Development of Interactive Multimedia Based on Gamification Learning to Improve Learning Outcomes for Children with Disabilities

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ABSTRACT

This research and development aims to produce a gamification-based interactive multimedia called "Bigame" (Game Self-Development) to improve self-development learning outcomes in the Clothing and Accessories Introduction material for students with disabilities. The research was motivated by low cognitive learning outcomes due to abstract material, monotonous learning methods, and the lack of interactive media that was suitable for students' characteristics. The method used is Research and Development (R&D) with the ADDIE model including the Analysis, Design, Development, Implementation, and Evaluation stages. Data was collected through observations, interviews, questionnaires, and tests. The validity of the product is assessed by subject matter experts, learning design experts, and media experts. Practicality is tested through individual, small group tests, and teacher assessments. Effectiveness was analyzed using pre-test and post-test on 15 students with a pair sample t-test. The results showed that Bigame was systematically developed according to the ADDIE model and had "excellent" qualifications with a validity percentage of 97.14% of material experts, 97.33% of media experts, and 98% of design experts. Practicality by teachers reached 96.67% with positive student responses. The average score increased from 64.67 to 76.07 with a significance of 0.001 (<0.05) and a high effect size. It can be concluded that gamification-based interactive multimedia "Bigame" is valid, practical, and effective in improving the learning outcomes of self-development, especially clothing and accessory recognition materials, in students with disabilities.

INTRODUCTION

The rapid development of technology today has affected various aspects of life, including the world of education. The use of technology in learning is now receiving wide attention and is considered an effective solution to improve the quality of education (Hidayah et al., 2024). The application of technology is able to create an effective and communicative learning atmosphere through digital media such as interactive presentations, learning videos, and

educational applications (Fitriyana et al., 2025). In this context, educational technology has two main roles, namely as a tool that provides digital tools and media to support learning, and as a professional study responsible for designing, developing, implementing, and evaluating learning in order to create an effective, systematic, and tailored learning process to students' needs. The reality in the field shows that the use of technology is not evenly distributed, especially in education for children with special needs. Problems that often arise in the learning practices of children with disabilities include: (1) learning materials are still abstract and less concrete; (2) monotonous learning methods and minimal interactive media; (3) limited facilities that suit the characteristics of students; (4) low motivation to learn; and (5) teachers' difficulties in designing individual learning (Salsabila & Sulistiyowati, 2024).

Children with disabilities are individuals with significant limitations in intellectual function and adaptive behavior that appear before the age of 18 (Febrianty et al., 2020). Data shows that of the 144,621 children who studied at SLB in 2020/2021, as many as 80,837 of them were people with disabilities (Sudiarti et al., 2020). This condition has an impact on cognitive barriers, social adaptation, and independence. Therefore, self-development learning is very essential because it aims to train daily life skills such as taking care of yourself, dressing, eating and drinking, and avoiding danger (Kurniawan, 2012; Bhayangkara & Raya, 2023). One of the important materials in self-development is the introduction of clothes and accessories that include the function of clothing, types of clothing based on the season, daily uniforms, complementary accessories, to traditional clothing. However, preliminary studies show that the average score of students is only 50 out of 100, with the highest score of 64 and the lowest of 40, which indicates low conceptual understanding due to the lack of concrete media and interactive approaches.

Technology-based learning or with multimedia allows students to learn anytime and anywhere according to the needs and learning speed of each student (Suartama et al., 2021). The gap in technology implementation in SLB further strengthens the urgency of learning innovation (Wulandari, 2024). Interactive multimedia has been proven to be able to stimulate memory through a combination of visual, audio, and animation, as well as help students understand the material in a more concrete and interesting way (Maulidiyah, 2020). Interactive media has also been proven to be effective in improving the learning ability and motivation of students with disabilities through the presentation of materials that are more varied and responsive to their learning needs (Fauzia et al., 2017; Sari et al., 2025). In addition, gamification integration through the application of points, levels, challenges, and rewards can

significantly increase student engagement, active participation, and learning outcomes (Suartama et al., 2023; Aguiar, 2023; Prabawa et al., 2020). The use of gamification elements has a positive impact on students' motivation and activeness (Suartama et al., 2023). The use of gamification elements is also reported to be able to increase the concentration and learning outcomes of children with disabilities and show the effectiveness of educational games in learning to recognize objects in a more fun and interactive way (Ismail, 2024).

