

MENTOR as a Learning Method for Slow Learners

Jerry Chong Chean Fuh, Khalida Shajaratuddur Harun, Nor Azlina Abd Rahman, Sandra A. P Gerald

Abstract: This paper proposed a prototype of an electronic learning system for slow learning children to enable the kindergarten education to create a better learning environment for children between the ages of four to six years old. The purpose is to enable the slow learning children to learn in more effectively and independently at anytime. In general, the term 'slow learning children' is referring to children who tend to take longer time to understand certain information when compared to other children with similar age. To elaborate further, kids who require multiple explanations before they are able to grasp a concept. The system should help children improve their ability to be flexible and creative as well as encourage slow learning children to gain confidence in their daily life. The prototype developed after considering several elements that is suitable for slow learner that focusing more on multimedia elements which are images, sounds and interactive activities. The prototype is not just focusing on learning but also enable the teachers to share the children progress with the parents. This paper presented a workable E-learning software prototype which is MENTOR system for young age users for self-improvement and learning. The prototype has 3 users; slow learner children, tutors and parents. In other words the parents able to monitor their child progress using this MENTOR system. The technologies used to develop the prototype and advantages of MENTOR system are also highlighted.

Keywords: component; MENTOR; slow learning children

I. INTRODUCTION

A Slow learner is a child their thinking skills have developed more slowly compared to the normal child for his/her age. This child will go through the same basic development stages as other children but their learning process will be in slower rate. Slow learner can also be due to specific learning disability such as Dyslexia, Dysgraphia, and Dyspraxia etc. E-Learning in general, overcomes the limitations of time, budget, distance and resources faced by both public and private schools. E-Learning delivers the qualities of ordinary textbooks and exercise books and transfers them into digital content filled with multimedia, animations, visual stimulations and a creative delivery of various information, so as to provide the children with the motivation required to remember and learn the information.

At times, children who are slow learners are forced to keep up with the pace of their teachers in classrooms [1]. Slow learner's learning interest and behavior while using computer and the potential that multimedia courseware can bring in motivating and increasing their interest in learning [1].

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Slow learning children aren't able to get involved in the learning process in classroom as there aren't any interactive contents, graphics or animation. E-Learning is able to integrate the involvement of slow learning kids instead of the average classroom teaching style of merely listening and interpreting the information given. E-Learning will allow for the growth of exploration and curiosity and ensure that the slow learning kids will be motivated to get to know the content in detail.

Computer-based learning is one of the effective tools that ease learning process. Reason being, this type of learning technique is able to facilitate slow learners and benefits them in their learning process [8]. Computer-based learning courseware is often associating multimedia elements. Collaborating the multimedia elements used in the computer-based learning courseware has given a great impact to improve learning process especially to slow learners [8]. The reason why the use of multimedia elements could help in improving their ability to learn things easily and complement the needs of slow learner children with learning disabilities is because the capability to present the same information into different forms such as sounds, animation, interaction, text and image which allow them to obtain different learning experiences [8].

A. Rationale

Conventionally slow learning kids study in a non-interactive way when they put in normal classrooms. Technology transforms education and is essential to empower learning. The software will be self-paced making it convenient to be accessed at any time and from any location. It would teach slow learning kids to be responsible for their own education, build self-knowledge and confidence as well as to become independent. These kids need to be entertained and engaged interactively with the material they are presented with for the best possible outcome. It encourages practice, gives feedback and provides support. The software would nurture a positive attitude towards learning for these kids while allowing them to have fun. The benefits of the system being developed would overcome the problems stated above.

B. Problem Statements

Classroom learning is proving to be insufficient and thus parents have to resort to sending their children for special classes. In an average teaching environment, teachers are not allowed to pay the extra attention required by slow learning children to help them understand the subject matter. If they were to do so, it would seem unfair to the other children who are able to learn at a normal pace. The entire teaching-learning process in that particular classroom would be interrupted.

Slow learner's learning interest and behavior while using computer and the potential that multimedia courseware can bring in motivating and increasing their interest in learning [1].

