



Development of Technology-based Non-Cognitive Diagnostic Assessment to Measure the Character of Mutual Cooperation and Learning Interest of Students

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Articles Information

Abstrak

Keywords:

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Penelitian ini bertujuan untuk mendeskripsikan pengembangan asesmen diagnostik non kognitif berbasis teknologi untuk mengukur karakter gotong royong dan minat belajar siswa kelas IV SD Negeri 03 Pontianak Selatan. Metode penelitian yang digunakan adalah penelitian dan pengembangan (research and development). Instrumen produk pengembangan asesmen diagnostik berbantuan teknologi divalidasi oleh ahli asesmen, materi dan media. Produk di uji coba pada 30 orang siswa dan di implementasikan pada 75 orang siswa. Data kuantitatif diperoleh dari validasi produk, kuesioner respon guru dan siswa. Data Kualitatif diperoleh dari hasil wawancara dan catatan perbaikan produk dari validator. Instrumen yang digunakan lembar validasi, wawancara dan kuesioner. Hasil yang diperoleh adalah kelayakan produk pengembangan asesmen diagnostik non kognitif berbasis word wall untuk mengukur karakter gotong royong sebesar 92,33% dengan kriteria sangat layak sementara produk pengembangan asesmen diagnostik non kognitif berbasis websites sebesar 99% dengan kriteria sangat layak, kepraktisan produk pengembangan asesmen diagnostik non kognitif berbasis word wall sebesar 84% dengan kriteria sangat praktis dan kepraktisan produk pengembangan asesmen diagnostik non kognitif berbasis websites untuk mengukur minat sebesar 90% dengan kriteria sangat praktis, dan pengukuran minat belajar dan karakter gotong dengan bantuan teknologi efektif meningkatkan hasil belajar kurikuler palajaran IPAS siswa kelas IV C dari 78,96 menjadi 93,61 dengan (N-gain) 0,54 (kategori sedang) dan mata pelajaran matematika di kelas IV B dari 77,25. menjadi 88,50 dengan N-gain 0,72 (kategori Tinggi). Dengan demikian, produk pengembangan asesmen diagnostic non kognitif berbasis teknologi untuk mengukur karakter gotong royong dan minat belajar siswa kelas IV layak untuk dikembangkan

Abstact

This study aims to describe the development of a technology-based non-cognitive diagnostic assessment to measure the cooperative character and learning interest of fourth-grade students at SD Negeri 03 Pontianak Selatan. The research method used in this study is research and development (R&D). The diagnostic assessment instrument was validated by assessment experts, subject matter experts, and media experts. The product was pilot-tested on 30 students and implemented on 75 students. Quantitative data were obtained from product validation, teacher and student response questionnaires. Qualitative data were obtained from interview results and product improvement notes from validators. The instruments used were validation sheets, interviews, and questionnaires. The results obtained were the feasibility of the non-cognitive diagnostic

assessment development product based on word walls to measure the character of cooperation was 92.33% with the criterion of very feasible, while the non-cognitive diagnostic assessment development product based on websites was 99% with the criterion of very feasible; the practicality of the non-cognitive diagnostic assessment product development based on word walls was 84% with the criteria of very practical, and the practicality of the non-cognitive diagnostic assessment product development based on websites to measure interest was 90% with the criteria of very practical and measuring learning interest and cooperative character with the help of technology effectively improved the curricular learning outcomes of IPAS lessons for fourth-grade students in class IV C from 78.96 to 93.61 with an N-gain of 0.54 (moderate category) and mathematics lessons in class IV B from 77.25 to 88.50 with an N-gain of 0.72 (high category). In conclusion, the development of a technology-based non-cognitive diagnostic assessment product to measure the spirit of mutual cooperation and learning interest of fourth-grade students is worth pursuing.

