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Development of Digital Briive (Brilliant Cognitive Instrument) as A Website-Based Cognitive Evaluation Tool for Children with Intellectual Disabilities

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ABSTRACT

The development of cognitive assessment for children with intellectual disabilities still faces limitations in terms of adaptability, efficiency, and utilization of digital technology. This study aims to develop Digital BRIIVE (Brilian Instrument Cognitive) as a website-based cognitive evaluation tool specifically designed to facilitate the assessment of basic thinking skills of students with intellectual disabilities. This development uses a Design-Based Research (DBR) model that includes the stages of needs analysis, system design, expert validation, design revision, and limited trials. This instrument measures aspects of cognitive development such as attention, working memory, and simple reasoning with the support of interactive visual and audio displays. The validation process was carried out by two validators, namely an expert in Special Education and a practicing teacher of Special Needs Education (SLB), covering aspects of appearance, content, language, and ease of use. The validation results showed an average score of 88% with a category of "very adequate". Revisions were made based on validator input, especially on simplifying the instruction language and increasing visual contrast. The limited trial involved five fourth-grade students with intellectual disabilities at Special Needs Education (SLB) C Autism Special Needs School in Kedungkandang, Malang. The results showed that students responded positively to the use of Digital BRIIVE, with increased motivation and ability to complete tests independently. Teachers also positively assessed the system's efficiency and ease of automatically displaying assessment results. Conceptually, Digital BRIIVE applies the principles of Universal Design for Learning and Dynamic Assessment, enabling adaptive and continuous assessment. The three-tier architecture system used ensures data stability and the security of the evaluation process. These findings indicate that Digital BRIIVE is feasible and effective as a technology-based cognitive assessment tool that is suited to the characteristics of children with special needs. The implications of this research strengthen the direction of digital transformation of special education assessment in Indonesia and open opportunities for the development of artificial intelligence-based instruments for more personalized and predictive evaluation in the future.

Keywords: cognitive assessment, intellectual disabilities, special education, digital evaluation, web-based assessment, Universal Design for Learning

INTRODUCTION

Technological advances, inextricably linked to the times, increasingly present both conveniences and challenges in every aspect. Inevitably, in the world of learning, technology, a crucial instrument in supporting educational progress in a country, has become crucial. Since the dawn of the Industrial Revolution 4.0, all human activities have

become increasingly influenced by technology. This is especially true for students with special needs, who urgently require knowledge, especially in the latest technology. In Indonesia, there are various types of special needs, including visual impairments, hearing impairments, intellectual disabilities, physical disabilities, and social disabilities. Furthermore, there are various other types of special needs, such as blindness, deafness, communication disorders, and multiple disabilities. Each type of special need requires an appropriate approach and services to meet the individual's needs. Research (Tuasikal, 2023) explains that knowledge of these various types of special needs is crucial for providing appropriate support and services to those who require them.

Students with special needs in several developing countries still face challenges, especially in Indonesia. The Indonesian government has conducted extensive research and provided attention to special needs, such as providing services for those with intellectual disabilities in several provinces (Purnama et al., 2021). However, numerous pressing issues remain for the Indonesian government in supporting students with special needs, particularly in the areas of technological devices and the provision of specialized services. This research focuses on children with intellectual disabilities. Children with intellectual disabilities, also known as intellectual disabilities, are a type of special needs child in Indonesia. Mental retardation is a condition of subnormal general intellectual functioning that begins during an individual's development and is associated with limited learning abilities, adjustments, and maturation, or both. The prevalence of intellectual disabilities in Indonesia is currently estimated at around 1-3% of the population, or approximately 6.6 million people. Children with intellectual disabilities require appropriate approaches and services to meet their needs, such as special education and appropriate therapy (Mumpuniarti, 2019).

