Tasheel Pedagogy of Topsy-Turvy Lexicons

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Abstract: Dyslexia is a learning disorder that involves difficulty in reading due to problems identifying speech sounds and learning how they relate to letters and words (decoding). It is identified that 5% to 17% of the world population are dyslexics. They tend to possess serious problems like identifying speech sounds and learning how they relate to letters and words, processing graphic symbols. They find it hard to spell correctly, read and write fluently compared to other children of their age. To overcome the stumbling blocks in learning for dyslexics, we develop a web application, that concentrates on helping dyslexic children to learn, read and write alphabets. This paper briefs upon employing cumulative and adaptive techniques for learning and evaluate the dyslexic students based on 3 criterions namely- visual, phonology and memory. The three modules are as follows- (i) Catapult (ii) Unleash ravel
(iii) Cumulative digest. Within the Catapult module, the child is taught to read and write an alphabet by a video. It are often played until the child is confident. Next within the Unleash ravel module, three tests are conducted to instill various micro-skills. Firstly, the child is asked to write down the alphabet that's instructed on a piece of paper. It's captured and evaluated using OCR. Secondly, the kid is asked to spell the alphabet that is displayed on the screen and record it. Eventually, the child is asked to sequentially identify the alphabet in question from a paragraph. It's done to enhance the visual tracking, visual discrimination skills of the child . When the child moves to further chapters, the previous lessons are cumulatively added to the Unleash ravel to enhance memory. The Cumulative Digest gives the report of the child's performance in three categories analyzing the micro-skills using machine learning. They are Visual, Phonology and Memory. A threshold is set for each test and if the kid score below the edge then tests are made to be adaptive in order that the child faces more exercises within the part he/she is under performing at. Thus, the TPTL application helps dyslexics to learn, test and analyze their skills which will improve their letter recognition, visual tracking, visual discrimination, visual memory, auditory memory and auditory discrimination.

Keywords: Dyslexia; visual; phonology; visual tracking; visual discrimination; visual memory; auditory memory; auditory discrimination

1. Introduction

Dyslexia is a learning disability in reading. People with dyslexia have trouble reading at an honest pace and without mistakes. They may even have a tough time with reading comprehension, spelling, and writing. But these challenges aren't a problem with intelligence. Dyslexia may be a common condition that creates it hard to read. Some experts believe that between 5 and 10 percent of individuals are affected with it. Others say as many as 17 percent of individuals show signs of reading challenges.

Kids with dyslexia don't outgrow it. But there are teaching approaches and methods which will help people with dyslexia improve their reading skills and manage the challenges. People of any age are often tested for dyslexia, although the tests are different for adults than for teenagers. People with dyslexia typically have trouble reading fluently. They often read slowly and make mistakes. which will impact how well they comprehend what they read. But when people read to them, they often haven't any problem understanding the text.

Dyslexia can create difficulty with other skills, too. These include

- Reading comprehension
- Spelling
- Writing
- Math

Dyslexia impacts people in several ways.So, symptoms won't look as equivalent from one person to other. A key sign of dyslexia is trouble in decoding words. This is often the power to match letters to sounds. Kids also can struggle with a more basic skill called phonemic

awareness. This is often the power to acknowledge the sounds in words. Trouble with phonemic awareness[10] can show up as early as preschool. In some people, dyslexia isn't picked up until afterward, once they have trouble with more complex skills. These can include grammar, reading comprehension, reading fluency, syntax and more in-depthwriting.

Some of the signs of dyslexia need to do with emotions and behavior. People with dyslexia might avoid reading, both aloud and to themselves. They'll even get anxious or frustrated when reading. This will happen even after they've mastered the fundamentals of reading. Dyslexia doesn't just affect learning. It also can impact everyday skills and activities. These include social interaction, memory, and handlin stress[7]. The only way to get to know if someone has dyslexia is by undergoing a full evaluation,done either at college or privately. Having a diagnosis (schools call it an identification) can cause supports and services at college , and accommodations at school and work.

Here are the types of dyslexia:

i) Primary dyslexia: This is often the foremost common sort of dyslexia, and may be a dysfunction of, instead of damage to, the left side of the brain (cerebral cortex) and doesn't change with age. There's variability within the severity of the incapacity for people with this sort of dyslexia, and most who receive an appropriate educational intervention are going to be academically successful throughout their lives. Unfortunately, there are others who still struggle significantly with reading, writing, and spelling throughout their adult lives. Primary dyslexia is passed in family lines through genes (hereditary) or through new genetic mutations and it's found more often in boys than in girls.

ii) Secondary or developmental dyslexia: This sort of dyslexia is caused by problems with brain development during the first stages of fetal development Developmental dyslexiadiminishes because the child matures. It's also more common in boys.

iii) Trauma dyslexia: This sort of dyslexia usually occurs after some sort of brain trauma or injury to the world of the brain that controls reading and writing.

