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ASSESSMENT TRENDS IN SCIENCE LEARNING IN JUNIOR HIGH SCHOOL: A SYSTEMATIC REVIEW

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Abstract. Effective assessment practices are essential in improving science education, yet determining the most suitable types of assessment for junior high school science remains a challenge. Current assessment practices often focus heavily on cognitive outcomes, with less emphasis on evaluating students' scientific process skills and attitudes. This study aims to identify and analyze the most effective assessment methods used in junior high school science education over the past decade. A systematic review method was employed to collect and examine relevant peer-reviewed articles published between 2014 and 2024. The review reveals a growing trend in the use of authentic assessment, which includes performance tasks, project-based learning assessments, and portfolios. Authentic assessment is identified as the most effective approach, as it holistically evaluates students' knowledge, skills, and attitudes in realistic contexts, aligning with the objectives of the national curriculum. The findings suggest that educators and policymakers should prioritize the development and implementation of authentic assessments to foster deeper learning and better prepare students for real-world problem-solving.

Keywords: assessment, science learning, systematic review

INTRODUCTION

The learning and assessment processes are integral to each other, both aimed at helping students succeed in their educational journey (Kemdikbud, 2021). Assessment, which uses various methods and tools to measure the extent of students' competency acquisition (Maemonah, 2014), is crucial for not only evaluating learning outcomes but also motivating students to reach their full potential. In Indonesia, national educational regulations, such as Law No. 20/2003 and Government Regulation No. 19/2005, require that assessments align with established standards, encompassing cognitive, affective, and psychomotor aspects of learning (Depdiknas, 2003).

However, despite these regulations, the practice of assessment in schools remains largely focused on cognitive outcomes, often neglecting other key aspects of student development, such as attitudes and skills. This is especially true in the context of science education at the junior high school level, which includes subjects like biology, physics, and chemistry. Many students face challenges such as a lack of readiness to learn, low engagement, and difficulties in collaborating with peers (Maduretno et al., 2016).

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These issues indicate the need for a more comprehensive approach to assessment that not only evaluates outcomes but also guides and enriches the learning process. Effective assessment in science should measure all aspects of learning—cognitive, affective, and psychomotor—and be used to inform teaching practices, communicate progress, and improve the learning environment (Suciati & Amirullah, 2017).

Previous studies have addressed various aspects of assessment in science education, such as the work by Ramadhani et al., (2021), which focused on formative assessments, and Khoiriah et al., (2020), who examined assessments for learning based on higher-order thinking skills. However, these studies only cover specific facets of assessment, such as the use of formative assessments or the development of higher-order thinking skills, without providing a comprehensive analysis of the broader trends in assessment practices at the junior high school level. There is a noticeable gap in the literature regarding the systematic mapping of assessment trends in science education over the past decade, particularly concerning the methods most commonly used, the materials most frequently tested, and the alignment of these practices with the national curriculum.

This gap is especially urgent now, as Indonesia has introduced the Merdeka Curriculum, which emphasizes authentic and holistic assessments. These reforms make it crucial to understand how current assessment practices align with the evolving educational landscape. Without a clear understanding of these trends, educators and policymakers may struggle to implement effective assessment strategies that truly meet students' needs and support curriculum goals.

Therefore, this study aims to fill this gap by reviewing existing literature on assessment practices in junior high school science education over the last decade. Specifically, the research seeks to identify the most commonly used assessment methods, the materials most frequently tested, and the degree to which these practices align with the demands of the national curriculum. By providing a comprehensive overview of current trends in science assessment, this study will offer valuable insights for educators and policymakers working to enhance assessment practices in line with the goals of the Merdeka Curriculum.

The practical benefit of this study is to provide guidance for teachers and schools in designing and implementing more effective and holistic assessments that support the overall development of students. Furthermore, this study is expected to contribute academically to researchers interested in the fields of education and assessment, as well as assist policymakers in formulating assessment policies that are more aligned with the current educational needs.