A learner may prefer visual elements in his or her instruction [2]. In a classroom kids aren't able to learn to be creative and think critically on their own. In a classroom the teacher will describe the attributes of the topic and in some cases the child have to visualize the images on their own. For slow learning kids, this may be a difficult task due to the fact that they will first have to understand the information that is transferred figuratively and after doing so only can they start to visualize it. Slow learning kids may be left behind in this scenario because they will take up a longer time to understand what the information is.

C. Aims

Below are the objectives of developing a learning system for slow learners:

- To see the words on screen as well hear how they ought to be pronounced and read while in a sentence. Most slow learning children find it difficult to read certain words as they do not know how it should be pronounced. E-Learning would help words sound out clearly and enable the children to learn what a specific word looks like and how it is pronounced. The voice output to help the kids understand and memorise those words easier.
- To improve flexibility and creativity while learning as well as improve the children' comprehension of various topics. The typical classroom can only provide space for the ordinary question and answer sessions between the teacher and the children. Whereas, E-Learning would provide the enchanting experience of allowing slow learning kids to be able to answer questions that are presented to them visually and in an animated way so as to spark their interest in answering the questions.
- To have voice output to help slow reading children use the system better and thoroughly understand the subject matter.
- To have visual images to enable the children understand the subject or object being discussed. In a classroom the teacher will describe the attributes of the topic and in some cases the children have to visualize the images on their own. For slow learning kids, this may be a difficult task due to the fact that they will first have to understand the information that is transferred figuratively and after doing so only can they start to visualize it. Slow learning kids may be left behind in this scenario because they will take up a longer time to understand what the information is.
- To allow the children to develop at their own pace. In a classroom children are not able to learn to be creative and think critically on their own.
- To provide parents with more learning aids to support their kids learning necessities.
- To provide a centralized tracking, updating and managing area for the kids' progress reports.

II. LEARNING METHODS FOR SLOW LEARNERS REVIEW

A. Multimedia Technology as a Learning Method for LD

Based on Research done by [3], Multimedia technology able to help the children with Learning Disabilities (LD) in their learning due to several benefits provided by multimedia [4]:

- Interactive application able to increase learner's motivation and attention span in learning as they feel like playing while actually learning at the same time.
- Multimedia able to provide the same information repeatedly without changes in mode or pace that allow mastery learning
- In reality, teachers not often do have time to provide all suitable practices and reinforcements needed by the students but multimedia allow creation of individualized learning instruction.

Another research done by [5], multimedia elements especially picture and graphic, able to help LD students to have better understanding especially in learning mathematics. Mathematic processes and remembering the sequences and directions in doing mathematic activities will become more effective and practical by applying the visual content and engaging the brain in order to experience and touch the Math facts visually. The researches focused on Dyslexic students who are suffering with Mathematics because of their difficulties in reading and writing. The British Dyslexia Association estimates that 50-60 percent of dyslexic populations are suffering with Dyscalculia. The most recommended techniques to overcome these causes are by using phonic reading. This systematic approach assists to provide the auditory format of mathematical questions that enable to help Dyslexic students to decode the written word by hearing their pronunciations. Taking advantage of their auditory sense can avoid their confusion and mistakes due to misunderstanding of the Math problems [5].

There have been two courseware developed by Researcher from Malaysian Universities to aid the learning process for slow learner students. MyLexics was developed by UTEM for dyslexic children while "Komputer Saya" was developed by Universiti Teknologi PETRONAS for learning disabled students.

B. My Lexics: Courseware Modules

My Lexics is a first Malaysian courseware for dyslexic children, particularly pre-school, to learn read and write in Malay language integrates all multimedia elements that supports interactive and self-learning environment. My Lexics is collaboration assignment between the Faculty of Information & Communication Technology, UTeM and Malaysia Dyslexia Association. The implementation via multimedia elements allows independent, interactive learning and engages the children in interesting tasks. My Lexics is expected to contribute as a technological teaching tool in Malay language education for dyslexic children in Malaysia.

This is aligned with the project by Ministry of Education Malaysia (MOE) called Dyslexia Pilot Projects (DPP) that was launched in March 2004 and currently being implemented in 30 government aided primary schools throughout the country. It has undergone an acceptance testing. The feedback and positive results from the dyslexic children at the center were very much promising.

