

Mobile Application Development for Android: Identification Tool for Children with Special Needs in Inclusive Schools

Mirnawati Mirnawati*, Amka Amka

Department of Special Education, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

*Email: mirnawati.plb@ulm.ac.id

Abstract: This research aims to develop an Android-based mobile application that acts as an identification tool for children with special needs. By using mobile technology, this application will facilitate the identification process for teachers and parents and provide clear guidelines for its use. This research method uses the R & D (Research and Development) ADDIE design, which consists of five stages, namely analysis, design, development, implementation and evaluation. Identification is carried out by filling in data on the application, with the dominant characteristics appearing after the data has been filled in. The identification process is based on the results of a Focus Group Discussion (FGD) with special needs teachers. The application also makes it easy to identify barriers that may be experienced by children with special needs by taking into account the scores obtained for certain types of barriers. Expert validation showed that the application falls into the highly valid category, indicating its readiness to be used and implemented by users such as teachers and parents. Thus, the development of this mobile application is expected to have a positive impact in supporting inclusive education and providing better services for children with special needs.

Keywords: Android; Identification; Mobile Application; Special Needs Child; Tool.

INTRODUCTION

Inclusive education, as defined by UNESCO, is a concept in which schools are expected to provide quality education to all students, regardless of the varying levels of ability of each individual. This principle, which states that every child should be treated with respect and given equal opportunities to learn together, represents the international standard for achieving social justice for all (Smith et al., 2023; Hamdan et al., 2021; Buli-Holmberg & Jeyaprathaban, 2016). The concept of inclusive education is an ongoing process that aims to ensure that every child has access to learning opportunities throughout his or her life (Tarantino et al., 2022). Inclusive education also involves the integration of children with special needs into mainstream classrooms designed for children without special needs, in accordance with the principle of equality (Jaspers-van der Maten et al., 2022). This concept emphasises that the education system should be able to accommodate a diversity of children, regardless of physical, intellectual, social, emotional, linguistic or other conditions. In the context of developing social skills and better social interactions, inclusive education is seen as an important approach for pupils (Vyrastekova, 2021; Eklund et al., 2009b; Ratnawulan et al., n.d.).

Inclusive education faces several challenges that seem to hinder the government's efforts to achieve the goal of inclusive education as a way to improve access to quality education for all citizens (Allam & Martin, 2021). These challenges include the difficulty of implementing the identification of children with special needs in inclusive schools (Eklund et al., 2009a). The early identification step is crucial in ensuring that potential problems can be addressed early, before they become more complicated to manage (Mapunda et al., 2017a; Anderson-Butcher, 2006). Inadequate identification can result in children not getting the help or support they need (Palmer et al., 2015; Forness et al., 2000).

The implementation of inclusive education at the elementary school level found several problems in the aspects of teacher understanding or skills in teaching students with special needs, school facilities and infrastructure, student attitudes with the presence of students with special needs in the same class, the role of parents, implementation of learning

and curriculum development, procurement of funds, and cooperation with various parties (Ediyanto et al., 2023; Idrees Naeemy & Yoneda, n.d.; Rosyidi, 2023). Based on preliminary research conducted in inclusive schools in the city of Banjarmasin, schools face limited resources, including time, staff and funding, which can affect the identification process of children with special needs. This lack of resources can hinder schools' ability to conduct a comprehensive assessment of each child. Difficulties in identifying children with special needs at an early stage can lead to delays in providing the necessary support (Nadiyah et al., 2022). By understanding these challenges and working together to overcome them, inclusive schools can improve the effectiveness of identifying children with special needs and better support their development and learning (Koegel et al., 2014).

With the development of mobile technology and the widespread use of smartphones, there is great potential to use mobile applications as tools to improve the quality of life, including to support children with special needs. Children with special needs often require extra attention and support to identify and meet their needs. In this context, the development of mobile applications for the Android platform can be an innovative and effective solution.

Mobile apps can be designed to help identify children's special needs quickly and accurately (Korczak & Zwierzchowska, 2020; Pradal-Cano et al., 2020). Such apps can provide parents, carers and educators with useful information to plan and deliver appropriate care. In addition, with features such as child development tracking and personalised advice, the app can be a valuable tool in supporting the development of children with special needs (Ntalindwa et al., 2020).

