Development of a Quizizz-Based Cognitive Diagnostic Assessment Instrument for the Science Subject of Grade IV of SD Negeri 2 Ciloa

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Abstract: The lack of use of interactive and innovative learning media in the implementation of cognitive diagnostic assessment in grade IV of SD Negeri 2 Ciloa makes students less enthusiastic and focused in participating in assessment activities. The purpose of this study is to develop a Quizizz-based cognitive diagnostic assessment instrument in the Natural and Social Sciences (IPAS) subject. Researchers also want to know the level of feasibility and effectiveness of the assessment instrument developed using Quizizz media. The subjects of this study were grade IV students of SD Negeri 2 Ciloa. Students in grade IV A (experimental class) with a total of 21 students and grade IV B (control class) with a total of 22 students. The research method used Research and Development (R&D) with the ADDIE (Analyze, Design, Development, Implementation and Evaluation) development model. The feasibility test of the Quizizz-based cognitive diagnostic assessment instrument meets the very feasible category with an average of 92.38% according to media experts, validation of learning evaluations of teaching materials obtained a percentage of 86% "very feasible", validation of learning evaluations of assessment questions obtained a percentage of 90% "very feasible". Based on the results obtained, the Quizizz-based cognitive diagnostic assessment instrument in the science subject is very suitable for use and improves student learning outcomes. The experimental class achieved an average learning outcome of 78.10%, and the control class achieved an average (mean) of 50.95%.

Keywords: Assessment instruments, Cognitive diagnostics, Quizizz, Science, Elementary School

PRELIMINARY

The development of the Industrial Revolution 5.0 era brings various challenges but also opportunities for educational institutions. Education needs to adapt to technology to support learning through interactive learning media (Adventyana et al., 2023). Selecting appropriate learning media tailored to student characteristics can make learning more effective and efficient (Saufi & Rizka, 2021). Conventional media and methods are still frequently used in learning, particularly in the implementation of cognitive diagnostic assessments.

Assessment instruments are used to collect data and information, with the goal of gathering specific data for processing (Maulana, 2022). Assessment instruments can take the form of tests or non-tests (Saputri, Zulhijrah & Larasati, 2023). Assessment is a crucial part of systematic and ongoing learning to obtain information on student progress (Munaroh, Lady, 2024). Cognitive diagnostic assessments are designed and used to determine students' learning abilities (Firdaus, 2024). The development of digitalization can be utilized by teachers to support learning. This means that education must be able to adapt to global technological advances (Heryani et al., 2022).

Learning media is anything in the form of objects or events that can be used to facilitate the learning process (Yaniar & Jadmiko, 2025). Quizizz is an interactive medium used as a cognitive diagnostic assessment instrument. Quizizz is a potential new solution for educators, making assessments more innovative, informative, and engaging. Quizizz can enhance the quality of learning, making it more interactive and enjoyable (Antari et al., 2023). Quizizz, a digital platform based on online games and quizzes, offers an interactive, competitive, and enjoyable learning experience. Quizizz can increase student engagement in learning (Pulungan et al., 2025).

Natural and Social Sciences learning focuses on students learning to understand nature and its contents (Alfatonah et al., 2023). Students' critical thinking skills can be enhanced through science learning because the learning relates to the natural environment and social phenomena (Meylovia & Julianto, 2023). Teachers play a crucial role in the teaching and learning process. One of these roles is developing interactive media as a learning aid. Through the use of appropriate media, learning becomes more enjoyable and meaningful (Wijayanti & Ekantini, 2023). (Sutisna et al., 2023) *"The use of engaging and innovative learning media is particularly effective in increasing student interest and promoting creative learning"*.

Based on observations and interviews at SD Negeri 2 Ciloa, it was found that the implementation of cognitive diagnostic assessments in science subjects at SD Negeri 2 Ciloa still uses conventional methods in the form of written tests on sheets of paper (LKS) provided by the teacher, making them less engaging for students. Students feel less enthusiastic and focused in participating in assessment activities in class. It is known that the learning outcomes of fourth-grade students at SD Negeri 2 Ciloa in science subjects are still considered low, with an average score still below the Minimum Completion

Criteria (KKM) of 70, whereas the KKM that should be achieved is 75. The development of a Quizizz-based cognitive diagnostic assessment instrument is based on two considerations: First, teachers at SD Negeri 2 Ciloa have never used interactive media as an assessment tool. Second, students tend to lack enthusiasm and focus during classroom assessments. This condition presents an opportunity for researchers to explore digital learning media that can serve as an assessment tool to make the evaluation process more interactive, innovative, and communicative, and not limited to text-based formats. This study aims to develop a Quizizz-based cognitive diagnostic assessment instrument for science subjects. In addition, the researchers seek to determine the feasibility and effectiveness of the developed instrument, as well as its impact on the learning outcomes of fourth-grade elementary school students. Quizizz, as a technology-based learning medium, plays an important role in improving the quality of learning (Wulandari et al., 2023). The use of the Quizizz application as an assessment tool can also create a more interactive and competitive learning environment (Azizah & Hidayat, 2024).