The courseware is in the form interactive CD comprising of three sub-modules, alphabets, syllables and words. The learning process starts by knowing the individual alphabet, both vowels and consonants. It is important to connect between the sound and the letter. Secondly, the children learn to combine the alphabets to construct two types of syllables. Lastly, syllables are used to construct the spoken word.

Alphabet Module – Children learn the foundation of recognizing and writing letters of the alphabet. They learn to recognize the letter, the shape of the letter, its categories: vowels and consonants. The children can click on the letters to start a 2D animation of letter writing. A voice over will pronounce the letter and dashes lines of the letter appear on screen as guidance. Children can place their fingers on the screen and follow the 2D animation to learn writing the letter. Dyslexics always rely on pictures and contextual clues to say a word [6]. To overcome this problem, MyLexics associated letters with images and audio. Visual and kinesthetic elements used will reinforce each other and the multimedia elements such as text, audio, images and animation for optimal learning.

Syllables Module - Children will learn the combination of a vowel and a consonant to form a syllable for two-letter syllables. In MyLexics, children will learn syllables using Simultaneous Oral Spelling (SOS) technique stresses four main components of learning, which are 1) Hear it, 2) Say it, 3) See it and 4) Write it. Hence, the courseware incorporates text, image, sound, and animation.

Words Module – This module teaches children read simple words, after they have acquired the skills of recognizing letters and basic syllables from the other two modules. The teaching approach is making use of family group of words that have syllables that sound very similar so that the children should be able to recognize the pattern of family word instantly. Hence, this module also uses images, text, audio and animation.

C. Development and Usability Study of Multimedia Courseware for Slow Learners: 'Komputer Saya'

This paper researched on a study of the development of a multimedia learning courseware dedicated for slow learners and tested on eight slow learners from the age of 8 to 14 years old. The study exploits the use of multimedia as an active learning environment for the slow learners. As a result of the research, the method of learning is proven to be an effective tool to be used to educate children with learning disability. The development of multimedia courseware namely "Komputer Saya" or in English, "My Computer", was specially designed for the slow learners. This courseware integrates Special Education Syllabus for Learning Disabled [7] with the learning multimedia theme. The research was successfully discussed the framework used for the courseware evaluation, and the results of the

usability evaluation indicate that "Komputer Saya" can be used as a leaning tool for the slow learners as it meets the requirement for its usability in terms of efficiency, ease of learning and satisfaction.

In usability evaluation, the research evaluates on how pleasant, satisfying or interesting the interface is to be used by the users [8]. Therefore, the study was done by distributing the checklist questionnaire of multimedia elements usage in order to evaluate whether multimedia elements in the courseware engaged the users (heuristic evaluation). An additional data is also obtained from observations on user's behavior and verbal expressions on any courseware's elements including usage of text, navigational icon, button, sound instruction, and etc that are attractive to slow learner children. When needed, assistance were given to the slow learner to complete the questionnaire or other test.

The participants are required to read through the words and select five adjectives that they think are most descriptive of the courseware and best describe their experience of using it. Results show that 'fun' adjective was chosen by all users; means 100% users agreed that the courseware is fun to be used and suitable to the age of slow learners in this study. Second most chosen adjective is 'satisfying' which depicts that 90% users agreed that the courseware fulfils user's satisfaction. 80% of users agreed that the courseware is attractive and useful. Courseware that promotes slow learners with satisfaction and pleasure will increase their motivation that they also are able to learn as other normal peers do; given a suitable learning aid that fulfils their learning needs. Suitable learning aid designed for slow learners guarantees success and enjoyment in their everyday lesson [8].

III. METHODS

This project consists of two major steps: research and development.

A. Research

There are many techniques of primary research that can be chosen to best suit the situation. Examples of primary research techniques include surveys, observation, interviews and questionnaires. There are two kinds of primary research techniques, these are qualitative and quantitative. For this project the researcher conducted observation, interviews and questionnaires. Observations and interviews are examples of qualitative methods whereas surveys and questionnaires are quantitative methods. The following section is having only the most significant part of the research materials.