The Indonesian government continues to strive to improve services for people with intellectual disabilities by providing inclusive schools and special services for them in several provinces. Assessment using the "Special Education Teachers for Intellectual Disabilities" Module outlines the basic concepts of assessment and evaluation of the learning process and outcomes of children with intellectual disabilities. Furthermore, information technology such as video or animation can also be used in assessment and learning for children with intellectual disabilities. IQ measurement tools for children with intellectual disabilities generally refer to intelligence tests such as the Stanford-Binet test or the Wechsler Scale. Children with mild intellectual disabilities, for example, can have an IQ between 50-70 (Rahmawati & Jagakarsa, 2018). These tests are usually administered by teachers or psychologists and involve various types of questions and tasks to measure various aspects of intelligence, including verbal, non-verbal, and other cognitive skills. These tests must be administered carefully and by professionals trained in administering and interpreting intelligence tests. However, a major problem remains the limited technology available to teachers to conduct cognitive assessments for children with intellectual disabilities. In Indonesia, there are limited tools for assessing children with intellectual disabilities (Farraswati & Siswanto, 2015). This problem stems from the limited availability of technology in each school, particularly in Greater Malang. Teachers, as educators, still use conventional procedures, particularly for archiving learning outcomes for students with intellectual disabilities (Ramadana, 2020). The learning outcomes of students with intellectual disabilities are still stored only on drives or as piles of paper that are then not reused. Consequently, the sustainability of students' cognitive ability results does not significantly impact the sustainability of evaluations and impacts students'

learning needs. This is considered inaccurate and inefficient. Therefore, a website is needed to facilitate the various needs of teachers in assessing and evaluating students with intellectual disabilities, providing accurate and precise results, namely through BRIIVE (Brilian Instrument Cognitive).

Improvements in cognitive ability measurement tools for children with intellectual disabilities, including technology-based instruments, are needed. Efforts to improve IQ measurement tools for children with intellectual disabilities by utilizing technology are also needed. A website called " BRIIVE: (Brilian Instrument Cognitive)" was developed to help educators evaluate the cognitive abilities of children with intellectual disabilities website-based. Briive (Brilian Instrument cognitive) has various benefits and uses, especially in the context of evaluation for children with intellectual disabilities. This website is designed to facilitate the digital-based evaluation process for inclusive school teachers in Malang Raya. Some of the benefits and uses of BRIIVE (Brilian Instrument cognitive) include: Helping teachers identify evaluation results easily and flexibly, the BRIIVE website also makes it easy for teachers to use, eliminating the need for teachers to use large amounts of paper to measure children's cognitive abilities, which makes the evaluation process inefficient. The BRIIVE (Brilian Instrument cognitive) website-based cognitive instrument is designed according to the needs and urgency of educators, especially teachers in inclusive schools with students with intellectual disabilities.

Based on the results of a preliminary study conducted in 2023, 80% of inclusive school teachers in Malang Raya still face obstacles in utilizing technology during the learning process. This has raised concerns for researchers regarding the limitations of technology amidst the onslaught of technological advances for educators. educators, especially in inclusive schools, as a learning medium, especially for educators in Malang. Therefore, this study aims to develop an innovation, namely the BRIIVE Website-Based Cognitive Test Tool (Brilian Instrument cognitive), as a tool to assist educators in Malang Raya, which is expected to facilitate learning evaluation through technology.

METHOD

Over time, educational advancements continue to change. This also applies to the methods used in research conducted in the 1980s. The research method used in this study, developed by Borg and Gall, is used to validate educational products and is also relevant to the development of research focused on products used in education, including educational evaluation. R&D is not only oriented toward evaluation but also underpins the development of effective products for specific school programs, such as learning materials and media. The R&D (research and development) method is a form of research aimed at generating new product designs, testing the effectiveness of existing products, and developing and creating new ones. As explained in the research (Nurmalasari & Erdiantoro, 2020), if the product has been tested, it is deemed suitable for use and can also simplify the work process, making it easier, more efficient, stable, and faster, with improved quality and quantity of results. In this study, the researchers used the Borg and Gall method. The steps in the R&D research flow can be seen in Figure 1.

The research was conducted in several stages, including reviewing relevant articles and journals relevant to the research, conducting a needs analysis, and developing a preparatory work plan. In this stage, researchers were expected to address or detail the issues and identify product needs, specifically a website containing cognitive evaluation

instruments for students with intellectual disabilities, which could be used in the field. Through the R&D method, the product that could be developed was a cognitive evaluation instrument for children with intellectual disabilities.

