

Aid for Children with Learning Disability

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Abstract

With rapid and fast development in AI, E-learning and distributed learning provides an excellent platform for children to learn at their own pace without much intervention from parents. Also, parents should keep in mind that early intervention will not only help an individual(child) in academics but can also create a positive impact in the workplace and relations with family and friends. Thus computer-based systems would help them to overcome their learning difficulties.

1. INTRODUCTION

Learning disabilities are neurologically-based processing problems. Such problems can result in a comparatively slower growth of a child's brain and their learning skills to their peers. These learning skills can include lower as well as higher level skills such as reading, signal processing, reasoning, memory, attention and writing. These learning disabilities most often can't be cured but it's effect can be reduced through early intervention by professionals and by creating a supportive environment around the child which should be done by their parents to help them through physical or challenging activities which can in turn improve their capabilities.

Some types of learning disabilities are as follows:

Dyscalculia: This type of learning disability involves difficulties in understanding math related problems, right from numbers to complex equations and hence can vary from person to person. For example, at an early stage the child might just struggle with numbers and counting but eventually can lead to inability in learning math facts such as equations and multiplication tables..

Dyslexia: This disability can be of two types, one in which the child faces difficulty in understanding sounds of similar words and another in which there is difficulty in grasping the meaning of a few words and sentences. Children might also face difficulties in expressing their thoughts into words, not knowing the meaning of those words.

Language Processing Disorder: It is a type of disorder in which the victim is unable to process the spoken or the natural language which means that there is difficulty in

understanding the meaning of spoken words and converting the same in a lower-level language.

ADHD: In this type of disorder the child is unable to stay focused and can get easily distracted by their surroundings which in turn shows their hyperactive behaviour and this can cause difficulty in their schooling. If this is controlled at an earlier stage, ADHD victims can be very successful in the later stage of their life. Hence, it is also termed as a neurodevelopmental disorder.

Down Syndrome: It is a type of genetic disorder which causes a distinct facial appearance, cognitive delays and intellectual disability. It is basically a condition in which an individual has an extra chromosome. Early intervention programmes are helpful for both children as well as adults in order to improve the quality of their lives.

With the fast progress of computer technology, researchers have assayed to use artificial intelligence to improve computer-aided instruction systems for children with learning disabilities. This system is to cure any type of disability which will enhance the learning and problem solving skills of a student. Meanwhile, researchers have also attempted to develop more efficient and impressive programs to enhance the learning performance of students. However, customary systems for testing merely give students a score, and don't give them the occasion or a chance to learn how to improve and develop their learning performance but such systems would really help them to interact and not worry about the performance of their peers. The analysis of these tests would help to advise the students with their learning patterns and indicate their strengths and

weaknesses. This analysis can be done using the computer based learning systems which use algorithms to track a student's progress and give them insights.

Such a system helps the students to learn at their own pace, time and place with a portable learning aid which also acts as a therapy to overcome their learning disabilities on the go.

With the system they can be freer in their actions so that they do not feel the pressure to do well. They feel free to try stupid actions, from which they can learn in a trial and error manner. A computer based system can help students to learn and test knowledge without being controlled by a teacher.

This learning aid is defined as an educational software with artificial intelligence and tracking a student's progress on a daily basis.

An intelligent tutoring module is very effective for students as it allows them to learn at their own pace without the fear of being overshadowed by their peers. Exercises which help individuals to overcome their fears, boredom, and get their interests are designed so that such children can improve their capabilities and be at par with the competitive world or environment outside their comfort zone.

People with disabilities – mental, physical and social - often either do not prefer to attend classes or get involved in human interaction, but are still motivated to learn. Several studies with disabled people have focused on dealing with physical disabilities (Visual, Hearing, etc). There are a number of learning aids developed for people with hearing, speaking disabilities.

This paper will explore a learning aid architecture for children with learning disabilities providing them with early intervention services in order to enhance their overall development skills and increase their learning performance.

Structure of the paper is as follows: Section 2 is the need for Learning aid, section 3 is Intervention of AI, section 4 is Objectives of our system and finally section 5 is about our proposed Methodology.

2. NEED FOR LEARNING AID

2.1. Problem Areas

Children having learning disabilities usually face issues such as :

- Lacking intellectual abilities to perform tasks which are required in daily life.
- Developmental delay: cognitive, language , self organisation, number skill
- Complex reasoning and judgement
- Communication and lack of speech: sentence structure, grammar and speech production
- Poor social skills : lack of inclusion due to speech

clarity

- Sensory problems
- Visual information is stronger than verbal:short term memory.
- Parents' willingness and patience to prolonged diagnosis and upcoming challenges.
- Individualised education plans.
- Emotional & behavioural issue.
- Poor mental health.
- Motor skills development

Also, the existing systems are not affordable by many people.

2.2. Assistive Devices

There are few existing tools such as special pencils, Large letter keyboards, Touch screen computers, Sound amplifiers, Spring loaded scissors. Some Visual supports for learning maths concepts are also available. Story telling sessions, listening, illustrations, pictorial explanations and Interactive videos also help children to learn. Tactile demos are also available which helps children to learn by performing certain tasks.