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INTRODUCTION

Curriculum is the main foundation for the implementation of the learning process in educational units, serving as an integral guideline for all teaching and learning activities (Kurniawati & Putri, 2023; Munandar, 2018). In efforts to recover learning post-pandemic, the Ministry of Education and Culture (Kemdikbud) issued a curriculum transition policy, which later evolved into the Merdeka Curriculum through the Sekolah Penggerak program as Rahmadayanti & Hartoyo (2022) emphasize that the Merdeka Curriculum was designed as an alternative solution to address learning gaps during the pandemic, providing flexibility to teachers and school principals in developing a curriculum tailored to students' needs.

The implementation of Merdeka Curriculum encompasses intraschool, cocurricular, and extracurricular learning, with an emphasis on cocurricular learning. These changes also impact to the assessment, which is the process of collecting and analyzing information to identify students' learning needs, progress, and achievement outcomes. Diagnostic assessments play an important role in mapping students' learning interests, learning styles, and initial abilities (Minister of Education and Culture of the Republic of Indonesia, 2020). Sulastri (2019) emphasizes that diagnostic assessment needs to be conducted regularly to monitor students' learning progress. Greenstein (2010), Carol & Tonya (2013), and Gyöngyvér (2019) also highlight the importance of diagnostic assessment in adapting learning to individual students' needs.

Diagnostic assessment consists of cognitive and non-cognitive assessments (Ministry of Education, Culture, Research, and Technology, 2021). Non-cognitive assessments aim to understand students' learning styles, interests, and talents, as well as the characteristics of the Pancasila Student Profile, including cooperation (Ministry of Education, Culture, Research, and Technology, 2024). However, Ardianti & Amalia (2022), Serani & Hairida (2024), Sayekti (2022), and Alimuddin (2023) found that elementary school teachers still face challenges in developing and implementing diagnostic assessments, especially non-cognitive assessments. Lack of understanding, skills, and adaptation to technology are the main obstacles.

Preliminary study results at SD Negeri 03 Pontianak Selatan show that teachers have used Google Forms to map students' interests and talents, but still face difficulties in developing comprehensive non-cognitive assessment instruments, particularly for measuring learning interests and cooperative character. Teachers also require more structured assessment references and development.

Technological advancements offer solutions to address these challenges. Selwyn (2012) and Purwanto (2022) state that integrating technology into education can enhance learning experiences and assessment efficiency. The use of digital platforms such as Quizizz and Google Forms has proven effective in increasing student engagement and formative assessment outcomes (Ranchana, 2017; Sibel et al., 2023). Therefore, the development of technology-based non-cognitive diagnostic assessments to measure the learning interests and cooperative attitudes of fourth-grade students at elementary school is crucial. This assessment is expected to provide accurate and comprehensive information about students' learning needs and characteristics, enabling teachers to design more effective and appropriate learning experiences aligned with the Pancasila Student Profile.

METHOD

The method used in this study is research and development (R&D) developed using the ADDIE model. As shown in the following figure:

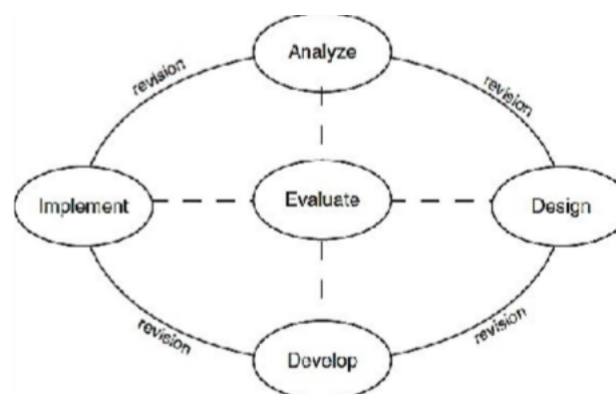


Figure 1: ADDIE Model Development Process Source: (Branch, 2009:2)

In this stage, the researcher conducts preliminary studies related to the assessments used by teachers. It aims to know the assessment used measure students' cooperative spirit and interest in learning and the development of technology-based assessments receive the support needed for implementation.

Before designing, the researcher looks the curriculum, students' characteristics, and indicators of mutual cooperation and interest in learning. The assessment is made adjusted to the indicators. In designing, the researcher choose the media and form of assessment presentation. It is also designed the validation sheets, teacher and student response questionnaires on the practicality of website-based assessments and Word walls.

