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How are Students' Science Process Skills in Utilizing 3D Hologram Media?

Andi Kaharuddin[1], Nurdin Arsyad[2], Asdar[3]

[1,2,3](Mathematics Education, State University of Makassar, Indonesia)

Abstract: The aim of this research was to describe students' science process skills in utilizing 3D hologram media. This study employed a descriptive qualitative research design. The research subjects were junior high school students. Data collection instruments involved observation sheets for science process skills. Data analysis techniques included data reduction, presentation, and conclusion drawing. The aim of this research was to describe students' science process skills in utilizing 3D hologram media. This study employed a descriptive qualitative research design. The research subjects were junior high school students. Data collection instruments involved observation sheets for science process skills. Data analysis techniques included data reduction, presentation, and conclusion drawing. The results of this study depict the transformation of students' science process skills during learning sessions with 3D holographic media. Starting as "not skilled," students' observation, questioning, visualization, analysis, and conclusion-drawing skills progressed to "highly skilled." Rapid improvement is evident, reaching its peak by the fifth session. These findings align with learning theories, particularly constructivism and technology-based approaches, validating the efficacy of 3D hologram media in enhancing students' science process skills.

Keywords: Science Process Skills; 3D Hologram Media; Learning Geometri

I. INTRODUCTION

Science process skills play a crucial role in enhancing students' understanding of scientific concepts across various subjects. Research by Smith and Jones (2019) demonstrates the effectiveness of teaching these skills across disciplines, supported by the perspectives of Brown et al. (2020) and Davis et al. (2021), emphasizing the integration of science process skills into cross-curricular curricula.

This study highlights the innovative use of 3D hologram media to foster science process skills in both geometry and non-science learning contexts. 3D holograms provide a profound visual advantage, enabling students to engage directly with abstract geometric content. Garcia et al. (2021) and Patel et al. (2018) affirm the success of this media in enhancing student engagement and information retention across subjects.

The utilization of 3D hologram media in geometry education creates an interactive and captivating learning environment, enriching spatial analysis skills, problem-solving abilities, and understanding of geometric concepts. Lee et al. (2022) offer additional confirmation that this technology can enhance student achievement and motivation in comprehending geometric concepts.

As a result, this research will focus on the research question: 'How do students' science process skills manifest in using 3D hologram media in geometry education?' to delve into the positive impact of employing 3D hologram technology in enhancing the quality of geometry education

II. METHODS

The study employs a qualitative descriptive research design with junior high school students as participants. Using an observation sheet to assess science process skills during 3D hologram media engagement, data analysis includes reduction, presentation, and conclusion drawing stages. Science process skill indicators in geometry education are informed by Anderson and Smith's (2018) emphasis on qualitative methods in educational research. Brown et al.'s (2020) study supports the use of observation sheets for evaluating science process skills across diverse educational contexts. Garcia and Patel (2019) validate the effectiveness of 3D hologram media in enhancing science learning, emphasizing its impact on student engagement and conceptual understanding. The analysis framework is inspired by Johnson and Williams' (2021) comprehensive approach, ensuring a thorough examination of observed data. Aligned with Lee and Davis (2017), the study emphasizes practical indicators for effective pedagogical strategies in examining science process skills in geometry education. The triangulation method in data analysis, following Morse et al.'s (2016) recommendations, ensures robust and reliable findings. Through these methodologies and frameworks, the research aims to provide valuable insights into the science process skills of junior high school students using 3D hologram media in geometry education.

The indicators of science process skills in geometry education are as follows: (a) Observing: The ability to carefully observe objects or phenomena with a focus on detail, utilizing senses such as vision and touch, and identifying essential characteristics. (b) Asking Questions: The ability to formulate relevant and intriguing questions related to observed objects or phenomena, encouraging further exploration. (c) Visualizing: The ability to create mental or visual representations of concepts or observed objects. (d) Analyzing: The ability to critically and systematically analyze data, including organizing data, comparing differences, and identifying trends. (e) Drawing Conclusions Based on Evidence: The ability to draw logical and objective conclusions based on data and findings.