IDEA (Individuals with disabilities education Act) provides therapy , exercises and activities.

3. INTERVENTION OF AI

Although some of the physical genetic limitations of the disabilities cannot be overcome, but correct education and helpful care will improve a lot of their way of living. This requires an early intervention program, an optimistic learning attitude and appropriate medical attention. The intervention of artificial intelligence at early stages will help to detect their learning issues and provide effective solutions with interactive user interface.

4. OBJECTIVES

The learning aid would teach basic language starting from alphabets, words, sentences and paragraphs through a phonics program. It will also make children familiar with basic mathematical concepts such as addition, subtraction and multiplication and make strong impact through visual learning which includes interactive videos and images. Thus it will help them to develop early motor skills in order to make them independent and able to react in adverse conditions.

The learning aid can help the child's parents to assess and evaluate his/her skills in order to provide effective early intervention services according to the child's mental age and to evaluate his progress through graphs.

5. METHODOLOGY

This is a learning interface which acts as a medium or rather an interpreter between the student and the aspects/

features of the system. This interface helps in controlling the two sides of the system effectively with the intervention of Artificial Intelligence which can understand the natural language of the user(child) and correct it efficiently with the help of graphical visuals which makes the product an interactive module for the child. The traditional method of learning can't fit the needs of children with learning

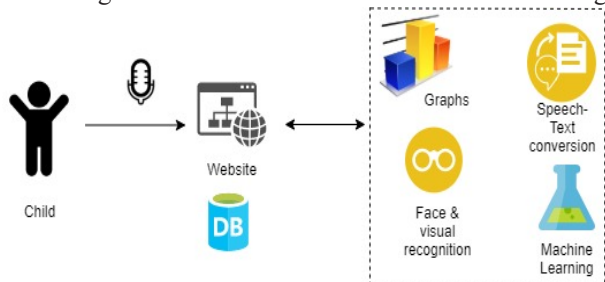


Figure 1: Block Diagram

disabilities, hence the intervention of Artificial Intelligence becomes all the more important.

This Learning aid would work on the following parameters:

- *Way of learning:* Each child has his/her own way of learning, by graphics, animation, sound and visuals.
- *Tracking Record:* We have to keep track about each child, his choices, the information and lessons he learned and the grade of each lesson, and so on.
- *Evaluation:* It will create a weekly report of a child's progress through graphs.
- *Repetition:* The learning process must be repeated for better understanding. Hence it could be a bit time consuming but would make the concepts clear.

The model has parameters of the sensory attributes like smell, touch, sight, hearing, vestibular where weights are assigned to each attribute between 0-1.



Figure 2: Five Senses

Choose the correct verb to complete the sentence

- I ____ dinner. (ate, eating)
- We ____ a three-course meal. (has, had, had been)
- Jack and Jill ____ up the hill. (went, goes)

Choose the most appropriate word

The ____ is kept on the shelf. (book, television)

Figure 3: Task: Grammar Nazi

Add and subtract

$$3+4-2 = \square$$

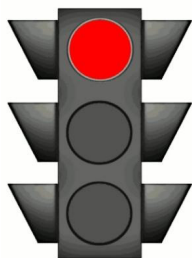
$$8+7-5 = \square$$

If John had five oranges and his father gave him seven more oranges. How many oranges does John have?

Peter has 20 coins in his pocket. He buys a 32 pens for 8 coins. How much is Peter's change?

Figure 4: Task: Number Fumble

What does the colour depict?



Choose the correct option

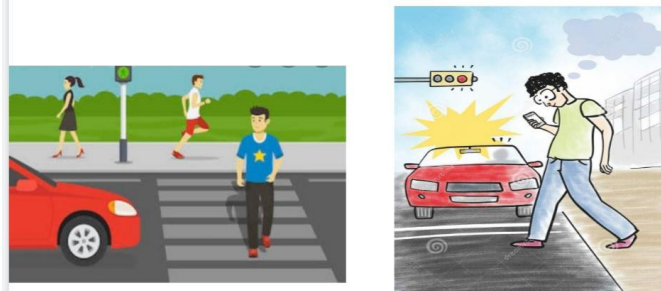


Figure 5: Task: Street Smart



Figure 6: Final Product View

The aid includes learning abilities of english and mathematics.

For english, it asks the child to pick the appropriate verb to insert in the sentence. Also there is an exercise where the child has to choose the most appropriate word in a sentence.

In the mathematics section, there are simple mathematical operations containing addition, subtraction and few word problems related to it.

Another section is built to create a general awareness among the kids. Situations regarding traffic accidents and dangers are shown to the child.

Various other tasks can also be created. The scores of all these tasks are recorded and the ML model does the analysis of these scores and shows the child's progress via a graph.

The ML-based system would learn from the IQ and response of the child which would then increase the difficulty level or the level of learning between stages.

If the child gets bored or the exercises become monotonous, the learning aid plays a few rhyme songs to grab the child's attention.

6. CONCLUSION

The tablet can be mounted depending on the child's height. The user friendly interactive model would grab the child's attention and motivate them to learn. Our model would be cost effective and can also be used by normal children.

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