3rd International Malaysian Educational Technology Convention

BLENDED EDUCATION:

Towards A Personalised Learning Environment

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The Development of Interactive CD Learning for Autism Children

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Abstract

This paper describes on how the Interactive CD Learning for Autism Children has been design and develops. This is the project to help the children as a difficulties learner like an autism children using computer based approach. The techniques are applied in this interactive CD is Discrete Trial Training (DTT) which are also known Applied Behavioral Analysis (ABA) as one of the technique as suitable for autism children treatment. Based on the case studies, the information collected has become a guidance to design a courseware. The theme for "Science, Social & Environment Components have been chosen.

Introduction

Nowadays, computers are increasingly present at the early stage of education settings. Computer offers the unique advantages in teaching. The unique advantage that form by computers and learning methods could emphasized practical learning, where teachers were trained to use various teaching aids, namely educational courseware, integrate computer-based technology into the educational curriculum in such a way improving the learning process. This could be true for child, which received a normal education.

However, there are no similar educational courseware have been designed and developed for particular learning disabilities such as Autism Spectrum Disorders (ASD). Therefore, this research is carried out to establish an educational courseware prototype which can be a basic electronic teaching and learning tools to help teachers and student with autism disorder in primary schools to a life path to normalcy.

Autism and treatment

According to Siegel B.(2003), Autism is a pervasive developmental disorder characterized by impairments in social interaction, communication, and restricted, repetitive, and stereotypic patterns of behaviors, interests, and activities. Symptoms of autism can be broadly grouped into three domains:

- Social Autistic Learning Disabilities
- Communicative Autistic Learning Disabilities
- Non-Social Autistic Learning Disabilities

As own efforts to get clear understanding, autism is a life-long developmental disability that prevents people from understanding what they see, hear, and otherwise sense. It is a development disorder characterized by unusual, repetitive, or severely limited activities and interests, problems with verbal and non-verbal communication and impaired social interaction.

According to Williams M. (2000), people learn using all five senses whereas 83% through the sense of sight, 10% through the sense of hearing, 4 % through smell, 2 % through touch and finally 1% through taste. Since so much learning is done involving the sense of sight, this ongoing prototype should capitalize on this fact and use it to the fullest advantage in helping autism students to learn more effectively. Multimedia elements consist of texts, graphic, animations, video and sound effects.

Since this on-going prototype is focused on children with autism, psychologists have shown that they can often improve the quality of life for many children with autism and help them to integrate more successfully into society using behavioral programs. The approach to treatment for children with autism is termed Discrete Trial Training, which is also known as Applied Behavioral Analysis (ABA) or Lovaas Method. DTT/ ABA is a procedure that uses the principles of learning theory to improve behaviors that are deemed socially significant and it is based on the theory of behaviorism. The use of BTT/ABA approach to treat children with autism was pioneered in the late 1960s and 1970s by Dr. Ivar Lovaas at UCLA. Lovaas was well trained as a Skinnerian behavioral psychologist.

Discrete Trial Training Approach involves a series of distinct repeated lessons or trials taught one to one. Each trial consists of an antecedent, a directive for the individual to perform action, or the reaction based on the response of the person. DTT has been used to successfully increase IQ and cognitive skills and has also been shown to have long-term success introduced by Lovaas in 1993. Children with autism often face many deficits and difficulties in learning. According to Siegel B. [1], below are the components of Discrete-trial training approach which can help to compensate for difficulties in learning for autism children.

Analyze From the Case Studies

The behaviorism learning theory of Skinner in argues that the use of technology in teaching can increase learned behavior by organizing learning objectives, increasing the frequency of positive reinforcement, customizing the learning experience and freeing teachers from repetitive teaching (Gary, 2003).

An analysis of user needs must be done in order to design and develop the courseware to meet those needs. In designing and developing this courseware prototype, the problem of autism children in learning and teaching are the most important that need to know and understand. Some interviews and study cases of autism children have been done.

