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Teacher Perception of Citizenship in Science Learning Tools Based on Critical Thinking Abilities

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ABSTRAK

Perangkat pembelajaran yang baik tidak hanya mencakup perencanaan yang sistematis, tetapi juga harus mampu memfasilitasi pengembangan keterampilan siswa sesuai dengan tuntutan zaman. Penelitian ini bertujuan untuk mengetahui persepsi guru terhadap perangkat pembelajaran yang telah dikembangkan. Metode yang digunakan dalam penelitian ini ialah *mixed method* dengan model eksplanatori. Teknik pengambilan sampel pada penelitian ini ialah purposive sampling dengan subjek penelitian sebanyak 9 guru IPA SMP. Instrumen yang digunakan berupa angket persepsi guru berjumlah 15 pernyataan dan lembar wawancara guru terhadap perangkat pembelajaran. Data kuantitatif dianalisis menggunakan deskripsi kuantitatif dan data kualitatif dianalisis menggunakan metode miles and huberman. Hasil persepsi guru IPA terhadap perangkat pembelajaran dikategorikan sangat baik dengan rata-rata persentase sebesar 90.06%. Dari hasil wawancara diketahui bahwa perangkat pembelajaran *Citizenship in Science* dapat mendukung proses pembelajaran IPA serta mengembangkan kemampuan berpikir kritis siswa pada materi Gerak Lurus Beraturan dan Gerak Lurus Berubah Beraturan

ABSTRACT

Good learning tools not only include systematic planning, but must also be able to facilitate the development of students' skills in accordance with the demands of the times. This research aims to determine teachers' perceptions of the learning tools that have been developed. The method used in this research is a mixed method with an explanatory model. The sampling technique in this research was purposive sampling with research subjects of 9 junior high school science teachers. The instruments used were teacher perception questionnaires totaling 15 statements and teacher interview sheets regarding learning tools. Quantitative data was analyzed using quantitative descriptions and qualitative data was analyzed using the Miles and Huberman method. The results of science teachers' perceptions of learning tools are categorized as very good with an average percentage of 90.06%. From the interview results, it is known that the Citizenship in Science learning tool can support the science learning process and develop students' critical thinking skills in the material of Regular Straight Motion and Regular Changing Straight Motion

1. PENDAHULUAN

Learning tools are one of the main elements in the educational process designed to assist teachers in delivering materials and guiding students to achieve learning objectives (Ahmal et al., 2020; Azni & Jailani, 2015; Fakhri, 2023). Good learning tools not only include systematic planning, but must also be able to facilitate the development of student skills according to the demands of the times (Harjono et al., 2019; Hartini, 2017; Nursari et al., 2021). In science learning, learning tools should ideally not only be oriented towards understanding concepts, but also encourage students to think critically and be able to relate material to real-life phenomena (Makhrus & Hadiprayitno, 2012; Novianti Taufik et al., 2023). Therefore, a learning approach based on active student involvement in science, such as Citizenship in Science, is becoming increasingly relevant to implement.

Citizenship in Science is an approach that emphasizes the importance of student participation in understanding science as part of social and environmental life. By using this concept, science learning not only focuses on transferring knowledge, but also builds students' awareness of science issues that impact society (Eleta et al., 2019; Mitchell et al., 2017; Queiruga-Dios et al., 2020). Through the application of Citizenship in Science, students are invited to think reflectively, identify science-based problems in everyday life, and contribute to finding solutions

(Muaziyah et al., 2023; Roche et al., 2020; Vesterinen et al., 2016). This is in line with the needs of 21st century learning which prioritizes critical thinking skills as one of the main competencies that must be developed in science learning.

Critical thinking skills are one of the most important skills in science learning because they allow students to analyze information in more depth, evaluate data, and make decisions based on valid evidence (Indiana et al., 2024; Rosdianto et al., 2020; Sevtia et al., 2022). Critical thinking also helps students understand the relationship between theory and practice, so that students can apply science concepts in various real situations (Mulia & Murni, 2022; Nuai & Nurkamiden, 2022; Yolanda et al., 2024). Therefore, the integration of critical thinking into science learning tools can improve the quality of learning by fostering a scientific mindset and a sense of responsibility towards environmental and social problems.

Science learning at the junior high school level aims to provide a strong foundation for students in understanding scientific concepts that support the development of students' critical and analytical thinking skills (Aprina et al., 2024; Suryaningsih, 2018; Vebrianto & Istiqomah, 2021). In the process, science learning not only teaches theory, but also encourages students to conduct observations, experiments, and data analysis in order to find patterns and scientific principles behind various natural phenomena (Anggareni et al., 2013; Juhji, 2015; Sawitri et al., 2024). However, the effectiveness of science learning is highly dependent on how learning tools are designed and implemented by teachers in teaching and learning activities in the classroom (Rosdianto et al., 2022). Learning tools that are not optimally designed have the potential to reduce student participation and weaken the development of critical and analytical thinking skills which are the main objectives of science learning.

