



Ganitha Sahaya

Math Tool for Special Education

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Abstract. Ganitha Sahaya – Math tool for special education, is a device that helps children suffering from autism in learning basic numbers and simple arithmetic operations. The device works for different levels of children, and it helps them in several stages. There are three modes of output that attract and are interactive with children using the device specially designed for autistic children.

Keywords: Autism · Learning Aids · Special Education

1 Introduction

Autism is a condition of neurological development that is characterized by limited and repetitive behavior as well as poor social interaction and communication. A triad of symptoms—impaired social interaction, impaired communication, limited interests, and repetitive behavior—typically accompany it.

Children with autism the age of five or below has less attention to their parents and will not be responsive compared to normal children and also will be less interactive in their daily activities and cannot talk or communicate with normal actions or signs like healthy children [1].

Major communication issues include difficulties engaging in imaginative play and converting symbols into language, a lack of natural speech to satisfy everyday requirements, delayed babbling beginning, strange gestures, decreased attentiveness, and vocal patterns that are not in sync with the carer. Less inclined to ask for things or tell others about their experiences and more likely to quote others. The research was conducted to look at the behavior of autistic kids when they are trained by expert trainers. To fully comprehend their behavior and the potential for technology interventions, a variety of methodologies and tests were applied, such as shadow studies and 3D- LATs [2] (Three-dimensional language acquisition tests) [3]. The observations after “5” sessions are listed here in abbreviated form (Total 12 h. of observation).

Predominant lack of responsiveness to external oral stimuli, such as few youngsters turning their heads or responding when their names were spoken, Minimal interaction with other students in a group setting or collaborative social relationships, and Little reaction to induced activity, which means that kids didn’t seem really interested in them and didn’t really pick up where the instructor left the activity, Occasionally, even after

completing, the youngsters were unable to indicate that the activity had been completed successfully. Possess a rudimentary understanding of the position, i.e., a spatial awareness, Actions are merely mimicked, not comprehended when duplicated, in imitation of others' behavior. Unable to complete the task without a lead.

2 Literature Survey

The studies say the attention and care needed in special education is more for learning math, and new technologies need to be used [4]. Hasson's studies say that children with ASD need special care and inclusivity in the learning process [5]. Christopher B. Denning mentioned in their study that ASD learners need to get new research learning practices to achieve academic activities [6].

According to the study and data collected by Dr. Shabina Ahmed the observation noticed that the communication ability could be connected to the user's body posture [7]. The research was done to understand the communication modes in humans, as shown in Table 1 [8].

Figure 1 provides an illustration of the typical classroom layout in a traditional school not using a teaching tool for an autistic student. Focus and attention are diverted away from the teacher and onto the toys, as was shown. Figure 2 is a conceptual illustration of the new classroom setup that includes a teaching aid for the autistic youngster. The toddler started to repeat and understand what the instructor is trying to explain because of toy's engagement in the lesson.

Table 1. Understanding the communications modes of Autistic children.

Body Language- 55%	The tone of voice- 38%	Content of words- 7%
Body posture	Pitch	Lexicon
Hand and leg gestures	Volume	Syllables
Facial Expressions	Timing	Repeatability of Words

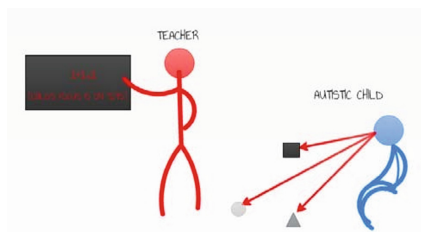


Fig. 1. A typical classroom layout in a traditional school not using a teaching tool