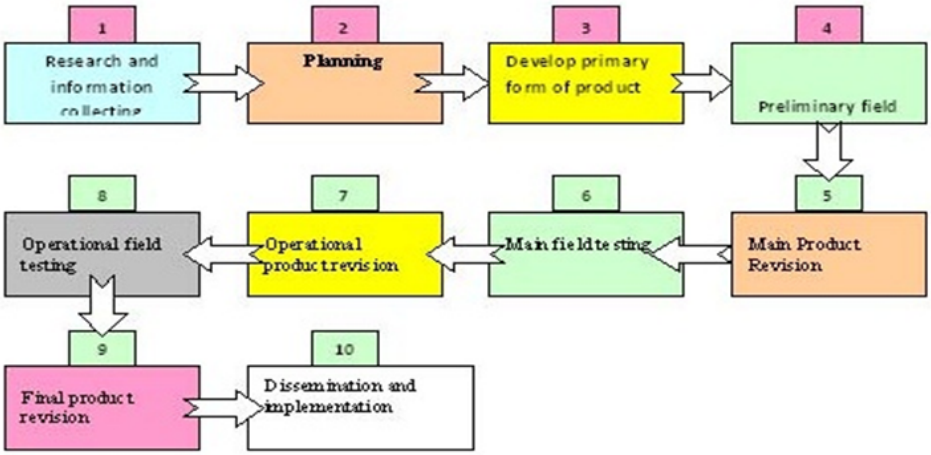

Figure 1. Flowchart of the R&D Method Stages of the Borg and Gall Model

The next research stage is planning. At this stage, researchers must be able to formulate the objectives of each stage, as well as design the research steps and the needs of the feasibility study. This stage also includes the RAB (Budget Plan) estimate, or draft budget, required during the research process. It can also identify parties with the capacity to justify the cognitive evaluation instrument product that will be produced. At this stage, researchers begin to determine the product design to be developed, starting from determining the research facilities or infrastructure needed during the research process, namely determining the stages of implementing design tests in the field, and distributing the job descriptions of each party or member involved in the research.

At this stage, the preliminary product is tested with a limited number (2-4) of selected parties through questionnaires, observations, and interviews with the aim of obtaining data analysis results for the next stage. Furthermore, researchers can also conduct initial field tests with several activities as follows: field tests are carried out repeatedly until a feasible design is obtained. There is a possibility of revisions to the developed website-based instrument product. The trial product revision is revised using data taken from the fourth step. This stage is referred to as the initial or main test where the website-based instrument product is tested on a larger scale and number of approximately (5-15) involved parties. Using qualitative methods for the data to be collected. The product that has been revised in the previous step, namely step six, is revised again and then developed into an operational design for final validation. Validation with the operational design is carried out on a large scale (30-40) namely through interviews, observations and questionnaires. In revising the final step, data is fundamental. Through data, it is intended to review whether the design is ready to be implemented in the educational realm without the presence of researchers as a companion. The product has been completely revised based on the data obtained in step eight and is ready to be launched as a website-based cognitive evaluation instrument product, namely Briive (Brilian Instrumen cognitive) in the world of education. Socialization is carried out for the community, specifically in the field of education, namely educators, through various means such as; webinars, seminars, direct presentations to related parties.

RESULT AND DISCUSSION

Digital BRIIVE (Brilliant Cognitive Instrument) is an innovation in special education technology that functions as a website-based cognitive evaluation tool. This product was developed to address the need for an adaptive, interactive, and easy-to-use assessment instrument for special education teachers in assessing the cognitive abilities of students with intellectual disabilities. In the context of special education schools (SLB), cognitive assessment activities are often still conducted manually, using paper-based tests that are limited to the teacher's subjective observations. This implies a lack of efficiency, objectivity, and accuracy of assessment results. Therefore, Digital BRIIVE exists to transform traditional evaluation processes into systematic and efficient digital ones.

Philosophically, the development of Digital BRIIVE is based on the paradigm of inclusive technology-based assessment, namely a technology-based assessment approach that considers the principles of inclusivity and accessibility for students with special needs. In this case, children with intellectual disabilities require an evaluation system capable of presenting simple instructions, engaging visual stimuli, and immediate feedback. The design principles of Digital BRIIVE follow the concept of universal design for learning (UDL) which emphasizes three main aspects: multiple means of representation (presenting material in various forms such as text, images, and sound), multiple means of engagement (increasing learning motivation through visual interaction and light games), and multiple means of expression (providing alternative responses, such as clicks, sounds, or touch). Technically, Digital BRIIVE was developed using the programming languages HTML, CSS, and JavaScript for the interface (front-end), and PHP and MySQL for the data management system (back-end). This product can be accessed via laptops, tablets, or school computers without requiring additional installation, just with an internet connection and a standard browser. This makes Digital BRIIVE easy to implement in special needs schools with limited technological resources.

