DEVELOPMENT OF A SOFTWARE PACKAGE CAPABLE OF TEACHING NUMBERS AND WORDS TO CHILDREN BETWEEN THE AGES OF 2-5 YEARS

By

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ABSTRACT

The application of computer science is fast-growing and things change day by day; with this there is a necessity to adapt to the changes as software applications are powerful tools that herald significant development in diversified fields including education. Adoption of the computer systems in various operations of schools (primary, secondary and tertiary), as well as individual homes, has come to replace the earlier method of lightening the burden of teaching and learning. With this background, the aim of this study was to develop a software application for teaching and learning of words for children between the age of 2 to 5 years and this involves the learning of two to four letter words along with numbers 0 to 9. This aim will be achieved by developing a software package capable of teaching numbers and words to children between the ages of 2 to 5 years, The designed software will be user-friendly and a reliable instructional material to teach in a short period of time and increase knowledge development of the child. As the teaching method uses computer aided method, pupil will be able to understand it better and will be more focused. Recognition of the word with the background of accompanying visuals, the understanding process will assist teachers and pupils alike, in improving the methods of teaching and learning basic words. Since the system is through media, there is more possibility that the pupils will learn faster and more efficiently. It will also help the pupils to identify the communicated words appropriately and effectively and effortlessly.

Keywords: Word recognition, Child development, Tutor, Software Package, Teaching, Computer Science, Children, Numbers, Program, Children's speech recognition.

INTRODUCTION

The adoption of the computer system in various operations of schools and individual homes has come to replace the earlier method of lightening the burden of teaching and learning. A computer is an instrument or scheme which achieves practices, computations, and tasks established on commands delivered by a software or hardware platform (Techopedia, 2020). The computer system and its applications are growing rapidly, updating every day with the fast-growing world.

A computer system has come to eliminate the numerous problems encountered by the human race. It aids in the area of learning to the human race. Children of this delicate stage, their brains are very sensitive and still in the developing stage. Therefore, they are prone to learning and developing their knowledge from the early stage and according to what they see around them, certainly, the learning and developing the process of children at the age of 2-5 is very sensitive, delicate and necessary. Children at this stage tend to imitate (Ogundokun et al., 2019, Awotunde et al., 2019) what they see or hear, and this aids their learning process. This is an easier learning process. This

could be achieved by the development of recognizing words and numbers.

Word recognition, according to the Literacy Information and Communication System (LINCS) is referred to as the capability of a reader to identify written characters or text accurately and effectively without any stress. Sometimes, it denotes a remote word identification which is as a result of the involvement of the reader's capability to identify words independently from a list without requiring related words for relative assistance (Blease et al., 1999). Although the relation of systematic phonics and word-recognition instruction to reading achievement is a much-debated topic, any enlightened discussion advocates of such instruction emphasize that it must be only a part of the total program of instruction (Snow et al., 1998). The main goal of such instruction is to help children figure out the alphabetic system of written English and become comfortable with that system as they become readers.

The software will focus on the recognition of the alphabets, words, and numbers with the proper pronunciation of the word relating to objects they see around every day. Since the world is gradually becoming a computer system world, it is therefore against these sorts of unsatisfactory background that modern software packages tutor is developed. The study aimed to develop a system for teaching and learning of words for children between the age of 2 to 5 years. (learning of two – four letter words) and numbers 0-9 and the study will achieve the following goals:

- To develop a software package capable of teaching numbers and word to children between the ages of 2 to 5 years.
- To make the design user-friendly as a reliable instructional material.
- To develop a software package capable of teaching in a short time.
- To increase child development knowledge.
- To ensure that the software packages are of children standard.

Developing strong word recognition skills is also critical for students who, for whatever reason, did not develop strong phonological awareness in early childhood, as they may need to rely more heavily on their vocabulary and less on decoding skills (Nunes et al., 2012). The software package will help the teacher and the pupil in improving the method of teaching and it will also ease the pupils in learning. Since it is a computer teaching method the pupil will be able to understand it better and will be more focused. Since the system is media enhanced, there is more possibility that the pupils will learn faster and more efficiently. It will also help pupils to identify and understand written texts appropriately and effectively effortlessly, since rapid and effortless word recognition is the main component of fluent reading.

