Indonesian Journal of Education & Mathematical Science
Vol. 5, No. 3, September 2024, pp. 209~215
ISSN: 2715-985X, DOI: 10.30596/ijems.v5i3.21372

The Development of Interactive Multimedia on Ethnoscience Integrated Acid and Base Material Oriented to Scientific Literacy Capabilities

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ABSTRACT

Education is a conscious and planned effort to create an environment and learning process where students actively develop religious spiritual strength, self-control, personality and intelligence. The independent learning curriculum proposes changes to the education system for educational progress that is relevant to modern times. The independent learning goal is to create fun education for teachers and students. . Because chemistry subjects require an understanding of abstract concepts, students often have difficulty understanding them. Ethnoscience integrated learning is a new innovation in the world of education that combines culture and science. The 2022 PISA results show that Indonesian students' reading literacy has decreased by 12 points from the 2018 PISA results. These results also explain that Indonesian students are lower than the global literacy average of 117 points. Sadly, only 25.46% of Indonesian students reach the PISA minimum competency standards for reading. Learning media, or even multimedia, is not only a tool to help teachers, but also increases the literacy and character values of each student. This study aims to determine the effectiveness of using interactive multimedia in integrated acid-base material in ethnoscience which is oriented towards scientific literacy abilities. The method used in this study is to compare data from several relevant journals. This research uses a narrative review approach. This research relies on secondary data such as journals and previous research on the relationship between interactive multimedia, ethnoscience, and scientific literacy. The research results show that interactive multimedia integrated with ethnoscience in acid-base material can influence scientific literacy abilities. This is proven from previous research sources that have been studied. Interactive multimedia with chemistry learning on interesting acid-base material integrated with ethnoscience has the benefit of influencing students' thinking abilities through interactive behavior. Chemistry material presented with an integrated ethnoscience culture can increase students' scientific literacy in learning.

Keywords: Interactive Multimedia, Ethnoscience, Scientific Literacy

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1. INTRODUCTION

According to SISDIKNAS Law no. 20 of 2003, Education is a conscious and planned effort to create an environment and learning process where students actively develop religious spiritual strength, self-control, personality and intelligence. Decree of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia number 262/M/2022 concerning guidelines for implementing the curriculum in the context of learning recovery number 56/M/2022. The independent learning curriculum proposes changes to the education system for educational progress that is relevant to modern times. The independent learning goal is to create fun education for teachers and students.

Chemistry is part of a subject taught comprehensively in senior secondary schools (SMA) in the independent curriculum. Because chemistry subjects require an understanding of abstract concepts, students often have difficulty understanding them (Arofah and Rinaningsih, 2021). One of the chemical materials is acids and bases, this acid-base material is considered difficult by most students because it is considered complex which includes the ability to analyze, calculate and make connections in the acid-base material which can hinder students' understanding ability in studying the acid-base material (Rahmadani & Guspatni, 2023).

Ethnoscience learning is an approach to creating a learning environment that integrates culture in the learning process (Iqlima Maytrea & Namirah, 2020). Ethnoscience integrated learning is a new innovation in the world of education that combines culture and science. This will influence how students use technology and science to solve problems and protect the environment (Putri et al., 2022). As a result of rapid globalization, Indonesia's local cultural values are being eroded. To prevent this from happening, an ethnoscience approach in the learning process must be applied (Puspasari et al., 2019).

One of the increasingly popular learning media is interactive multimedia technology, which can be accessed via various devices, consisting of text, images, audio, animation and video. Learning media, or even multimedia, is not only a tool to help teachers, but also increases the literacy and character values of each student. With interactive multimedia, students can understand lessons and improve their scientific literacy skills through the content contained in interactive multimedia.

The 2022 PISA results show that Indonesian students' reading literacy has decreased by 12 points from the 2018 PISA results. These results also explain that Indonesian students are lower than the global literacy average of 117 points. Sadly, only 25.46% of Indonesian students reach the PISA minimum competency standards for reading (OECD, 2023). Scientific literacy is very important because it can improve inquiry skills, increase oral and written vocabulary to understand and communicate science, and improve relations between science, technology and society (Pertiwi et al., 2018).

This research is important because it examines the development of interactive multimedia that is integrated with ethnoscience which is oriented towards scientific literacy skills which is a preventive step in overcoming students' learning difficulties in chemistry, especially acids and bases, as well as addressing students' scientific literacy skills considering this. Indonesian students' reading literacy is decreasing. With the aim of finding out the effectiveness of using interactive multimedia in integrated acid-base material in ethnoscience which is oriented towards scientific literacy abilities. It is hoped that this can support students' problems in learning chemistry, especially acids and bases, and can overcome students' scientific literacy abilities, especially in Indonesia itself.