Result from the interviews that has been done with Encik Anuar bin Mohd Said, who is a special education officer in Special Needs Unit at Melaka State Department of Education, he said that individuals with autism have extremely difficulty in learning language, social skills and in relating to people. Below are the characteristics of autism children that have been summarized from the interviews:

- Display indifference
- Does not play other children
- Talk incessantly about one topic
- Echolalia, copies like parrot
- No eye contact
- Some can do thing very well and quickly but not tasks involving social understanding
- Variety is not the spice of life
- One-sided interaction and lack of creative

Result from the interviews that have been done with Madame Rose Mary, a special need teacher in Malacca Bukit Cina Primary School, she said that children with autism have their own world. They are not able to communicate and mix with the other people. Some of them can learn and do something very well and quickly but they cannot memorize it for the long time. They like to do the same things and talk about something repetitively. They like something that is constant and able to focus in doing something, but they hate changes in their routines. In generally, autism children can learn and understand things, but it is difficult because of their difficulty in learning language, behavior and lack of social interaction.

Two study cases have been conducted in special education of Malacca Bukit Cina Primary School in order to know and understand the current levels of performance of autism student. In first study case, Siew Ting, who is 9 years old and a female autism student, able to answer and response simple questions such as her favorite colors and name. She looks normal like other normal students. She can follow simple instructions and response to the questions. She looks to the people, but there is no eye contact and have flat affect with the people talk to her. According to her teacher, Madam Rose Mary, she is able to learn things but lacks of social interaction with her friends.

In second study case, Mohammad Danial, who is 7 years old and a male autism student, able to answer his name, but he is keep on repeating his name until his teachers touch her neck, then he will stop mentioned his name. He can answer, understand and response to the questions. He engages in repetitive body movements such as hand clipping and displays a narrow range of emotion.

Designing an interactive CD Learning for Autism Children

The elements to consider in designing visuals can be divided into visual elements and verbal elements.

- **Visual elements (pictures, illustration and graphics)**
  Visual elements comprise pictures, illustrations and graphics to be used. They can vary from realistic to graphic to even abstract representations of the actual objects. When choosing visual element, it is important to ensure that it matches the text goes with it. Picture used for decorative

purposes are not allowed as they may distract the learner from the main message. According to Abd Latif A.R.(2007), the picture and graphic used to teach autism children should be clear and big.

Picture Exchange Communication System (PECS) is typically used as an aid for autism children. It is a great tool for helping non-verbal children such as those with autism to communicate without words (Siegel, 2003). PECS introduces using graphics and pictures of desired objects. Ultimately, the pictures can be replaced with words.

- **Verbal elements (text)**
  Verbal elements refer to text to be used in the visual. The font type should be consistent and harmonies with the other elements of visuals. There are two major types of font, serif such as Times New Roman and san serif (without serif) such as Arial. It may good to use a san serif-type for the main text, which is the letter do not have decoration. This is because serif fonts may look crowded on a computer screen. However, it may consider the use of Serif fonts for headings. Avoid using fancy font styles which are difficult to read. If variations of a particular font are to be used, keep it to a maximum of four variations. Short headlines or titles of no more than six words may be written in all capitals (upper case). For anything longer than that, best legibility is achieved by using lower case lettering for all words, adding capitals only where normally required. Contrast lettering with the background. This contrasting technique makes the words easy to see and read. A one-and-a-half line spacing may be the best choice. Limit each slide to no more than eight lines of text.

