



# Mobile Learning with Mind tools Can Improve Problem Solving Skills in Learning for Autistic Children

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## Abstract

This study aims to determine the effect of mobile learning with mind tools on the problem-solving abilities of autistic children in learning. This study uses qualitative research using a descriptive approach. The sample used is one student with special needs. Instruments and data collection were made in the form of questionnaires and tests. The results of the analysis show that problem solving skills in autistic children can increase the chances of identifying responses. In addition, mobile learning as a mind tool is very suitable for use for children with autism to improve problem solving skills. Autistic children have limitations in communication and social interaction, appropriate or supportive learning by using mobile learning because it supports the use of various learning applications that can be adapted to the characteristics of autistic children. This shows that the use of mobile learning with mind tools from the results of the analysis can improve the thinking skills of autistic children.

**Keywords:** Mobile learning, mind tools, problem solving, autistic children

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## 1. Introduction

The gap in the field of accelerated learning technology cannot be fully followed by all stakeholders in education for children with special needs. The acceleration of the transformation of educational technology

that is not followed by the readiness of both teachers and students through the use of mobile learning as mind tools. In learning, of course, it will cause problems that must be taken seriously by both regular students and students with autism spectrum present.



Special schools, inclusive schools, parents, therapists, and teachers must work together to provide meaningful learning and still achieve educational programs for autistic children through the use of mobile learning as mind tools (Bakare, Ebigbo and Ubochi, 2012; Criollo-C *et al.*, 2021)

Children with autism are characterized by developmental disorders in several aspects, namely communication, social interaction and behavior (Faridi and Khosrowabadi, 2017). They are very, very difficult to want to make eye contact with other people let alone play and interact with their peers, these kids are more preoccupied with their own world and don't seem to care about other people. These obstacles are what increasingly create problem nodes that must be unraveled by utilizing various learning resources as a result of learning technology innovations, namely by using mobile learning as mind tools for children with autism to improve problem solving skills for children autism in achieving meaningful learning (Robinson *et al.*, 2009; Criollo-C *et al.*, 2021).

Learning to use mobile learning as mind tools for children with autism spectrum is expected to be part of problem-solving solutions and increase decision-making skills in using digital learning resources which will also affect self-regulated learning for children with autism to be able to adapt and reduce their dependence on formal rules that stiff and difficult to move from previous activities. autistic individuals with Asperger's syndrome have a marked dependence on formal rules and rigid social conventions and lack spontaneity in adaptation (Grelotti *et al.*, 2005).

Children with autism are also literate in

IT (information technology) but cannot be varied because it is difficult to concentrate in learning. Research results from the University of Cambridge on Indonesian students are among the highest technology users in the world in the field of education, with the following results: 67% or more than 2/3 of students in smartphone-based learning, and doing their homework with this mobile technology by 81%. Students in Indonesia are the highest laptop users who do schoolwork at home (84%) after the United States (85%) (Kumm, Viljoen and de Vries, 2022).

Mobile learning as mind tools for children with autism is flexible and independent of time and place. By utilizing mobile learning as a mind tool in learning, children with autism are expected to be able to visualize knowledge and share knowledge in learning so that meaningful learning is easier to achieve. Children with autism can learn to solve their own problems and are able to self-regulate in learning and are more sensitive in decision making or making decisions. Children with autism can communicate and learn to interact socially through the use of mobile learning as mind tools through learning resources provided in the form of audio, text, video, chat (instant message) in WhatsApp, chat in telegram, line, or platforms that can be selected and provided in mobile learning used. Learning using mobile learning in children with autism can also be done asynchronously which can be done at different times or there is a time lag in interacting with the teacher. Interaction between students and teachers can be done at the same time (delayed time) in learning called asynchronous (Yee, 2012).

Children with autism spectrum disorders



may experience varying degrees of social communication and behavioral deficits that impact the development of appropriate interpersonal problem-solving skills, peer acceptance and instructional support. Autism spectrum disorders (Autism Spectrum Disorder) are children who have characteristics of deficits in social and communication functions and the presence of stereotyped or repetitive behavior(Charitaki, Soulis and Tyropoli, 2021). Problem solving skills are needed by autistic children to improve appropriate responses and reduce maladaptive behavior so that learning goals for autistic children can be achieved(Lora *et al.*, 2020). Individuals with autism spectrum problem-solving abilities can increase the likelihood of identifying the correct response and allow for reduced maladaptive behaviors such as aggressiveness, stereotypes, tantrums, property damage or self-harm. It is possible that problem-solving skills can be a solution to social barriers and self-regulation deficits in them.