2. RESEARCH METHOD

By comparing data from several relevant journals, this research uses a narrative review approach. This research relies on secondary data such as journals and previous research on the relationship between interactive multimedia, ethnoscience, and scientific literacy. In this preparation, descriptive analysis is used. Several electronic databases, such as Goegle Scholar, PubMed, and Semantic Scholar, performed the searches. Articles included in this research must meet the following criteria: have an ISSN, be freely accessible, be full of text, and have relevance between the title and content of the article with one of the dependent variables (scientific literacy ability); independent variable (interactive multimedia development); and published between 2020 and 2024.

3. RESULTS AND DISCUSSION

Research Result

Based on the criteria testing carried out, five articles were selected to be used as references in this literature study, as shown in the following table.

Table 1.
List of Reference Journals Used

Author and Year	Journal Name	Research Title	Summary of Research Results
(Hutama & Hidayah, 2022	UNESA Journal of Chemical Education	Pengembangan Multimedia Interaktiff Berbasis Flash	The research results showed that the average percentage of validation results was 88.96% with very valid criteria. Based on practicality, the average percentage result was 89.165%,

		Pada Materi Titrasi Asam Basa	which is included in the very practical criteria. The effectiveness of getting classical completion results is 100% with an average score of 88.34%.
Iqlima Maytrea & Namirah, 2020	Journal of Chemistry Education Research	*Development Of Ethnoscience-Based Learning Module In Acid And Base Themes For The 11th Graders Of Senior High School*	The research results show that the module developed according to BSNP is valid with Aiken's calculations for content and media aspects of 0.99 and 0.97. Student responses in the high, medium and low groups had percentages of 92%, 93% and 92% which were included in the very good category.
Ramadhoni & Muchtar, 2024	Jurnal Teknologi Pendidikan: Jurnal Penelitian dan Pengembangan Pembelajaran	*Development of Integrated Smart Apps Creator Media with Guided Inquiry Learning Model on Reaction Rate Material*	This research produces Smart Apps Creator media learning that is integrated with the guided inquiry learning model on reaction rate material. The results of validation by media assessment experts obtained an average of 89.6% (very valid). The results of the teacher response assessment obtained an average of 89.5% (very practical) and the results of the student response assessment obtained an average of 82.2% (very practical).
Azkia et al., 2023	JCAE (Journal of Chemistry And Education)	Pengembangan Media Pembelajaran Interaktif Terintegrasi Etnosains Untuk Meningkatkan Kemampuan Literasi Sains dan Motivasi Belajar Peserta Didik Pada Materi Hidrolisis Garam	The research results show that the development of learning media is based on the criteria: (1) Validity; viewed from the aspects of content, presentation, language and media, the average score was 95.32 (very valid). (2) Practicality, viewed from the results of the readability of learning media in the individual test of 4.08 (good) and the small group test of 4.32 (very good), the results of the student response questionnaire were 3.9 (good), and the results of observations implementation of learning is 4.51 (very good), (3) Effectiveness, in terms of increasing scientific literacy skills with an N-gain score of 0.49 (medium) and learning motivation with an N-gain score of 0.61 (medium).
Robbia & Fuadi, 2024	Jurnal Ilmiah Profesi Pendidikan	Pengembangan Keterampilan Multimedia Interaktif Pembelajaran Ipa Untuk Meningkatkan Literasi Sains Peserta Didik di Abad 21	With scientific literacy in learning, it is hoped that students will have the ability to knowledge and understand scientific concepts, the ability to search for or determine answers to questions originating from curiosity from everyday experience, have the ability to explain existing phenomena, be able to identify scientific problems and information technology.

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Based on the table above, most research states that the development of interactive multimedia integrated with ethnoscience is effective and good to use in overcoming scientific literacy abilities. This makes the material presented easier for students to understand, improves their thinking abilities, and enables active learning (Putri et al., 2024).