To ensure that the development of media is truly in accordance with the characteristics of students with disabilities, this study also designed structured observation and interview instruments as part of the needs analysis and evaluation of media use. The observation instrument was focused on five main aspects, namely: (1) usability with indicators of students being able to follow instructions on multimedia; (2) focus with the indicator of students focusing on the screen; (3) interest in student indicators shows enthusiasm; (4) response with indicators of students responding to sounds and animations; and (5) independence with indicators of students trying to use the media independently (Pradnyana et al., 2020; Novayani, 2023). All indicators were assessed using a Yes/No scale with direct data sources from students as the main users of the media. In addition to observation, interview instruments were also developed to explore students' learning experiences through five aspects, namely: (1) interest or feeling of pleasure in the use of multimedia; (2) visual or easy to understand the appearance of the image; (3) audio or clarity and usefulness of sound and video; (4) gamification or interest in point elements; and (5) sustainability or the desire to use the media again. Both instruments are designed to be simple and concrete to suit the communication skills of students with disabilities and provide a comprehensive picture of their engagement, experience, and response to the media developed.

Based on this presentation, this research is focused on the development of gamification-based interactive multimedia on self-development learning of clothing and accessories recognition materials with a product called "Bigame" (Bina Diri Game). This product is equipped with a competency menu, level games, evaluations, instructions for use, voice narrator, and a reward system in the form of stars. Development using the ADDIE model with the support of Articulate Storyline 3, Canva, Audacity, and CapCut software. This study aims to describe the design of the product, analyze its validity, practicality, and effectiveness in improving the learning outcomes of self-development of students with disabilities. Thus, this research is expected to make a real contribution to the provision of innovative learning media that is in accordance

with the learning needs of disabled children and supports the improvement of their independence in a sustainable manner.

RESEARCH METHOD

This research uses the Research and Development (R&D) method which aims to design and evaluate the effectiveness of a product systematically (Waruwu, 2024). The development model used is the ADDIE (Analyze, Design, Development, Implementation, Evaluation) model because this model is general, systematic, and suitable for learning media development research (Anafi et al., 2021; Tegeh & Kirna, 2013). The ADDIE model was chosen because it has structured stages that allow researchers to plan, manufacture, implement, and evaluate products sequentially, so that the products produced are effective and in accordance with the needs of students with disabilities. The stages of the ADDIE model consist of analysis, design, development, implementation, and evaluation (Meyrelda & Putri, 2021).
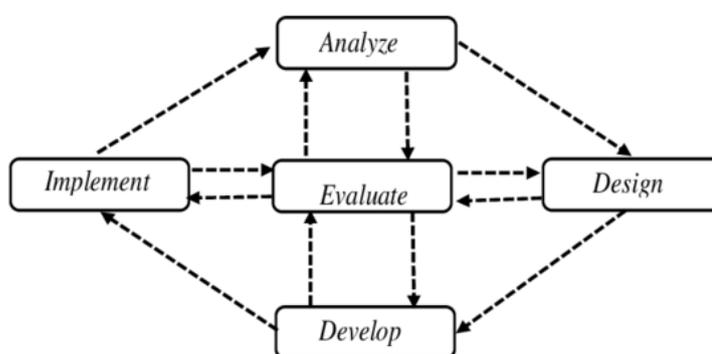

Figure 1. Research Stages

The analysis stage is carried out to identify the learning needs as a whole. The activities carried out include needs analysis, student characteristics analysis, curriculum analysis, and software and hardware analysis. Needs analysis was carried out through observation of the learning process and interviews with teachers, which showed that students had difficulty understanding clothing and accessories material without the support of attractive visual media. Analysis of student characteristics was carried out to understand the thinking ability, learning style, and level of understanding of students with disabilities through observation and initial tests. Curriculum analysis examines the Independent Curriculum in self-development subjects with learning outcomes for students to be able to recognize and understand the types of clothing and accessories according to their functions and daily life situations. Software and hardware analysis ensures the readiness of supporting

facilities, with software used including Canva, CapCut, and Articulate Storyline 3.