The activities in development stage are:

1. Creating website-based assessments and Word walls.
2. Validating with design experts, learning experts, and language experts
3. Revising according to comments and suggestions
4. Confirming the results of the revision with validators
5. Website-based assessments and Word walls are implemented in classes IV A and IV D (small-scale pilot)
6. Distribute and calculate the results of the practicality assessment sheets for teachers.
7. Distribute and calculate the results of the student response questionnaires on the practicality of the assessments.

The implementation stage activities are:

1. Website-based and Word wall assessments were implemented in classes IV A -IV D.
2. Distributed and calculated the results of the practicality assessment sheets for website- based and Word wall assessments for teachers.
3. Distributed and calculated the results of student response questionnaires regarding the practicality of the assessments.
4. Analyzing the results of technology-assisted assessment implementation by interviewing teachers and analyzing learning outcomes after assessment implementation.

Data analysis in this study was conducted quantitatively and qualitatively. Qualitative data consisted of written information obtained from interviews and comments and suggestions from expert validation. The interview data, which were in the form of recordings, were then transcribed by writing down the words as they were spoken in the interview recordings. The results of the transcription were then summarized to determine the wordwall-based assessment products and websites to be developed.

The quantitative data consisted of scores obtained from expert validators, namely subject matter experts, media experts, language experts, and practitioners (students). The results of expert validation and practitioner responses in the form of comments and suggestions were used as material for improvement in product revisions. The feasibility of technology-assisted diagnostic assessment products developed to measure cooperative behavior and interest in learning was analyzed by considering product validity. Data was collected from questionnaires administered to subject matter experts, assessors, and digital media experts. The data was then analyzed using descriptive statistics. The validity or feasibility of the product was calculated using the following formula:

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

Notes:

P = percentage of validity

Sx = total number of respondents' answers

Sxi = total number of ideal scores

Table 1
Product Eligibility Guidelines

Interval Skor Percentage	Category	Notes	Additional Notes
81%-100%	Very good	Highly recommended	No revision needed
61%-80%	Good	Worthed	No revision needed
31%-60%	Less than good	Less worthed	revised

The practicality of technology-based assessment in the learning activities of fourth-grade students at SD Negeri 03 Pontianak Selatan was taken from the responses of teachers and students regarding the practicality of assessments based on Wordwall and websites that had been tested on a small scale and implemented in several classes.

The practicality analysis was conducted by analyzing data obtained from teacher response questionnaires and student response questionnaires. The practicality analysis can be performed using the following formula:

$$Practical = \frac{\text{Marks obtained}}{\text{Maximum Marks}}$$

The effectiveness of the module is seen from the follow-up by teachers after conducting assessments using the developed product and analyzing student learning outcomes after using technology-assisted diagnostic assessments. Analysis of learning outcomes before and after measuring interest and gotong royong character is measured to see if there are differences in learning outcomes after measurement with diagnostic assessments and testing the N-gain.

Table 2 Interpretation of Product Practicality

Mean score (%)	Criterion
75-100	Very practical
51-75	Practical
26-50	Not practical
0-25	Not very practical

The effectiveness of the module is seen from the follow-up by teachers after conducting assessments using the developed product and analyzing student learning outcomes after using technology-assisted diagnostic assessments. Analysis of learning outcomes before and after measuring interest and gotong royong character is measured to see if there are differences in learning outcomes after measurement with diagnostic assessments and testing the N-gain.

RESULT AND DISCUSSION

1. Results of the design and validation of the Wordwall-based Gotong Royong character assessment product prototype.

The design of a diagnostic assessment of cooperative character based on word walls is not much different from the development of interest assessments. Assessment questions to be included in word walls are first validated by experts. Next, the researcher prepares a word wall template and a Google Site to add instructions and usage steps, as well as measurement results using the word wall. Once all materials are ready, the researcher determines the layout and menus to be included in the Google Site and the developed word wall.