This study is in line with the research conducted by Zagoto & Dakhi, (2018) which states that the availability of adequate learning devices will help teachers in implementing the learning process to achieve the expected learning goals and objectives. In addition, learning devices need to be designed in such a way as to encourage students to be actively involved in building their own knowledge and skills (Doyan et al., 2024; Fakhri, 2023; Rosdianto et al., 2018). Although various studies have discussed the importance of learning devices, there is still a research gap regarding how teachers perceive Citizenship in Science learning devices based on students' critical thinking skills, especially in the material of Uniform Straight Motion and Uniformly Accelerated Straight Motion. According to Wahyuni et al., (2017) a person's perception is an active process that plays a role, not only the stimulus that affects it but also the individual as a whole with their experiences, motivations and attitudes that are relevant in responding to the stimulus. In addition, perception is a process of making judgments or building impressions about various things in a person's sensory field (Istiani et al., 2017; Yudha et al., 2023). Based on the description above, it is necessary to carry out a readability test to describe teacher and student perceptions of learning tools for train students' developed critical thinking skills.

2. METHOD

This study uses a mixed method with an explanatory model, with variables in the form of teacher perceptions of learning devices on Uniform Straight Motion and Uniformly Accelerated Straight Motion materials. The mixed method explanatory model is a combination of quantitative and qualitative research methods carried out sequentially (Subedi, 2016). In the first stage, quantitative data collection is carried out which is then continued with the second stage, namely qualitative data collection. In quantitative research, the samples used are analyzed systematically and the results are presented in numerical form.

The subjects of the study consisted of 9 science teachers of grade VII junior high schools who taught Uniform Straight Motion and Uniformly Accelerated Straight Motion materials. The selection of subjects was carried out purposively to ensure that respondents had a direct relationship with the research topic.

Quantitative data collection was carried out using a questionnaire. Strengthening and complementing quantitative data can be done with qualitative data. This qualitative data was obtained from the results of interview analysis. The sampling technique in this study used the purposive sampling technique. Purposive sampling is a sampling technique from data sources with certain considerations (Rosdianto et al., 2017; Tanti et al., 2021). Considerations in sampling are grade VII science teachers who teach Uniform Straight Motion and Uniformly Accelerated Straight Motion materials.

Table 1. Teacher Perception Questionnaire Grid

Assessment Aspects	Statement Number
Appearance	1,2,3,4,5
Content or material	6,7,8,9,10,11
Usefulness	12.13
Relevance	14.15

Table 2. Teacher Interview Sheet Grid

Assessment Aspects	Statement
Appearance	Overall view of learning devices
Content or material	Ease and clarity of content
Usefulness	Supports critical thinking skills
Relevance	Learning tools support 21st century learning

The questionnaire data on teacher perceptions of learning devices were collected using a Likert scale. The level of teacher perception of learning devices was used to determine the category of teacher perception, namely: very good, good, not good, and very not good.

Table 3. Interpretation of Likert Scale

No.	Criteria	Score
1	Very good	4
2	Good	3
3	Not good	2
4	Very not good	1

(Siahaan et al., 2019)

Furthermore, the interval data can be analyzed by calculating the percentage of answers based on scoring each answer from the respondent using the following formula:

$$Score\ percentage = \frac{total\ score}{maximum\ score} \times 100\%$$

The percentage of perceptions obtained is then interpreted into criteria based on table 4

Table 4. Teacher Perception Result Criteria

No.	Percentage	Category
1	0%-25%	Very not good
2	26%-50%	Not good
3	51%-75%	Good
4	76%-100%	Very good

(Fortuna et al., 2022)

Qualitative data were analyzed using Miles and Hubarman analysis. Sugiyono, (2015) revealed that analysis activities in Miles & Huberman data include reducing data, presenting data, and drawing research conclusions. Reducing data is an activity to summarize into several important focuses. Data presentation is an activity to present data in the form of tables, graphs, and so on so that the data will be organized and easy to understand. The last activity is drawing conclusions and verification. The following are the procedures in this research.

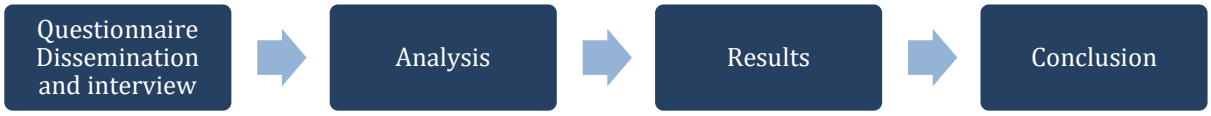

Figure 1. Research Procedure

3. RESULT AND DISCUSSION

3.1. Result

The collection of teacher perception data was carried out by distributing a questionnaire consisting of 15 questions consisting of aspects of appearance, content or material, usefulness, and relevance filled out by 9 science teachers. The level of teacher perception of learning devices on Uniform Straight Motion and Uniformly Accelerated Straight Motion materials can be seen in Table 5.