1.Literature Review

At the early stage of education for children, parents prefer their children to start talking clearly when most of them have reached the age of 2. Due to the improvement in technology, a software package can be enhanced that could allow children to interact with the computer. Most educated parents now prepare their children with learning tools at an early stage before the age of 2 for them to play with and learn. They also register their children at school for their successful life. How to best teach children to read has long been debated. Adopting a balanced approach, one that includes direct, explicit instruction as well as extensive opportunities for authentic reading and writing has been advocated by many reading educators for decades (Adams, 1990; Adams & Bruck, 1993; Chall, 1967). Learning to read is based on complex, cognitive, emotional, social, and instructional factors. The purpose of reading is to construct meaning from print. At the heart of being able to construct meaning is the ability to recognize words automatically. This is why word recognition is so important. With automatic word recognition, the child does not have to concentrate on the words and can concentrate fully on the meaning of the text (Chall, 1967).

Some other related existing educational software for Children include (Amazon, 2019; Best app for kids, n.d.; Schiola, 2017)

- *Joe Rock and Friends:* Three fun stories in three languages each, often reading listening and speaking practice. Best for young, learning to read, native speakers in English, French or Spanish, also good for

early new language learners.

- *Timez Attack:* A narrowly focused educational software program, cleverly disguised as a captivating video game, wants to learn your times' tables while playing a video game.
- *Jump Start Reading with Karaoke:* A phonics-based, learn to read program with the addition of audio feedback.
- *Word Rock:* A strong drill and test vocabulary /spelling/grammar program hidden in some games. The educational component will be attractive to parents and teachers, as well as to the student who wants to learn or challenge themselves.
- *Gary Gadget: Building cars:* A fun program that combines an element of classic search and exploration games. Best for young children who like to build things, and /or to explore and solve puzzles and designed for true video games players.

Other than the applications discussed above, few other applications include:

- Sight Words
- Learn to Read NOK Syllables
- Andy Helps You Read
- A to Z Playful Learning
- Monsters Behave! (http://www.bestappsforkids.com/tag/word-recognition)

1.1 Related Works

Li et al. (2008) projected an automatic reading training system using state-of-the-art speaking identification technologies and the objective of the system was to enhance the oral recitation ability of the children. The characteristics of the system comprised of a closely packed and powerfully built language prototype being designed for deducing disfluencies in kid's speech, low footmark executions and integrated-microphone array.

Erion and Ronka (2004) reported a technique for enhancing verbalized reading effortlessness which is stress-free for parents to understand and convey to their children.

Hagen et al. (2004) suggested current improvements in sound and language modeling which enhance recognition performance when children read out aloud within digital notebooks. conclusively, the study explained a new real-time execution which encompassed time-adaptive audio and language modeling.

2. System Design

2.1 Evaluation of the Existing Systems

After researching various systems, it was discovered that a similar word recognition system exists, 'Project Optimize' later known as 'The Early Reading Intervention Program'.

Project Optimize, a scripted program, was designed for children who need early, intensive intervention in phonological awareness, letter names, letter sounds, word reading, spelling, and simple-sentence reading. Daily 30-minute lessons include 15 minutes of phonological and alphabetical understanding and 15 minutes of handwriting letters and spelling. There are 126 lessons. A lot of resources in terms of human resources and funds were required to implement project optimize.

Developmental Reading Assessment (DRA) is a measurement tool used by teachers who believe that reading involves meaning, language context, prediction, anticipation, and graphophone. Using the DRA, teachers are provided with information regarding the kind of strategies students are using and whether these strategies need to be reviewed. Teachers receive information from the DRA on how a fluent a student is and how accurate the student is with words, and also a instructional resource for the students. Teachers can also determine if students need instructions in certain areas of understanding such as retelling and sequencing events. The DRA's major purpose is to help guide instruction.

Dynamic Indicators of Basic Early Intervention Skills (DIBELS) provides teachers with the chance to hear each student read aloud in class. A DIBELS test is a very short oral exam administered to a student by a teacher to obtain the literacy skill level the student is reading at. It is used to keep track of students' performance at early grades and is advisably done once or twice a year. The testing levels are different at different grades.

2.2 Improvement of the Proposed System Over the Existing system

The proposed system is a well-structured, object-oriented,

user-friendly system that relates to children on a basic level to incorporate a certain level of understanding about basic words and numbers.