The design stage is the process of designing a product concept to be developed. The activities carried out include making flowcharts that describe the flow of media use, designing storyboards as a visual guide for each screen, arranging materials and questions, designing user interfaces (UI/UX), selecting multimedia components, and determining game characteristics. Flowchart is designed simply with flows ranging from the login page, start menu, instructions for use, learning objectives, to the main menu that provides a menu of materials and a game menu. Storyboards are designed with a child-friendly look in mind, featuring elements such as sound effects, award stars, and verbal praise. The characteristics of the game consist of five levels of the game with multiple-choice interactive quizzes, matching images, drag and drop, and equipped with a star reward system as a sign of achievement.

The development stage realizes the design into an interactive multimedia product that is ready to be used. The user model is designed with the characteristics of students with disabilities such as limited memory and short focus. Product development uses Articulate Storyline 3 as the main application, supported by Canva for graphic design, Audacity for audio editing, and CapCut for video editing. At this stage, a product test design was also prepared which involved the review of material experts, media experts, and learning design experts, as well as the determination of trial subjects consisting of expert trials, individual trials, small group trials, and field trials.

The implementation stage is carried out after the media is validated by experts. Media is implemented to students in schools to test the feasibility, convenience, and effectiveness of media directly. Media assessment is carried out through assessment instruments that include visual, interactivity, ease of use, and material suitability. The effectiveness test is carried out by providing a pre-test before the use of media and post-test after learning to determine the improvement of students' understanding and ability.

The evaluation stage is carried out to assess the entire development process and ensure the product is in accordance with the set objectives. The evaluation includes assessments from students, media experts, and subject matter experts to obtain input on the strengths and weaknesses of the media. The results of the evaluation are the basis for determining the feasibility of the media and the material for improvement considerations in the next stage.

The subjects in this study are class V students with disabilities who take part in the self-development subject of clothing introduction material. The selection of subjects was carried out taking into account the level of intellectual

ability and the proportion of gender. The trial was carried out through four stages: (1) expert trials involving learning design experts, media experts, and material experts; (2) individual trials involving 1-3 students; (3) small group trials involving 5-8 students; and (4) field trials involving 15 students. The data collection method uses quantitative and qualitative approaches. Interviews were used on individual and small group tests to explore students' responses and experiences (Romdona et al., 2025). The questionnaire was used to identify students' learning styles and assess the validity of the product by experts (Prawiyogi et al., 2021). Multiple-choice tests are used as the main instrument in field tests to measure student learning outcomes before and after using media (Khaatimah et al., 2017; Putri et al., 2022).

The research instrument was developed based on a grid that includes aspects of curriculum, materials, grammar, evaluation, technical, text, images, sound, interactivity, ease of use, suitability of student characteristics, learning efficiency, clarity of material, learning implementation, and media benefits (Suartama, 2016). Before use, the test instrument went through content validity testing using the Gregory technique involving two experts and obtained a validity value of 1.00 with a very valid category. The test validity test using Corrected Item–Total Correlation in SPSS resulted in 20 valid questions out of 30 items tested. The reliability test using Cronbach's Alpha obtained a value of 0.830 indicating high internal consistency. The differentiating power test showed that all 20 questions had a very good category, and the difficulty level test showed that all questions were in the easy category with an index of >0.71, according to the ability of the disabled child. Data analysis uses quantitative and qualitative methods. Quantitative descriptive analysis was used to process the questionnaire data by calculating the percentage of the assessment score, which was then converted into a scale of five eligibility criteria (Agung, 2017). Qualitative analysis uses the Miles and Huberman model which consists of data reduction, data presentation, and conclusion drawing to process interview and observation data. Prerequisite tests include a normality test using Shapiro-Wilk and a homogeneity test using Levene's Test. The hypothesis test used a paired sample t-test with a significance level of 0.05 to determine the difference in learning outcomes before and after using the media. The hypothesis used is as follows.

a) H_0: There was no significant difference in the learning outcomes of self-development in children with disabilities in class V before and after using gamification-based interactive multimedia.

    b) H_1: There was a significant difference in the learning outcomes of self-development in children with disabilities in class V before and after using gamification-based interactive multimedia.