METHOD

The research method applied was Research and Development (R&D), using the ADDIE development model, which includes the stages of Analyze, Design, Development, Implementation, and Evaluation. R&D method is a series of research procedures carried out systematically to collect data, analyze relevant information, and draw conclusions (Fari et al., 2024). The subjects of this study were fourth-grade students at SD Negeri 2 Ciloa. A total of 21 students from class IV A were designated as the experimental group, receiving treatment through a Quizizz-based cognitive diagnostic assessment instrument, while 22 students from class IV B served as the control group. Data collection techniques and instruments included observation, interviews, expert validation, and questionnaires administered to both teachers and students. Observations were conducted to examine the condition and behavior of the research subjects, while interviews aimed to explore and identify the problems under investigation. Product validity was determined based on the average score from the expert assessment sheets. Practicality was analyzed from teacher and student responses through the questionnaires, while product effectiveness was measured by comparing the learning outcomes of students in the control and experimental classes using descriptive statistical analysis.

RESULTS

The results of the development research were carried out by producing a product in the form of a Quizizz-based cognitive diagnostic assessment instrument for the science subject for fourth-grade students at SD Negeri 2 Ciloa.
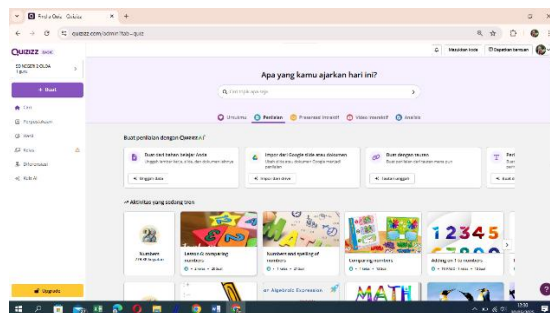

Figure 1. Tampilan Aplikasi Quizizz

1. Problem Identification Results

Before beginning the fieldwork, the researchers identified existing problems. Based on the results of the problem identification conducted at SD Negeri 2 Ciloa, the following were identified:

a. The implementation of cognitive diagnostic assessments is still conventional.

b. Lack of enthusiasm and focus on learning for students participating in cognitive diagnostic assessments.

The fourth-grade teachers at SD Negeri 2 Ciloa still use conventional methods to administer cognitive diagnostic assessments in fourth-grade students and have never used online applications. This means that the assessment is still conducted offline (conventionally), consisting of written tests on sheets of paper provided by the teacher or through verbal question-and-answer sessions with students. The teacher provides a number of questions on sheets of paper given to students, then the students read and answer the questions, which are then collected back to the teacher for analysis and to determine each student's learning outcomes. It was found that students' enthusiasm and focus on learning for cognitive diagnostic assessments were lacking because the assessment process was perceived as tedious and boring.

2. Problem Analysis Results

Based on the results of the problem identification conducted at SD Negeri 2 Ciloa, researchers can use it as a basis for developing the Quizizz learning media as a cognitive diagnostic assessment instrument. Teachers are said to have not optimally

utilized interactive media in implementing learning assessments. Therefore, this study needs to develop a Quizizz-based cognitive diagnostic assessment instrument.

3. Needs Analysis Results

Based on the needs analysis, researchers need to develop a Quizizz-based cognitive diagnostic assessment instrument. The Quizizz media used as the assessment instrument is a quiz- or game-based educational application that can be used by students.
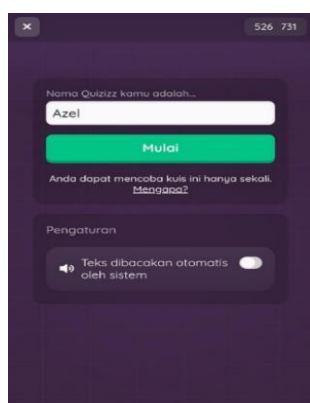

Figure 2. Quizizz Login Display on Student Mobile Phones

Figure 3. Quizizz Login Display on Student Mobile Phones

Figure 2 shows the Quizizz media login screen on students' mobile phones. Furthermore, Figure 3 contains the scope of learning materials, namely Natural and Social Sciences materials with educational units in the assessment instruments on the media aimed at fourth grade students of SDN 2 Ciloa. The display in Figure 4 in the form of a Reaction Emoji functions as a tool for expressing emotions, encouraging student interaction and providing student feedback on assessments that have been completed.