Some of the improvements of the proposed system over the existing system are:

- *Audio Presentation of Words: Words* are spelled character by character to enhance spelling skills.
- *Fewer Resources Used:* Only a teacher and a computer with average specifications are needed.
- *More User (kid) Friendly:* The Graphical User Interface (GUI) presented to pupils (children) can be easily understood and related to. Also, pictures of objects are available to children to help them easily remember the word.
- *Portability*: The software application can easily be used in different environments since it requires fewer resources, as long as the environment satisfies the software requirements.
- *Maintainability:* The software can easily be maintained since its modules are not too complex.
- *Structured Management*: The management of the features/components contained in the software is arranged in an order that makes Creation, Reading, Updating, and Deleting (CRUD) contents in the database quite easy.

This study will make use of some modeling techniques used by most Structured System Development Methodology (which is a technique that focuses on modeling processes, modeling data and modeling objects that encapsulate the concerns of data and processes that act on data) in the analysis stage of System Development.

Figure 1 shows the flowchart of the software design using Unified Modeling Language (UML).

2.3 Programming Tools

Microsoft Visual Studio 2015 was used in the development of the character recognition software. The language to be

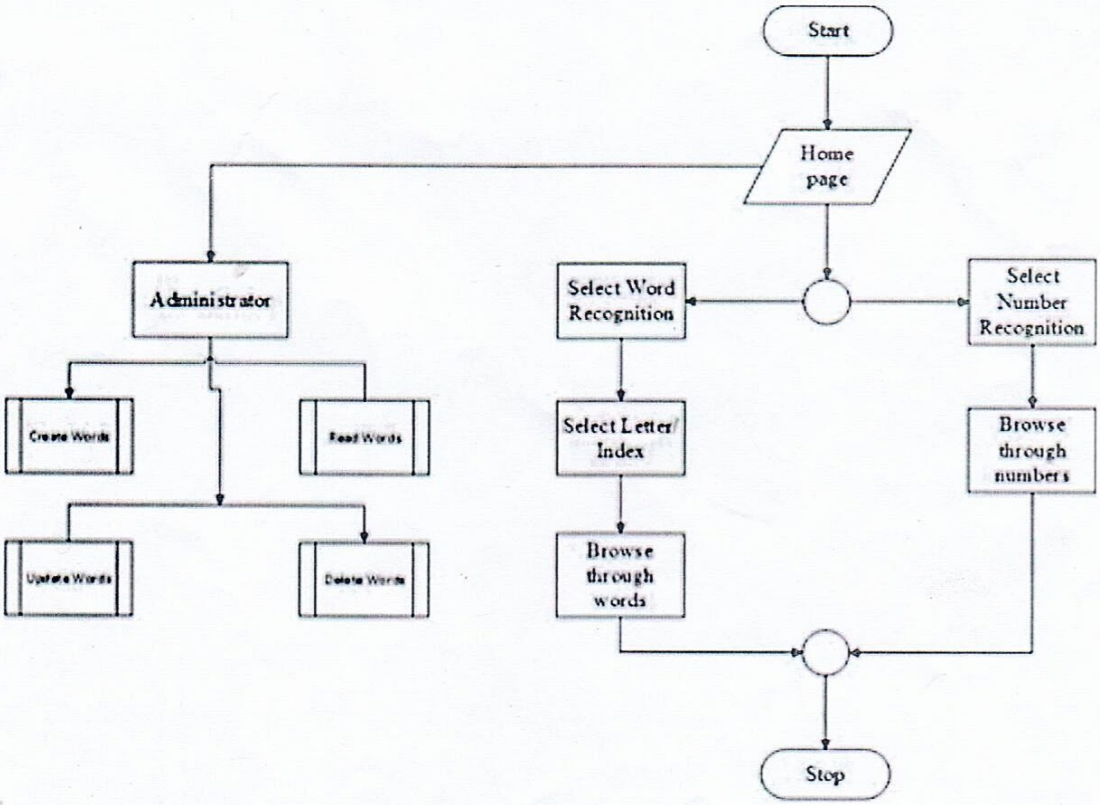


Figure 1. System Flowchart

used is C# (pronounced C Sharp). C# is an object-oriented programming language developed by Microsoft Corporation. C# is a multi-paradigm programming language encompassing strong typing, imperative, declarative, functional, and generic applications.

3. Methodology

The implementation is the process of putting theory into practice, i.e., all the system designs being written is put to test and properly handled. The writing of the programs is modularized and each module has a windows form.

