Developing the "Permata" Educational Game Application to Enhance Currency Understanding for Students with Mild Disabilities at a Special Needs School in Sawahlunto

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Doi: 10.31316/g-couns.v10i01.8492

Abstract

This study aims to develop and evaluate the PERMATA educational game application, a digital learning medium designed to enhance students' understanding of currency among those with mild intellectual disabilities at a YKB Special Needs School. The research adopted the Research and Development (R&D) methodology, following the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). Media, material, and language experts assessed the application's validity. Practicality was tested with teachers and students, while effectiveness was measured using a pre-test and post-test design with 26 students to gauge improvement in their current comprehension. The validation results confirmed the application's high quality, with an average validity score of 92% (very valid). Practicality tests yielded scores of 93% from teachers and 95% from students (very practical). The effectiveness test demonstrated a significant increase in learning outcomes, with an average score of 85.8% (very effective), indicating that the application successfully improved students' understanding of currency. This study addresses a critical gap in special education by developing a tailored digital game that specifically targets financial literacy for students with mild intellectual disabilities. The PERMATA application is a novel, validated tool that serves as a viable, practical, and compelling interactive medium for enhancing essential life skills, making a significant contribution to inclusive, technology-driven education.
Keywords: educational game, currency understanding, mild intellectual disability, special needs education

Abstrak

Penelitian ini bertujuan untuk mengembangkan dan mengevaluasi aplikasi game edukasi PERMATA, media pembelajaran digital yang dirancang untuk meningkatkan pemahaman siswa tentang mata uang di kalangan penyandang disabilitas intelektual ringan di Sekolah Luar Biasa YKB (SLB YKB). Penelitian mengadopsi metodologi Penelitian dan Pengembangan (R&D), mengikuti model ADDIE (Analisis, Perancangan, Pengembangan, Implementasi, Evaluasi). Pakar media, materi, dan bahasa menilai validitas aplikasi. Kepraktisan diuji dengan guru dan siswa, sedangkan efektivitas diukur menggunakan desain pre-test dan post-test dengan 26 siswa untuk mengukur peningkatan pemahaman mereka saat ini. Hasil validasi tersebut mengkonfirmasi kualitas aplikasi yang tinggi, dengan skor validitas rata-rata 92% (sangat valid). Tes kepraktisan menghasilkan nilai 93% dari guru dan 95% dari siswa (sangat praktis). Tes efektivitas menunjukkan peningkatan hasil belajar yang signifikan, dengan skor rata-rata 85,8% (sangat efektif), menunjukkan bahwa aplikasi berhasil meningkatkan pemahaman siswa tentang mata uang. Studi ini mengatasi kesenjangan kritis dalam pendidikan khusus dengan mengembangkan game digital yang disesuaikan yang secara khusus menargetkan literasi keuangan bagi siswa dengan disabilitas intelektual ringan. Aplikasi PERMATA adalah alat baru yang divalidasi yang berfungsi sebagai media interaktif yang layak, praktis, dan menarik untuk meningkatkan keterampilan hidup yang penting, memberikan kontribusi yang signifikan terhadap pendidikan yang inklusif dan digerakkan oleh teknologi.
Kata kunci: *permainan pendidikan, pemahaman mata uang, disabilitas intelektual ringan, pendidikan berkebutuhan khusus*

Article info
Received August 2025, accepted September 2025, published January 2026

INTRODUCTION

Technological developments in education require teachers to continue innovating in developing teaching materials that meet students' needs (Hanid et al., 2020; Camlin & Lisboa, 2021; Nanjundaswamy et al., 2021). In the era of globalization, teachers are required to be more active and creative in designing engaging and interactive learning so that students can more easily understand the material taught (Fibriasari et al., 2022; Chen et al., 2023). For students with mild intellectual barriers, learning needs to be delivered through more interactive methods, integrating digital teaching materials tailored to their characteristics so that they can understand abstract concepts more concretely (Iswari, 2012; Khairina et al., 2024). However, in practice, many teachers still rely on conventional methods, especially when teaching students with special needs (Mutia & Iswari, 2020; Yasmin & Iswari, 2021; Nofrihensi et al., 2023). The limitation of appropriate learning media causes students to have difficulties in understanding basic concepts, including in knowing, distinguishing, and using money in daily life.