1. Observation

In the case of the E-Learning System for Slow Learning Kids, the observation method was considered as observation would produce an in depth understanding of how slow learning kids act and react to their studies. The other point to note would be that the case involves children between the ages of four to six years old. As such the character and attitude of a child at that age is highly volatile.

The observation of how the child reacts to their surroundings and how they observe and respond to the information being delivered is most certainly helpful to the final software design as well as the core functions of the software.

The observation was done in the classrooms to observe classroom activities such as reading, teaching letters, words or numbers, teaching songs or music, storytelling, singing a song, doing arts and crafts, playing games and sports, and watching educational television program. Table 1 shows the numbers of occurrences for each classroom activities and the observed effective rate. The effective rate is based on the researcher observation on the students' responses to the classroom activities.

Table1. Classroom Activities Occurrences Observed

Classroom Activities	Occurences	Effective rate
Reading	20	3
Teaching letters, words, or numbers	20	3
Teaching songs or music	5	5
Storytelling	10	4
Teaching arts and crafts	10	4
Playing games or sports	5	5
Watching educational television	5	4
Effective Rate (5: very effective and 1 :less effective)		

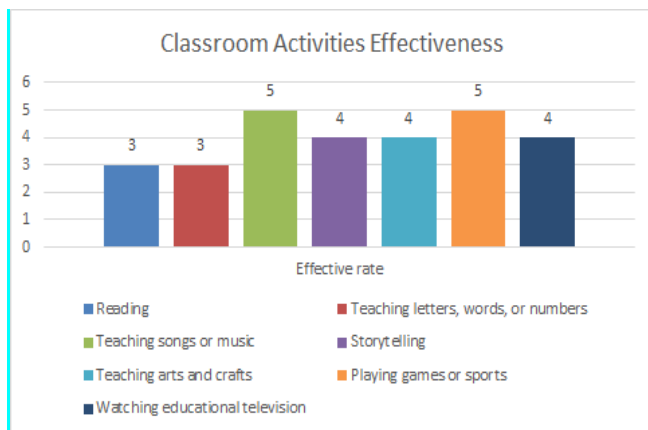


Figure 1. Classroom Activities Effectiveness

Based on figure 1, it was clear that the slow learning kids responded very well to the information departed when music, cartoons, vivid colors or images were integrated into the education. The child listened more attentively when there was something in the information that they found bright or attractive. This observation severely helped and confirmed the software design to be accurate and effective.

2. Questionnaire

The objective of this questionnaire is to collect information about the traditional classroom learning system and the views on the E-Learning solution for children who are slow learners. By carrying out this questionnaire, the information gained will be gathered from a large scale of people. Thus the acceptance of the new proposed E-Learning software can be determined.

This questionnaire is distributed only to parents of four to six year olds and tutors of the same age group. The information gathered would complement the interview technique. The numbers of estimated respondents are 20

respondents. These figures are estimated with the consideration of acquiring specialized feedback of parents and tutors involved in this project and not misleading feedback from the public.

Figure 2 shows the different characteristic of children and how e-learning would benefit them. The results show that 60% of the children are introvert, 25% are ambivert and 15% are extrovert. The researchers are aware that the majority of children would benefit from the program because E-Learning would benefit the introvert and ambivert child to engage more in education through the computer rather than in a large group.

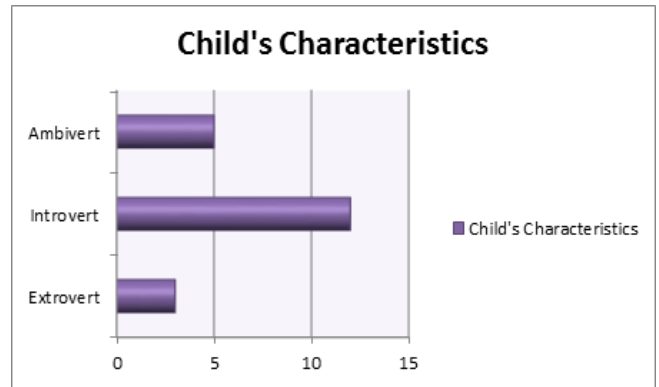


Figure 2. Child's Characteristics

Figure 3 shows time spent on computers by the kindergarten students in school.