3.1 Using the Software

The software has been developed with simple English language which users (CHILDREN) can understand clearly. It is user-friendly, and the graphical user interface (GUI) is colorful. Its navigation is also straightforward using the menu at the top of the screen for major navigations.

3.2 System Evaluation

The word recognition system is interactively designed to meet the operation of an average kid, this application will go a long way in helping children in recognizing basic English words and numbers.

4. Result and Discussions

4.1 Homepage

When the application is launched, the main screen is loaded and it provides an interface where other modules can be accessed.

4.2 Words

This module is responsible for recognition of words only. Every letter of the alphabet is displayed, the desired letter is selected and words beginning with that letter are displayed and spelled out and pronounced.

4.3 Numeric Characters

This module is responsible for character recognition for numbers only (0 -9). A category of number is selected and the numbers within this category are browsed through, the system spells these numbers and pronounces them.

4.4 Interactive Section

This module is responsible for the interactive part, where testing occurs.



Figure 2. System Homepage

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y
				Z

Figure 3.System Word Categories



Figure 4. Example of a Word in the C Letter Category

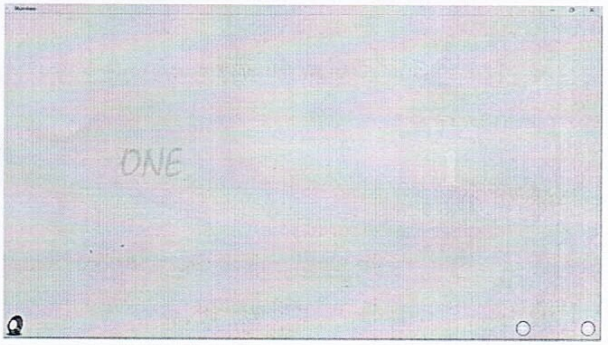


Figure 5. Example of a Number

4.5 Administrator

There is also a module available for the administrator of the system for Creation, Reading, Updating and Deletion (CRUD) operations. This makes the system flexible. This

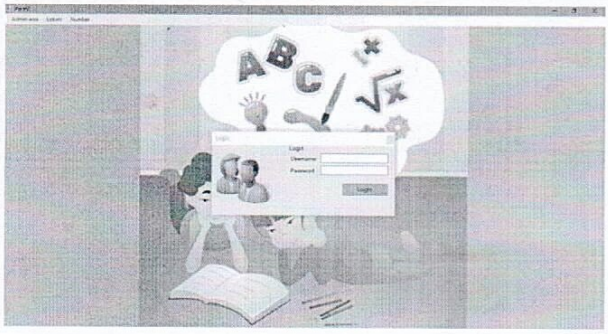


Figure 6. Administrator Login

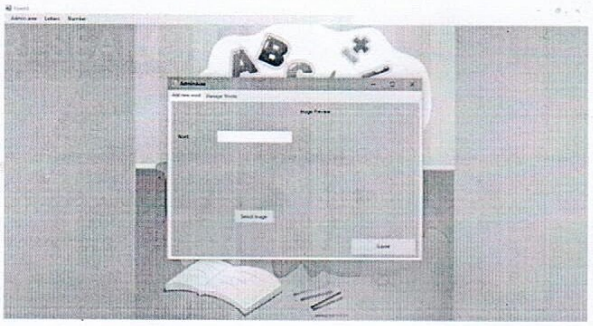


Figure 7. Word Creation Interface

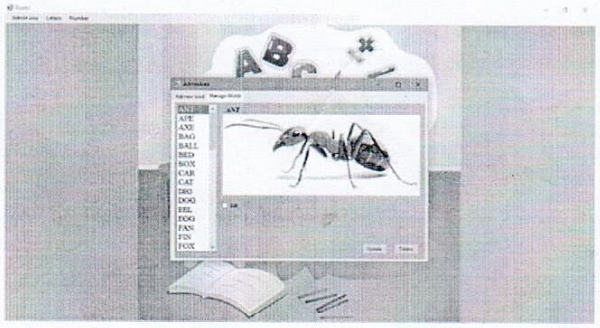


Figure 8. Word Reading, Update and Deletion interface

module is authenticated for the sake of security to avoid unnecessary manipulation of the system.

Conclusion

This research took a look at the application of the software to the problem domain. The existing approach to imparting knowledge to children is through the "traditional static book" which is often boring and most times it makes children to sleep. Traditional static books are time-consuming, voluminous and less interactive.

