

Interactive Web Based Design for Learning Disabled Children

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Abstract—Learning disabilities is one of the most difficult problem that is faced by the school going children or kids and recovering process is relatively slow. Computers and educational multimedia courseware have the strength to help these children in their education and also for self-development and will help them for motivation as well. We have developed an webportal that helps the dyslexic children to solve their respective problems and as a result it helps the child to grow individually and boost their confidence as well.

Keywords— learning disabilities, dyslexia, dyscalculia, neural networks, randomised quiz generator

I. INTRODUCTION [1-14]

Learning disabilities amongst the school going children is due to the difficulties they have faced earlier in their education. As per our view, this disability is regarding academics only. Problems while reading or writing, or unable to read or write a word or a sentence during primary school are an early symptoms that the child needs special attention and continuous support from the teacher. Reading and writing skills are the most basic and important skills that are required in early education days, as there are various inputs to new information that require them to grasp it from various books and other sources[1]. Learning Disabilities(L.D.) is defined as “*Neurologically based processing problems*”[14] by LDA of America.

II. BACKGROUND AND RELATED WORK [1-14]

Each and every child can have different symptoms about the learning disability problem he/she is facing. There are mainly three different types of perspectives that can be observed, and they are as shown in the fig.1.



Fig. 1. Different types of perspective about dyslexia

A. Researcher's Perspective: [1-13]

The Researcher's perspective is the perspective of the students helping the dyslexic children with the help of technology or by any other means. Each and every researcher will have a different perspective about the same dyslexic problem. With the introduction of newer

technologies, many researchers found various techniques to deal with learning disabilities.

Chen Liang, Xiao Yang, Neisarg Dave, Drew Wham, Bart Pursel, and C. Lee Giles proposed **Distractor Generation for Multiple Choice Questions Using Learning to Rank**[7]. In this paper they proposed a system that will generate Multiple Choice Questions (MCQs) with the help of learning rank for Distractor Generation (DG).

Sandeep Nandlal Gupta, and Amol Joglekar proposed **Generation of Online quiz using Neural Network**[4]. In this paper they developed a Web-based online learning quiz which helps the students to learn about a particular topic and gain practical knowledge.

Hacne Fouchal, Estelle Perrin, and Paul Renson presented **Collecting data about the way dyslexic children write**[8]. In this paper they designed a system to detect whether the dyslexic children could read more effectively in a 3D view of words

Aisha Alsobhi, Nawaz Khan, and Harjinder Rahanu proposed **Dyslexia Adaptive e-Learning System Based on Multi-layer Architecture**[5], which proposed an e-learning system for dyslexic children based on five adaptive learning modules.

Mohamad Firdaus Che Abdul Rani, Rizawati Rohizan, and Nor Azlina Abd Rahman proposed **Web-based learning tool for primary school student with Dyscalculia**[2]. In this paper they designed Web-based learning tool provides incorporated environment of various technologies to support diverse instructor and learner needs via the Internet

Nur Amalina Mahamad Hasawawi, and Syariffanor Hisham presented **Online Dyslexia screening test for Malaysian young adult in Bahasa Melayu**[9]. They designed a system that will capture preliminary data to check the person is dyslexic or not.

Aisha Yaquob Alsobhi, Nawaz Khan, and Harjinder Rahanu proposed **Toward Linking Dyslexia Types and Symptoms to The Available Assistive Technologies**[10]. It described dyslexia conditions and actions as well. And also prepared decision table for dyslexia types and actions.

S. Mohamad, W. Mansor, Khuan Y. Lee presented **Review of Neurological Techniques of Diagnosing Dyslexia in Children**[11] that describes various neurological techniques like EEG, genetic approaches, which can be used for the early diagnosis of dyslexia in kids.

Danica Damljanovic, David Miler, Daniel O’Sullivan proposed **Learning from Quizzes using Intelligent Learning Companions**[12]. In this paper it described an approach in which linked data is used to create learning exercises, led and choreographed by an intelligent tutor.

Jignesh Khakhar, Sriganesh Madhvanath proposed **JollyMate: Assistive Technology for Young Children with Dyslexia**[13]. This paper states how JollyMate helps the dyslexic children to read and write alphabets, numbers with the help of audio-visual techniques.