In terms of interface, Digital BRIIVE is designed with user-cantered design principles in mind. Background colours are chosen using soft, high-contrast combinations (such as light blue, pastel yellow, and white) to facilitate students' visual focus. Each icon is accompanied by a concrete illustration familiar to children, such as images of fruit, animals, or school objects. The fonts are large, sans-serif type for easy reading, and each text instruction is accompanied by automated voice narration to make it accessible to students with reading disabilities.

Furthermore, navigation between pages is simple and consistent. The "Next," "Repeat," and "Back" buttons are symbolized by large, boldly coloured arrows, and the buttons are spaced to facilitate operation by children with fine motor disabilities. The platform also features instant feedback, where each correct answer displays an animated star and a simple audible compliment such as "Good!" or "Great!". This has been shown to increase student motivation and attention during tests, as evidenced by behavioural reinforcement theory in the learning of children with special needs (Skinner, 1971; Shunk, 2020).

From a teacher's perspective, Digital BRIIVE simplifies the documentation of assessment results. Each student who completes the test will have their scores automatically recorded in a database. Teachers can download the results in .xls or .pdf format, containing the scores for each cognitive aspect, the date of the test, and a description of the results. The report also includes a cognitive tendency profile (e.g., "visual memory is good, but focus still needs improvement") generated based on a scoring algorithm. This allows teachers to create an Individual Cognitive Profile (ICP) without having to manually assess students. Besides being a testing tool, Digital BRIIVE also serves as a light cognitive intervention tool, as several sections of the test include repetitive exercises with a game-based learning pattern, such as "matching objects" or "arranging numbers." This feature aims to make the assessment feel less like a formal exam and more like a fun and meaningful play activity for students.

The development of Digital BRIIVE also considers accessibility for teachers and students in special needs schools (SLB). The system is designed to be lightweight (easy to access on a 3G connection or school Wi-Fi), can be run without complex logins, and has an offline mode option for local use. In limited network conditions, teachers can download a standalone version of the application and sync data to the main server once a connection is available. With these features, Digital BRIIVE is a comprehensive and practical tool for assessing the cognitive abilities of children with intellectual disabilities. This platform serves not only as an assessment tool but also as a reflection tool for teachers to understand students' learning potential and difficulties. Through this development, it is hoped that cognitive assessment in special needs schools can move towards a digital, inclusive, and data-driven evaluation approach, supporting the goals of special needs education in the era of digital transformation. The Digital BRIIVE (Brilian Instrument Cognitive) system architecture is designed using a three-layer architecture consisting of a front-end, back-end, and database server. This model was chosen because it offers advantages in terms of scalability, security, and ease of system maintenance, in line with the principles of developing web-based educational evaluation systems.

The main technologies used are HTML5, CSS3, and JavaScript (React-based) to ensure an interactive and responsive interface across various devices (PCs, laptops, and tablets). The programming languages used are PHP and Node.js, while the Laravel framework (optional) is used for neat and efficient code structure management. The database system uses MySQL Server, with simple encryption features to maintain the security of student personal data. Inter-layer communication is carried out through a JSON-based Application Programming Interface (API) that allows for flexible integration in the future, such as developing an Android mobile app version or integration with the school's data system. The validation process was conducted to assess the quality, feasibility, and suitability of the product's content before it was implemented in field trials. Validation was conducted by two experts; the results are shown in Table 1. Based on the data in Table 1, the average overall score was 4.43, categorized as Very Valid. The validation results indicate that Digital BRIIVE is suitable for testing with minor revisions. The validator provided several improvement notes that served as the basis for product revisions.

Table 1. BRIIVE Digital Expert Validation Results

Aspects Assessed	Expert 1	Expert 2	Average	Category
Visual appearance and aesthetics	4	5	4,5	Very Good
Ease of navigation	4	4	4,0	Good
Clarity of instructions	5	5	5,0	Very Good
Relevance of cognitive items	4	4	4,0	Good
Suitability to the characteristics of children with intellectual disabilities	5	4	4,5	Very Good
Content alignment with the curriculum	4	4	4,0	Good
Benefits for teachers	5	5	5,0	Very Good

Based on the validation results, several suggestions for improvement proposed by the experts included: a) Adding audio guidance to each instruction to make it easier for children with language barriers to understand; b) Enlarging the navigation icons and answer choice buttons to make it easier for students with limited fine motor coordination; c) Adjusting the difficulty level of several cognitive items (especially those related to arithmetic) to better suit the abilities of students with mild intellectual disabilities; d) Simplifying the language on the initial display to avoid confusion. Revisions were carried out over two weeks, improving the interface and navigation system, and adding an audio guidance feature. Following the revisions, the product was retested by the validator and declared suitable for trial with students.