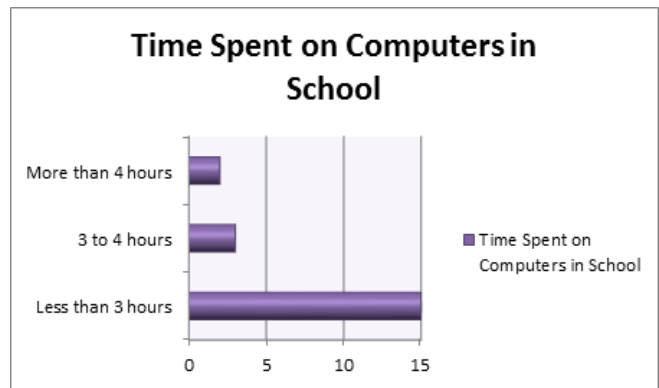


Figure 3. Time Spent on Computers in School

Participants stated that 75% of the children spend less than three hours on computer programs in school and only 10% spend more than four hours on it. The researchers understand that the child has little and sufficient knowledge of using a computer hence the design of the system should be simple and easy to use.

Figure 4 shows time spend by the tutors and parents in child's or students' academic activities.

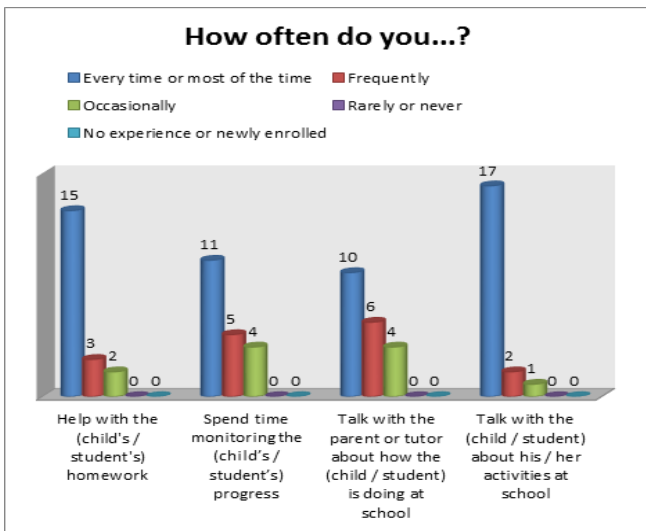


Figure 4. Tutor and parents involvement in child's/student's education

From the results above the researcher understand that majority of parents and tutors spend a lot of time with the child's academic matters. They also spend considerable amount of time to interact with each other with regards to the child's progress. E-Learning would provide a centralized monitoring system for both parties. It would allow parents and tutors to be more involved with the children through an interactive medium.

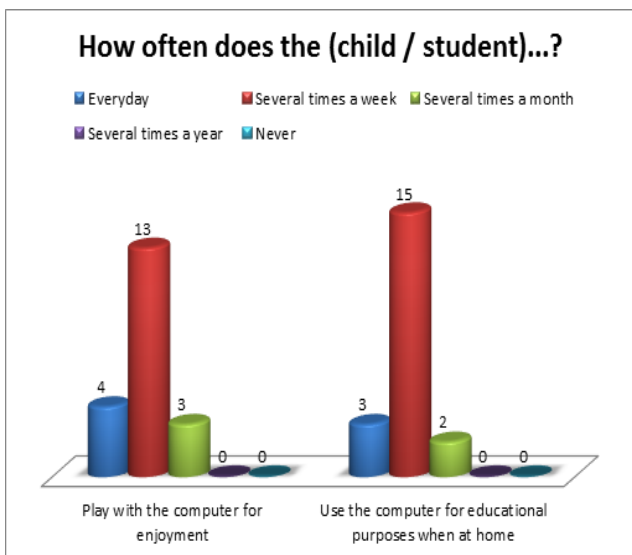


Figure 5. Computer usage by the Childs/Students

For both questions as in figure 5, the results show that the majority of children use the computer for enjoyment and educational purposes several times a week. As such the child's level of knowledge in using a computer is relatively high and sufficient for the purpose of E-Learning.