The characteristic have been chosen from the DTT Approach and try to applied into the courseware are:

- **Cause-effect learning and observational learning**
  Children with autism typically have a great deal of difficulty in "picking things up" from their environments. To compensate then, DTT teaches skills and behaviors explicitly, without relying on these areas of difficulty. Using discrete trials a full motor - prompting, the child is presented with a simple task (like touch nose)

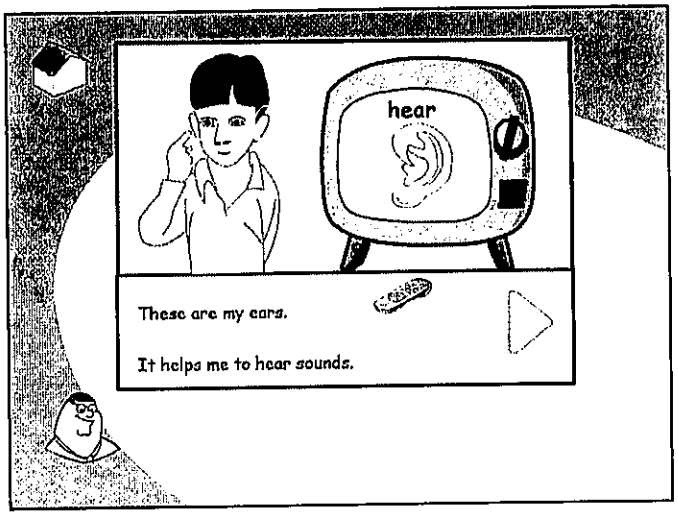

Figure 1.1 To help children read with word guidance highlighted

- **Attention**

Many children with autism begin a program with rather short attention spans. In DTT, tasks are broken down into short, simple trials. At the start of a program, interactions may only be a few seconds in length. As the child's attention span increases, the length of the interactions increases accordingly.

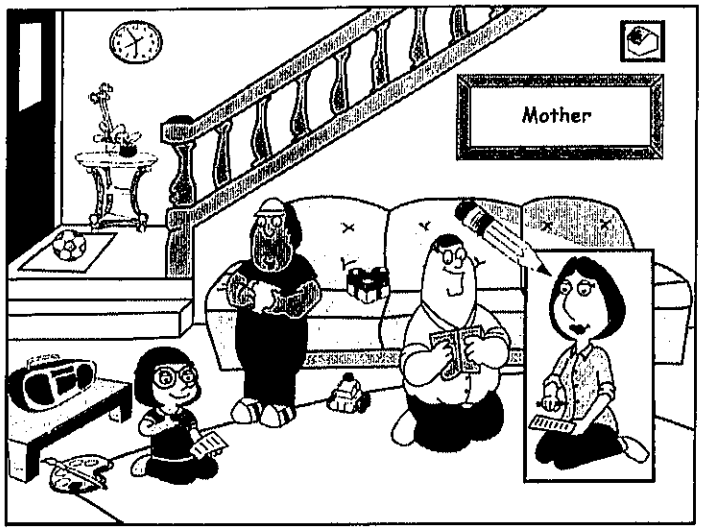

Figure 1.2 Give attention with figure highlighted

- **Motivation**
  Children with autism may not be as motivated to work as other children might be. DTT attempts to build this motivation by rewarding performance of desired behaviors and completion of tasks with tangible or external reinforcement (food, toys, and time to play). That external reinforcement is paired with social praise with the hope that eventually praise will become as reinforcing as the treats.

