing and evaluating information obtained through various means such as observation, experience, common sense, and communication media to guide actions or decisions (Faiz, 2012). Critical thinking skills involve a deep understanding of a topic and the ability to identify weaknesses in arguments, thereby distinguishing between facts and opinions (Puspita, 2024). Students must have critical thinking skills to evaluate critically and objectively, thus drawing accurate conclusions from acquired information. Students' ability to grasp concepts using their reasoning will develop through critical thinking. Critical thinking activities involve all aspects, not just the knowledge possessed, but also the relationships between concepts learned in lessons and everyday life (Sa'diyah & Aini, 2022). This will solidify students' understanding of what they learn, thus impacting the achievement of the learning objectives themselves. However, based on theoretical studies, it is known that students' critical thinking skills are still low, especially for subjects that involve memorization and require students to grasp concepts. This is supported by Purwanti's research which found that students' critical thinking skills in the topic of plant life systems, assessed across five aspects, scored an overall percentage of 57.5%, categorized as inadequate (Purwanti, 2023). Research on students' critical thinking skills on the topic of temperature and heat also remains in the low category with a score of 55 (Sundari & Sarkity, 2021). Moreover, another study found that students' critical thinking skills are still low with a percentage of 60.39% in the topic of reaction rates. The test instrument consisted of essay questions with a sample of 72 students (Yusar & Kurniawati, 2023). One way to enhance critical thinking skills is by using appropriate learning models. This is because critical thinking skills can be developed during learning activities.

Chemistry is the topic that students find most challenging (Lubis et al., 2022). One of the chemistry topics that involves memorization is the combustion of hydrocarbons. Combustion of hydrocarbons is a sub-topic of hydrocarbon material. In the 2013 curriculum, the combustion of hydrocarbons is part of Basic Competencies 3.3 and 4.3 (Kemdikbud, 2018). The content of combustion of hydrocarbons includes the reactions of hydrocarbon combustion divided into complete combustion and incomplete combustion, as

well as the properties of the combustion products. In this topic, students are also required to develop ideas on how to address the environmental and health impacts of carbon compound combustion. This topic is extensive and involves many theories that require memorization, which often makes students feel difficulty and confusion. Based on the description above, further analysis is needed on students' critical thinking skills regarding the combustion of hydrocarbons using conventional learning. This analysis is crucial information for teachers in determining the appropriate teaching model for the combustion of hydrocarbons.

2. Materials and Methods

The study was conducted in the first semester of the 2023/2024 academic year at one of the Senior High Schools in South Tangerang, which still employs conventional teaching methods. The research method used was quantitative descriptive with a test instrument. Purposive sampling was employed, involving 35 students from the 11^{th} grade of the Science Program. Students' critical thinking skills were measured based on Ennis's critical thinking aspects. Robert H. Ennis outlines 5 aspects of critical thinking skills: elementary clarification, basic support, inference, advanced clarification, and strategy and tactics. These aspects are further divided into 12 indicators, including focusing on a question, analyzing arguments, asking and answering clarification questions, assessing source credibility, evaluating observation reports, deducing and judging deductions, inducing and judging inductions, making and evaluating value judgments, defining terms and evaluating definitions, identifying assumptions, deciding on actions, and interacting with others. The test used consisted of 22 essay questions on the topic of hydrocarbon combustion, which underwent validation stages. Each test item was scored from 0 to 4, where each question represented an Ennis critical thinking indicator. The scores obtained by students from the test questions are percentages of the maximum score achievable if all answers were correct. The assessment of scores can be converted into percentages using the formula:

$$NP = \frac{R}{SM}\ x\ 100\%$$

Information:

NP = Percentage of achievement

R = scores obtained by students

SM= maximum scores (Purwanto, 2013).

The categories of students' critical thinking skills are determined based on their percentage mastery level, which can be converted according to Table 1.

Table 1. The category of critical thinking skills (Normaya, 2015)

Percentage of achievement (%)	Category
$81.25 < x \leq 100$	Very High
$71.5 < x \leq 81.25$	High
$62.5 < x \leq 71.5$	Moderate
$43.75 < x \leq 62.5$	Low
$0 < x \leq 43.75$	Very Low

3. Results and Discussions

Students' critical thinking skills are measured using Ennis's critical thinking aspects, which consist of 5 aspects further detailed into 12 indicators. The instrument used is an essay test on the topic of hydrocarbon combustion. There are a total of 26 essay questions, with each question representing an Ennis thinking indicator. Subsequently, the questions underwent validation by expert validators and empirical testing, resulting in 22 valid questions ready for use. The alignment between the questions and Ennis's critical thinking indicators is shown in Table 2.