The analysis was followed by an effect size test using Cohen's d to determine the magnitude of the effect of treatment practically in the low, medium, or high category.

RESULT AND DISCUSSION
Results
Design and Build Interactive Multimedia Development

The design and development of this product describes the process of designing and developing gamification-based interactive multimedia media developed using Articulate Storyline 3 as the main application, supported by Canva for visual display, Audacity for audio recording and processing, and CapCut for editing learning videos. All components are then integrated into one complete interactive multimedia that is ready to be used in learning. The multimedia structure includes a login flow, a start menu, instructions for use, learning objectives, and a main menu as a navigation hub that directs users to two branches, namely learning materials and games. The material section provides content and videos on clothing and accessories, while the game section contains interactive instructions and activities such as choosing school uniforms, daily clothes, activities, and accessories and choosing accessories. This interactive multimedia product can be accessed through the Bigame platform at https://go.undiksha.ac.id/BinaDiriGame. Bigame is designed as an interactive medium that presents material through simple illustrations, then students are directed to a multi-level game with instructions at each level. The app's home page directs students to fill in their names as identities. The user manual page provides a brief explanation of the functions of icons and buttons in the game. The learning objectives page briefly displays self-building goals through supporting text and illustrations. The main menu serves as a navigation center that provides access to the game's material menu and menu, complete with developer profile icons, music settings, exit buttons, and a welcome greeting featuring the student's name. In the material selection menu, students can choose the material they want to learn, namely the material of getting to know clothes or getting to know accessories through an attractive and easily recognizable illustration display. This systematic design supports students' understanding in stages according to the learning characteristics of children with disabilities.

Validity Multimedia

Validation of material experts is carried out to assess the feasibility of gamification-based interactive multimedia from the aspects of curriculum, materials, grammar, and evaluation. The validation results from the two subject matter experts showed that subject matter expert I gave a score of 69 out of a maximum score of 70 with a percentage of 98.57%, while subject matter expert II gave a score of 67 out of a maximum score of 70 with a percentage of 95.71%. Calculation of eligibility percentage using the formula:

$$Persentase = \frac{\sum R}{n} \; x \; 100\%$$

Description:

$\sum$R (Sigma R) = the sum of all scores obtained (total score of assessment/response results).

n = the ideal maximum score number (SMI) *or* the maximum number of possible scores.

100% = a constant to convert the result into a percentage form.

Based on the results of validation by material experts (97.14%), media experts (97.33%), and learning design experts (98%), an average eligibility percentage of 97.49% was obtained which is in the very good category. These results show that the gamification-based interactive multimedia developed is very feasible for use in self-development learning for students with disabilities. However, several improvement inputs were given for product improvement, including changing level 3 games to activities of pairing clothes according to the background of the activity and level 5 games to activities of choosing accessories with drag *and drop* techniques, adding instructions for use, improving font and font size, changing the "start" button to "Start", improving the layout and appearance of menu buttons, enlarging images, text, and video, and added a caption to the user's goal "for 5th grade SD" in the initial view. Overall, the validation results show that the product has met the curriculum aspects, material content, learning design, and technical quality of the media optimally.