METHOD

The method used to collect information is to use a systematic review method (Alber et al., 2019). By using the PRISMA method (Priority Reporting Units for Systematic Reviews and Meta-Analyses), we can conduct systematic analyses and meta-analyses in a more structured manner (Page & Moher, 2017). The systematic method of literature search involves the process of evaluating, identifying, and interpreting all relevant information pertaining to the research topic to answer a specific question (Paul et al., 2021). The articles to be analyzed later were obtained by searching in the Publish Or Perish application for databases from Google Scholar and Crossref, searching for research literature in line with the keywords “science learning assessment.” The Systematic Review Literature (SLR) method allows researchers to conduct a structured review and identify journals systematically by following predetermined steps (Suantara & Suastra, 2019).

The inclusion criteria were articles published between 2018 and 2024, focusing on natural science topics. Exclusion criteria included articles that were not fully accessible, lacked full text, were unrelated to natural science, were not intended for junior high school, or were in languages other than English and Indonesian. The sources for this literature search were Google Scholar and Crossref databases. The article selection process involved inclusion and exclusion based on these criteria, with the researcher evaluating the data according to the specified parameters. Table 1 outlines the inclusion and exclusion criteria.

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
1) The research topic covers science learning	1) The research topic does not cover science learning (material outside science).
2) The object of research is limited to junior high school / equivalent level only	2) The object of research at the SD/ MI level, SMA/ SMK, Higher Education
3) Indonesian and English	3) Non Indonesian/English language
4) Full text	4) Only abstracts/ articles cannot be downloaded
5) Journal articles	5) Non-article/Book chapter /HTML

Once the inclusion and exclusion criteria were set, the articles to be reviewed were selected. Chart 1 is a diagram of the selection process using the Prism method.

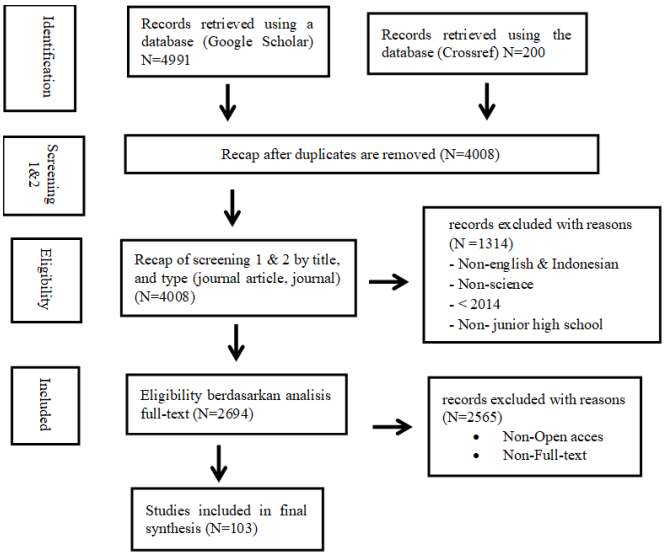

Chart 1. Flow of article selection (Prism Method)

The final stage of the SLR is the reporting stage. The activities carried out in this stage are writing the results of the article study that has been found (Sukaton et al., 2024). Based on chart 1. 4991 were found (755 articles from Google Scholar and 100 articles from Crossref). After screening, 983 duplicate articles were found based on title and type so that the article became 4008. After that, criteria selection was carried out based on non-English & Indonesian and non-sciences so that 2694 articles were obtained, and the third selection based on the inclusion criteria obtained the final result of 103 articles.

In the methodology section, data analysis was performed using a descriptive approach to identify patterns and trends in the selected articles. The articles were

analyzed by examining the frequency, annual trends, and topics related to science assessments.

A coding system was used to categorize the articles by assessment methods, instruments, and science topics (e.g., authentic assessment, tests, and biology). This helped group articles based on inclusion criteria and analyze the frequency of assessment types and topics over time, revealing trends in science assessment practices at the junior high school level. This approach combines descriptive analysis and coding to categorize assessment methods, instruments, and topics.

