Implementation of Visual, Auditory, Kineshthetic, Tactile Model Learning System to Help Mild Retarded Children in Alphabetical and Numeric Learning

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Abstract. The aim of this paper is the development of application learning system using implementation of Visual, Auditory, Kinaesthetic and Tactile learning model to help mild retarded children in alphabetical and numeric learning. There are 4 stages to go through for application development, which are concept the system to describe of learning model that combine into technology mobile, design system stages to describe the system architecture and requirements specification for system development, Assembly and development software, and last do testing system using pre and post-test involving 33 children with special needs in an educational institution. The application learning system built based on for mobile applications because it can be used by children anywhere and anytime. The Experimental result it show that applications usage showed an increase in understanding of language learning by 26.45% and computational learning by 17.60%, based on that with this application the child can learn to understand the language and calculation better

1. Introduction
Mild retarded children is one type of special needs children who have intelligence below normal intelligence with Intelligence Quotient (IQ) equal to or lower than 70. In school, Mild retarded children also studied mathematics, Indonesian language, and science like elementary school students in general. Using conventional learning such as book or presentation by teacher to learn mathematics counting or remembering name of things in Indonesia language cannot be done even the teacher using some learning aids.[1-3]

A multisensory approach known as Visual, Auditory, kinesthetic and tactile (VAKT). Visual elements are represented by the presentation of images, posters, photos, movies, keywords and colorful writing. Auditory elements are equipped with presentation presentations, loud reading, discussions, audio recordings and music. Kinesthetic elements by moving position, movement, acting, role-play and tactile as elements involving touch. According to Vaughan multimedia is a combination of text, art, sound, images, animation and video delivered to your computer or manipulated digitally and can be delivered and / or controlled interactively. [4-7] Interactive is related to two-way communication / something that is mutually take action, active and interconnected with each other and has a reciprocal between one another. Something interactive involves two or more parties are active in it. Interactive multimedia is a multimedia equipped with a controller that can be operated by the user, so the user can choose what you want for the next process learning is a change in a relatively permanent behavioral
tendencies as a result of practices that reinforced that there are causes of learning. Learning itself occurs between the cause and result of learning (Kimble & Garmezy. 1963: 133). In the process of learning, a relatively permanent change refers to a change in appearance (performance). However, appearances can be observed, but learning (learning) itself cannot be observed. It can be concluded that a person has done to learn if he had been able to do something that previously could not do. but not all learned to produce changes in behavior or appearance. There are at least six criteria, namely multimedia interactive saying: ease of navigation, content of cognition, presentation of information, integration of media, artistic and aesthetic, and overall functionality. [8-11]

Based on interviews with one of the teachers teaching in a special educational institution it happened because when learning, the children cannot have chance to try the learning aids repeatedly by themselves, and the learning aids not equipped with auditory guide and visual of things that they learning. Based on research “Increasing the Ability to Know the Numbers 1 through 10 Through the VAKT Method For Mild retarded children” that have been done by Zulkifi is concluded the VAKT method can improve the ability of each child in recognizing the numbers 1 to 10 because they equipped with visual modalities (sight), auditory (hearing) and tactile-kinesthetic (gestures). Besides that the conventional learning method in some mild retarded school less effective because it focused on the delivery of the material using the presentation method. The presentation method requires the child to always pay attention, but with the characteristics of student’s mild retarded children that difficult to think in the abstract that makes the method is considered less effective. Other things that become obstacles of learning of mild retarded children is supporting media learning in SLB including poster, whiteboard, textbook, and other supporting tools. Lessons that use books tend to remain in a state of silence (immobile, inactive, and unchanged) so that interactive supporters of the media are needed to provide convenience to teachers in learning and students in understanding lessons.

Based on the problem, it is required to develop of multimedia application learning system, which can involve a more active interaction with the child to deal with something using visual to show the learning object, guide auditory that mention the things they learn and tactile-kinesthetic to improve cognitive abilities. Thus, the aim of this paper is the development of application learning system using implementation of Visual, Auditory, Kinaesthetic and Tactile learning model to help mild retarded children in alphabetical and numeric learning.

2. Research Methodology
This research has 4 stages. Each step has a systematic and logical method; thus, it can support the Implementation of research. The research methodology used is described in Figure 1 below:
1. Concept
The research objectives are determined in this stage, including identifying learning concepts and modeling of VAKT methods for children with special needs

2. Design System
At this stage, do analysis of hardware and software requirements and identify the need for users of the system. At this stage also mapping the functional and non-functional needs of the system

3. Assembly and Development
At this stage, the development of a system in the form mobile based application by combining the application with a learning model that involves the visual in the form of pictures sounds to make visual explanation tools and the use of movements by children as a form of interaction to improve the ability of cognitive and reasoning power

4. Testing
This stage is tested on the benefit of application that has been built. The purpose of this test is to determine whether the built application can improve the child's understanding of language learning and numeracy. Tests conducted by using pre and posttest to several samples done by giving practice questions as much as 5 questions in the form of multiple choice or selection of
answers to measure the success of instructional media built in helping students understand the subject matter that is delivered.