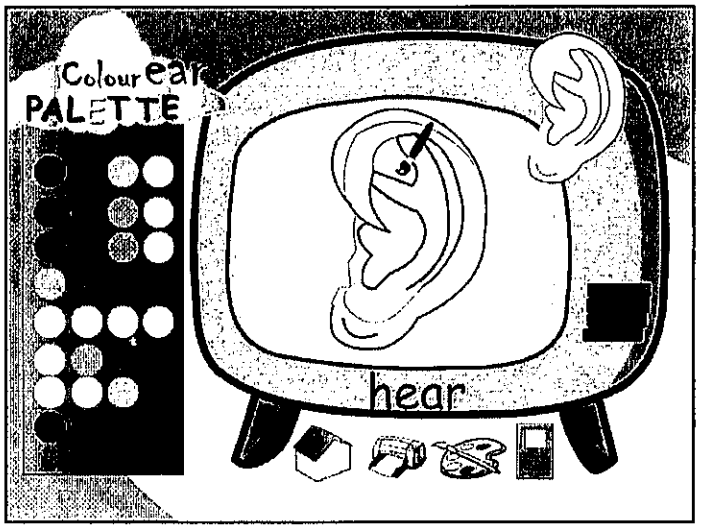

Figure 1.3 Give children opportunity with coloring activity

- **Stimulus control**
  In DTT the presented stimuli (typically instructions from a teacher or parent) are clear and relatively consistent. The child is given rewards only for behaviors in response to those stimuli so that eventually he comes to understand that certain stimuli are probably more deserving of his attention than others.

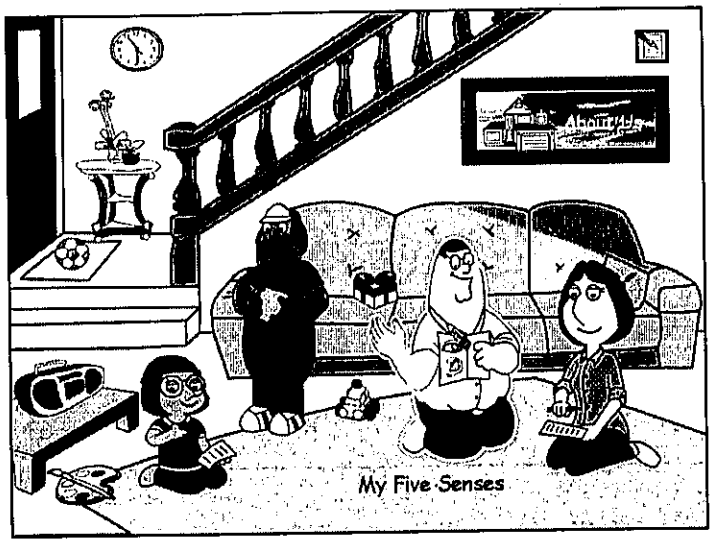

Figure 1.4 Opportunity explore the courseware with familiar figure such as family

- **Generalization**
  Generalization, the application of a behavior or skill across a number of environments or to a number of related behaviors, is typically quite difficult for children with autism. Consequently, the instructions in good DTT programs are designed to change over time, in content (the verbiage of the instruction) and context (who is giving the instruction, where and when it is being given).

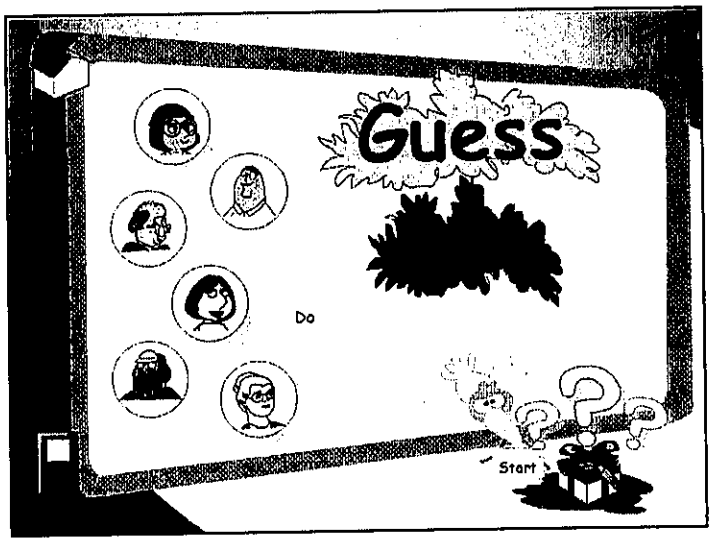

Figure 1.5 Using the familiar image with a family perspective

- **Communication**
  Often in children with autism, both expressive and receptive languages are deficient. Teaching that relies on a great deal of verbiage from the teacher, then, is often too difficult for these children. The instructions given in discrete trials are simple, concrete, and clearly provide only the most salient information, especially at first. The DTT/ABA approach presents several advantages for children with autistic spectrum disorders. It uses clear behavioral principles to establish a learning contract that for many parents of children with autistic spectrum disorders provides them with their first opportunity to teach their child directly and effectively. As the conclusion for this section, this approach can be applied in developing an educational courseware prototype for children with autism.