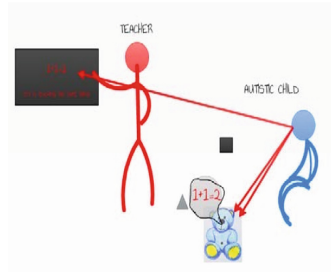


Fig. 2. A new classroom setup that includes a teaching aid

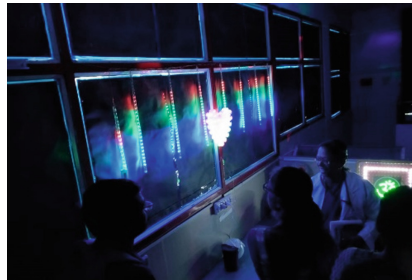


Fig. 3. The tools/equipment used to train autistic children

3 Case Study

A case study can be conducted to understand the behavior, tools, focus, and teaching methods of autistic children. This information can then be used as input for developing the prototype of the learning math tool. The case study is conducted in a special school that works with autistic children. The study involved observing and interacting with the children over a period to gain insights into their behavior, learning styles, and preferences. The study also involved interviewing teachers, and other caregivers to gain additional perspectives on the children's needs and challenges. The insights gained from the case study is used to develop the prototype of the “Ganitha Sahaya” tool effectively.

Figures 3, 4, 5 and 6 show the teaching methods used by teachers.

4 Methodology

Ganitha Sahaya aims to make autistic children learn Numbers, number systems & simple arithmetic operations. This device is intended to help autistic children with their learning abilities in the simplest way. It is a board consisting of two sets of numerical input accompanied by a push button respectively. Each set consists of numerical 0–9 and a separate operations button for addition, subtraction, multiplication, and division.

The learning process for children depends on the individual. Initially, the child needs to know the numbers, then the child needs to figure out the shape of the number, and its



Fig. 4. Different colored lights, attract the children to keep them focused in one place



Fig. 5. Classroom for the differently-abled children



Fig. 6. Teachers/Mentor use various teaching methods

value too, the placing of two sets of numbers and the respective LEDs, when the child will be perfect with all ten digits {i.e., 0–9}.

The next level will be introducing the two-digit numbers where these two sets of numbers help the child understand the formation of two-digit numbers the next level will be the application of basic arithmetic operations and the formation of a simple equation, as the device consists of four different buttons four different operations (+, -, *, /).

Figure 7 shows the block diagram of the developed math tool. Figure 8 shows the prototype of Ganitha Sahaya – Math tool for special education.

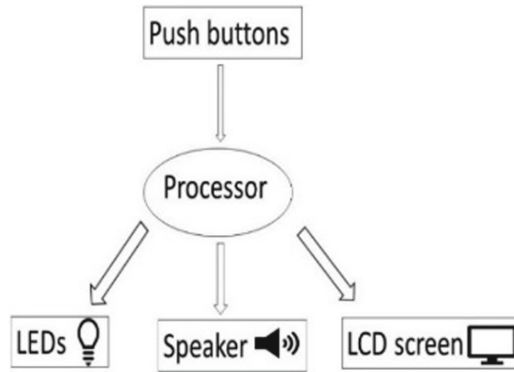


Fig. 7. Block Diagram



Fig. 8. Prototype of Ganitha Sahaya – Math tool for special education.

4.1 Prototype

5 Conclusion

Ganitha Sahaya is an excellent tool for autistic children to learn the basics of numbers and simple arithmetic operations. The device addresses all the key points where an autistic child needs help overcoming their abnormality. The implementation of this device in the education of autistic children can make a significant positive impact on their academic and personal growth. By providing them with the necessary resources and support, we can help these children reach their full potential and succeed in mathematics and beyond. The device works for different levels of children as it starts with teaching numbers and various mathematical operations (addition, subtraction, multiplication and division).

6 Future Scope

A pilot study can be conducted to evaluate the tool's effectiveness in improving math skills in children with autism. A sample size of at least 10 to 20 subjects is usually recommended. The participants in the study could be from special schools, therapy centers, or other institutions that work with children with autism. The study can be designed as a randomized controlled trial, with one group of children using the "Ganitha Sahaya" tool and another group using traditional methods of teaching math. A quantitative study could involve assessing the performance of children with autism in learning math using the tool. The data could be collected through standardized tests.

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