Other sorts of learning disorder include :

- The term visual dyslexia is usually won'tto ask visual processing disorder[6], a condition during which the brain doesn't properly interpret visual signals.
- The term auditory dyslexia has been wont to ask auditory Processing disorder. Almost like visual processing disorder, there are problems with the brain's processing of sounds and speech.
- Dysgraphia refers to the child's difficulty holding and controlling a pencil in order that the right markings are often made on the paper.

Statistics on the dyslexic population

Dyslexia is the commonest learning disorder and impacts one in five students or about 20% of the population (Dyslexia Center of Utah). It impacts males and females at an equivalent rate 30% of scholars diagnosed with Dyslexia also experience a minimum of a light sort of ADHD Dyslexia impacts all ethnicities and Socioeconomic classes at about an equivalent rate.

More than 40 million people within the US have Dyslexia, but only about 2 million are diagnosed. It is estimated that 1 in 10 people have dyslexia.20% of school-aged children within the US are dyslexic. Over 50% of NASA employees are dyslexic. About 13– 14% of the varsity population nationwide features a handicapping condition that qualifies them for education. Current studies indicate that one half all the scholars who qualify for education are classified as having a learning disorder (LD) (6–7%). About 85% of these students have a primary learning disorder in reading and language processing.

2. Literature Survey

There are different methodologies that were proposed and carried out to determine individuals to have dyslexia and train them with various instructional[7] strategies. Diverse educating and assessment procedures are utilized in light of the fact that the typical approaches don't show great outcomes or upgrades in dyslexics. A programmed remedy framework that identifies and adjusts dyslexic errors in Arabic content uses a language model dependent on the Prediction by Partial Matching (PPM) text pressure plot[2] that creates potential options for each incorrectly spelled word. The major limitation of this system is that it doesn't confer to all the other languages except Arabic and the accuracy based on prediction is low. Also, the classical dialects of Arabic language vary from the traditional ones, thus creating chaos in matching procedures. Tutoring must be done in an adaptive manner so as to evaluate the students based on their object manipulation[5].The solution presented here focuses on the visual processing of text, while "dyslexia is best characterized as a problem with language processing at the phenomenal level, not a problem with visual processing(Lyon et al)".Similar techniques deploy machine learning, trying to eradicate the confusion sets like homonyms, particularly when the degree of orthographic difference between lexicons [3]is more. present a small scale approach using binary decision tree classification, which falters

for complex training sets as of 80/20 principle. Since the dyslexic students find it hard to perceive, store and retrieve the information, proofreading with chromatic colors could've been done for their ease of understanding. Thus, a simplified pedagogical approach in a feel good manner is the need of the hour wherein the learning process right from the fundamentals of the language should be incorporated. Starting off with the alphabets to reading comprehension, mended with the teaching of phonetics and syllables, wherein colored text overlays or lenses are used[4], provides clear projection of data in the children, suffering from dyslexia.

3. Proposed System

The proposed framework is a web application employing adaptive learning strategy which improves learning approach and furthermore gives gaming climate to the children[5]. This framework in its underlying stage is to instruct letter sets to the children above the age of five years. It instructs letters in order as well as assists them to gain the abilities that are recognized to slack in dyslexics. There are certain micro-skills that are fundamental for learning. They are: as follows:

AUDITORY SKILLS:

- Auditory memory
- Auditory closure
- Auditory discrimination

VISUAL SKILLS:

- Visual tracking
- Visual discrimination
- Visual constancy
- Visual closure
- Visual memory

KINESTHETIC SKILLS:

- Directionality
- Eye hand coordination
- Spatial memory
- Proprioception

The proposed framework is planned so that the child acquires all these miniature abilities while rehearsing and mastering utilizing it. This framework gives preparing, testing and result examination interfaces. It is coordinated into 3 modules. They are:

1. Catapult
2. Unleash ravel
3. Cumulative digest

Figure 3.1: Representation of modules of the application

In Catapult, the framework lists the chapters available as a tutorial. This for the time being is confined to letters in order. Every letter set is considered as a different section. In the wake of entering a part, the child figures out how to compose and pursue letters[6] in order from a video. It very well may be played redundantly until the child comprehends it totally. After learning the letters in order, the framework moves to 'Unleash ravel' module. Here the test is conducted employing adaptive and cumulative methodology, wherein the child needs to write the

letter set that is said in the guidance, also, he needs to record the order that is shown on the screen and record it. At long last, the client is given an activity for improving visual following, visual separation, visual memory and other related abilities. In this activity the client is given an irregular section and letters in order. From the section the client needs to choose every one of the places of the provided letter set as per the pattern in which of their appearance. This causes them to peruse perceptions in later stages. Lastly comes the Report. Here the exhibitions of the client in the Knowledge Analysis is assessed and results are appeared. The exhibition is assessed dependent on 3 classes - (I) Visual[9], (ii) Phonological and (iii) Memory. What's more, an edge of marks, as a threshold is set for every class. At the point when the client neglects to cross it then the test is taken once more[1]. The critical idea here is the point at which the client moves to the following part the test is directed aggregately for example remembers recently finished sections for request to hold the memory of prior learnt parcels. Furthermore, the test is led adaptively for example the part wherein the client fails to meet expectations is distinguished and given more activities on it[5][6][[7][8].