A limited trial was conducted at SLB C Autism Special Needs School in Kedungkandang, Malang, involving five fourth-grade students with intellectual disabilities. The trial was conducted over two 60-minute sessions. The trial aimed to assess the usability and user response (teacher and student) to Digital BRIIVE. Before the test began, the teacher provided a brief explanation of how to use the application. Each student used a laptop with a browser installed and access to the Digital BRIIVE website. The teacher assisted the students throughout the test. Observation and questionnaire results indicated that students were able to understand the instructions and complete the test effectively. The average completion time was 20–25 minutes per student. Most students demonstrated high enthusiasm when using this digital tool.

Table 2. BRIIVE Digital Limited Trial Results

Indicator	Average Score	Category
Student interest in the media	4,6	Very Good
Students' ability to understand instructions	4,2	Good
Content's suitability to cognitive abilities	4,4	Good
Teacher response to ease of use	4,8	Very Good
Technical constraints (system stability, loading, errors)	3,8	Pretty Good

Based on the results in Table 2, it can be concluded that the limited trial results showed that Digital BRIIVE received a very positive response from both students and teachers. Teachers stated that the application facilitated the assessment process because it could automatically save and display scores, while students felt more motivated because of its attractive and interactive interface. However, there were several minor obstacles, such as unstable internet connections in the classroom and some students having difficulty using a mouse. Therefore, the use of touchscreen devices (tablets) is recommended for wider implementation.

The development of Digital BRIIVE as a web-based cognitive evaluation tool demonstrates high relevance to the needs of modern assessment for children with intellectual disabilities. In the context of inclusive education, assessments serve not only as a measure of academic ability but also as a means of diagnosing cognitive development (Elliott & Resing, 2015). Expert validation results indicate that BRIIVE aligns with the principles of adaptive and technology-based assessment, which are considered capable of accommodating individual student needs. According to the Universal Design for Learning theory (CAST, 2018), the flexibility of media and methods in assessment allows each child to demonstrate their full potential without format or context constraints. The validation results from two expert validators one Special Education lecturer and one practicing SLB teacher obtained an average score of 88%, indicating a "very appropriate" category. This positive assessment indicates that the display, navigation, test content, and system responses are appropriate to the needs of students with intellectual disabilities. Special Education experts highlighted that BRIIVE's main advantage lies in the preparation of test items that adapt to the concrete operational thinking stage, as described by Piaget (1972). Thus, the test does not require high abstraction skills, but instead emphasizes pattern recognition, simple relationships, and basic logical concepts.

Validation also revealed several significant insights. It was suggested that the language and instructions be simplified and accompanied by stronger visual guidance to minimize cognitive load. These improvements align with Vygotsky's (1978) view of scaffolding in learning, where adaptive visual and instructional aids can expand students' zone of proximal development. After the revision, the BRIIVE interface became more child friendly, and colour contrast was improved to facilitate visual focus for students with attentional difficulties. From a technical perspective, validation results demonstrated that the web-based system provides easy access for both teachers and students. Through an integrated dashboard, teachers can view results in real time and download reports in both graphical and numerical formats. This supports assessment efficiency, as outlined by Brown and Abeywickrama (2019), who argued that valid and reliable digital assessments must provide rapid and actionable feedback. The feasibility of this system also represents a concrete step toward the digital transformation of assessment in special education in Indonesia. Conceptually, BRIIVE is able to integrate cognitive-based evaluative approaches and educational technology, thus bridging the gap between field needs and technological innovation. According to the Technology Acceptance Model theory (Davis, 1989), the acceptance of a new system is determined by perceptions of usefulness and ease of use. Both aspects were proven high in the validation results, indicating that BRIIVE is not only functionally feasible but also practically accepted by special education users.