The problem-solving skills that children with autism spectrum must get used to are related to their deficits in terms of receptiveness, contextual understanding, and conceptual understanding. Learners with autism spectrum have difficulty choosing the right approach because they have difficulty with weak central coherence, difficulty seeing similarities, and general structure of different examples and exercises. A didactic approach that is adapted to the characteristics of autistic children for word problem solving should be at improving reading comprehension, mathematical vocabulary, computing, and everyday mathematical knowledge.Solving math problems using

mind-training questions Children on the autism spectrum have difficulty because of their inner executive dysfunction. By using mobile learning as a mind tool in facilitating the learning of autistic children, it is hoped that they can better regulate their ability to regulate themselves. Academic success, a predictor of children's involvement in school and peer acceptance is determined by the child's ability to self-regulate which is an important life skill to develop in students with autism spectrum disorders (ASD) interacting with friends and socially environment(Jahromi, Bryce and Swanson, 2013). A teacher or therapist must recognize and understand the problems when providing learning to autistic children related to the ability of self-regulation in children's learning.

Mobile learning as mind tools is studied in thematic learning of children with autism adapted from the K-13 Special Education curriculum for SMPLB by looking at the effect on language and mathematics subjects which are expected to have a significant effect on increasing problem-solving skills, self-regulated learning and decision making for children with autism.This study aims to examine the effect of using mobile learning as mind tools on problem-solving skills in children with autism, which is carried out by facilitating learning for children with autism with various learning objects such as learning media formats in the form of text, animation, video, audio, educational games, simulations, hypermedia or a combination of all formats in the form of flexible and accommodating mobile-based software.

## 2. Method

This research is experimental research at

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students with special needs with limited subjects. The experiment given is by giving treatment to research subjects related to learning for children with autism using mobile learning as mind tools in learning activities. Single Subject Research has features equivalent to other experimental research designs. A single-subject experiment is an

experiment with a single participant or one person, two or more people. In this study, single-subject research was chosen with an A-B-A design, on the grounds that a causal relationship can be seen between treatment and intervention in the participant between variables.

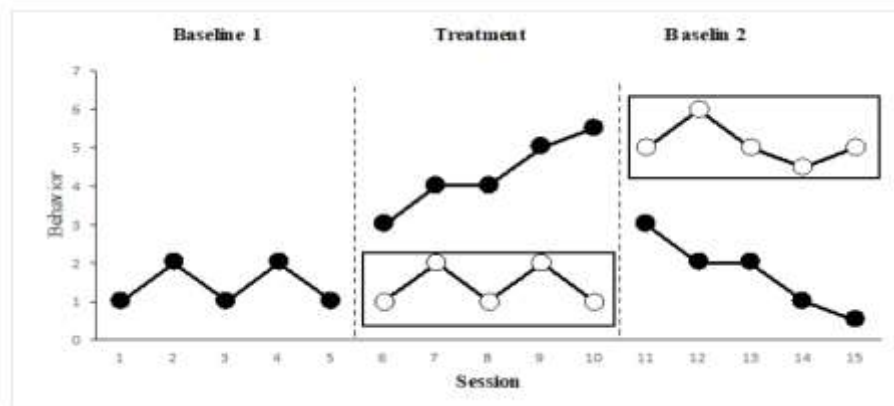


Figure 1. Design A-B-A

In this study, multiple baselines across participants are also needed to determine the consequences of the treatment/intervention on the subjects studied in the use of mobile learning as mind tools for problem-solving, self-regulated learning, and decision-making skills in children with autism. Single subject approach (SSR) research is a single subject approach designed to study the individual behavior of research subjects. Focusing on research observations of behavior change in one or several individuals. It SSR is to examine individual subjects by comparing before being given treatment and after being given the intervention. This experiment using mobile

learning as mind tools was carried out with multiple baseline designs and will be carried out in 14 weeks or until the trend.

During the experiment, both in the baseline and intervention sessions, the four research subjects were not allowed to communicate in order to obtain accurate or unbiased results in this study. Every week, each research subject will be given word problem solving questions using mobile learning as mind tools to 20 questions related in math and language skills. Each of these participants will be trained in problem solving syntax in 6 days pre-experiment.

Subyek I	000I <sub>1</sub> 00000I <sub>2</sub> 000000
Subyek II	000I <sub>1</sub> 00000000I <sub>2</sub> 000
Subyek III	00000I <sub>1</sub> 00000000I <sub>2</sub> 00
Subyek IV	00000I <sub>1</sub> 00000000I <sub>2</sub> 00

Figure 2. Multiple Baseline across *N* by Kratochwill & Brody (1978)

Baseline data (A1) on Subject I for 3 weeks, Subject II for 4 weeks, and Subject III for 5 weeks, Subject IV for 5 weeks. Intervention (B) on Subject I for 5 weeks, Subject II for 6 weeks, Subject III for 7 weeks, and Subject IV for 7. Baseline data (A2) on Subject I for 6 weeks, Subject II for 4 weeks, and Subject III for 2 weeks, Subject IV for 2 weeks. Variables are activities or objects, values, properties, and attributes that have certain variations that have been determined to be studied and concluded by researchers. The effect of using mobile learning as mindtools on problem-solving skills in children with autism by using SSR. In this study, four children with autism type Asperger syndrome were taken at the Extraordinary Junior High School (SMPLB) level as research subjects.