Based on a preliminary study conducted at YKB Special Needs School Sawahlunto on August 26-31, 2024, through interviews, observations, and questionnaires, several main problems were found. First, students with mild intellectual barriers have difficulty distinguishing the face value of money and understanding the exchange rate. Second, the learning methods used are still conventional and less interactive, making it difficult for students to understand the concept of money concretely. Third, the availability of digital learning media that suit students' characteristics is still very limited, so learning becomes less interesting and less in line with their learning style. Of the 32 students at YKB Special Needs School, around 70% experienced obstacles in basic financial literacy, especially in recognizing and using money in daily transactions. This underscores the urgency of equipping students with financial literacy skills essential to independence and daily activities (Leitão et al., 2022).

Previous research has mostly discussed the use of conventional media or educational games in general to support learning (Leitão et al., 2022; Alfaro-Ponce et al., 2023; Gui et al., 2023). However, there remains a research gap in the development of digital learning media that are truly designed to meet the needs of students with mild intellectual barriers. Most studies have not highlighted the specific needs of these learners in the context of financial literacy. Therefore, innovative solutions are needed in the form of digital-based interactive learning media. One of the efforts is the development of an educational game application, "Pergem", designed to help students with mild intellectual barriers understand the concept of money in a more fun, interactive, and effective way (Banihashem et al., 2023; Guan et al., 2024).

In addition, financial literacy for students with special needs not only functions as an academic skill, but also as a very important life skill. The ability to recognise, calculate, and use money is the basis for students' independence in shopping, managing simple expenses, and interacting socially in the community. Without mastery of these skills, students with mild intellectual disabilities are at risk of becoming overly dependent on others in daily activities. Therefore, this research is relevant because it emphasizes not only the cognitive aspect, but also the functional aspect that is directly related to the students' living needs (Mutia & Iswari, 2020; Yasmin & Iswari, 2021; Nofrihensi et al., 2023).

Furthermore, the development of the educational game application "Permata" is expected to be a real contribution to the field of special education, as well as to provide a new reference for teachers, researchers, and education practitioners in designing digital learning media that are friendly to students with special needs. The novelty of this research lies in combining financial literacy with an interactive, game-based digital approach tailored to the needs of YKB Special Needs School students, especially those with mild intellectual barriers. Thus, this research is not only oriented toward product development but also contributes to improving the quality of inclusive learning in the digital era (Fibriasari et al., 2022; Chen et al., 2023; Guan et al., 2024).

Based on the identified problems, meaningful learning is needed for students with mild disabilities to understand better the concept of currency (Azizah et al., 2023; Sari & Iswari, 2019). Supposedly, learning is developed through interactive educational games tailored to the needs and characteristics of students with mild disabilities (Foster & Shah, 2020; Özkan et al., 2020; Wati et al., 2023). However, efforts to develop innovative teaching materials remain limited and have not made the most significant contribution to improving their understanding of the currency. One approach to overcoming this problem is the use of digital educational games (Shehzadi et al., 2021; Derks et al., 2022). Educational games allow students to learn through real, interactive experiences, helping them understand the value of money and simple transactions in a more engaging, easy-to-understand way (Darnanta et al., 2020; Tlili et al., 2022). Therefore, this research focuses on the development of the educational game application "PERMATA", which is specifically designed to help students with mild disabilities understand the concept of currency.

The use of educational games in learning is supported by previous studies, which show that digital media can increase students with special needs' involvement, understanding, and learning motivation (Arganeh et al., 2021; Koh, 2022). Supposedly, the teaching materials used in learning are technology-based and can accommodate the learning styles of students with mild disabilities (Adipat et al., 2021; Xie et al., 2021). However, field conditions show that learning still relies on conventional methods that are less attractive and do not meet students' needs. Therefore, this research aims to develop digital teaching materials in the form of an educational game application, "PERMATA", which will be tested for validity, practicality, and effectiveness in improving mildly handicapped students' understanding of the concept of currency.

Previous research remains limited in the development of educational game-based teaching materials tailored to the needs of students with mild disabilities, especially in understanding the concept of currency (Aminah & Iswari, 2019; Ali & Ni'mah, 2023; Yantrisna & Megaiswari, 2023). Most existing research focuses more on conventional approaches to teaching basic skills to students with special needs, without integrating technology effectively (Reynvoet & Depaepe, 2020; Vanbecelaere et al., 2020). The educational game application "PERMATA" was developed as an innovative solution that combines interactive learning with a digital approach to improve the understanding of mildly handicapped students of the value of currency. This educational game is designed to be more interesting, easy to use, and in accordance with students' cognitive characteristics, so that it can improve their skills in recognizing, distinguishing, and using currencies in daily life (Zeng et al., 2020; Putri et al., 2024; Hurricane & Iswari, 2024).