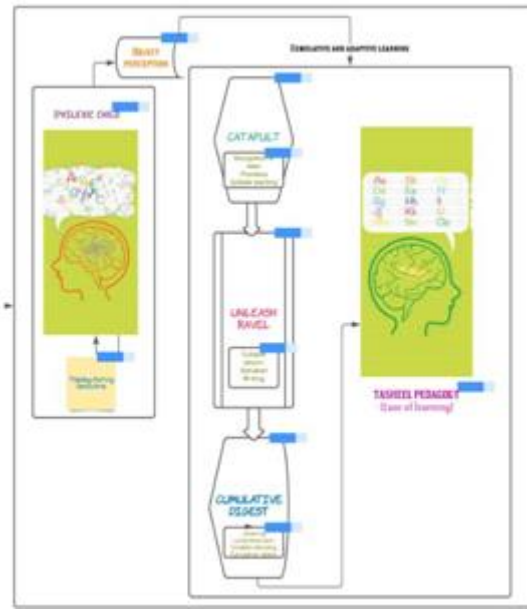

Figure 3.2: Architecture of the proposed system

4. Working Methodology

A. Catapult

In Catapult, all the chapters are listed initially. After completing the primary chapter the user can move to next chapter. Picking chapters randomly isn't advisable because it involves cumulative assessment techniques. After choosing a chapter and getting into it, the user is taught to spell and write the alphabet like the chapter with the assistance of a video. This video are often played multiple times until he/she feels confident [9].

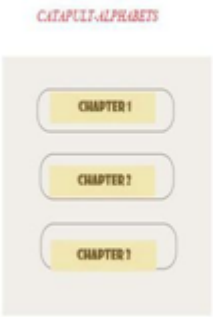

Figure 4.1: Catapult section of alphabets

Figure 4.2: Catapult of 'a'

The figure above shows the screen during which the video is played. It shows the writing procedure along side pronunciation of the letter.

B.Unleash ravel

After learning the pronunciation and therefore the writing procedure, the user is tested with 3 sub-modules- write, read aloud and visual tracking.

➢ Writing: The user has to hear voice command by pressing a button. The voice command instructs the user to write down an alphabet. The user has got to write an equivalent during a paper within a brief period and show it to the online camera of the PC. The camera captures the a part of the paper shown. This image is then evaluated using OCR- Optical Character Recognition. Training dataset for all the alphabets are given. The OCR algorithm compares the captured image with the dataset and evaluates the user. Visual memory, visual closure, directionality, auditory memory, following oral instructions are the micro-skills checked during this test.

➢ Read aloud: An alphabet is displayed on the screen and the user has got to read it aloud and record the pronunciation within the given time. This audio file is converted to an audio signal. This recorded signal is compared with the predefined audio signal that's stored within the memory. Before comparing, the recorded audio signal undergoes various steps like preprocessing, removing noise, sampling, frequency checking etc. Depending upon the similarity between the signals the mark is allotted for this module. Auditory memory, auditory closure, visual memory, memory are the micro-skills checked in this test.

➢ Visual Tracking: The user is presented with a random paragraph. A voice command gives an alphabet. The user has got to select or click on the positions where all that alphabet is present within the paragraph within the order of their appearance i.e. the user shouldn't skip lines or words in between. this is often an exercise that creates the dyslexic to

follow the sentence completely [6]without getting distracted. this may help them to read without skipping or missing lines and helps to know comprehensions. Depending on the sequence that the user has tried to take care of the mark is allotted consistent with it. Visual tracking, visual discrimination, cross-lateral motion, eye hand coordination, visual memory, auditory memory, working memory are the micro-skills that are tested during this module.

Figure 4.3: Writing section of the chapter

Figure 4.4: Recording session of the chapter C. Cumulative Digest

The performance of the user within the Unleash ravel module is evaluated. The result is displayed under three categories namely visual, phonological and memory. This is calculated on the idea of the micro-skills that are tested in each test modules. If the user fails to attain above the threshold say 50%, then the test pattern suggests retest. When the user moves to next chapter, the sooner portions are tested cumulatively so as to see the memory of the learner[1]. The system also analyses the part during which the user under performs and adaptively provides more tests in it.

Figure 4.5: Cumulative digest for the chapter

5. Conclusion

The application aims to aid the dyslexic students in their learning process inculcating the assistive skills namely visual, auditory and kinesthetic skills. The feel good attitude in which the pedagogy is implemented facilitates a gaming like environment for the children above five years, and thus elevates their ease zone for understanding and retrieving stuffs.The topsy-turvy lexicons as object manipulations are employed through cumulative and adaptive techniques, so as to teach them right from alphabets, syllables proceeding to phonetics. Teaching to comprehend passages would be the further enhancement. Under its complete development, TPTL can

be way too useful for teaching dyslexic children, thus transforming the process of learning in an innovative and stress free manner..

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