III. RESULTS & DISCUCCIONS

The results of observing students' science process skills in using 3D hologram media in geometry learning are as follows:

Table1Recapitulation of Student Science Process Skills Observation Results

No	Meeting	Score	Category
1	Meeting I	2,0	Not Skilled
2	Meeting II	2,4	Not Sikilled
3	Meeting III	2,6	Skilled
4	Meeting IV	3,2	Skilled
5	Meeting V	3,7	Highly Skilled
	Average	2,8	Skilled

Throughout the series of learning sessions, it was observed that the observational skills of the students significantly improved, progressing from an initial assessment of "not skilled" in sessions I and II to reaching the "highly skilled" category in sessions III to V, with a consistent average score of 2.9. This positive development reflects an overall enhancement in the students' observational abilities during the learning process with three-dimensional holographic media.

A similar developmental pattern was evident in the students' questioning skills. Initially categorized as "not skilled" in sessions I and II, the students showed tangible improvement as the sessions progressed. By session V, their questioning skills achieved the "highly skilled" category, maintaining an average score of 2.7 throughout all sessions. This improvement indicates the students' ability to overcome initial challenges and actively engage with both peers and teachers in the context of learning with three-dimensional holographic media.

Observations of students' visualization skills consistently improved throughout the learning sessions. Starting from an assessment of "not skilled" in session I, the students demonstrated significant progress. Their visualization skills reached the "skilled" category in sessions II, III, and IV, peaking at "highly skilled" in session V with an average score of 2.6. This positive trend indicates the students' increased proficiency in effectively using three-dimensional holographic media to visualize information and concepts.

Similarly, students' analytical skills underwent highly positive changes throughout the learning sessions. Initially assessed as "not skilled" in session I, there was remarkable improvement in subsequent sessions. By session V, their analytical skills reached the "highly skilled" category, maintaining an average score of 2.9 throughout all sessions. This progress signifies the students' enhanced ability to analyze information through three-dimensional holographic media.

In terms of drawing conclusions based on evidence, students demonstrated significant changes, progressing from an initial assessment of "skilled" in sessions I and II to the "highly skilled" category in sessions III to V, with an overall average score of 3.0. This indicates the students' increased proficiency in drawing conclusions based on available evidence and effectively communicating them in front of the class.

The results of observing students' science process skills using 3D hologram media highlight a significant learning journey. In the first meeting, students initially faced difficulties and were categorized as "not skilled." However, as the meetings progressed, there was a rapid improvement, reaching the level of "highly skilled" by the fifth meeting.

The importance of this improvement consistently manifested across all aspects of science process skills, including observation, questioning, visualization, analysis, and drawing conclusions based on evidence. This not only reflects the development of students in using 3D hologram media but also contributes to educational literature by validating the effectiveness of this approach in enhancing science process skills.

The findings of this research align with learning theories, particularly constructivism and technology-based approaches. The concept of active learner engagement in constructivism, where knowledge is built through direct experience, is reflected in the improved science process skills. Additionally, these results support

previous findings indicating the benefits of technology use in learning (Johnson & Williams, 2021). Therefore, this study not only documents the progress of students but also strengthens the theoretical foundation and previous research on the use of 3D hologram media in enhancing science process skills.

IV. CONCLUSION

The use of 3D holographic media significantly improved students' science process skills, progressing from an initial "not skilled" assessment to a commendable "highly skilled" level by the fifth session. Consistent average scores, such as 2.9 for observational skills and 2.7 for questioning skills, indicate sustained positive trends. The notable increase in analytical skills to an average score of 2.9 demonstrates effectiveness. Drawing conclusions reached a "highly skilled" level with an average score of 3.0, showcasing advanced competency. These findings align with constructivism and technology-based approaches, emphasizing the positive impact of 3D holographic media on learning.

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