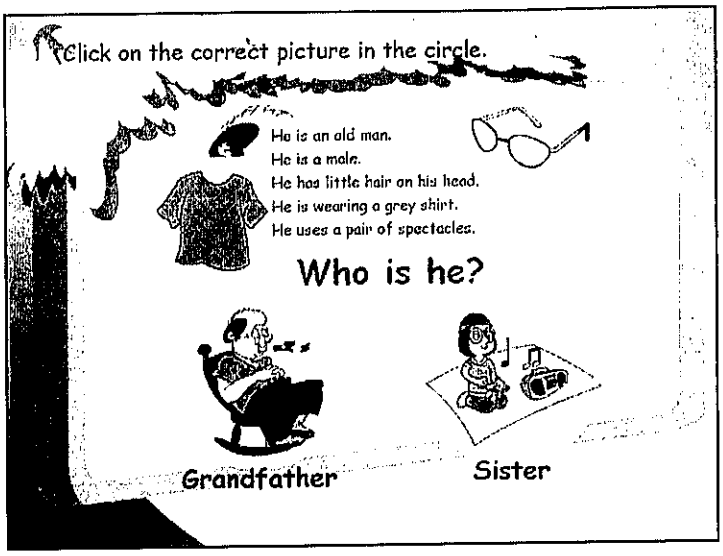

Figure 1.6 Hear and read with interactive way

Conclusion

To design and produce some courseware as learning tools especially for a students have a disabilities learning not an easy job. It needs a deep study to search a suitable approach, technique and method for each disabilities student. One of the suitable approaches for autism students is using a Discrete Trial Training Approach

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Designing a Virtual Laboratory for Chemistry Using Animated Pedagogical Agent (APA)

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Abstract

This paper presents about designing the animated pedagogical agent in virtual laboratory for chemistry subject, alcohol. To further develop and exploit this potential, there are, however, several issues that need to be resolved. In this paper we discuss on theoretical framework modelling that is divided into five parts which is analysis, design, development, implementation and evaluation. For the second objective, researcher will view on the visual form of virtual laboratory and key aspects of look of animated pedagogical agent to make human-computer interaction more enjoyable and productive. In designing the development of virtual laboratory, researcher has used approach in learning theory such as cognitive and constructivism. Concept through learning-by-doing and simulation will be added in the virtual laboratory where through the concept used student can obtain understanding via experience.

Introduction

Chemistry learning method practiced in schooling system in Malaysia more patterned passive and behaves one-way. It is contrary to education policy who wants an effective methodology of education through active discovery process. In realizing this need, a new lesson method based on technology orientation should give attention naturally in helping teacher produce learning pattern that is required nowadays.

Current learning theory suggests that student's learning is increased when more interactive and multimedia richness of the educational resources are use for active learning. High interactive and rich multimedia learning environment is best meet with simulation and virtual laboratories can simulate real-world behaviour in an engaging and intuitive graphic environment to help students acquire new knowledge and skills through learning by doing, Morozov et al. (2004).

The virtual laboratory allows students to experiment on their own, instead of having to follow instructions rigidly, as they would in a traditional lab. It also allows students to experiment more than they would be able to in a real lab. Because of time and safety constraints, students usually cannot freely experiment with real chemicals. On the other hand, the computer simulations in the virtual laboratory encourage students to experiment and have some fun, Dan Carnevale (2003).