A validated non-cognitive diagnostic assessment of mutual cooperation was then entered into a specially designed Wordwall. The results of the validation of the non-cognitive diagnostic assessment Wordwall can be seen in Figure 2 below.

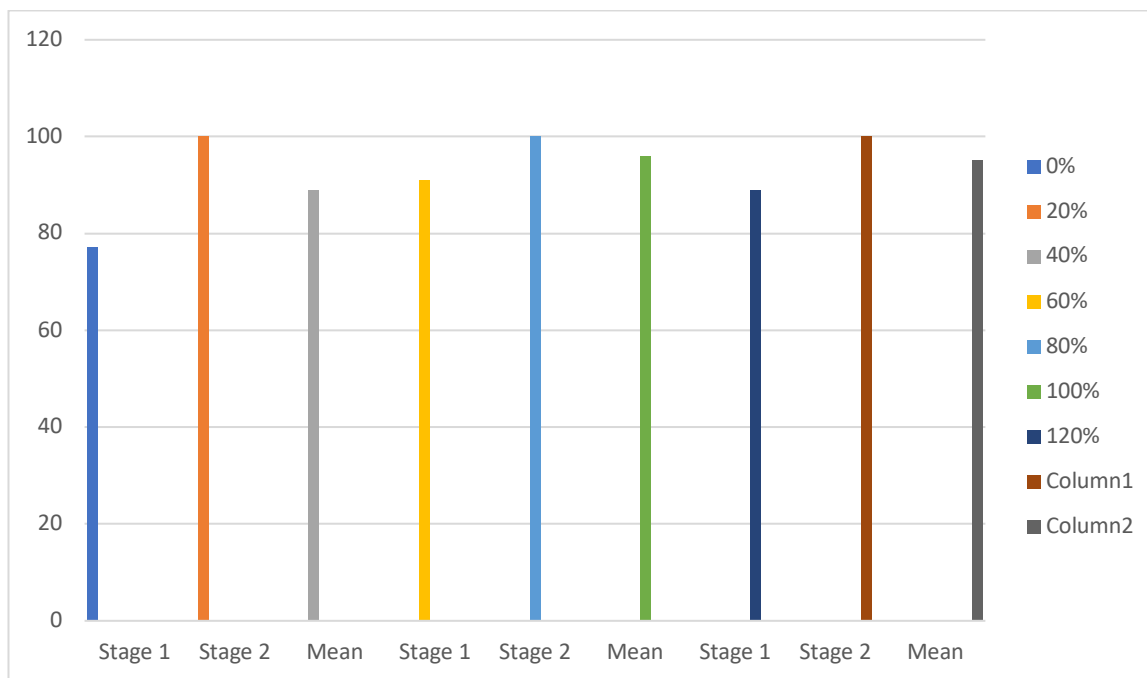


Figure 2. Validity Results of the Wordwall Instrument for Non-Cognitive Diagnostic Assessment of Gotong Royong Character

Based on the results of expert assessment validation, it was found that the validation of the diagnostic assessment questions on mutual cooperation was carried out in two stages. The average results of validator 1 were 89% (very valid criteria), validator 2 were 96% (very valid criteria), and validator 3 were 95% (very valid criteria). The validation process for the non- cognitive diagnostic assessment website on learning interest included revisions and input from experts, as shown in Table 3.

Table 3

Revisions to the Non-Cognitive Diagnostic Assessment Website on Learning Interest by Experts

Expert comments	Before revised	After revised
Add the Interest Measurement Results and Mutual Assistance Measurement tabs.		

Expert comments

Before revised

After revised

The header and design of the interest assessment display are distinguished by the spirit of mutual cooperation.

The text size on the assessment display for mutual assistance and interest is enlarged/clarified.

Distinguish between recommendations and results based on mutual cooperation and interests.