Multimedia Practicality

Based on the results of the practicality test by teachers, a score of 58 out of a maximum score of 60 was obtained with a percentage of 96.67% which was in the very good qualification, showing that the media is easy to use, flexible, in accordance with the characteristics of students with disabilities, efficient in the learning process, and able to increase student involvement. The results of individual trials (3 students) and small groups (9 students) also showed very

positive responses, where all students at both stages gave positive responses to the aspects of ease of use, interest, and response to media. In the focus aspect, most students were able to maintain attention (2 out of 3 students in the individual test and 8 out of 9 students in the small group), while in the independence aspect most students were able to use the media independently (2 out of 3 students in the individual test and 6 out of 9 students in the small group), although there were still some students who needed assistance. The results of the interviews reinforced the findings, where all students expressed that they enjoyed using the media, assessed the visual and audio display as easy to understand, received the point feature as part of learning, and showed a desire to use the media again. Overall, these findings show that gamification-based interactive multimedia has a very good level of practicality and can be used effectively in learning, although in the aspect of independence assistance is still needed for some students.

Multimedia Effectiveness

The effectiveness of gamification-based interactive multimedia was analyzed to find out the extent to which the "Bigame" product was able to improve the learning outcomes of self-development of students with disabilities in clothing and accessories recognition materials. Effectiveness testing was carried out by comparing *the pre-test* and *post-test scores* obtained by students before and after using multimedia. Before the hypothesis test was carried out using the paired sample t-test, an analysis prerequisite test was first carried out to ensure that the data met the parametric statistical assumptions. The prerequisite test includes the normality test and the homogeneity test. After the data is declared to meet the prerequisites, it is followed by a hypothesis test using a pair sample t-test to find out whether there is a significant difference between learning outcomes before and after treatment. In addition, effect size calculations were also carried out to determine the influence of multimedia use on improving learning outcomes.

The normality test is carried out to find out whether *the pre-test* and *post-test data* are distributed normally as one of the conditions for using the parametric test (*paired sample t-test*). The tests used Kolmogorov-Smirnov and Shapiro-Wilk. The basis for decision-making, If the significance value (Sig.) > 0.05, then the data is normally distributed, while if the significance value is < 0.05, then the data is not distributed normally. The results of the normality test are presented in the following table.

Table 1.
Normality Test Results

	Treatment	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Resu lts	*Pre-test*	0,104	15	0,200*	0,970	15	0,855
	Post-test	0,111	15	0,200*	0,969	15	0,849
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

Based on the results of the Shapiro-Wilk test, the *significance value of the pre-test* was 0.855 and *the post-test* was 0.849. Since the two values are greater than 0.05 (0.855 > 0.05 and 0.849 > 0.05), it can be concluded that *the pre-test* and *post-test data* are normally distributed.

The variance homogeneity test was carried out to find out whether the variance of data between groups was homogeneous. Testing using Levene's Test. The basis for decision-making, If the significance value (Sig.) > 0.05, then the data variance is homogeneous, while if the significance value is < 0.05, then the data variance is not homogeneous. The results of the homogeneity test are presented in the following table.

Table 2.
Homogeneity Test Results

		Levene Statistic	df1	df2	Sig.
Result s	Based on Mean	0,195	1	28	0,662
	Based on Median	0,213	1	28	0,648
	Based on Median and with adjusted df	0,213	1	27,8 39	0,648
	Based on trimmed mean	0,198	1	28	0,660

The variance homogeneity test using Levene's Test yielded a significance value of 0.662. The test criteria state that the variance between data groups is homogeneous if the significance value > 0.05. Thus, the variance between data groups was declared homogeneous because it was 0.662 > 0.05.

The *paired sample t-test* was conducted to find out whether there was a difference in learning outcomes before and after using gamification-based interactive multimedia. The basis for decision-making, If the value of Sig. (2-tailed) < 0.05, then H_0 is rejected and H_1 is accepted (there is a significant difference). If Sig. (2-tailed) > 0.05 then H_0 is accepted (there is no significant

difference). The results of the paired sample t-test are presented in the following table.

Table 3.
Paired Sample t-test Results

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Hours of deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Treatmen Results	-73,36	10,263	1,873	-77,19	-69,534	-39,1	29	0,001

The results of the analysis showed a Sig. (2-tailed) value of 0.001. The test criteria state that H0 is rejected and H1 is accepted if the significance value < 0.05. Thus, there was a significant difference in the learning outcomes of self-development of disabled students before and after using gamification-based interactive multimedia because of 0.001 < 0.05.