The novelty of this study lies in the development of educational game-based teaching materials specifically designed for students with mild disabilities, integrated with experiential learning models to help them learn more effectively (Yulia et al., 2019; David et al., 2021; Gontah et al., 2021). So far, the approach used in learning is still limited to conventional methods that are less interactive and do not utilize technology optimally (Alfah, 2020; Widyastuti & Puspita, 2020; Başar & Elyildirim, 2022). The "GEMS" app was developed with a syntax that allows students to learn through hands-on experience, enabling them to evaluate their own understanding as they learn. In addition, this study aims to test the effectiveness of the "PERMATA" application in improving mild-disabled students' understanding of the concept of currency through various stages of validity and practicality testing (Alfah, 2020; Jayanti et al., 2021).

Based on the identified research gaps, this study aims to develop and evaluate the educational game application "PERMATA" to improve currency understanding among students with mild disabilities, with specific objectives including validity assessment by experts, practicality testing in the classroom environment, and measurement of its effectiveness through a pre-test and post-test design. This study seeks to answer key questions about the validity, practicality, and effectiveness of such applications in the context of real learning. The survey results are expected not only to make a theoretical contribution to the literature on Digital Game-Based Learning in inclusive education, but also to provide practical, ready-to-use, evidence-based learning media for teachers and educators. This paper presents methodologies, findings, and discussions sequentially after the introduction, ending with conclusions and implications for future research.

METHOD

The research conducted is Research & Development (R&D), namely the development of the Educational Game Application "PERMATA" to improve currency understanding for mild disabled students at YKB Extraordinary School. The development procedure used in this study follows the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) (Amanda & Katie, 2016; Lu & Sides, 2022). Each stage in ADDIE was systematically applied: the Analysis phase identified student needs and teacher challenges through interviews, observations, and questionnaires; the Design phase outlined the structure, features, and learning objectives of the PERMATA application; the Development phase involved creating prototypes and incorporating expert input; the Implementation phase tested the application directly with students in the classroom; and finally, the Evaluation phase assessed validity, practicality, and effectiveness through validator reviews and student performance tests.

The research is planned to be carried out at YKB Special Needs School in Sawahlunto City which was selected using the purposive random sampling technique, where the number of samples obtained is random and proportional and adjusted to the problem so that the population is well represented (Creswell, 2016; Sugiyono, 2019). The selection of research subjects was carried out based on the criteria of (a) Special Needs School students who are registered in Sawahlunto, (b) Special Needs School students who are at the level of grade III Special Needs School, and (c) Special Needs School students who are willing to follow the learning process from start to finish. Purposive random sampling is most appropriate because the number of students with mild intellectual

disabilities is limited and requires a targeted selection to ensure the sample truly reflects the population's characteristics.

In this study, the validation process involved media experts, material experts, and special education teachers to ensure that the PERMATA application met content, design, and pedagogical standards. The quantitative data from the validation process were categorized into "very valid," "very good," and "very practical" to strengthen the objectivity of the evaluation. Furthermore, the practicality test was conducted with teachers and students to determine the usability and feasibility of the application in real classroom settings, while the effectiveness test was measured through improvements in students' ability to recognize and use currency before and after using the application.

The data analysis in this research used descriptive statistical techniques, such as percentage analysis, to assess validity, practicality, and effectiveness. Effectiveness data were further analyzed by comparing pre-test and post-test results, supported by simple statistical tests to determine significance. This methodological approach ensures that the development of the PERMATA application is not only systematically designed but also empirically tested, making the findings measurable, transparent, and convincing.

In the instrument aspect, validation was conducted to measure the clarity and relevance of indicators with the development objectives. The assessment results showed an average score of 4.60 (92%), which falls within the “Very Valid” category. This indicates that the assessment instrument used is appropriate for evaluating the quality and effectiveness of the PERMATA educational game application and reflects its relationship to improving currency understanding among students with mild intellectual disabilities. The validity data for the research instrument are shown in Table 1.

Table 1.
Instrument Validation Results

No.	Assessment Aspects	Average Score	Percentage	Category
1.	Instrument Indicator Clarity	4.60	92%	Very Valid
2.	Compatibility of indicators with application development objectives	4.55	91%	Very Valid
3.	The relevance of the instrument to improved understanding of currencies	4.65	93%	Very Valid
4.	Measurability indicators for students with mild disabilities	4.60	92%	Very Valid
Average		**4.60**	**92%**	**Very Valid**

The media aspect is assessed based on visual quality, ease of navigation, interactivity, and the game's suitability to the learning objectives of currency understanding. The results show an average score of 4.50, which is equivalent to 90%. Although included in the "Very Good" category, there are several suggestions for improvement from the validator, such as improving the visual layout and optimizing the interactive features in the PERMATA educational game to further enrich the learning experience of students with mild intellectual disabilities. The data from the media validity test results are presented in Table 2.