RESULTS AND DISCUSSION

Assessment Trend by Grade

In this study, researchers analyzed articles that had been found based on grade levels VII, VIII, and IX. The following is the assessment based on grade level in Figure 1.

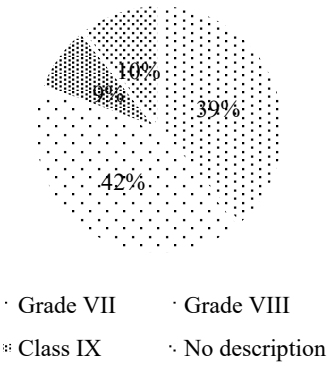

Figure 1. Assessment by grade

Figure 1 shows that from the articles that have been found, class VIII occupies the grade level most studied by previous researchers in the development and use of assessments in the science learning process, with a percentage of 42%. While class IX is still a little experimental at this level at around 9%.

Assessment Trend by Year

In this study, the articles that have been found are analyzed based on the types of assessments that are most commonly used for one year from 2014 to 2024. The following is the type of assessment based on the year in Table 2.

Table 2. Assessment by year

Year	Trend Assessment I	Total	Trend Assessment II	Total
2014	Performance Assessment	3	-	-
2015	Authentic Assessment	5	-	-
2016	Authentic Assessment	4	Performance Assessment	4
2017	Project Assessment	2	Formative Assessment	2
2018	Authentic Assessment	3	Performance Assessment	2
2019	Performance Assessment	2	Formative Assessment	2
2020	Performance Assessment	4	Authentic Assessment	2
2021	Diagnostic Assessment	3	Authentic Assessment	2
2022	Argument Assessment	3	Performance Assessment	3
2023	HOTS Assessment	4	Authentic Assessment	2
2024	Science Process Skills Assessment	2	-	-

Based on Table 2, from 2014 to 2020, the most commonly used assessment type was authentic assessment, reflecting its widespread use in the 2013 curriculum. In contrast, the Merdeka curriculum emphasizes assessments focused on argumentation skills, science process skills, and higher-order thinking skills (HOTS), such as critical and creative thinking.

Trend of assessment based on natural science topics

This study analyzed science topics in grades VII, VIII, and IX. Assessment in science serves as a means to plan, guide, and enrich science learning in the classroom; a means of communicating with students, administrators, and parents about the relevance of science; a means of monitoring science learning outcomes and improving learning; and a means of improving science curriculum and teaching methods (Iskandar & Hidayat, 1997). Therefore, assessment results appear to have a very broad role, not just measuring student success in learning.

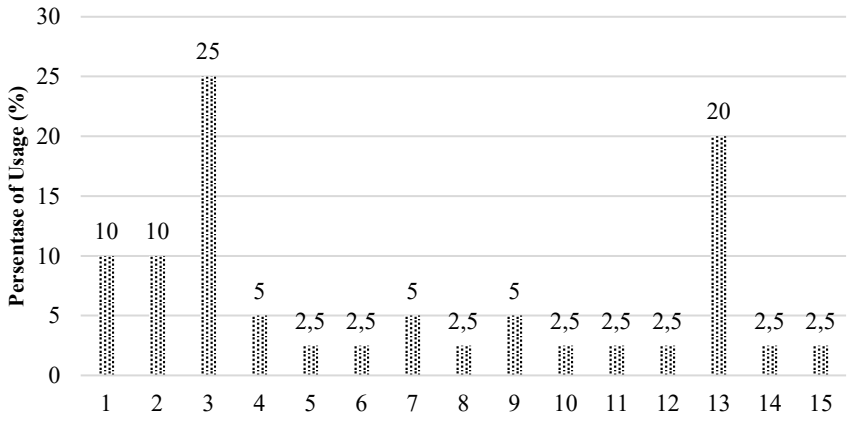

Figure 2. Grade VII Science Topics

Information: 1) Ecosystem, 2) Environmental Pollution, 3) Temperature and Heat, 4) Interaction of Living Things, 5) Getting to know the Microscope, 6) Object Classification, 7) Mixture Separation, 8) Motion and Force, 9) Classification of Living Things, 10) Substance Characteristics, 11) Global Warming, 12) Matter and Energy, 13) Science, 14) Physics, 15) Biology