The BRIIVE Digital system architecture is designed with the principles of simplicity, accessibility, and reliability in mind. The system consists of three main layers: the user interface layer, the application processing layer, and the database management layer. The user interface layer displays test items in text and interactive visuals, while the application processing layer handles adaptive logic and results analysis. The database is used to store test results, student profiles, and progress records. This architectural model follows the three-tier architecture framework commonly used in web-based educational applications (Rahimi et al., 2020). The system workflow begins with user login (teacher and student), followed by selecting the test type based on the developmental aspects to be measured, such

as working memory, attention, and simple reasoning. Students then work on the questions with the aid of supporting audio and visuals. Upon completion, the system automatically calculates scores and displays the results in the form of a progress graph. The architectural diagram shows that BRIIVE uses two-way communication between the frontend and backend via a secure HTTP protocol, ensuring the integrity of test result data.

From an educational software engineering perspective, this structure meets the principles of usability and interoperability. This aligns with the ISO/IEC 9126 standard on software quality, where effectiveness, efficiency, and user satisfaction are key benchmarks (Pressman, 2020). With an intuitive and responsive interface, students with intellectual disabilities can access and complete tests without significant difficulty, while teachers can efficiently manage test result data. Expert analysis also confirmed that BRIIVE's use of server-side processing facilitates data integration between test sessions. This means the system can store previous results for longitudinal comparison, supporting the principle of dynamic assessment, which assesses development over time (Sternberg & Grigorenko, 2002). This feature makes BRIIVE superior to conventional assessments that rely solely on one-shot testing. Thus, the architecture and flow of the BRIIVE Digital system are not only technically functional but also support the philosophy of special education, which emphasizes continuous development. The integration of digital diagnostic and reporting functions allows teachers to adjust learning based on concrete, measurable data, as recommended by the Data-Driven Instruction theory (Bambrick-Santoyo, 2019).

A limited trial of the Digital BRIIVE was conducted with five fourth-grade students with intellectual disabilities at the Special Needs for Autism (SLB C) in Kedungkandang, Malang. The results showed that students were able to interact well with the provided digital media. Most students showed increased attention and motivation when taking the test compared to the conventional paper-based format. According to Deci and Ryan (2000), this increased motivation is related to the fulfilment of basic psychological needs in Self-Determination Theory: autonomy, competence, and relatedness. The teacher assistant who facilitated the trial gave positive feedback on the ease of use and clarity of the display. Based on observations, students required approximately 5–10 minutes of adaptation time to become accustomed to the system's navigation flow. Afterward, all participants were able to complete the test with minimal assistance. This indicates that the interface design and presentation of BRIIVE instructions effectively support independent learning for students with mild to moderate intellectual disabilities.

In addition to the positive responses, several technical challenges were also identified. These included the need for a stable internet connection and limited student focus time during longer sessions. These issues align with the findings of Gentry et al. (2022) found that children with intellectual disabilities require short-term interventions and segmented sessions in digital activities to maintain optimal engagement. Therefore, improvements were made by dividing the test duration into several short sub-sessions. From a pedagogical perspective, the trial results reinforce the importance of a technology-mediated scaffolding approach in special education assessments. Technological support not only transfers the assessment format to digital media but also builds responsive interactions to student needs (Holmes et al., 2019). Teachers can act as facilitators, monitoring results and adjusting follow-up learning based on BRIIVE data. Overall, the positive response from students and

teachers indicates that BRIIVE is not only technically effective but also socially and psychologically relevant in an inclusive learning context. This confirms BRIIVE's position as a digital assessment innovation that prioritizes humanistic and adaptive principles in line with the direction of 21st-century education, which is data-driven and empathetic.

The results of the BRIIVE development have theoretical implications for understanding technology-based cognitive assessment for students with intellectual disabilities. Theoretically, this research expands the application of the Computer-Based Assessment (CBA) concept in special education. While CBA has been widely used in general education, BRIIVE demonstrates that this approach can be adapted to more complex individual needs while maintaining the validity and reliability of the measurement tool (Redecker & Johannessen, 2013).

The practical implications are evident in the ease with which teachers can conduct evaluations without the need for manual corrections. The automated data processing system accelerates the process of interpreting results, which can be used directly to develop individualized learning programs (IEPs). This reinforces the function of formative assessment in special education, as explained by Black & Wiliam (2009), who argue that effective assessment is one that informs subsequent learning activities. Furthermore, the results of this research also emphasize the relevance of constructivist theory in the context of digital assessment. Students are not merely test subjects but are actively involved in the process of understanding the results through the communicative visual display of the final results. This experience fosters metacognitive awareness, which is crucial for developing higher-order thinking skills, even within limited capacities (Flavell, 1979).