Discussion

Interactive multimedia is media that consists of two or more components consisting of text, graphics, images, audio, video and animation. By combining images, animation, and even interesting sound, interactive media can display concepts with an attractive appearance. Students may not get bored with monotonous learning with a display like that. This will make them more interested in understanding what they are learning. This is in accordance with "cognitive theory of multimedia learning, multimedia representations may produce deeper learning and understanding than presentations presented in only one format" (Mayer, 2009: 100). With environmental-based technology, teachers are trained to change teacher-centered learning approaches to student-centered learning approaches. This technology encourages students to actively participate and interact during the learning process. It is hoped that interactive multimedia, especially those related to certain subjects, can help the learning process in the classroom (Robbia & Fuadi, 2024), especially in acid-base chemistry subjects.

Ethnoscience learning is an approach to creating a learning environment that integrates culture in the learning process (Iqlima Maytrea & Namirah, 2020). Because chemistry lessons are related to everyday life, ethnoscience learning helps students understand chemistry material (Arfianawati et al., 2016). The ethnoscience approach can improve student learning outcomes and produce a generation that is scientifically literate, innovative and scientifically minded (Setiawan, 2013). Therefore, in cultural ethnoscience integrated chemistry learning helps students transform what they see into creative principles and forms about nature. They not only imitate or accept what is taught, but they also create meaning, understanding and significance from what they learn (Sumarni, 2018).

Scientific literacy means understanding science, communicating it (orally or in writing), and applying science to solve problems. This also means having a strong attitude and sensitivity towards oneself and one's environment when making decisions. In its development, PISA in 2015 determined that scientific literacy consists of four major dimensions (aspects) that are interconnected, namely competence (science process), science knowledge or content, science context, and attitudes. According to PISA, scientific literacy skills are measured through three indicators: finding scientific problems or questions, explaining phenomena scientifically, and using scientific evidence. This aims to foster students' scientific literacy skills which are based on logic, reasoning, and critical and creative analysis (Jufri, 2017). Scientific literacy is very important because it can improve inquiry skills, increase oral and written vocabulary to understand and communicate science, and improve relations between science, technology and society (Pertiwi et al., 2018).

According to (Hutama & Hidayah, 2022) Based on research conducted on the Development of Flash-Based Interactive Multimedia on Acid-Base Titration Material, it was found that interactive multimedia is suitable for use as a learning medium to improve student learning outcomes. When compared with conventional learning media, interactive multimedia learning such as the Adobe Flash CS6 Professional program increases students' understanding of chemistry, especially acid-base titration material. Flash-based interactive multimedia is presented in relevant lessons and also has video demonstrations that help students understand the concepts being studied. There are several other studies such as research conducted by (Iqlima Maytrea & Namirah, 2020). Based on the description of the research results regarding the development of an ethnoscience-based chemistry learning module on the theme of acids and bases for class XI high school, it can be concluded that learning using an ethnoscience integrated module allows students to participate actively and directly in scientific activities and increase their awareness and pride in their own culture. By incorporating culture into teaching materials, this learning makes students more aware and proud of their own culture. Other research regarding the development of integrated Smart Apps Creator media with guided inquiry learning models on reaction rate material carried out by (Ramadhoni & Muchtar, 2024) showed that the results of applying reaction rates using Smart Apps Creator software are very feasible

and practical to use in learning because they can be accessed at any time and anywhere and used to help the learning process.

This is also continuous in the research of Robbia & Fuadi, (2024) where the use of interactive multimedia has a great influence on students' scientific literacy abilities. Current developments require the use of technology in various fields, including education, so interactive media becomes important. With scientific literacy in learning, it is hoped that students can understand and comprehend scientific concepts, search for or determine answers to questions that originate from everyday curiosity, explain existing phenomena, and identify scientific problems and technological information. An educator increases the scientific literacy of his students to increase: 1) scientific knowledge and explanations; 2) spoken and written vocabulary necessary to understand and communicate science; and 3) the relationship between science, technology and society.

The use of interactive multimedia integrated with ethnoscience is very important for students' scientific literacy abilities. This is in line with previous research, namely research by Azkia et al., (2023) which shows that after using interactive learning media that combines ethnoscience, the posttest score is between the medium and high categories. This shows that students have better scientific literacy after learning. These results are in line with research conducted by Yunita et al., (2018), who found that adding the surrounding environment to chemistry learning helped students gain an understanding of knowledge concepts and make them related to real world situations, which resulted in a more meaningful learning experience. . Learning local culture improves students' critical thinking, understanding of concepts, and abilities in the science process (Syahmani et al., 2022). In chemistry learning, the surrounding environmental context increases students' scientific literacy (Kusasi et al., 2021).