In class VII material, there is temperature and heat material, which is the most widely used test assessment in the science learning process at school, with a percentage value of 25%. The concepts of temperature and heat in physics are often difficult for students to grasp, as they frequently develop misconceptions in their understanding (Saparini et al., 2021). Science material follows, with a 20% use of test assessments. The development of test assessments in ecosystem and environmental pollution materials both account for 10% of science assessments in junior high school, while materials on the interaction of living things, mixture separation, and classification of living things each make up 5%. Test assessments are rarely used in topics such as microscopes, classification of objects, motion and force, characteristics of substances, global warming, and matter and energy, each with a 2.5% usage rate. The results show that test assessments have been applied to almost all class VII materials, except for earth and solar system topics. The following is the 8th-grade science material as seen in Figure 3.

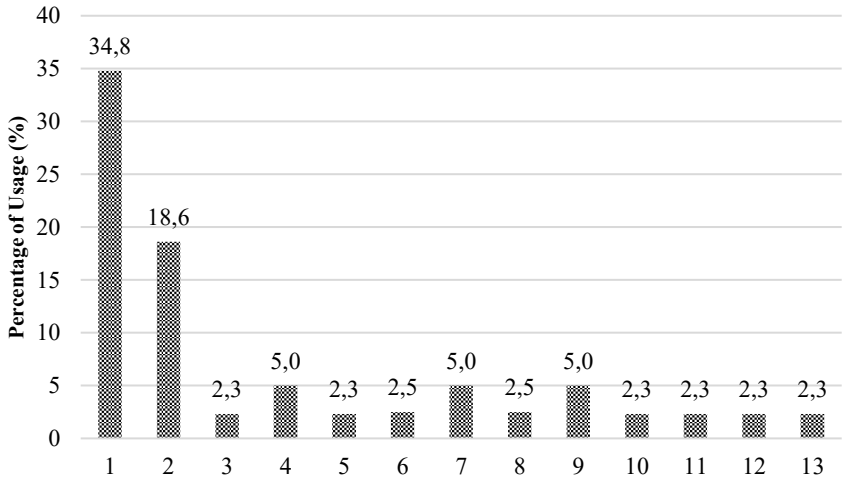

Figure 3. Class VIII science topics

Information: 1) Science, 2) Vibrations and Waves, 3) Human Digestive System, 4) Light and Optical Devices, 5) Human Movement System, 6) Human Excretory System, 7) Respiratory System, 8) Motion of objects & living things, 9) Circulatory System, 10) Additives & Addictive Substances, 11) Simple Aircraft, 12) Archimedes' Law, 13) Life System

In class VIII material, the test assessment has been carried out on all components of science material. From this study, many test assessments were carried out on 34.8% science material, which included the fields of biology, physics, and chemistry. There is science material, while test assessments are still little done on the material of the human digestive system, human motion system, living systems, Archimedes' law, addictive substances, and simple aircraft material with a percentage of 2.3% each. Figure 4 shows the 9th grade science material.

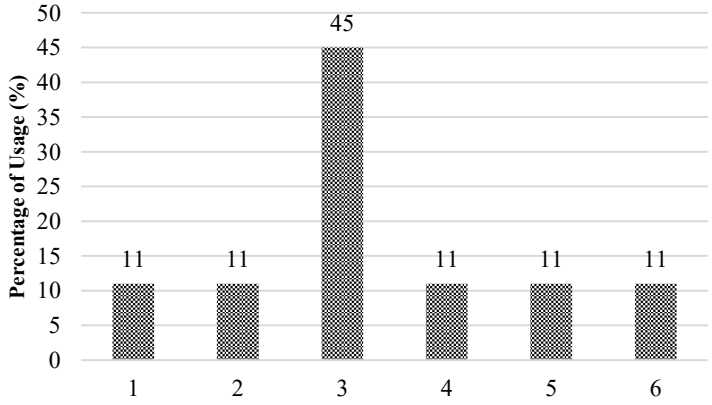

Figure 4. Science topics for class IX

Information: 1) Science, 2) Atoms, Ions and Molecules, 3) Dynamic Electricity, 4) Biotechnology, 5) Nervous System, 6) Cell Division