Virtual laboratory that will be developed can get more attention by the student in their new way learning. Activity in the virtual laboratory is based on the interactive laboratory in order to ensure the understanding student in chemistry material process and also to do experiments. By that, virtual laboratory will reduce cost such as time in lab, material and component used in the experiment where it differs in conventional lab (Norasiken and Halimah, 2005). In other way, student and teacher can do the experiment as long as they want and it will avoid the student from using the dangerous material.

In order to make human-computer interaction more enjoyable and productive, an animated pedagogical agent was added to the interface of the laboratory. An animated pedagogical agent can be considered an extension of an intelligent tutoring system.An agent can have a positive impact as learning partners in a virtual world environment. It was found that the agent encouraged the use of explanation resources designed to help students generate more effective explanations. Agent might act as advisors in the process of generating explanations. Jeffrey Holmes (2005).

Propose of Research

The purpose of the research can be divided into two components:

i) Developing virtual laboratory for chemistry subject, alcohol for form 5 science students.
   a. Define methodology for virtual laboratory content.
   b. Creating Instructional Design Model (ID Model) for virtual laboratory content.
   c. Develop prototype of the content based on cognitive-constructivism approach.
ii) Do a research on the successfulness of virtual laboratory among students at MRSM Tun Ghafar Baba, Malacca.

Virtual Laboratory

The virtual laboratories is vary from static Web pages with didatic videos and texts, to dynamic pages with sophisticated environments, collaborative authoring (Emigh & Herring, 2005), videos on demand, virtual meetings,and many other features. These virtual laboratories may also allow remote access to measurement instruments, video cameras, microphones, electrical and mechanical circuits, chemical reactions, biological experiments, and so forth.

A virtual laboratory can be regarded as the simulation and extension of a real laboratory by means of computer support. Therefore, a virtual laboratory allows one, in principle, to evaluate real experiments and operations (Mahdavi et al. 2002). The laboratory based courses are being successfully delivered with limited or no travel required for the student (Lynn et al., 2005)

Educational Theories

Cognitive Theory

Cognitive theorist refers to the process of thinking that happened to someone while in the process of learning. It relate with short term and long term memory. Cognitive can produce learning by transferring information to the learner and helping them to organize it in such a way that they are able to recall it later.

One of the cognitive theories is information processing in learning computer. This theory offer active learning where students actively to get restructure and define knowledge in order to make learning more fun. It is because students need a transformation in learning and gain knowledge. The theory focused on new knowledge and past knowledge.

Based on cognitive theory, some guidelines have been used in creating and evaluate learning based on computer (Simonson and Thomson, 1990). The guidelines as below:

a. The willingness to study is important to start, maintain and ensure the objective of learning.
b. Structure and types of knowledge to teach. It is based on opinion, that student start to understand concrete operation, graphic display from reality and abstract expression and number system.
c. The sequences of learning material are important to define the type of student in processing the information they get. Knowledge of cognitive children style through parts of dominant brain and processing level are important to know style of learning.

Constructivism Theory

Through constructivism educational theory, students have their own mind that has been created by interaction with the environment. Concepts that own by each students are differing and mistake will be occurred if the concept created opposite with the concept accepted in the classroom. Through constructivism approach in classroom, students will actively involved in educational process and they have the chance to create their own knowledge based on their background, Roziah Abdullah (2004).

By helping student in their integration with experience and new knowledge they already have, the activity should be in the context of needed requirement and in different perspective. Jonassen 1994, Oliver 2000.

Theoretical Framework model

Theoretical framework model showed the structured profile that is Analysis and Design (I), Development (II) and Evaluation (III) for this virtual laboratory. The development model can be seen in figure 1, research on theoretical framework model. To achieve the purpose of research, some main question and research hypothesis is design as follows:

a) What kind of technique of Virtual Laboratory courseware is suitable for Form 5 students for learning Alcohol topic?

b) Is there any significant difference in student's result based on pre and post-test for the 'control group' and 'Experimental group' for Carbon Compound Topic?