So, the most effective solution to overcome difficulties in students' scientific literacy skills in acid-base lessons is to use interactive multimedia that can be accessed by students. Interactive multimedia with chemistry learning on interesting, ethnoscience-integrated acid-base material has the benefit of influencing students' thinking abilities through interactive behavior. Chemical material presented with an integrated culture of ethnoscience can increase students' scientific literacy in learning (Azkia et al., 2023), one of which is acid-base material. The public's view of chemistry is not only about abstract material, difficult to understand, and discussing dangerous chemicals. But it is found in everyday life, for example, ethnoscientific culture related to acid-base substances in Jambi province, including the tradition of making batik, betel nut, and the use of local Jambi plants as acid-base indicators. Therefore, by studying ethnoscience, the concept of acid-base material which is related to everyday life, it can help students to understand local culture and discover that there is a relationship between ethnoscience and acid-base material.

According to Bloom et al. (1956), learning outcomes can be broken down into three domains: cognitive, affective, and psychomotor. Each domain has several levels of ability, from simple to complex, from easy to difficult, and from concrete to abstract. The following is a table explanation of the relationship between the evaluation aspects of Bloom's taxonomy and students' scientific literacy abilities:
1. Scientific Literacy in the Cognitive Realm.

Table 2.
Scientific Literacy in the Cognitive Realm

Cognitive	Scientific Literacy
Understand	Explains natural phenomena and changes made to nature through human activities.
	Identify questions and problem issues.
	Explain phenomena scientifically.
Apply	Using scientific evidence.
Analyze	Linking relationships with the application of science in everyday life.

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2. Scientific Literacy in the Affective Domain

Table 3.
Scientific Literacy in the Affective Domain

Affective	Scientific Literacy
Respond	Compromising the answer to a question or solving a scientific problem.
Organize	Classify the fields of science application in personal, social and global forms.
	Combines content knowledge, procedural knowledge, and epistemic knowledge.

3. Scientific Literacy in the Psychomotor Realm

Table 4.
Scientific Literacy in the Psychomotor Realm

Psychomotor	Scientific Literacy
Articulation	Integrating the application of science in everyday life
Naturalization	Creating scientific literacy abilities in students that are based on logic, reasoning, and critical and creative analysis.

Below is also a schematic of the relationship between interactive multimedia, ethnoscience characteristics, aspects of scientific literacy, and evaluation aspects of Bloom's taxonomy.

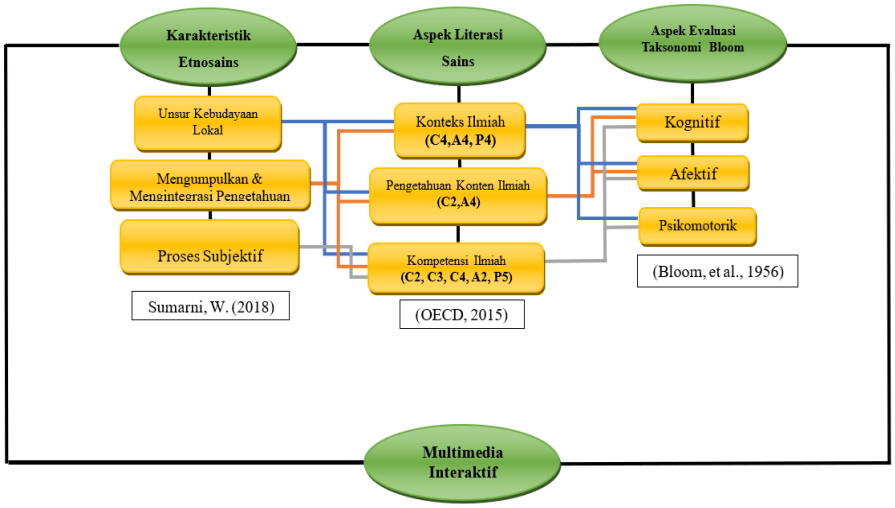


Fig 1. Scheme of the Relationship Between Ethnoscientific Characteristics, Aspects of Scientific Literacy, and Evaluation Aspects of Bloom's Taxonomy

4. CONCLUSION

In improving the quality of education itself, one way is to use technology, especially what is currently popular, namely interactive multimedia. Interactive multimedia integrated with ethnoscience in acid-base material can influence scientific literacy skills. This is proven from previous research sources that have been studied. Interactive multimedia with chemistry learning on interesting acid base material integrated with ethnoscience has the benefit of influencing students' thinking abilities through interactive behavior. Chemistry material presented with an integrated ethnoscience culture can increase students' scientific literacy in learning.

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