The research subjects or participants consist of PKLK Insan Istimewa Magetan. Collection techniques and instruments are

observation data, questionnaires, and tests. The form of the test in the use of mobile learning as mind tools in this study used word problem solving with material adaptation from the thematic book for class VII SMPLB Autism theme 2 K-13 special education curriculum. In solving problems problem-solving skills. The form of problem-solving tests for children with autism as research subjects is provided in online and offline forms that can be accessed via mobile technology. Problem-solving tests are given to participants to be solved or find solutions with mobile learning as mind tools. This test aims to monitor and control the treatment of the problem-solving process with mobile learning as a mind tool. Data analysis was made in the form of a comprehensive picture of the results of the interventions carried out in this study during a certain period analyzed using simple descriptive statistics.

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### 3. Results and Discussion

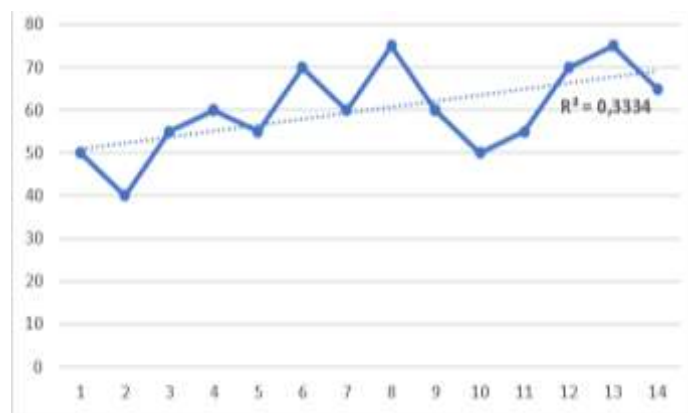


Figure 3.  $R^2$  Child problem solving skills

At baseline 1, Child 1 did not experience an increase in problem solving skills, when at the intervention, experienced an increase in problem solving skills with an estimated trend of 3.5 after using mobile learning as mind tools. At baseline 2 there was a slight downward trend in problem solving skills of 3,286. The calculation of  $R^2$  shows 0.3334 which means that the use of mobile learning as mind tools on problem solving skills in child 1 has an effect of 33.34% and is classified as high. The use of mobile learning as mind tools based on the results of this study shows that it is very influential on problem solving skills in children with autism by reviewing the  $R^2$  value range of the four participants. The use of mobile learning based on the results of research from (Al-Khateeb, 2018). It shows that students are better at solving problems than those who do not. Utilization of technology in the learning process is effective in developing learning and the results for the better (Stathopoulou *et al.*, 2020). The use of various kinds of learning applications through mobile learning makes children with autism fast from day to day in learning with pleasure, communicating well and practicing (Stathopoulou *et al.*, 2020). The use of mobile learning based on research results from (Crompton and Burke, 2020) shows that learning transformation is better than

without using it, which is 54% compared to 46%. Learning using mobile learning for children with autism can help their learning with various applications to be used both in the classroom and outside the classroom, and teachers can use various learning models (Alvarez, 2014).

The use of mobile learning as mind tools can help students in problem solving where they will be consciously involved in their learning tasks by thinking more meaningfully by building the reality of their own knowledge (Huda *et al.*, 2022). Mindtools help in facilitating the settings and domains as well as students' cognitive processes that will make them think harder (Kirschner and Wopereis, 2003). The use of various applications in learning allows students to synthesize their knowledge which will improve problem solving abilities (Chu, Hwang and Tsai, 2010). Research from (Herrero and Lorenzo, 2020) in children with autism using virtual reality shows an effect in developing problem solving. Children with autism using mobile learning are able to overcome various obstacles they have, such as barriers to communication, social emotions, and functional life skills that have an impact on problem solving skills by using various learning applications (Stathopoulou *et al.*, 2019).

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Mobile learning in learning for children with autism can do individual learning facilitated by various available devices so that the limitations of children with autism are greatly helped (Vlachou and Drigas, 2017). Individual learning with the use of mobile learning is very helpful for children with autism in exploring various learning resources related to devices that are able to overcome their communication and concentration barriers (Koumpouros and Kafazis, 2019). Research from (Siyam and Abdallah, 2021) shows that the use of mobile learning for autism spectrum disorders is very good in use, because it supports learning coordination and communication. The use of mobile learning as mind tools for children with autism provides independent time that adjusts to their level of development and ability in the problem-solving process (Cheng *et al.*, 2018).

#### 4. Conclusion

Based on the results of the analysis, it was found that the use of mobile learning as a mind tool had a very effective effect on the problem-solving skills of children with autism in SMPLB. The four participants in this study experienced an increase which was classified as very effective in changing the problem-solving skills of children with autism in SMPLB during the learning process. There are several things that need to be considered when using mind tools in learning, namely Mobile learning as mind tools are very suitable to be used for children with autism to improve problem-solving skills. Autistic children who have limitations in communication and social interaction, appropriate or supportive learning by using mobile learning because it supports the use

of various learning applications that can be adapted to the characteristics of children with autism.

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