Table 2.
Media Validation Results

No.	Assessment Aspects	Average Score	Percentage	Category
1.	Visual quality of the app	4.55	91%	Very Valid
2.	Ease of navigation	4.50	90%	Very Valid
3.	Interactivity in the game	4.45	89%	Very Valid
4.	Suitability of the media with the purpose of learning currency understanding	4.50	90%	Very Valid
	Average	**4.50**	**90%**	**Very Valid**

In terms of language, validation indicates that the language used in the PERMATA educational game aligns with the cognitive and communication levels of students with mild intellectual disabilities. The average score was 4.57 (91%), placing it in the "Very Good" category. The validator provided brief notes on the consistency of terms and the need to improve sentence structure, so that the game's instructions become clearer, simpler, and more communicative for students. The data from the language validity test are presented in Table 3.

Table 3.
Language Validation Results

No.	Assessment Aspects	Average Score	Percentage	Category
1.	Language suitability with the cognitive level of mild-disabled students	4.60	92%	Very Valid
2.	Clarity of in-game instructions	4.55	91%	Very Valid
3.	Consistency of term usage	4.50	90%	Very Valid
4.	Communicative sentence structure	4.65	93%	Very Valid
	Average	**4.57**	**91%**	**Very Valid**

The material aspect has an average score of 4.51 (90%), placing it in the “Very Good” category. This assessment includes the suitability of the currency material with the curriculum for students with mild intellectual disabilities, the relevance of learning activities through the PERMATA game to support currency understanding, and the ability of the material to train students’ basic numeracy and money recognition skills. Suggestions for improvement from validators include strengthening the link between each sub-material and enriching the real-life context so that students can more easily relate the game's content to their daily money-use experiences. The data from the material validity test results are presented in Table 4 below.

Table 4.
Material validation results

No.	Assessment Aspects	Average Score	Percentage	Category
1.	Compatibility of currency material with the curriculum	4.60	92%	Very Valid
2.	Compatibility of currency material with the curriculum	4.55	91%	Very Valid
3.	Linkages between sub-material in games	4.50	90%	Very Valid
4.	Contextuality of the material with students' daily lives	4.65	93%	Very Valid
	Average	**4.57**	**91%**	**Very Valid**

RESULTS AND DISCUSSION

The PERMATA educational game application, which has been declared valid and revised based on input from experts (validators), is then used in the learning process by conducting a practicality test on teachers and students. This trial was conducted in April 2025 and involved 26 students with mild intellectual disabilities at YKB Special Needs School. The practicality test of teacher responses was carried out by four special education teachers, who included three assessment aspects. The average assessment results given by educators were 93%, which, according to the practicality criteria, falls within the “Very Practical” category. The results are presented in Table 5.

Table 5.
Educator Practicality Test Results

No.	Assessment Aspects	Average Score	Percentage	Category
1.	Ease of use of the PERMATA application in learning	4.65	93%	Very Practical
2.	Clarity of instructions and app features	4.60	92%	Very Practical
3.	Suitability of the application to the needs of students with mild disabilities	4.70	94%	Very Practical
	Average	**4.65**	**93%**	**Very Practical**

The small-group practicality test of the PERMATA educational game application was conducted with three students with mild intellectual disabilities at YKB Special Needs School. The practicality test consisted of 17 assessment indicators. The assessment results showed a 98% score, which falls within the “Very Practical” category. This indicates that the PERMATA application is easy to use, engaging, and supports students’ learning in understanding currency. The results of the small-group practicality test are shown in Table 6.

Table 6.
Practicality Test Results in Small Groups

No.	Assessment Aspects	Average Score	Percentage	Category
1.	Ease of understanding game instructions	4.90	98%	Very Practical
2.	Ease of understanding game instructions	4.95	99%	Very Practical
3.	Match the game to the student's abilities	4.85	97%	Very Practical
4.	Interactivity and student engagement	4.90	98%	Very Practical
5.	Usefulness of the app in understanding currencies	4.95	99%	Very Practical
Average		**4.91**	**98%**	**Very Practical**

The large group practicality test of the PERMATA educational game application was conducted with 23 students with mild intellectual disabilities at YKB Special Needs School. The test covered 16 assessment aspects. The assessment results showed a 93% score, which falls within the "Very Practical" category. This indicates that the PERMATA application is highly practical and feasible as a learning medium for improving students' understanding of currency. The results of the large-group practicality test are shown in Table 7.