Research into the development of a mobile application for Android as an identification tool for children with special needs is important to provide innovative and accessible solutions to communities in need (Ntalindwa et al., 2021). With the right approach to app development, based on sound research and methodology, this app can be a valuable addition in supporting children with special needs and their carers (Azahari et al., 2016). This research has the potential to cover the effectiveness of the application in real situations and identify challenges and opportunities for further development, so that it can provide significant solutions and have a positive impact on communities in need.

Therefore, this research aims to develop an Android-based mobile application that can be used as an identification tool for children with special needs. This involves creating an application that can collect data, analyse the information and provide recommendations or actions based on the identification results. The application should help to identify potential developmental or health problems in children quickly and efficiently (Aziz et al., 2014; Al-Saadi & Al-Thani, 2023). By providing better tools for identifying children with special needs, another aim of this research is to improve the quality of services provided to children and their families. This includes providing appropriate recommendations and support based on the identification results (Khan et al., 2018; Bonnot et al., 2021). This research also aims to encourage further research into the development of technology for children with special needs. It is hoped that the development of this application will open the door to further research into the development of other applications and technologies to support children with special needs.

METHOD

This research is classified as a type of R&D (Research and Development) research method used to produce certain products and test the effectiveness of these products. Using the ADDIE development model, which consists of five stages including analysis, design, development, implementation and evaluation. Dick and Carrey in (Sugiyono, 2015).

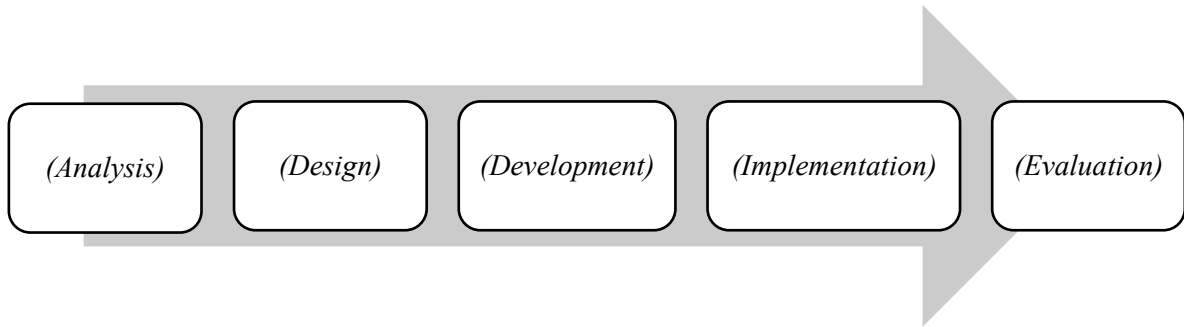


Figure 1. 5 ADDIE Stages

1. Analysis stage

At this stage, the main activity is to analyse the need to develop an android-based mobile application as a tool for identifying students with special needs and to analyse the feasibility and requirements for developing an android-based mobile application as a tool for identifying students with special needs. In the analysis phase, the researchers conducted interviews with a number of teachers and special assistants regarding the implementation of the identification of children with special needs at school, in terms of effectiveness and efficiency, as well as the problems experienced in carrying out the identification of children with special needs in inclusive schools.

2. Design stage

At this stage, the research team created a conceptual design related to the appearance of the product in the form of an Android-based mobile application as a tool for identifying students with special needs, and at the design stage, an FGD (Focus Group Discussion) was also conducted involving teachers to agree on the content or content of statement items suitable for identifying each type of child with special needs.

3. Development stage

The product design prepared by the research team in the form of a product display concept and the content of the statement items for identifying children with special needs agreed through the FGD (Focus Group Discussion) are then submitted to the partners for development. The developed product is then validated by experts to get an assessment and input into the product development, if there is input from the expert, it is then returned to the partner to be corrected according to the input, if the validator's assessment meets the valid criteria, then the product is ready to be used in the implementation phase.

4. Implementation stage

The implementation phase will be carried out on special assistant teachers who are in charge of identifying children with special needs in inclusive schools.

After the user completes the use of the product, the researcher will provide a questionnaire in the form of a google form to be filled by the user to determine the effectiveness and efficiency of the product in the form of an android-based mobile application as a tool for identifying students with special needs in inclusive schools.

5. Evaluation Stage

Evaluation is the process of analysing the results of the user assessment at the implementation stage, if there are no further revisions then the product is suitable for use.

The results of this study are intended for Inclusive Education Providing Schools in Banjarmasin City, so the product development process involves classroom teachers, special assistant teachers from Inclusive Education Providing Schools from elementary to high school levels. Data were collected through interviews, questionnaires and documentation.