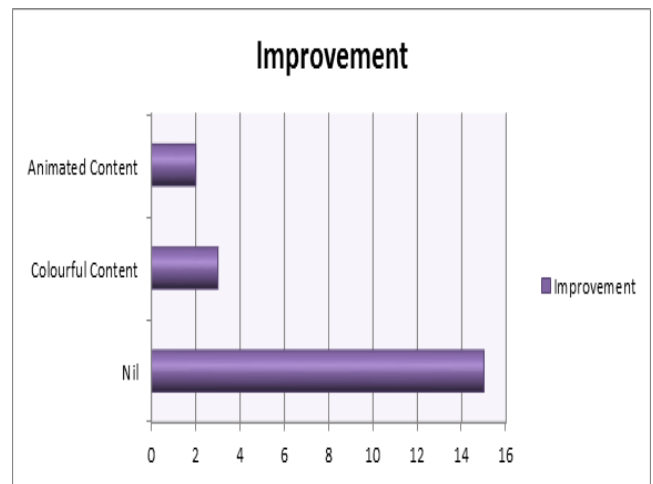


Figure 6. System Content and Interface Design

Based on figure 6, majority had no suggestions to give to improve the E-Learning software to further accommodate the child's needs, there were the 15% that stated that the system should be more attractive in terms of being colourful and 10% stated for the system to be animated to increase the child's concentration and attention.

B. System Flow Diagram/System Design

Figure 7 shows the use case diagram for MENTOR system.

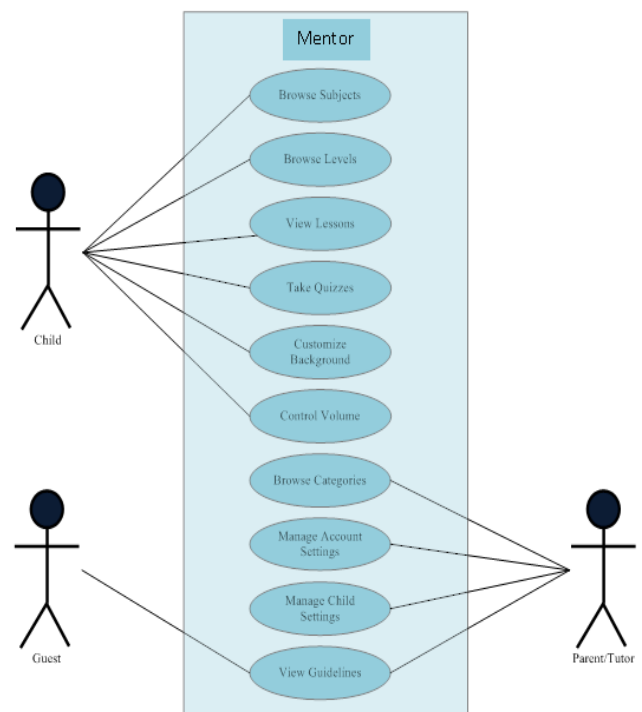


Figure 7. Mentor System

Figure 8 and Figure 9 show extended use cases for parents, tutors and guests in managing account settings and child settings.