Figure 4. Emoji Reaction Display on Quizizz Media
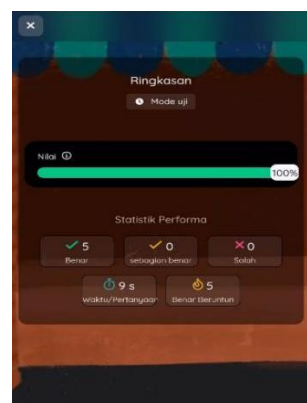

Figure 5. Display of Student Assessment Results on Quizizz Media

The display in Figure 4 in the form of a Reaction Emoji functions as a tool for expressing emotions, encouraging student interaction and providing student feedback on assessments that have been completed. The figure 5 shows the results of the Quizizz-based cognitive diagnostic assessment of students. Here, students can see their final assessment results or scores after completing all questions. A summary of the scores obtained by the students is provided. The validation stage was carried out with learning media experts on the Quizizz-based cognitive diagnostic assessment instrument that was developed.

Table 1. Media Expert Validation Results

No	Indicators	Scores provided by media experts
1	The display design is appropriate for student characteristics	5
2	The menu display is easy to understand	5
3	The buttons are easy to use	5
4	The background color of the media display is attractive	3
5	The font size/letters used are easy to read and understand.	4
6	The use of images and videos is relevant to the material being tested.	5
7	The image and video quality is clear.	5
8	The sound quality in the video is clear.	5
9	The product can be used long-term.	5
10	It is tailored to the conditions and needs of students.	4
11	It is interactive and has two-way communication.	5
12	The resulting product can attract students' attention.	3
13	Quizizz media can be used as a cognitive diagnostic assessment instrument.	5
14	Suitability of Quizizz-based cognitive diagnostic assessment materials.	5
15	The media is easy to understand.	5
16	The media is easy to operate.	5
17	The media can be used on various devices.	4
18	The effectiveness and efficiency of the Quizizz application as a learning assessment instrument.	5
19	Application loading speed.	5
20	The language used in the application is clear and easy to understand.	4
21	Use of good and correct Indonesian.	5
	Total Score	97
	Average	4,6
	Percentage	92,38%
	Criteria	**Very Valid**

Based on the format of Table 1, the validation test results, conducted by media experts at the University of Muhammadiyah Kuningan using a calculation formula with 21 indicators, yielded an average score of 4.6, or 92.38%, and were declared highly valid by the media experts.

Validation was then conducted with learning evaluation experts on the material to be used in the cognitive diagnostic assessment activity. The goal was to determine the level of feasibility and validity of the material to be used.

Table 2. Results of Learning Evaluation Validation Against Material Validation

No	Indicators	Scores given by learning evaluation
1	Material alignment with learning objectives	4
2	Material alignment with concepts presented in cognitive diagnostic assessments	4
3	Material alignment with Learning Outcomes (CP) Phase B	5
4	Material alignment with Quizizz media in Quizizz-based cognitive diagnostic assessments	5
5	Use of images and videos relevant to the test questions	4
6	Language conformity with linguistic rules	4
7	Use of good and correct Indonesian	5
8	Clarity of sentences in cognitive diagnostic assessment items	4
9	Question item alignment with learning objective achievement indicators for Chapter 2 "States of Matter and Their Changes" Topic C "How Do Objects Change Their State?"	4
10	Assessment items align with Bloom's Taxonomy level and learning objective achievement indicators	4
	Total Score	43
	Average	4,3
	Percentage	86%
	Criteria	**Very Valid**

Highly Valid: Table 2 shows the results of the validation test on the material to be presented in the cognitive diagnostic assessment to learning evaluation experts who are educators at SD Negeri 2 Ciloa. Using the assessment calculation formula with 10 indicators, the average score was 4.3, with a percentage of 86% in the very valid category according to the learning evaluation experts.

The validation stage was carried out with the learning evaluation experts on the questions to be used in the cognitive diagnostic assessment activities. The aim was to determine the level of feasibility and validity of the questions to be used.