A follow-up effect *size test* using Cohen's d was conducted to determine the extent of the effect of practical treatment on improving student learning outcomes. If the t-test only shows whether or not there is a statistically significant difference, then *the effect size* provides additional information about how powerful gamification-based interactive multimedia influences on changes in learning outcomes.

Table 4.
Effect Size Advanced Test Results

			Standard izera	Point Estimate	95% Confidence Interval	
					Lower	Upper
Pair 1	Treatment - Results	Cohen's d	10,26371	-7,148	-9,008	-5,280
		Hedges' correction	10,39885	-7,055	-8,891	-5,212

The results of the analysis show that the Point Estimate value is -7.148. Negative signs appear because of the order of deduction used in the analysis, i.e. the initial score is subtracted by the final score. If the score after treatment is higher than the score before treatment, then the result of the difference will be negative. The minus sign only indicates the direction of change, not the weak influence of the treatment. In the interpretation of *effect size*, the main focus is

the magnitude of the absolute value. The *effect size criteria* can be seen in the following table.

Table 5.
Effect Size Criteria

Effect size	Category
0 ≤ IS ≤ 0.2	Low
0.2 ≤ IS ≤ 0.8	Medium
IT IS ≥ 0.8	Height

The absolute value of 7.148 far exceeds the limit of 0.8, so it belongs to the category of enormous influence. This shows that treatment has a very strong influence on the improvement of the ability to recognize clothes and accessories.

Discussion

Design and Build Gamification-Based Interactive Multimedia

The development of gamification-based interactive multimedia in this study has been carried out systematically through the stages of the ADDIE model. The analysis stage includes the analysis of self-development learning needs, characteristics of students with disabilities, curriculum, and learning support facilities. The results of the analysis show that students need learning media that is able to present material in a concrete, interactive, and fun way. The design stage includes creating *flowcharts* and *storyboards* as a reference for the flow of material presentation, game activities, and media navigation. The development stage realizes the design into an interactive multimedia product that contains materials that recognize clothes and accessories with the support of visual, audio, and interactivity elements using Articulate Storyline 3, Canva, Audacity, and CapCut software. The implementation stage is carried out through validation tests by material experts, media experts, and learning design experts as well as trials for students. The evaluation stage is carried out by examining the input of experts and test results as a basis for product improvement. The integration of each stage in the ADDIE model ensures the suitability of the media with the characteristics of students with disabilities, self-development learning goals, and learning conditions. This is in line with the findings of Mukhammad (2024) who stated that the ADDIE model is effective in directing the development of learning products that are in accordance with the characteristics and needs of children with disabilities.

The Validity of Gamification-Based Interactive Multimedia

The results of expert validation show that gamification-based interactive multimedia has received a very decent rating from experts. The validation of

material experts obtained a percentage of 97.14% with the excellent category, which indicates that the self-development material is in accordance with basic competencies, learning indicators, student characteristics, and using simple language and concrete examples. The validation of media experts obtained a percentage of 97.33% with the excellent category, showing that multimedia meets the technical aspects of learning such as visual display, navigation, text and image quality, and interactivity that support ease of learning. The validation of the design expert obtained a percentage of 98% with the excellent category, confirming that the learning design has been prepared systematically, in line with basic competencies, and supported by a multisensory approach and gamification elements. The high validity of this product is in line with the research of Pradnyana et al. (2020) who developed PPKN interactive learning multimedia for students with disabilities with the concept of gamification and obtained a feasibility score of 1.00 from material experts and media experts. Similarly, the research of Fauzia et al. (2017) shows that the interactive multimedia developed obtained the validation of media experts by 97% and material experts by 76% with the feasible category. These results confirm that the gamification-based interactive multimedia developed has good quality and is suitable for use in self-development learning for children with disabilities.