B. Teacher’s Perspective: [1-14]

Teacher’s at the POSAT foundation gave us input about how the dyslexic children have problem with reading and writing. The information that they provided is as follows:

1. They have problem with flashing text
2. Each and every alphabet must have different color
3. They have problem while dealing with grid images, because they have issues with eye scanning
4. These children are hyperactive
5. These children gets distracted easily
6. They have lack of concentration

The way these children think is always different from the normal ones. Dyslexic children can be extraordinary talented, produce magnificent ideas, multidimensional thinkers and highly creative [2].

The difficulties being faced by the dyslexic children vary in degree from one person to another, but they can be broadly classified into five categories [2].

1. Confusion between items that are similar like the letters “b” and “d”.
2. Short term memory problem.
3. Coordination problem.
4. Reading and writing problems.
5. Problems in decoding symbols and sounds.

People with dyslexia are not lazy or stupid, they just face difficulties in processing the information. Most of them have average or above average intelligence [2]. Different types of learning disabilities are as shown in the following table:

TABLE I. DIFFERENT TYPES OF LEARNING DISABILITIES[1-14]

Type	Difficulty with	Problem with
Dyslexia	Reading	Reading, writing, spelling, speaking
Dyscalculia	Maths	Doing maths problems, understanding time, using money
Dysgraphia	Writing	Handwriting, spelling, organizing ideas
Dyspraxia	Fine motor skills	Hand-eye coordination, balance
Dysphasia	Language	Understanding spoken language,

		poor reading comprehension
Auditory Processing Disorder	Hearing differences between sounds	Reading comprehension, language
Visual Processing Disorder	Interpreting visual information	Reading maps, charts, symbols, pictures.

As shown in the above table, the different types of learning disabilities are dyslexia, dyscalculia, Dysgraphia, Dyspraxia, Dysphasia, Auditory Processing Disorder, Visual Processing Disorder.

C. Doctor’s Perspective:

Dyslexia is neurological in its origin, that means the problem is located physically in the brain and so it is lifelong problem. Dyslexia is mainly caused due to some inherited traits or due to genes that control the development of the brain. The normal human brain together with the spinal cord forms the central nervous system and the master controller of sensory motor and intellectual functions. The brain can be divided into two halves: right hemisphere and left hemisphere. Left hemisphere is responsible for speech, language processing and reading. Within each hemisphere, four lobes are found which are as follows:[6]

1. **Frontal lobe:** Controls motor and intellectual functions
2. **Temporal lobe:** Controls auditory functions
3. **Parietal lobe:** Together with temporal lobe it has interconnecting pathways
4. **Occipital lobe:** Controls visual functions . All four lobes forms the cerebrum .

The other two parts are cerebellum and brainstem. In case of dyslexia the left side of brain which is responsible for motor skills and coordination is less well developed.

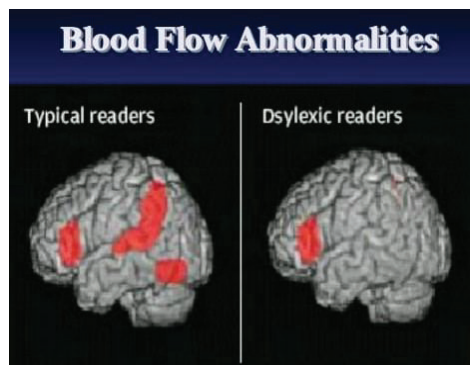


Fig. 2. Typical/Normal Brain Vs. Dyslexic Brain [6].

1. **Structural deficiencies in dyslexia:** In dyslexia the areas of brain in frontal lobe, parietotemporal lobe or occipitotemporal lobe are shown to have less grey and white matter .Depending on the area involved if it is frontal the disorder is dyslexia ,if it is parietotemporal it is auditory function defect and if it is occipitotemporal it is dysgraphia and dyscalculia.
2. **Functional deficiencies in dyslexia :** Studies have shown metabolic differences in dyslexic brain and defects in interconnecting neuronal pathways.

- Anatomical and physiological basis of therapy:** Studies have shown that repetitions and practice of motor and intellectual skills can open up dormant neuronal interconnections, this forms the basis of therapy.