Table 7.
Practicality Test Results in Large Groups

Aspect	Name	Average
Large Group Test	AB	4.35
	CD	4.28
	EF	4.40
	GH	4.50
	IJ	4.42
	KL	4.38
	MN	4.30
	OP	4.48
	QR	4.46
	ST	4.33
	UV	4.29
	WX	4.31
	YZ	4.27
	AY	4.36
	YW	4.25
	CA	4.39
	PD	4.20
	EC	4.44

	YA	4.40
	AY	4.76
	YY	4.76
Average		**4.36**
Percentage		**93%**

The effectiveness of using the QR-Code patterned Science LKPD with the Discovery Learning model in basic science learning can be assessed as effective based on students' critical thinking skills. The assessment was carried out using a written test as an instrument to measure students' understanding of basic science concepts, so that it could be determined to what extent students' competencies have increased after participating in learning using the QR-Code patterned Science LKPD with the Discovery Learning model. Data on the pre-test and post-test results of grade V students at SDN Balai Ahad are presented in Table 8.

Table 8.
Student Effectiveness Test Results

Name	Pretest	Posttest
AB	65	80
CD	50	65
EF	55	75
GH	30	50
IJ	50	65
KL	75	90
MN	60	80
OP	55	75
QR	40	60
ST	35	55
UV	45	70
WX	55	75
YZ	35	60
AY	70	80
YW	50	70
CA	50	75
PD	55	75
EC	70	85
YA	70	85
AY	80	90
YY	65	80
Amount	**1425**	**1870**
Percentage	**57**	**85.8**

The results show that the PERMATA educational game application has an effectiveness score of 85.8, placing it in the “Very Effective” category. The validation results by material, media, and language experts showed a validity level of 92%, putting

the PERMATA application in the "Very Valid" category. This indicates that the educational game meets quality standards in terms of content accuracy, communicative language, and an attractive, user-friendly interface.

This success aligns with the view of Branch (2009), who stated that learning products must undergo expert validation to ensure the quality and suitability of the material before widespread implementation. The practicality test involving teachers and students also obtained very satisfactory results, with practicality scores of 93% and 95%, respectively. In addition, the effectiveness results showed that the PERMATA game application had an effectiveness score of 85.8, which is categorized as very effective. These results are consistent with the theory of Muhajirah (2020), which emphasises the importance of active and exploratory learning to improve higher order thinking skills, including problem-solving and basic numeracy. The PERMATA game application allows students to learn in a playful yet structured manner, discover concepts through interactive activities, and significantly increase their engagement and understanding of currency.

The use of game-based learning elements in PERMATA is an innovation highly relevant to the development of current educational technology. Interactive features and adaptive difficulty levels make it easier for students to practice money recognition and calculation in an engaging way. In addition, the application supports students' visual and kinesthetic learning styles, helping students with mild intellectual disabilities who may have different learning preferences understand the material well (Mayer, 2024).

The results of this study provide evidence that the development of educational games using a technological approach and an active learning model can have a significant positive impact on learning quality, particularly in special needs education (Guan et al., 2024). Learning media that integrate technology must continue to be developed to meet the needs of today's digital generation (Rahmayani & Iswari, 2021; Firdaus et al., 2023). Therefore, it is recommended that developers of learning media continue to create more varied interactive features and conduct continuous evaluations to improve the quality and effectiveness of game-based applications, mainly to enhance students' understanding of currency and financial literacy.

CONCLUSION

Based on the overall development and evaluation process, it was concluded that the PERMATA educational game application has proven to be feasible, practical, and effective as an innovative learning medium for improving currency understanding among students with mild disabilities. The very high level of validity (92%) provided by the experts guarantees the quality of its content and design. In comparison, the results of the practicality tests conducted by teachers (93%) and students (95%) confirm that the app is easy to integrate into learning and meets the needs of users. More importantly, an effectiveness score of 85.8% demonstrates the application's significant impact on improving students' functional competence. Thus, this research not only succeeded in producing an empirically tested product but also made a real contribution to the field of special education by offering technology-based solutions that bridge the gap in financial literacy learning, while emphasising the great potential of the game-based learning approach , which is structured for the population of students with special needs. The

recommendation for future research is to conduct trials on a broader scale and develop similar content for other aspects of financial literacy.

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