The interview technique was used to collect information from teachers about the current implementation of identification of children with special needs in the field, which was then analysed to see the feasibility of developing this product. Questionnaire technique, used to obtain information or data about the validity of the developed product and to evaluate the use of the product by the users. Documentation technique, documentation used in this study in the form of photos and videos of a series of research activities. The data were analysed using descriptive statistics by comparing the number of scores obtained by the respondents (Σ) with the ideal number of scores (N).

FINDING AND DISCUSSION

Finding(s)

Analysis

The main activities in this phase were to assess the need for developing an Android-based mobile application as a tool for identifying students with special needs, and to assess the possibilities and requirements for developing such an application. In this analysis process, the researcher conducted interviews with a number of teachers and special assistants regarding the process of identifying students with special needs in schools, including an evaluation of the effectiveness, efficiency and challenges faced in carrying out identification in an inclusive school environment.

The analysis of the interviews revealed several findings, including: 1) the lack of identification instruments available in the school means that teachers have to make their own instruments before identifying children with special needs; 2) the process of obtaining complete information about a child's condition takes a long time; 3) the use of printed identification instruments has not proved to be effective and efficient; 4) data analysis of the results of identifying children with special needs obtained through printed instruments also takes considerable time and effort.

Design

In this phase, the research team developed a conceptual design for the product presentation, namely an Android-based mobile application that aims to be a tool for identifying students with special needs. In addition, during the design phase, a Focus Group Discussion (FGD) was conducted with teachers to agree on the content or set of statements that would be appropriate for identifying different types of children with special needs. The results of the agreement from the FGD regarding statements and items that describe the characteristics of each child with special needs are as follows:

Table 1. Results of FGDs on identification items for children with special needs

Children with special needs category	Instrument Item
Visually impaired	<ol style="list-style-type: none"> 1. Cannot see at all 2. Less able to see clearly despite the use of aids 3. Often fumbles and trips or bumps into things 4. Able to read large print at close range or with a magnifying glass
Deaf	<ol style="list-style-type: none"> 1. No hearing at all/no response to nearby sounds or noises 2. Hearing loud noises at a very close distance and/or frequently tilting the head in an effort to hear 3. Often uses signs to communicate 4. Verbal language is unclear in terms of pronunciation, articulation and intonation
Mentally impaired	<ol style="list-style-type: none"> 1. Difficulties with self-help/activities of daily living 2. Difficulty understanding social rules

Children with special needs category	Instrument Item
Physically impaired	<ol style="list-style-type: none"> 3. Experiencing barriers in maintaining social relationships with peers 4. Inability to show adaptive behaviour 5. Difficulties in reading, writing, counting 6. Facial structure resembles mongoloid (narrow and slanted eyes, thick tongue and usually tends to stick out, small ears, dry hands, small nose, skull bones appear short from face to back) <ol style="list-style-type: none"> 1. Upper limbs (hands) are stiff/weak/paralysed/sluggish 2. Lower limbs (legs) are stiff/weak/lame/paralysed 3. There is impaired co-ordination of movements (eyes with hands; eyes with feet; eyes hands and feet) 4. The movement shown is a tremor (movement as if shaking) 5. Partial or total loss of limbs (hands and feet)
Social Emotional impaired	<ol style="list-style-type: none"> 1. Often emotional/ irritable/selfish 2. Often defies authority/breaks established rules 3. Often acts aggressively/ destructively/ disruptively/ fights/ attacks without reason 4. Often acts against social norms/moral standards/law and religion 5. Often behaves in a disrespectful manner/speaks harsh or dirty words
Autistic	<ol style="list-style-type: none"> 1. Avoid or refuse eye contact 2. No attempt to interact or communicate with others, preoccupied with playing alone/tends to be alone 3. Unable to show empathy/often refuses to be hugged 4. Often laughs to self, cries or gets angry for no apparent reason 5. Often has uncontrollable tantrums, especially if he does not get what he wants, may become aggressive and destructive 6. Does not play according to the function of the toy, e.g. the bicycle is turned upside down and the wheels are twisted 7. Likes to hurt himself and/or others 8. Speaks meaningless words / a lot of imitation or echolalia or makes meaningless movements (hand flicking) 9. Does not understand the concept of safety / unable to avoid danger
Attention Deficit Hyperactivity Disorder-Inattention	<ol style="list-style-type: none"> 1. Often fails to pay attention to details or makes careless mistakes in school work and other activities 2. Often has difficulty concentrating on play tasks 3. Often does not listen/ignores when spoken to directly (not due to hearing loss) 4. Often does not follow instructions well and does not complete work (not due to oppositional behaviour or inability to understand instructions) 5. Often has difficulty carrying out tasks and activities 6. Often loses items/objects essential for tasks and activities 7. Often avoids or dislikes doing tasks that require thinking skills, e.g. 'regrets school work' 8. Often confused/distracted by external stimuli 9. Often forgets quickly when carrying out daily activities
Attention Deficit Hyperactivity Disorder- impulsive hyperactivity	<ol style="list-style-type: none"> 1. Often fidgets with hands or feet and often squirms in chair 2. Often leaves their seat in the classroom or in other situations 3. Often runs around or climbs on surrounding objects excessively in inappropriate situations and conditions 4. Often has difficulty playing or engaging in quiet leisure activities 5. Often moves or acts as if controlled by a motor (without feeling tired), 6. Often talks excessively 7. Often answers before the question is finished 8. Often has difficulty waiting his turn 9. Often interrupts the conversation
Gifted	<ol style="list-style-type: none"> 1. Easy to understand the lesson 2. Easy to recall the lesson