Table 2. Indicators of critical thinking skills and essay test questions

No	Critical Thinking Skills	Critical Thinking Skills Indicators	Questions
1	Elementary clarification	Focusing on a question	11, 20
		Analyzing arguments	12, 21
		Asking and answering questions of clarification	14
2	Basic support	Judging the credibility of a source	7, 15
		Observing and judging observation reports	8, 16
3	Inference	Deducing and judging deductions	3
		Inducing and judging inductions	22, 1
		Making and judging value judgements	10, 17
4	Advanced clarification	Defining terms and judging definitions	13, 4
		Identifying assumptions	9, 18
5	Strategy and tactics	Deciding on an action	2, 5
		Interacting with others	6, 19

The scores obtained by students are then converted into percentages to determine the categories of students' critical thinking skills. The research findings indicate that students' critical thinking skills at one of the Senior High Schools in South Tangerang, using conventional learning methods, fall into the low category with a percentage of 52.80%. his is consistent with previous research indicating that students'

critical thinking skills are categorized as low, with a score of 36.87 (Setianingsih et al., 2022). An interview with a chemistry teacher in the previous study mentioned several factors contributing to the low critical thinking skills of students. These factors include teachers tending to use conventional learning such as lectures and question-and-answer sessions, the lack of active participation from students, and the conceptual nature of chemistry material (Laili et al., 2023). Table 3 displays the categories of critical thinking skills for each indicator.

Table 3. Category critical thinking skills

No	Critical Thinking Skills	Critical Thinking Skills Indicator	Percentage of achievement	Category
1	Elementary clarification	Focusing on a question	40%	Very Low
		Analyzing arguments	50.71%	Low
		Asking and answering questions of clarification	89.29%	Very High
2	Basic support	Judging the credibility of a source	44.29%	Low
		Observing and judging observation reports	76.07%	High
3	Inference	Deducing and judging deductions	32.14%	Very Low
		Inducing and judging inductions	56.07%	Low
		Making and judging value judgements	36.07%	Very Low
4	Advanced clarification	Defining terms and judging definitions	61.07%	Low
		Identifying assumptions	45%	Low
5	Strategy and tactics	Deciding on an action	43.21%	Very Low
		Interacting with others	59.64%	Low

Based on Table 3, it is noted that the highest percentage of achievement is found in the indicator asking and answering questions of clarification with 89.29%, while the lowest is in the indicator deducing and judging deductions with 32.14%.

3.1. Elementary clarification

The first aspect of critical thinking skills is elementary clarification. This aspect is divided into three indicators: focusing on a question, analyzing arguments, and asking and answering clarification questions. In focusing on a question indicator, students are required to identify or formulate questions from a discourse. This indicator was assessed with 2 essay questions and obtained a very low category with a percentage of achievement at 40%. The analyzing arguments indicator, also evaluated by 2 essay questions, scored low with a percentage achievement of 50.71%. Students were tasked with identifying reasons or causes based on information found in the discourse to evaluate this indicator. The highest percentage among Ennis's critical thinking indicators is in the elementary clarification aspect, specifically in the asking and answering questions of clarification indicator, scoring 89.29% and categorized as very high. This is in

line with previous research which found that the achievement indicator for asking and answering questions was 77.08% with a high category (Yusar & Kurniawati, 2023). This indicator was evaluated using the critical thinking sub-indicator, namely giving examples or providing simple explanations.

3.2. Basic support

The research findings on the next aspect of critical thinking skills, basic support, indicate results categorized as both low and high. The low category, scoring 44.29%, is observed in the indicator judging the credibility of a source. This indicator was assessed with 2 essay questions focusing on critical thinking sub-indicators such as considering appropriate procedures and providing reasons. On the other hand, the indicator observing and judging observation reports achieved a high category with a percentage of 76.07%. Students were required to use strong evidence in answering test questions. Students must seek information and gather data to solve the problem.

3.3. Inference

The third aspect of Ennis's critical thinking skills is inference. This aspect consists of the indicators deducing and judging deductions, inducing and judging inductions, and making and judging value judgments. Students were asked to interpret data in the deducing and judging deductions indicator, which obtained the lowest percentage at 32.14% and was categorized as very low. The next indicator consists of sub-indicators drawing conclusions based on facts and making reasonable opinions or assumptions. This indicator was evaluated with two questions and achieved a percentage of 56.07% with a low category. The indicator-making and judging value judgments also received a very low category with a percentage of 36.07%. Students were required to make and determine outcomes based on alternative thinking.

3.4. Advanced clarification

The fourth aspect of Ennis's critical thinking skills is advanced clarification. The indicators in this aspect consist of defining terms judging definitions and identifying assumptions. In this aspect, both indicators obtained low categories with percentages of 61.07% and 45%. Defining terms and judging definitions were measured with two questions, specifically questions 13 and 4, where students had to formulate a definition. In the indicator identifying assumptions, students were required to provide further explanation.

3.5. Strategy and tactics

The last aspect of critical thinking is strategy and tactics. This aspect consists of two indicators deciding on an action and interacting with others. In this aspect, students' critical thinking skills also showed a low level. The research results indicate that the indicator deciding on an action obtained a very low

category with a percentage of 43.21%. This indicator was assessed using 2 questions that required students to formulate alternative solutions based on the discourse in the questions. The indicator interacting with others achieved a percentage of 59.64%, where students were asked to provide opinions or arguments based on the discourse in the questions.