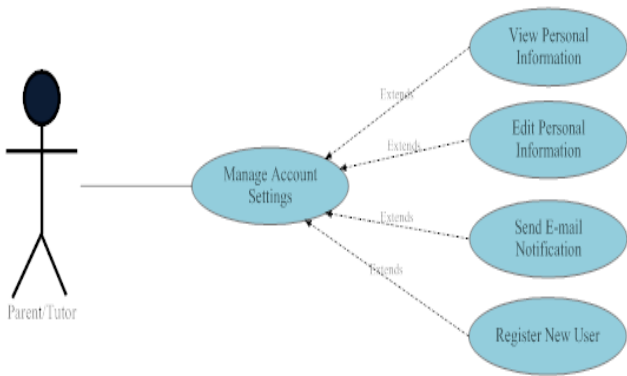


Figure 8. Manage Account

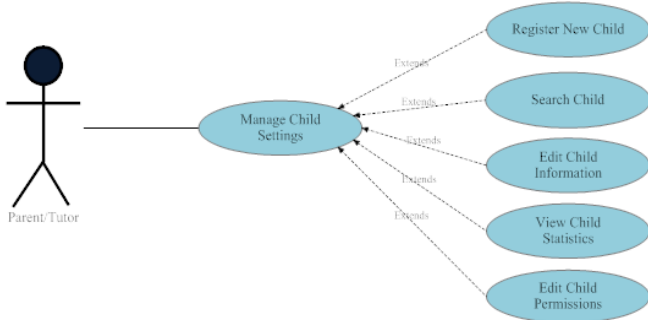


Figure 9. Child Settings

C. Technologies used for Prototype Development

The prototype was developed with C#, Windows Presentation Foundation (WPF), Microsoft SQL Server.

C# is the language chosen because of its modernity, flexibility, type-safety, consistency, object-oriented, version support, compatibility, scalability support and lots of other features that make developing solution faster and easier. One of the most important parts of Mentor is its GUI, to captivate the child user.

Windows Presentation Foundation (WPF) builds Windows client applications with exquisite user experiences. WPF allows the creation of both stand alone and browser hosted applications.

Through an in depth analysis of Oracle, PHP and SQL Server, the developer concluded that, for situations where scale out architectures is the only choice, Oracle, PHP and SQL Server can be considered as equally viable options.

IV. MENTOR PROTOTYPE

This section discusses several functionalities of MENTOR prototype. Figure 10 is the welcome screen that loads before the start page loads.



Figure 10. Splash Screen

Figure 11 is the start page. At this page, the Child able to select his/her name from the drop down list then clicks the login button to proceed to the Main page.



Figure 11. Start Page

Figure 12 is the Child Main Page that shows all the available subjects and levels that have been set to able or disable by the user (parent/tutor).



Figure 12. Child Main Page

Figure 13 shows four tabs for the child to explore with two lessons



and two quizzes. This format is followed by all subjects and levels.



Figure 13. General Knowledge Level 1

Help page as shown in figure 14 shows the page pops up when the help button is clicked. It has an option to listen to the help via audio output. The voice used is Microsoft Anna.



Figure 14. Help Page

Figure 15 shows the screenshot of User Login. The users able to choose either login either to his/her accounts or to register a new user.



Figure 15. User Login

Figure 16 shows Register User screenshot that allows the user to create a new account in the Mentor program after filling in all the required fields.



Figure 16. Register User

Figure 17 is the main use page that offers the user two options to either manage his/her personal account settings or manage child settings.



Figure 17. Main User Page

Account Setting page as shown in figure 18 enable users to view and update personal information through this page.



Figure 18. Account Settings

Figure 19 shows the child settings screenshot. The user has two options to either register a new child to the system or search for an existing child to view his/her personal details.



Figure 19. Child Settings

MENTOR as a Learning Method for Slow Learners

Register Child page as shown in Figure 20 allow the users to registers a new child to be able to access the program by filling in all required fields on this page.

Figure 20. Register Child

Figure 21, Figure 22 and Figure 23 show screenshots for Child Account related pages. The user can view and edit the child's information, view child's statistics and manage subject or level of permissions.

Figure 21. Child Account

No.	Quiz Level num.	Score	Date
1	English Level 1	4	11-Apr-14 12:14:38 AM
2	English Level 1	4	11-Apr-14 12:14:59 AM

Figure 22. View the details

Subject	Level	Permission
English	Level 1:	Able
English	Level 2:	Disable
English	Level 3:	Disable
Maths	Level 1:	Able
Maths	Level 2:	Disable
Maths	Level 3:	Disable
GK	Level 1:	Able
GK	Level 2:	Disable
GK	Level 3:	Disable

Figure 23. Permission settings

V. MENTOR ADVANTAGES

The following is a tabulated version of the success of the system based on the aims, objectives evaluation success criteria that had already been established.

