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Developing Mathematics Skills through Audio Interfaces for Blind Children

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Abstract - The use of audio highlights the diverse views for foster learning and cognition in blind children. The purpose is to use the computer sound and voice to explore audio sense for knowing and thinking. Mathematics is used as a domain to enhance learning of mathematics knowledge for blind children. This paper presents design, development, usability and evaluation of audio-based virtual environment. After interaction the children were highly motivated, solve problem and learned basic of mathematics. So as a result the audio based virtual environment help to ameliorate the complexity of blind children to learn mathematics.

Keywords: Interface for blind children, audio – based navigation, usability, mathematicslearning.

I. INTRODUCTION

Mathematics learning has been studied in current literacy literature. A number of studies tend to agree that most children have difficulties in learning mathematics. The society is heavily based on science and technology, children do not have any understanding capability of basic knowledge in mathematics may cause serious suffer in this society. This limitation is also extensive to children who are with visual disabilities. Diverse authors have posed that when blindness is associated to social deprivation the issue of learning primary school mathematics is really a critical issue[1].Thus the literature has children with visual disabilities is to access mathematics information, learn basic operation, and solve problem[3]. Early learning and practice of mathematics skills can facilitate a more meaningful construction of mathematics knowledge in children with visual disabilities [4].

Audio interfaces can be used to foster learning and cognition in blind children. Mathematics learning can be very complex to these children because of their poor abstraction skills and motivation for learning mathematics.In this study, there will be intending for foster learning and practice of mathematics concepts such as addition, subtraction. For this, there was a construction for audio that includes creating interesting to learn mathematics learning. A preliminary result which concerning the mathematical knowledge test indicates that children evidence positive changes in mathematics knowledge. Interesting results were obtained.

II. DESIGN

A. Model

The model has the following components: Audio function, strategy, computer representation, evaluation and user (see Figure1).

Audio functions contain the fundamentals of mathematics like addition and subtraction. The audio voice will first teach addition to children then will ask question to interact with the children. Then the child will have to give answer to the question, the answer will be verified by other child in the team, likewise the subtractions are taught.

Strategy has been embedded to be used in order to solve the problems posed.

Computer representation which is developed with a functioning methodology allowing maintaining the coherence between the teaching and exercises posed to the user.

Evaluation this component evaluates the students learning by analyzing the final results obtained by the learner and comparing them with the correct answer.

Interface during interface the students will be paired among themselves, and they will be given time to analysis the concept of what has been thought one person will explain the step from the beginning and other person shall continue with until what is taught

User is the component which corresponds to the person who interacts with the audio.

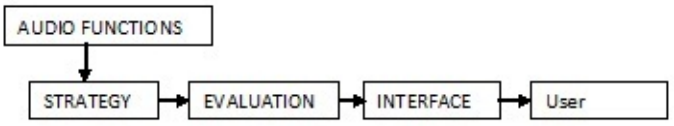

Figure1: Audio block

B. Software and Hardware Tools

The audio was recorded by using sound forge based software. By using this software, the voice can be recorded through microphone, and the voice can be edited. Laptop, CD player, remote these are the hardware tool used for teaching.

C. Interaction

The children are separated into two groups. Each group will have ten students. First group of the student will ask question to other group of student, the answer is given by the second group of the student, and the answer is verified by the first group of student, then the second group of the student will ask question to first group, and the answer is verified by the second group of the student.

III. COGNITIVE EMPHASIS

The main objective of this work is to evaluate the impact of using audio on the development of mathematic knowledge to blind children. Audio emphasizes learning concepts such as establishing correspondence and memory development. In

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addition the audio allows the child to learn and develop the concept of number. It assists learners to learn basic number operation such as addition, subtraction.

IV. METHODOLOGY

A. Materials

For their identification of what is one, how does a plus symbol look like and extra information are clearly taught to them by the instructor already working there. And the material suits to teach them are already available in their subject code.

B. Evaluation Instruments

Measurement test were used to evaluate the mathematics concepts such as addition and subtraction. Evaluation of mathematics knowledge test (Chadwick&Fuentes, 1980), will be based on; 1. The capacity to understand numbers; 2. The skills to make oral and written calculations; 3. The skills for mathematics reasoning.

C. Procedure

Contact the pre-test and post-test. After the pre-test analyses that the student have the precalculus idea about addition and subtraction.

V. RESULTS

Learners evidenced positive changes in their mathematic knowledge after interaction with audio. Most learners gained mathematics knowledge as measured by the pre-test and post-test. Learners who presented major changes were those who interacted with audio and participated in post-test.

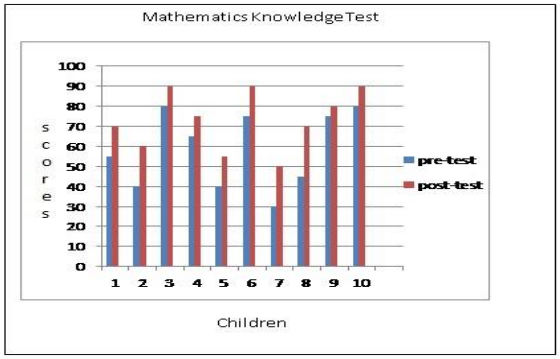

Figure 2: Mathematics Knowledge test

VI. DISCUSSION AND CONCLUSIONS

Blind children obtained positive mathematics skills gains knowledge after interaction. Audio voice was highly accepted by end-users. They liked, enjoyed, and were motivated when interacted with audio. The flexibility of this audio is also one of the pluspoints. Audio can be used to support memory when learning specific concepts and processes in a given subject matter.

Our audio fits well for the learning of mathematic concepts such as addition, and subtraction. Children performed increasingly well in mathematical knowledge test. Here firmly concluded that interaction with audio associated with cognitive tasks can help to improve mathematical learning for these children.

As a conclusion, that post-test gave good result because the use of audio oriented method for students is used for motivation and interaction. Government is already supporting the visual disability students; if they even give more support then the student will have a bright scope.

VII. FUTURE ENHANCEMENT

The use of audio is for only addition and subtraction. In future there will be a development in audio for other mathematical concepts also. In this paper consideration is only for the blind children. In future this process can be applicable for residual vision children also.

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