III. THE PRESENT STUDY[1-14]

The system can be used for children under the age group of 5 to 9 years. The systems design method is wherever the ideas that may be the backbone of the particular system area unit developed. It's an abstract model that describes the structure associated behaviour of the projected system or of an existing system. The model may embrace the technical framework, user necessities, and a listing of system parts (hardware and software). The total number of users for the system is 30. As we influence by the reference paper [5]. The layered architecture provides the developer a flexible and reusable approach to implement the respective system. There are in total 5 layers, as follows:[5]

- User Layer:** The user's dealing with the system are categorized into Admin, Teacher(from Posat) and Student.
- Presentation Layer:** The Presentation Layer mainly deals with the Student details.
- Learning Management System Layer:** This layer looks after the Quiz management.
- Application Server Layer:** The Application Server Layer is responsible for handling the user authentication service.
- Database Layer:** This is the most important layer, where all the data resides. It looks after Access rights, authentication database, and adaptive database.

IV. METHODS

As have visited POSAT Foundation, we have met children facing with dyslexia. Thus we can say that every student does not have same problems while facing dyslexia. The three main components that are considered for the implementation of the system are as follows:[1]

A. Participants: [1]

The web application can be used by the children under the age group of 5 to 9 years. The total number of users for the system is 30.

B. Learning Tool: [1]

The main aim of these learning modules is to provide a strong knowledge base to the students. This module consists of different sub-modules like alphabets, numbers, fruits, colours, birds, animals, etc. This the entry point to the web-app from where the student like start his/her learning curve.

C. Procedure:[1]

Once the student has completed the different learning modules such as alphabets, numbers, shapes, emotions, colors, vegetables, fruits, etc., then student is directed towards the quiz module. After playing these quizzes results are generated and mapped on the basis of the different indicators.

V. ANALYSIS AND DISCUSSIONS

The parameters which are considered for conducting analysis are: [1-14]

- Time required to answer the respective question
- Number of attempts required to clear the level
- Correct Sequencing and the pattern of answers
- Correlating letters (grapheme) and objects with their sound (phoneme) and appearance.

On completion of the quiz, the scores (for student) are generated in the form of :

- Excellent
- Very Good
- Good
- Can be better

Negative Feedback is never provided to the student these children get demotivated easily. There the feedback is always in a positive manner. The student's analysis will be done in order to understand the level of improvement in areas like: [1-14]

- Memory improvisation
- Concentration
- Perception
- Eye scanning
- Attentiveness

The analysis of the generated report will help us to determine what further changes are needed in order to help the children grow and boost their confidence and learning curve. On completion of the learning modules, the next section is the quiz section.

Following fig.3 and fig.4 shows some of the quiz modules. These modules helps the child to recite previously learned knowledge from the learning modules. They help the child to build up concentration by using repetition mechanism.

FILL IN THE MISSING LETTER



Fig. 3. Fill in the blank quiz module.

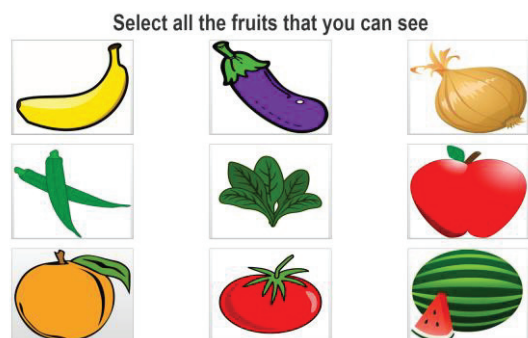


Fig. 4. Select fruits quiz module.

Fig. 3 and Fig. 4. are among the various quiz modules for dyslexic children. The above quiz modules helps the children to learn about different objects with the help of Fill in the blanks quiz and the select fruits module helps them to identify images and improve their knowledge. All the quiz modules are time bounded. The scores are shown on the basis of correct answers and the time required.

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VI. CONCLUSION

The webportal is viable enough to help the dyslexic children by providing them basic knowledge about primarily important topics, without dealing with a much more complex interface. It is also much more fun to use this project to help the lower age groups, to educate them as children these day are more inclined towards the technologies. To make the whole module interactive instead of having static quizzes, the module will load randomly quizzes from the predefined database. The system will also help the student to boost self-confidence and help each and every student to grow individually. It will be a remedial solution for those students who have learning disabilities

and who require special attention from their teachers, because it aims at providing fun with learning.

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