The Practicality of Gamification-Based Interactive Multimedia

The results of the practicality test showed that gamification-based interactive multimedia has a very good level of practicality. The teacher's assessment obtained a percentage of 96.67% with very good qualifications, which means that the media is easy to use, flexible, according to student characteristics, efficient in learning, and able to increase student involvement. Individual and small group trials showed that all students were able to use the media well, showed high interest, and responded positively to visual and audio stimuli. These findings are in line with the research of Pradnyana et al. (2020) which showed that student responses to individual tests were 93.33%, small group tests 92.22%, and field tests 91.11% with the very good category. Research by Ari et al. (2024) also shows that all students find the application interesting and easy to understand, and teachers respond very positively to interactive learning media for students with disabilities. However, in the aspect of independence, there are still some students who need assistance, especially in the early stages of media use. This is in accordance with the characteristics of children with disabilities who have limitations in understanding instruction and require guidance in learning (Rahmandhani et al., 2021). Thus, gamification-based interactive multimedia has proven to be practical in self-

development learning, although teacher assistance is still needed to optimize students' learning independence.

The Effectiveness of Gamification-Based Interactive Multimedia

The results of the effectiveness test showed that gamification-based interactive multimedia was effective in improving the learning outcomes of self-development of children with disabilities. The increase in the average score from *the pre-test* of 64.67 to *the post-test* of 76.07 with a difference of 11.4 points indicates an increase in students' understanding of the introduction of clothes and accessories. The *paired sample t-test* showed a significant difference with a Sig. (2-tailed) value of 0.001 < 0.05, and the *effect size test* showed a very large effect with a Cohen's value of d -7.148. These findings are in line with the research of Fauzia et al. (2017) which proves that interactive multimedia is effective in improving the initial reading ability of students with a calculated t value greater than the t table. Pupu's research (2012) also showed a significant increase in the early reading ability of children with mild disabilities through interactive multimedia, with the mean level increasing from 10% at baseline to 60% in the intervention phase. Research by Khairina et al. (2024) proves the effectiveness of PowerPoint-based interactive media in improving noun reading ability for children with mild disabilities with an increase from 40% to 87%. The effectiveness of gamification-based interactive multimedia is inseparable from the application of multimedia principles that are in accordance with the learning characteristics of children with disabilities. The principle of segmentation is applied through the gradual presentation of material in five levels of the game, allowing students to process information without cognitive overload (Prasandha et al., 2024). The tagging principle is applied through the use of contrasting colors, symbols, and sound cues that direct students' attention to important information (Prabawa et al., 2025). The principle of generative activity is applied through the active involvement of students in the activity of choosing, matching, and determining the function of clothing, so that learning becomes more meaningful (Prabawa et al., 2025). Thus, gamification-based interactive multimedia has proven to be statistically and practically effective in improving the learning outcomes of self-development of children with disabilities.

CONCLUSION

Based on the results of the research and discussions that have been presented, it can be concluded that the development of a gamification-based interactive multimedia called Bigame (Bina Diri Game) on clothing and accessories recognition materials for students with disabilities in class V has

been successfully implemented through a systematic ADDIE development model. This product has proven to have excellent validity, with a feasibility percentage of material experts of 97.14%, media experts of 97.33%, and design experts of 98%, which shows that this media is suitable for use in terms of curriculum, materials, technical, and learning design. In terms of practicality, this multimedia received a very practical assessment from teachers with a percentage of 96.67%, and received positive responses from students in individual and small group trials, where all students showed ease of use, interest, and good response even though the independence aspect still required assistance. The effectiveness of the product is also significantly proven through the improvement of student learning outcomes, with the average pre-test score of 64.67 increasing to 76.07 in the post-test. The results of the paired sample t-test showed a Sig. (2-tailed) value of 0.001 < 0.05 which means there was a significant difference, and the effect size test with Cohen's d value of -7.148 which was included in the category of influence was very large. Thus, Bigame's gamification-based interactive multimedia is declared valid, practical, and effective in improving the learning outcomes of students with disabilities, and is suitable for use as an innovative learning media that is in accordance with the characteristics of students.

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