Children with special needs category	Instrument Item
	<ol style="list-style-type: none"> 3. Has a wide vocabulary 4. Sharp reasoning (logical thinking, critical thinking, understanding cause and effect relationships) 5. Can express thoughts, feelings or opinions fluently in writing or orally 6. Has a strong curiosity for intellectual matters, including carrying out simple experiments and studying dictionaries 7. Has a good sense of duty 8. Shows outstanding talent in the arts or sports
Specific Learning Difficulties	<ol style="list-style-type: none"> 1. Demonstrate good self-help skills 2. Demonstrate adaptive behaviour 3. Able to establish good social relationships 4. Difficulties in reading (subtracting or adding words, letter 'p' as 'q' and letter 'b' as 'd', often reversing words, e.g. book is read as 'duku', difficulties in spelling) 5. Difficulties with writing (inconsistent formation of letter shapes, use of upper and lower case letters is still mixed, the size and shape of the letters in his writing are not proportional, it is difficult to hold a pencil correctly, the way of writing is inconsistent and does not follow the flow, the writing is difficult to read and understand) 6. Difficulties in counting (difficulty in using symbols, in understanding narrative problems, also less able to understand the steps in solving a problem)

Development

The research team has developed a conceptual design of the product that combines the concept of appearance and content of statement items to identify children with special needs, as agreed upon through FGD (Focus Group Discussion). This design will also be presented to partners who are IT experts to be further developed in the form of applications. Initial product development by partners takes approximately 2 months which includes product revisions based on suggestions and input from validators. In detail, the resulting product is an Android-based mobile application that aims to identify students with special needs in inclusive schools.