For special education institutions, BRIIVE serves as a strategic tool to accelerate the digitalization of assessment services. Its web-based system allows for widespread use across schools and districts, without geographic boundaries. This aligns with the national digital transformation policy for education, which emphasizes the integration of digital assessments into the education system (Ministry of Education, Culture, Research, and Technology, 2023). Finally, from a learning technology perspective, BRIIVE serves as a concrete model for implementing design-based research principles, combining iterative development, expert validation, and limited field testing. This cycle reflects a scientific approach to developing empirical and sustainable technology-based educational solutions (Anderson & Shattuck, 2012).

Although the research results demonstrate significant success, several limitations remain noteworthy. First, the number of test subjects was limited to five students, so the results cannot be widely generalized. Second, infrastructure constraints such as internet connection and school hardware were limiting factors in optimal implementation. This indicates the need for an offline mode approach or a hybrid system to ensure the application remains functional in low-network conditions. Furthermore, cognitive aspects measured in BRIIVE still focus on basic thinking domains such as working memory, attention, and simple reasoning. Going forward, more varied assessment items need to be developed to measure more complex metacognitive and adaptive skills. This effort will strengthen BRIIVE's position as a comprehensive assessment tool for students with diverse cognitive abilities.

From a technical perspective, the system needs to be developed with an analytics dashboard feature that allows teachers and school psychologists to monitor student progress over time. This approach aligns with Learning Analytics theory (Siemens, 2013), which emphasizes the importance of digital data analysis for evidence-based decision-making in education. Pedagogically, further research is recommended to examine the impact of BRIIVE on students' academic learning outcomes and critical thinking skills. If proven effective, this tool will serve not only as an assessment instrument but also as a learning-by-assessment tool. This will expand BRIIVE's function from a measurement tool to a reflective learning tool. Thus, BRIIVE has opened a new direction in the development of digital assessment for special education. These limitations do not diminish its innovative value, but instead serve as a stepping stone for further development toward an inclusive assessment system that is adaptive, equitable, and based on intelligent technology.

CONCLUSION

Research into the development of the Digital BRIIVE (Brilliant Cognitive Instrument) has resulted in an innovative web-based assessment specifically designed to evaluate the cognitive abilities of children with intellectual disabilities. The development process included needs analysis, system design, expert validation, and limited trials. Validation by two experts, a Special Education expert and a practicing teacher at a special education school (SLB), yielded an average score of 88%, categorized as "very appropriate." This demonstrates that the Digital BRIIVE meets eligibility standards in terms of appearance, content, language, and ease of use. After minor revisions based on validator feedback, the product demonstrated significant improvements in instruction clarity, visual contrast, and user navigation.

Results of a limited trial with five fourth-grade students with intellectual disabilities at the Kedungkandang Malang Special Education School for Autism (SLB C) showed that the Digital BRIIVE was well-received by users. Students demonstrated high motivation and were able to complete the test independently with minimal guidance, while teachers responded positively to the system's ease of operation and speed in displaying assessment results. These findings reinforce that the BRIIVE is not only content-valid but also practically effective in a special education context.

Theoretically, BRIIVE implements the principles of Universal Design for Learning (CAST, 2018), the Technology Acceptance Model (Davis, 1989), and Dynamic Assessment (Sternberg & Grigorenko, 2002) in an integrated manner. This system emphasizes adaptive assessment that allows children to demonstrate their best abilities without format or instruction constraints. In addition, its three-tier architecture design and data-driven instruction approach make BRIIVE a responsive instrument to teachers' needs for longitudinal student development monitoring. From a practical perspective, BRIIVE facilitates the process of evaluating the cognitive abilities of students with special needs through automated reporting, communicative visual displays of results, and database-based data storage. This feature has the potential to increase teacher efficiency in developing individualized learning programs (IEPs). With the support of web-based technology, BRIIVE also supports equitable access to digital assessment in special and inclusive schools across various regions. Thus, it can be concluded that Digital BRIIVE is a technology-based cognitive assessment instrument that is feasible, effective, and adaptive

for use in special education. Its existence is a strategic step in strengthening the digital transformation of assessment in Indonesia and bridging the gap between field needs and equitable educational technology innovations for students with intellectual disabilities.

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