This diagnostic assessment of mutual cooperation is a non-cognitive, web-based diagnostic assessment instrument for learning interest that was developed and validated by three media experts with the following assessment summary:

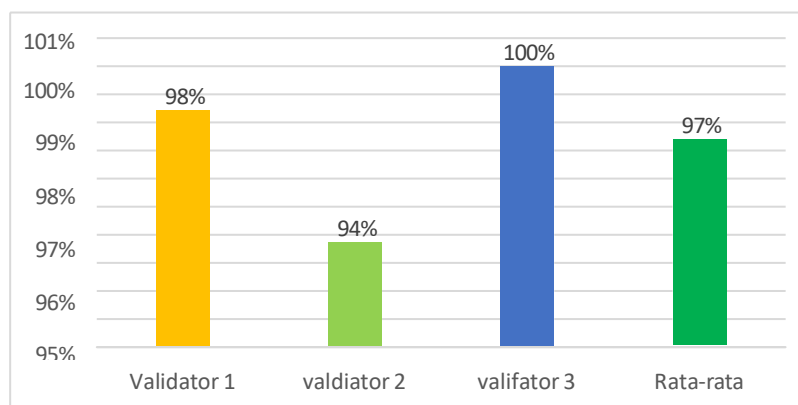


Figure 3 Media expert validation results

The results of media expert validation show that the diagnostic assessment of mutual cooperation using Wordwall is 97% valid and suitable for measuring students' interest in mutual cooperation.

1. Results of the Design and Validation of a Website-Based Learning Interest Assessment Product Prototype. The design of technology-based diagnostic assessment products is carried out in several stages. In the initial stage, researchers develop assessments to be included in the website and Wordwall. Assessment questions measuring cooperative character and interest in learning are validated by assessment and language experts for use in product development. Next, researchers prepare website templates and supporting images for the design of the developed website. Once all materials are ready, the researchers determine the layout and menus to be included in the developed website. Specifically for the diagnostic assessment of interest, the researchers use assessment questions that have been validated in previous research related to assessing students' learning interest. The items in the non-cognitive diagnostic assessment instrument for students' learning interests refer to previous research by Hairida et al., 2024. This website-based diagnostic assessment of learning interests has very high validity. The validation results of the non-cognitive diagnostic assessment instrument for learning interests yielded an average CVR of 0.99 (99%). The CVR calculation results of the website graphic expert validation had an average value of 1. Based on these results, it is known that the calculated CVR is greater than the table CVR (0.62 and 0.99), indicating that the developed website-based non-cognitive diagnostic assessment instrument for learning interest is highly valid and suitable for measuring student learning interest.

Product Practicality Test. The practicality of the product was assessed based on student responses when using Wordwall to measure cooperative character and the website to measure interest. The results of the small-scale trial and implementation for each product are as follows: Practicality of the Wordwall-based diagnostic assessment product for measuring the character trait of cooperation Small-scale trial. Practicality data from the trial phase was taken from student responses when completing the assessment with Wordwall, which was given to students by filling out a Google form, with the following results:

Table 5

Summary of Responses to the Use of Wordwall for Measuring Small-Scale Mutual Assistance

Number of Students(S)	Maximum Score	Mean score	Percentage
30	40	33,53	84%

Based on the information in the practicality test summary table, it was found that the diagnostic assessment of gotong royong character measurement using Wordwall was 84% with a practicality criterion of very practical.

b. Practicality of the Wordwall-based diagnostic assessment of gotong royong character. The practicality data for the Wordwall-based diagnostic assessment was obtained from the implementation of the assessment on 75 fourth-grade students at SDN 03 Pontianak Selatan, with the following practicality results:

Summary of Responses to the Use of Wordwall for Measuring Gotong Royong at SDN 03 Pontianak Selatan

Table 6

Summary of Responses to the Use of Wordwall for Measuring Gotong Royong at SDN 03 Pontianak Selatan

Number of Students(S)	Maximum Score	Mean score	Percentage
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Based on the information in the table summarizing the practicality of the Wordwall-based assessment product for 75 fourth-grade students at SDN 03 Pontianak Selatan, it was found that the average practicality score for the diagnostic assessment of cooperative character using Wordwall was 84%, which is considered very practical.