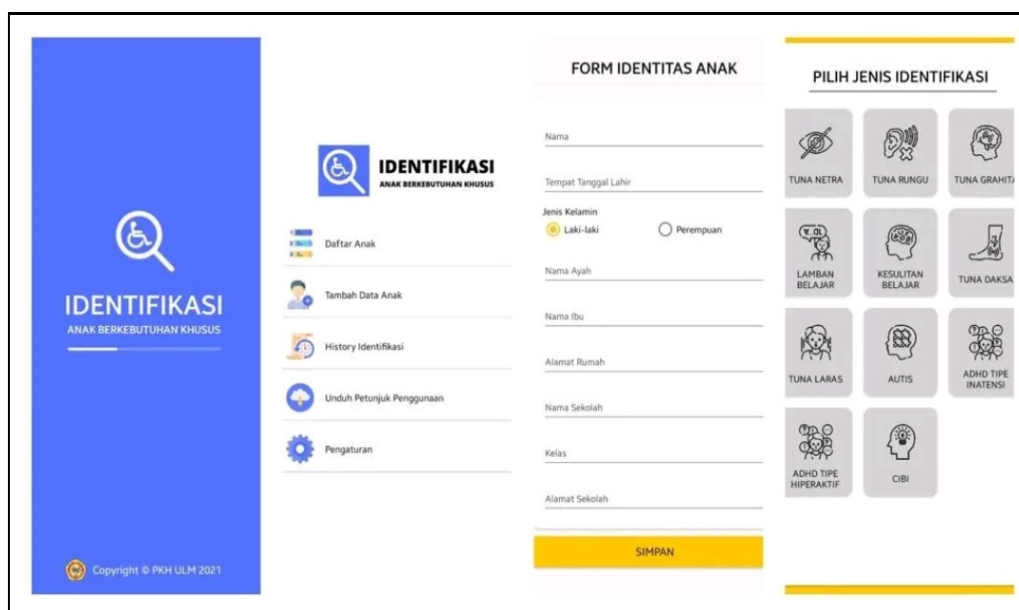


Figure 2. Product Development

Once the product has been developed, the next step is to validate the product by involving experts in order to obtain the necessary evaluation and input for further development. If there is input from the expert, the product is revised by the partner according to the suggestions given. Once the product has been validated by the validator, it is ready for the implementation phase. The results of the expert validation showed that the developed product, namely an Android-based mobile application for identifying students with special needs in a wetland environment, was considered to be highly valid. The percentage of validity was 80% according to the first validator and 85.45% according to the second validator. Therefore, the product is considered very feasible to be used or implemented by users.

Implementation

The implementation phase was carried out with the involvement of special assistant teachers who are responsible for identifying children with special needs in inclusive schools. The research team first socialised the use of the application to the users before it was used as a tool for identifying students with special needs in inclusive schools. The implementation of the product use was carried out in four primary schools providing inclusive education in the Banjarmasin area over a period of one week. The four selected schools have been providing inclusive education for a long time and have special assistance teachers with special education backgrounds, so it is expected that users who are special assistance teachers will be able to provide feedback and input on the development of the products.

Table 5. Data of Trial Schools and Number of Users

No	School	Users
1	SDN Pasar Lama 6	3 teachers
2	SDN Banua Anyar 8	4 teachers
3	SD IT Alfirdaus	3 teachers
4	SDN Sungai Andai 3	5 teachers
Total		15 teachers

In principle, there are no significant obstacles in the implementation of product use by users, several students are assisted to accompany each user in identifying children with special needs in their respective schools. the developed product can be used to identify children with special needs with types of Visually impaired, Deaf, Mentally impaired, Physically impaired, Social Emotional impaired, Autistic, Attention Deficit Hyperactivity Disorder-Inatensi, Attention Deficit Hyperactivity Disorder-impulsive hyperactivity, Gifted, and Specific Learning Difficulties.

Evaluation

After the users had used the product, the researcher submitted a questionnaire via Google Form to collect the users' responses on the use of Android-based mobile applications as a tool for identifying students with special needs in a wetland environment. Some of the aspects assessed in the questionnaire include: product interface, layout, ease of use, choice of icons, meaning, usefulness, effectiveness and efficiency. The following is a visualisation of the users' evaluation results regarding the use of Android-based mobile applications as a tool for identifying students with special needs in a wetland environment.

Evaluation is a step to examine the results of user evaluations during the implementation phase, with the aim of identifying any shortcomings or weaknesses that may exist. If there is no need for revision, the product is considered ready for use. The results of

the evaluation of the responses of 15 special assistant teachers as users on the use of the developed product are as follows:

Table 6. Product implementation evaluation results

No	Statement	Presentation	Categories
1	Attractive product display	70,8%	Good
2	Attractive product layout	62,5%	Good enough
3	The crew identification application product is easy to use	95,8%	Very good
4	Symbols used in product are interesting and relevant	91,7%	Very good
5	The language used in the instrument items is EYD compliant.	95,8%	Very good
6	Statement on each instrument item is not ambiguous	95,8%	Very good
7	The statement on each item is easy to understand	91,7%	Very good
8	The identification report is easy to understand and interpret	75%	Good
9	Downloadable identification document files are very useful for school administration needs.	100%	Very good
10	The application makes it easier for teachers to identify children with disabilities	95,8%	Very good
11	The implementation of identification of children with disabilities can be more efficient with the use of the developed application.	100%	Very good
Average		82,6%	Good

Based on the evaluation of the user's reaction to the use of the product, the overall percentage obtained was 82.6% with the category "good". however, the layout aspect of the product was still considered to be quite good with several inputs including: 1) it is necessary to add a user manual feature, and 2) in the child list menu it should be possible to make edits if there are child data errors. Based on this, the product will be revised by development partners in accordance with the suggestions and input provided by users before the product is implemented further.