Table 3. Results of Expert Validation of Learning Evaluation of Assessment Questions

No	Indicators	Scores given by learning evaluation experts
1	Assessment questions align with learning indicators	5
2	Assessment questions align with learning objectives	5

3	Assessment questions align with the material in Chapter 2 "States of Matter and Their Changes" Topic C "How Do Objects Change Their State?"	5
4	Assessment questions are clear and easy to understand	4
5	Use language that is easy to understand	4
6	Language aligns with linguistic rules	4
7	Assessment items align with learning objective achievement indicators in Chapter 2 "States of Matter and Their Changes" Topic C "How Do Objects Change Their State?"	5
8	Assessment items align with Bloom's Taxonomy levels and learning objective achievement indicators	4
	Total Score	36
	Average	4,5
	Percentage	90%
	Criteria	Very Valid

Table 3 shows the validation conducted with a learning evaluation expert, namely one of the educators at SD Negeri 2 Ciloa. Using the assessment calculation formula and testing cognitive diagnostic assessment questions with 8 indicators, the average score was 4.5, with a percentage of 90%. This indicates that the assessment questions created with Quizizz are highly valid for use.

Table 4. Assessment Results of Control and Experimental Classes

Class	Minimum Value	Maximum Value
Control	20	80
Experiment	40	100
Average	**50,95**	**78,10**

Table 4 shows a significant difference in the learning outcomes of fourth-grade students at SD Negeri 2 Ciloa, namely in the control class and the experimental class. The control class achieved an average of 50.95, while the experimental class achieved an average of 78.10. The results show a comparison of the learning outcomes of students in the control and experimental classes when assessing using Quizizz media and not using media, indicating a significant improvement with the implementation of Quizizz as a cognitive diagnostic assessment instrument. The results of the student response questionnaire regarding the implementation of the Quizizz-based cognitive diagnostic assessment, with 13 indicators, yielded an average of 5.80, with a percentage of 89.37% being categorized as "very practical" according to students. The results of the teacher response questionnaire, with 14 indicators, yielded an average of 4.42, with a percentage of 88.57% being categorized as "very practical" according to teachers.

DISCUSSION

The cognitive diagnostic assessment instrument developed by the researcher is by using Quizizz learning media that can be used by teachers in implementing assessments to be more interactive, innovative and communicative. The Quizizz-based assessment instrument developed by the researcher is based on problem analysis and needs analysis at SD Negeri 2 Ciloa. The Quizizz-based assessment instrument developed is very valid for use, this is reviewed from the assessment conducted by media experts. Based on the validity level of the Quizizz-based cognitive diagnostic assessment instrument, the validation results of the media expert obtained 92.38% with the category of "very valid" meaning that the quality of the feasibility and effectiveness of the Quizizz-based instrument is appropriate and attracts students' attention. The validation results of the learning evaluation expert on the material used in the cognitive diagnostic assessment obtained 86% in the category of "very valid". The learning evaluation expert on the questions used obtained 90% in the category of "very valid". Based on the results of the cognitive diagnostic assessment, it is known that the learning outcomes of the experimental class obtained an average of 78.10 and the control class with an average of 50.95. The results of the student response questionnaire obtained a score of 89.37%, categorized as "very valid," and the results of the teacher response questionnaire obtained a score of 88.57%, categorized as "very valid."

The research conducted by Shaleha et al., (2024) on "Development of a Quizizz-Assisted Cognitive Diagnostic Assessment Instrument on the Human Respiratory System" The results of the study met the criteria of being very feasible and can be used without revision based on the results of the media expert validation test, namely 84%, categorized as "Very Feasible." The research conducted by Jahring et al., (2022) on "Development of an Online-Based Mathematics Learning Evaluation Instrument Using the Quizizz Application" The results of the study met the criteria of being valid, practical, and effective for use as an evaluation instrument for mathematics learning with an average student learning outcome of 78.33%. These findings support the potential of Quizizz as a reliable platform for developing digital assessme. These findings support the potential of Quizizz as a reliable platform for developing digital assessment tools that are both engaging and pedagogically effective across various subjects.

CONCLUSION

The results of the research on the development of a Quizizz-based cognitive diagnostic assessment instrument in the fourth grade of the Natural Sciences subject of SD Negeri 2 Ciloa by media experts with a percentage of 92.38% in the "very valid" category, by learning evaluation experts on the material presented in the assessment with a percentage of 86% in the "very valid" category and the assessment carried out by learning evaluation experts on the questions used in the cognitive diagnostic assessment obtained a 90% "very valid" category for use. The learning outcomes of experimental class students obtained a percentage of 78.10 and the control class with a percentage of 50.95. The results of the student response questionnaire obtained a percentage of 89.37% in the "very valid" category and the teacher response questionnaire was 88.57% in the "very valid" category so it can be concluded that the Quizizz-based cognitive diagnostic assessment instrument developed in this study is very suitable for use and can improve student learning outcomes in the Natural Sciences subject.

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