Practicality of the diagnostic assessment product for measuring learning interest based on websites Small-scale trial. Practicality data for the diagnostic assessment of learning interest using websites was obtained from data on 30 students from a combination of grades IV A and IV D, with the following practicality response results:

Table 7 Summary of Responses to the Trial Use of Websites for Measuring Learning Interest

Number of Students(S)	Maximum Score	Mean score	Percentage
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Based on the above response data, the practicality test of the assessment website for measuring learning interest was 86% with the criteria of very practical. Practicality of the website-based diagnostic assessment product for measuring learning interest. The practicality data of the website-based diagnostic assessment for measuring learning interest was obtained from 75 fourth-grade students at SDN 03 Pontianak Selatan. The measurement results are presented in Table 12 below.

Table 8**Summary of Responses to the Use of Websites for Measuring Learning Interest at SDN 03 Pontianak Selatan**

Number of Students(S)	Maximum Score	Mean score	Persentase
75	40	36	90%

Based on the above response data, the practicality of assessment websites for measuring learning interest is 90% with the criteria of very practical.

Product Effectiveness Results. The effectiveness of the technology-based assessment product implemented in grade IV of SDN 03 Pontianak Selatan was assessed based on interviews with several grade IV homeroom teachers. The results of measuring the character of mutual cooperation at SDN 03 Pontianak Selatan were used as material for dividing groups in project activities that required cooperation between students. The fourth-grade teacher revealed that group division for P5 implementation in the classroom was divided so that students with high cooperation characteristics were mixed with students with adequate or good characteristics to increase involvement in P5. Based on the P5 report card results for Project 1 compared to Project 2, there was an increase in the criteria for students who developed significantly overall in the fourth grade. Meanwhile, the results of interest measurement were used by teachers to design learning activities that align with students' characteristics and improve the learning process through strategies and the use of diverse and engaging learning media.

Based on interviews with the Grade 4C homeroom teacher, there was an improvement in learning outcomes before and after the mapping was conducted. The learning outcomes of IPAS students in class IV C before interest measurement were 78.29. After interest measurement, the average formative learning outcomes increased to 90.11. Interviews with class IV B teachers also showed an increase in student learning outcomes in mathematics. Before measurement, the average formative learning outcomes for class IV were 78.96. After the measurement and improvement of the learning process, the class average rose to 93.61. The analysis of the effectiveness score (N-gain) yielded a result of 0.54 (moderate category) for IPAS and an N-gain score of 0.72 (high category) for mathematics. The data analysis for IPAS and mathematics learning outcomes can be seen in the following table:

Table 13 Standard Deviation Calculation of Grade IV Learning Outcomes

Score	Mean	Std. Deviation	N
Math Pre-Test	78.96	6.12	28
Math Post-Test	93.61	3.45	28
Natural science education Pre-Test	78.29	6.02	28
Natural science education	90.11	5.87	28

Notes:

N = Number of students

Std Deviation = Standard deviation Mean = average learning outcome

Based on the data presented, it can be concluded that measuring mutual cooperation and learning interest using technology-assisted assessment effectively improves curricular learning outcomes in schools.

CONCLUSION

This study produced a technology-based non-cognitive diagnostic assessment tool to measure the cooperative character and learning interest of fourth-grade students. The conclusions based on the formulated problems are as follows: 1) The feasibility of the non-cognitive diagnostic assessment development product based on word walls to measure cooperative character is 92.33% with the criterion of highly feasible, while the non-cognitive diagnostic assessment development product based on websites is 99% with the criterion of highly feasible. 2) The practicality of the non-cognitive diagnostic assessment product development based on word walls is 84% with the criteria of very practical, while the practicality of the non-cognitive diagnostic assessment product development based on websites to measure interest is 90% with the criteria of very practical. 3) The measurement of learning interest and character with the help of technology effectively improved the curricular learning outcomes of IPAS students in class IV C from 78.96 to 93.61 with an N-gain of 0.54 (moderate category) and mathematics in class IV B from 77.25. to 88.50 with an N-gain of 0.72 (high category). Thus, the development of a technology-based non-cognitive diagnostic assessment product to measure the spirit of mutual cooperation and learning interest of fourth-grade students is worth pursuing.

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