As the world is moving towards computerization, the researchers developed a modern software tutor for children to learns simple words and numbers. Character recognition tutor is designed to implement proper teaching and learning of words and numbers 0-9. This is implemented by fulfilling the following:

- To develop a software package capable of teaching numbers and word to children between the ages of two to five years.
- To make the design user-friendly as a reliable instructional material
- To develop a software package capable of teaching in a short time.
- To increase child development knowledge.
- To ensure that the software packages are of kid standard.

The study dealt with words and numbers for children from age 2 years to recognize and pronounce words and numbers with enabled voice and interactive icons.

Recommendation

This study software can serve as an operational tool for teachers, parents, guardians in imparting knowledge to children between the ages of 2. In light of this, the following are recommended:

- Embedding of video to the application.
- Extending the application by allowing teachers to add content

References

[1]. Adams, M. J. (1990). *Beginning to Read: Thinking and Learning About Print.* Cambridge, MA: MIT Press. Retrieved from https://files.eric.ed.gov/fulltext/ED315740.pdf

[2]. Adams, M. J., & Bruck, M. (1993). Word recognition: The interface of educational policies and scientific research. *Reading and Writing,* 5(2), 113-139. https://doi.org/10.1007/BF01027480

[3]. Amazon, (2019). *Educational software.* https://www.amazon.com/s?k=educational+software+for+kids&crid=3373UF38P6N5D&sprefix=educational+software+%2Caps%2C413&ref=nb_sb_ss_i_1_21

[4]. Awotunde, J. B., Ogundokun, R. O., Ayo, F. E., Ajamu, G. J., Adeniyi, E. A., & Ogundokun, E. O. (2019, September). Social media acceptance and use among university

students for learning purpose using UTAUT model. In *International Conference on Information Systems Architecture and Technology* (pp. 91-102). Springer, Cham. https://doi.org/10.1007/978-3-030-30440-9_10

[5]. **Best App for Kids.** *Word recognition*. www.bestappsforkids.com/tag/word-recognition

[6]. **Blease, C., Ecklund, K., & Hitzman, M. (1999).** *Improving Word Recognition among First Grade Students*. Retrieved from https://eric.ed.gov/?id=ED433503

[7]. **Chall, (1967).** *Learning to read: The Great Debate*. Retrieved from https://www.weber.edu/wsuimages/jmitchell/MEDUC%206355/The%20Great%20Debate.pdf

[8]. **Erion, J., & Ronka, C. S. (2004).** Improve Reading Fluency with Parent Tutoring. *Teaching Exceptional Children Plus,* 1(2), n2.

[9]. **Hagen, A., Pellom, B., Van Vuuren, S., & Cole, R. (2004).** Advances in children's speech recognition within an interactive literacy tutor. In *Proceedings of HLT-NAACL 2004: Short Papers* (pp. 25-28).

[10]. **Li, X., Deng, L., Ju, Y. C., & Acero, A. (2008).** Automatic children's reading tutor on hand-held devices. In *Ninth Annual Conference of the International Speech Communication Association,* 1733-1736.

[11]. **Nunes, T., Bryant, P., & Barros, R. (2012).** The development of word recognition and its significance for comprehension and fluency. *Journal of Educational Psychology,* 104(4), 959–973. https://doi.org/10.1037/a0027412

[12]. **Ogundokun, R. O., Adebiyi, M. O., Abikoye, O. C., Oladele, T. O., Lukman, A. F., Adeniyi, A. E., ... & Akande, N. O. (2019).** *Evaluation of the scholastic performance of students in 12 programs from a private university in the south-west geopolitical zone in Nigeria.* F1000Research, 8, pp.154. https://doi.org/10.12688%2Ff1000research.16762.2

[13]. **Schiola, E. (2017).** *The best apps for kids,* Digitaltrends. Retrieved from https://www.digitaltrends.com/mobile/best-apps-for-kids/

[14]. **Snow, C., Bums, M., & Griffin, P. (1998).** *Preventing reading difficulties in young children.* Washington, DC: National Academy Press. https://files.eric.ed.gov/fulltext/ED416465.pdf

[15]. **Techopedia, (2020).** *Computer system*. Retrieved from https://www.techopedia.com/definition/593/

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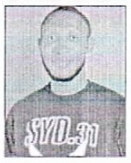
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