3. Results and Discussion

3.1. Concept of VAKT Multimedia Learning System
Interactive multimedia learning application for mild retarded children in alphabetical learning and counting number lessons with learning method using visual modalities (auditory), auditory (hearing), tactile-kinesthetic (gestures). Symbolized sounds by letters or numbers using visual, auditory, kinesthetic, and tactile alignment.

In this application the children are taught to know the numbers, recognize the letters of the alphabet in the Indonesian language with the help of sounds and images accompanied by objects corresponding to the image, then the child - writing exercises by throwing dots in letters or numbers that have been taught. There is a matching number game and search for letters. This application is made using special learning principles for mild retarded children such as repetition and flow of the system directed and gradually.

3.1.1. Visual. Learning that uses visual elements (visual) on the application to be built has an important role, because one of the active and dominant senses in the child is the eyes or vision eyes. The use of visual modalities in the application to be built can be observed in figure 2.

The visual modalities in the introduction of numbers explain how to introduce the number to mild retarded children. Recognition of numbers accompanied by 1 object associated with numbers. The relationship is from the same element of pronunciation, for example the number of 'one' object is 'sapi'. The initial pronunciation of the word has a similarity that is 'sa -'.
3.1.2. **Auditory.** Learning that utilizes the ear as a sense of hearing also plays an important role for mild retarded children. The need for sound from mild retarded students is a cheery type voice and has elements of children in his voice, such as the sound of music or the soundtrack of children's songs. A cheerful voice affects the student's interest in learning. Adjusted voice volume is not too hard and not too weak so as not to interfere with learning. The use of auditory modalities in the application to be built is as follows:

a. Issue sound from every lesson, depending on what lesson to study
b. Speaks the sound of questions related to the comprehension test
c. Pull out the sound of the appreciation marks successfully and fail.
d. Removing the sound of the musical instrument for the background of the application at run time.

3.1.3. **Kinaesthetic and Tactile.** Learning by responding to every lesson received with physical motion. Mild retarded children have limitations in physical movement, but this can be a solution to train children's motors to limit the motion can be minimized. In the application to be built kinesthetic modalities applied to aspects of writing numbers and letters. By following the pattern or shape of letters and numbers, the child will be guided to write the letters and numbers.

Movement animation letter "a" can be observed in figure 3 and movement animation number "1" can be observed in figure 4.

![Figure 3. Letter “a” Animation Movement](image)

![Figure 4. Number “1” Animation Movement](image)

3.2. **Software Specification Requirement**
The software specification of the system to be built is divided into 2, SKPL-NF (Non-Functional Requirement Specification) and SKPL-F (Functional Specification Requirement).

Table 1 gives an explanation of Non-Functional Requirement Specification of the system to be built and Table 2 gives an explanation of Functional Requirement Specification of the system to be built.

| Code      | Specification Requirement                                      |
|-----------|----------------------------------------------------------------|
| SKPL-NF-01| System require hardware for VAKT model learning application   |
| SKPL-NF-02| System require software for VAKT model learning application    |

| Code      | Specification Requirement                                      |
|-----------|----------------------------------------------------------------|
| SKPL-F-01 | The system can perform language learning                       |
| SKPL-F-02 | The system can perform numeracy learning                       |
| SKPL-F-03 | The system can perform evaluate learning                       |
| SKPL-F-04 | The system can show AR object                                 |
3.3. Use Case Diagram
Use case diagram is used to describe a number of external actors with use cases contained in the system. Use case diagram can illustrate how the User interacts with any system and behaviour that the system does. Figure 5 describes Use case Diagram of the system to be built.

![Use Case Diagram](image)

**Figure 5.** Use Case Diagrams

3.4. Testing
At this stage a measurement is done to determine how far the level of understanding the child can increase before and after the application is used. At this stage, the provision of pre and post-test by giving 5 pieces of the problem to 33 children with special needs who are inside a special educational institution in the form of multiple choice. The results will be compared with the original value before the application is used and the value obtained after the application is used, to see the level of effectiveness of action in the form of use of the application then used the calculation formula of goodwin and coates in surisman. Table 3 shown value comparison results before and after the application is used

| Subject Learning | Average Pre-Test | Average Post-Test | Increase Point | Percentage Increase |
|------------------|------------------|-------------------|----------------|---------------------|
| Numeric Counting | 60,94            | 71,67             | 10,73          | 17,60%              |
| Language Alphabetical | 61,97         | 78,36             | 16,36          | 26,45%              |

Based on the test the number of children who originally did not pass in counting as many as 11 children from 33 where the number of graduation is 60 with an average value of 60.94 has increased the value of
17.60% to 71.67 with the percentage of graduation of 100% while for learning alphabet average value the beginning of 61.97 increased by 26.45% to 78.36.

4. Conclusion
Based on result test that have been done to 33 children by giving 5 question that related on subject learning, before and after application being used, it shown that application can help improve understanding of mild retarded children in understanding alphabet language lessons and numeracy where there experience a value increase that is not too large but can improve the child's understanding so that children get the value in accordance with the minimum passing limit where the original graduation rate is 66.67% to 100% for alphabet learning.

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