In class IX, science assessments rarely cover dynamic electricity material. This study found that dynamic electricity is the most frequently tested topic, but it presents significant challenges for students, particularly when solving problems that involve image representations. Students frequently find it difficult to solve problems due to insufficient understanding of formula symbols, and image-based questions are still

perceived as obstacles in the analysis process (Tambychik & Meerah, 2010). Meanwhile, science materials, atoms, ions, and molecules, biotechnology, the nervous system, and cell division are each about 11%.

Trend Assessment 2014-2024

This study synthesized multiple articles and found variations in the results, with authentic assessment being the most commonly used. In the assessment processing stage, teachers have not carried out their tasks optimally. This is due to the mismatch between the processing of affective aspects and the assessment standards (Kadir & Hasri, 2021). The various types of authentic assessments that can be conducted include performance assessments, systematic observations, open-ended questions, portfolios, self-evaluations, and diaries (Nurgiyantoro, 2008).

The results of the article analysis show that previous studies have conducted research with the type of authentic assessment by 52% (Sriyati et al., 2016; Venna et al., 2021). Followed by diagnostic assessment at 9%, HOTS assessment at 9%, formative assessment at 8%, argumentation assessment at 7%, science process skills assessment at 6%, summative assessment at 5%, literacy assessment at 3%, and cognitive assessment with the smallest percentage at 1%.

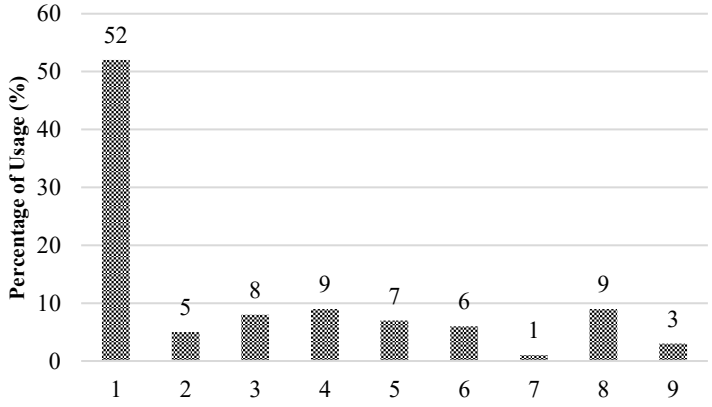

Figure 5: Science topics for class IX

Information: 1) Authentic, 2) Summative, 3) Formative, 4) Diagnostic, 5) Argumentation KPS, 6) Cognitive, 7) HOTS, 8) Literacy

Based on the figure above, the most common type of assessment used in the science learning process over the past 10 years is authentic assessment. This is because authentic assessment is suitable for measuring all aspects of learning at school, both inside and outside the classroom (Fityana et al., 2017). Based on the literature review, most assessment studies focus on grade VIII, with grade VII assessments often covering temperature and heat, and grade IX focusing on dynamic electricity. Over the past decade (2014-2024), authentic assessment has become the most commonly used in science education, as it effectively evaluates all aspects of student learning.

CONCLUSION

Based on the reviewed articles, it is concluded that trends in junior high school science learning assessment from 2014 to 2024 show extensive use of authentic assessment. Junior high school science assessments are generally conducted more frequently in grade VIII. In the articles reviewed, a range of science materials from

grade VII showed that the most commonly tested materials were temperature and heat. In grade VIII, almost all materials have been tested using tests, while in grade IX, dynamic electricity is the most commonly tested material. Based on the results of the reviewed articles, it is recommended that future researchers develop assessment tests on earth and solar system materials in grade VII. This step is important so that assessments can reflect all learning outcomes targeted by the curriculum fairly and equitably and support competency-based learning, which is at the core of the National Curriculum.

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