Critical thinking skills are crucial for students to achieve learning objectives and also as an asset in the workplace. The choice of learning models used is the key to educational success. Previous research has reported that high-quality learning will produce high-quality outcomes (Hasibuan et al., 2022). Teachers can utilize specific teaching models to enhance the effectiveness of teaching and learning activities, which will ultimately impact the skills students acquire.

5. Conclusions

Students' critical thinking skills in conventional learning are categorized as low. This is based on the percentage of achievement of the five aspects of Ennis's critical thinking skills, which is only 52.80%. The highest percentage is achieved in the asking and answering questions indicator in the elementary clarification aspect, with 89.29%. The lowest percentage is in the making deductions and judging deductions indicator in the inference aspect with 32.14%. Innovation in learning is necessary to enhance students' critical thinking skills.

References

Amin, & Sumendap, L. Y. S. (2022). *164 Model Pembelajaran Kontemporer*. Pusat Penerbitan LPPM Universitas Islam 45 Bekasi: Bekasi

Ennis, R. H. (1985). *A Logical Basis for Measuring Critical Thinking Skills*. Association for Supervision and Curriculum Development

Faiz, F. (2012). *Thinking Skill: Pengantar Menuju Berpikir Kritis*. SUKA-Press UIN Sunan Kalijaga: Yogyakarta

Hasibuan, D. R., Daulay, R. A., & Hasibuan, A. (2002). STAD Cooperative Learning Using Mind Mapping Media and Question Cards on Student Learning Outcomes on Chemical Bonding Material. *Lavoisier: Chemistry Education Jurnal*, 1(1), 17-26. https://doi.org/10.24952/lavoisier.v1i1.5452

Kapoh, R. J., & Komarudin, M. A. (2023). *Ragam Metode Pembelajaran*. Penerbit Lakeisha: Klaten

Kemdikbud. (2018). *Permendikbud Nomor 37 Tahun 2018 Tentang Kompetensi Inti dan Kompetensi Dasar Pelajaran pada Kurikulum 2013 pada Pendidikan Dasar dan Pendidikan Menengah*

Laili, P. I. M., Raehanah, & Multazam. (2023). The Discovery Learning Model Influence on Student Critical Thinking Abilities and Chemistry Learning Outcomes in MA. Mu'allimat Nwdi Pancor. *SPIN: Jurnal Kimia dan Pendidikan Kimia*, 5(2), 275-284. https://doi.org/10.20414/spin.v5i2.8340

Lubis, E. L. S. W., Rahmania, S., & Siregar, A. (2022). The Effectiveness of Contextual Teaching and Learning with Multimedia to Increase Student's Achievement on Hydrocarbon Topic. *Lavoisier: Chemistry Education Jurnal*, 1(1), 27-34. https://doi.org/10.24952/lavoisier.v1i1.5453

Normaya, K. (2015). Kemampuan Berpikir Kritis Siswa dalam Pembelajaran Matematika dengan Menggunakan Model Jucama di Sekolah Menengah Pertama. *EDU-MAT: Jurnal Pendidikan Matematika*, 3(1), 92-104. http://dx.doi.org/10.20527/edumat.v3i1.634

Purwanti, E. (2023). Analisis Keterampilan Berpikir Kritis Siswa SMP pada Materi Sistem Kehidupan Tumbuhan. *Bioscientist: Jurnal Ilmiah Biologi*, 11(1), 864-873. https://doi.org/10.33394/bioscientist.v11i1.8541

Purwanto, N. (2013). *Prinsip-prinsip dan Teknik Evaluasi Pengajaran*. Remaja Rosdakarya: Bandung

Puspita, K. (2024). *Panduan Praktis untuk Berpikir Kritis dan Analitis*. Victory Pustaka Media: Yogyakarta

Sa'diyah, H., & Aini, S. (2022). *Model Pembelajaran Inkuiri pada Perkembangan Berpikir Kritis Siswa: Literature Review*. *Journal of Professional Elementary* Education, 1(1), 1-120. https://doi.org/10.46306/jpee.v1i1

Setianingsih, R., Novita, M., & Patonah, S. (2022). Kemampuan Berpikir Kritis Peserta Didik pada Pembelajaran Kimia dalam Pokok Bahasan Laju Reaksi di SMA Negeri 1 Bantarbolang. *Media Penelitian Pendidikan: Jurnal Penelitian dalam Bidang Pendidikan dan Pengajaran*, 16(1), 5-9. https://doi.org/10.26877/mpp.v16i1.11806

Sundari, P. D., & Sarkity, D. (2021). Keterampilan Berpikir Kritis Siswa SMA pada Materi Suhu dan Kalor dalam Pembelajaran Fisika. *Journal of Natural Science and Integration*, 4(2), 149-161. http://dx.doi.org/10.24014/jnsi.v4i2.11445

Tiastra, M. (2022). *Model Pembelajaran Inkuiri Terbimbing Berbasis Asesmen Portofolio dalam Pembelajaran Kimia di SMA*. CV Bintang Semesta Media: Sleman

Yusar, T. R., & Kurniawati, D. (2023). Analysis of Students Critical Thinking Skills using Essay Tests on Topics of Rate Reaction. *J. Pijar MIPA*, 18(1), 13-19. 10.29303/jpm.v18i1.4507