Discussion(s)

One of the challenges in implementing inclusive education is to provide learning services to children with special needs according to their conditions and learning needs. One of the most important things to do before providing learning services is to identify children with special needs (Ydesen & Andersen, 2020); (Shelton et al., 2021). The identification and assessment process is a very important stage as it is the basis for designing learning programmes for children with special needs (Martika, 2020); (Elder et al., 2021). The identification of children with special needs in inclusive schools still faces various challenges in its implementation (Mapunda et al., 2017b); (Lipsky & Kantor, 2019). These include teachers who do not have the capacity to develop identification tools, parents who do not understand their children's conditions, and parents who do not provide teachers with transparent information about their children's development. Challenges related to families' knowledge of child development and available services, professional practices and training are significant barriers that contribute to low rates of early identification (Weglarz-ward et al., 2013; Yonkaitis & Shannon, 2017).

Failure to identify children with special needs from the outset can result in the development of service programmes that are not appropriate for their conditions and needs (Aquino1 & Bittinger2, 2019; Rofiah & Kawai, 2020). These issues can hinder the provision of intervention services for children with special needs. Early identification of developmental delays and disabilities through routine developmental screening is critical to

achieving positive outcomes for children, families and communities (Weglarz-ward et al., 2013). By recognising the characteristics of students with special needs, we can identify the barriers children face and support them to overcome the learning challenges they face (Wiliyanto, 2017).

It is hoped that the development of an Android-based mobile application as a tool for identifying students with special needs will make it easier for teachers and parents to identify children with special needs. The application is designed to be a very user-friendly tool and comes with a guide to make it easy for anyone to use. After the teacher or parent fills in the data on the tool according to the child's condition, the application will provide information and an indication of the barriers the child may face according to the type of special needs. Specifically, the results of the identification that has been carried out on children with special needs can then be downloaded by teachers who can use them as administrative documents for the implementation of identification of children with special needs in inclusive schools.

The app provides easy access for parents, teachers or health professionals to identify children with special needs in their neighbourhood (Apostolidou & Fokaidis, 2023) (Kraleva & Kralev, 2018). Designed with a friendly user interface, the app is easy to understand and use by users with no technical background (Saputra & Kania, 2022). By providing a range of useful features, such as a selection of special features, advice or recommendations, and links to relevant resources or services, the app has comprehensive functionality (Weichbroth, 2024). The app supports early intervention by identifying special needs early in a child's development, which can improve long-term outcomes for these children (Rajeev & Verma, n.d.). However, it has limitations in detecting various special characteristics with a high degree of accuracy, such as IQ test results.

There are therefore several implications for future research: There is a need to focus on developing more sophisticated identification algorithms and technologies to improve the accuracy of identifying children with special needs (Weichbroth, 2024). Developers need to expand and improve key features of the app, such as more sophisticated information filtering, better recognition of special characteristics, and integration with a wider range of resources and services (Kraleva & Kralev, 2018). This will improve the functionality of the app and enrich the user experience. There is also a need for field trials with potential users to measure the performance, effectiveness and usability of the application (Rubio-Martín et al., 2024). A more in-depth evaluation will help to identify problems or areas for improvement that need to be further developed in the development of the app. With these implications in mind, further development of the app can be more targeted and effective, and can make a significant contribution to supporting the identification and care of children with special needs.

CONCLUSION

The conclusions from research related to "Mobile Application Development for Android: A Special Needs Child Identification Tool" are as follows: 1) The development of an Android-based mobile application as an identification tool for children with special needs has made a significant contribution in facilitating the identification process by teachers and parents. This application allows them to recognize various types of special needs, such as visual impairment, hearing impairment, autism, ADHD, and others, and provides clear guidance in its use; 2) Identification of children with special needs is carried out by filling in data in the application, where the dominant characteristics appear after the data is filled in. This process is based on the results of an agreement from a Focus Group Discussion (FGD) involving teachers with a special education background. For children with autism and

ADHD, characteristics are defined based on DSM V; 3) This application is an effective tool in identifying obstacles that may be experienced by children with special needs, by considering the scores obtained on certain types of obstacles; 4) With this application, it is hoped that it can facilitate the identification process, assist in preparing appropriate service programs, and improve appropriate interventions for children with special needs; 5) Validation from experts shows that this application is in the very valid category, indicating that this application is ready to be used and implemented by users, such as teachers and parents.

Thus, the development of this mobile application has the potential to have a positive impact in supporting inclusive education and providing better services for children with special needs.

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