- Kids are able to use and familiarize themselves with computers and the computing environments
- Be a fun, interactive and friendly environment for kids to study in. The system would be flexible and each child would be able to study at their own pace. Kids would be more interested in learning and improving their grades by the interactive content, graphics and animation provided by this system.
- Improve the performance of kids academically. The system would offer opportunities to support kids with a range of learning difficulties in ways which cannot be overcome in a classroom condition
- Reduce time, cost and resources spent on the traditional learning process. Assessments can be done within a matter of seconds by the program itself instead hours by the teachers. Parents will not need to spend their time and money on additional tuition classes. The system will be able to support multiple children in comparison to a classroom environment.
- Provide parents with more learning aids to support their kids learning necessities
- Provide tutors with more learning aids to use and administer the teaching process more effectively and dynamically
- The system would also improve personalisation and motivate the kids that may have felt isolated during normal classroom days. It will lead to greater satisfaction in relation to their subject of study.
- Provide a centralized tracking, updating and managing area for the kids' progress reports
- It would give these kids more confidence in themselves from a young age in terms of independence, obligation, determination, discipline and ingenuity.

VI. FUTURE WORK

The researchers had kept in mind the extensibility principal that is one of the principals of the Object Oriented paradigm where developing this project. The Mentor program is designed to support additional features with minimum effort. This system can be further improved to provide an even higher level of functionality, usability and security. Hence below are some of the suggested improvements and enhancements for the Mentor system.

- **Intelligent system**
If the system is to be redesigned by the developer, the developer would implement an intelligent system. The system would be able to respond immediately to the child's input. This would increase the interactivity of the program for the child user.
- **Additional subject, lessons and quizzes**
Due to the time frame and that the developer was working on the project individually,

the modules, subjects, lessons and quizzes are limited. However in the future all this can be improved and the child would have more to explore, learn and play with.

- **Additional Animations**

With additional time and resources, the program would be able to support more animation, audio and video modules for the betterment of the child's academics.

- **Touch Screen Technology**

To develop a program that would be able to support touch screen technologies would dramatically improve the performance and usability of the Mentor program.

- **Connect to a web server**

In the future instead of using the system alone, the child would be able to communicate with other users through a chat tool. Parents and tutors would also be able to communicate with each other.

- **Multi-platform adaptability**

The developer would redesigned the system be able to run on multiple platforms. This would increase mobility and usefulness. The system would reach out to a larger group of users.

VII. CONCLUSION

The traditional classroom learning system's problems and limitations have been highlighted and rationalized in this paper. It is important to understand that the researchers do not motion to abolish the traditional classroom learning system's but use the E-Learning Software for Slow Learning Kids to enhance the teaching and learning experience in kindergartens and preschools. The researchers aimed to create a better learning environment for kids between the ages of four to six years old to allow them to mentally develop at their pace. The researchers also aimed to assist parents and tutors in monitoring the child's progress in a safe and centralized way. The Mentor program has thus reached those goals and has been successfully accepted by the users.

The slow learner children performance in academic matters would improve by permitting them to develop at their own pace. Parents are given an opportunity to be diversely involved in the child's learning process. Tutors are equipped with an additional learning aid to use and administer in schools for a more effective and dynamical teaching process.

The prototype has been tested with 1) Unit Testing 2) Integration/Module Testing, 3) System Testing and 4) User Acceptance Testing (UAT). The user acceptance test was conducted in a kindergarten and in households with children between the ages of four to six years old. A total of 20 children, five tutors and five parents participated in the testing of the implemented system. The test was focused on determining if the users were able to handle the system and were satisfied with its functionalities. It also aimed to obtain feedback from participants as notes for the future enhancements of the system. Testers were provided with the pilot copy of the system and also a user guide to assist them.

Based on UAT result, several improvements have been made to eliminate system error and at the end the system is running properly and all tests have passed correctly. Overall, the system has been tested by potential user and obtained a

good score in acceptance testing. Therefore, the result has been fulfilling requirements.

Above all the Mentor program is a creative, interesting, interactive and friendly environment for kids to study in. It allows them to use all sensory organs in the process of learning. The programs gives them the privilege of customizing background colors so the children are comfortable using the system and it also gives the child a sense of control of what they are using. The developer is extremely satisfied with the outcome of the product given the limited time frame and resources that was available.

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