Table 5. Results of the teacher perception questionnaire on learning tools

Aspect	Total Score	Maximum Score	Percentage	Category
Appearance	161	180	89.44 %	Very good
Content or material	195	216	90.27 %	Very good
Usefulness	66	72	91.66 %	Very good
Relevance	64	72	88.88 %	Very good
Average	121.5	135	90.06 %	Very good

Based on the table of results of teacher perceptions of learning tools, the average percentage of data obtained from the teacher perception questionnaire of learning tools is 90.06% out of 100% with the very good category, so according to the teacher, this learning device can be an alternative in helping to train students' critical thinking skills in science learning, especially on Uniform Straight Motion and Uniformly Accelerated Straight Motion materials. The following is a summary of the results of interviews with 9 science teachers regarding the development of learning devices.

Table 6. Summary of the results of interviews with 9 teachers regarding learning devices

Aspect	Answer
Overall view of learning devices	Most teachers stated that the appearance of the learning device was quite attractive and systematic. Seven out of nine teachers stated that the design was quite neat and easy to understand, especially in the presentation of materials and instructions. However, one teacher suggested that the use of colors and visualizations be more varied to increase student appeal.
Ease and clarity of content	Eight teachers considered the content of the material to be clear and easy to understand, both by teachers and students. The structure of the concept delivery was considered systematic and not confusing.
Usefulness	Nine teachers agreed that the learning tool was good enough to encourage students to think critically. This can be seen from the presence of trigger questions, analysis tasks, and discussions that require students to explore concepts more deeply.
Relevance	Most teachers stated that the learning devices already accommodated aspects of 21st century learning, especially in terms of collaboration and problem solving. Eight teachers highlighted the existence of discussion-based activities and group work that strengthen communication skills and include technology-based group activities, such as the use of interactive visual simulations using Phet Simulation, to be more in line with current learning needs.

3.2. Discussion

The results of interviews with nine teachers regarding learning devices on the overall display statement of learning devices, most teachers stated that the display of learning devices was quite attractive and systematic. This shows that the design of the device has met good aesthetic and readability standards in supporting the learning process. However, one teacher provided input so that the use of colors and visualization was more varied to increase student appeal. Previous research has shown that attractive visual design can increase student engagement in learning (Mayer, 2014). Therefore, increasing graphic elements and colors in devices can be one strategy to increase learning effectiveness.

Ease and clarity of material content, eight teachers considered the material content to be clear and easy to understand by both teachers and students. The systematic concept delivery structure is considered to support better understanding of the material. Language adjustment is very important in learning tools to make it simpler and in accordance with the level of student understanding. This is in line with the constructivist learning theory which emphasizes that the language used in the material must be in accordance with the level of cognitive development of students to make it easier to understand (Vygotsky & Cole, 1978).

The usefulness of the device in supporting critical thinking, all teachers agree that this learning device has a good contribution in encouraging students to think critically. The existence of trigger questions, analysis tasks, and discussions are the main factors that support the development of students' critical thinking skills. This is in accordance with the results of Ennis's research, (2011), which emphasizes that learning that involves analysis and discussion can significantly improve critical thinking skills. Therefore, this learning device can be considered effective in encouraging students' ability to explore concepts more deeply.

Relevance to 21st century learning, most teachers stated that the learning devices have accommodated aspects of 21st century learning, especially in terms of collaboration and problem solving. Eight teachers highlighted that discussion activities and group work in the devices have supported the strengthening of communication and cooperation skills. In addition, teachers also appreciated the use of interactive simulation-based technology, such as Phet Simulation, which is considered capable of improving conceptual understanding through a more concrete visual approach. This is in accordance with the technology-based learning approach recommended by Mishra & Koehler, (2006) in the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasizes the importance of integrating technology in learning to improve teaching effectiveness.

The results of the study indicate that the Citizenship in Science learning device based on critical thinking skills on Uniform Straight Motion and Uniformly Accelerated Straight Motion materials obtained a perception with an average percentage is 90.06% which is categorized as very good. In addition, in-depth interviews revealed that this device is interesting, systematic, and supports 21st century learning through collaborative and technology-

based activities. The implication of this finding is that the Citizenship in Science learning device can be a model for the development of other devices that are more innovative and in accordance with current educational needs. By strengthening the visualization aspect, simplifying language, and utilizing technology more optimally, this device has the potential to improve the quality of science learning in schools and help students develop better critical thinking skills in facing the challenges of the digital era.

Although this learning tool has received a good response, there are some limitations, namely that this study only involved nine teachers as respondents, so the generalization of the findings to a wider population still needs to be studied further. Therefore, further research with a wider scope and direct implementation trials in the classroom can provide a more comprehensive picture of the effectiveness of this tool in improving the quality of learning.

4. CONCLUSION AND RECOMMENDATION

Based on the results of the study, it shows that the Citizenship in Science learning device based on critical thinking skills on Uniform Straight Motion and Uniformly Accelerated Straight Motion materials received very good perceptions from teachers, with an average percentage is 90.06%. Further interviews revealed that this device was considered interesting, systematic, and supported 21st century learning through collaborative activities and the use of technology. Overall, this learning device has the potential to be an innovative model in science learning, especially in developing students' critical thinking skills, but further research is needed to test its effectiveness in classroom learning practices

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