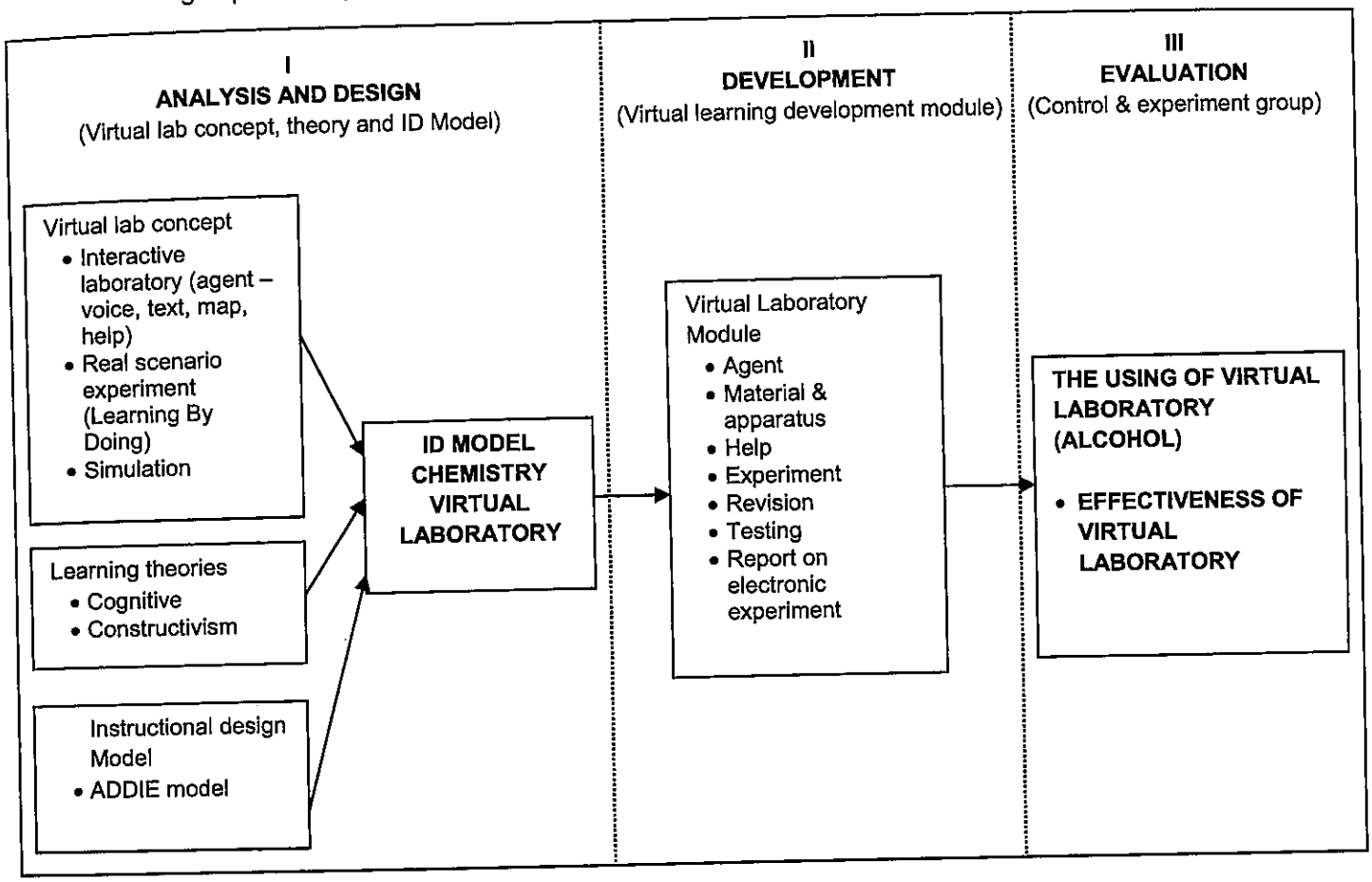

Figure 1 Research on theoretical framework model

ADDIE Model Life Cycle

The development of this virtual laboratory are based on ADDIE model

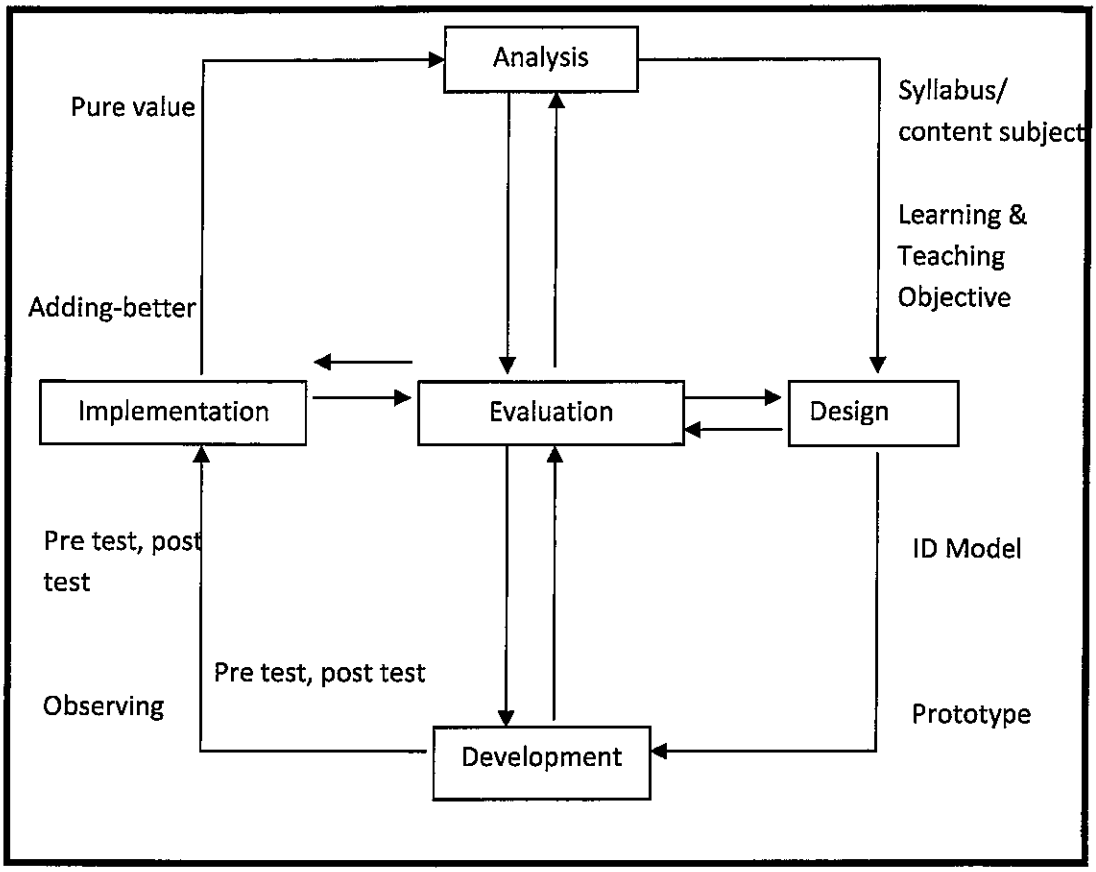

Figure 2 ADDIE Model Life Cycle

Phase 1: Analysis

Some elements have been listed during this phase to fulfill the requirements of this virtual learning development. The elements are as follows:

a. Target group
b. Learning and teaching objectives
c. Students background
d. Students existing knowledge
e. Domination of teaching and learning material
f. Constrain (hardware and software)
g. Pure value
h. Assessment planning

This research has been conducted by involving chemistry teacher and form 5 students.

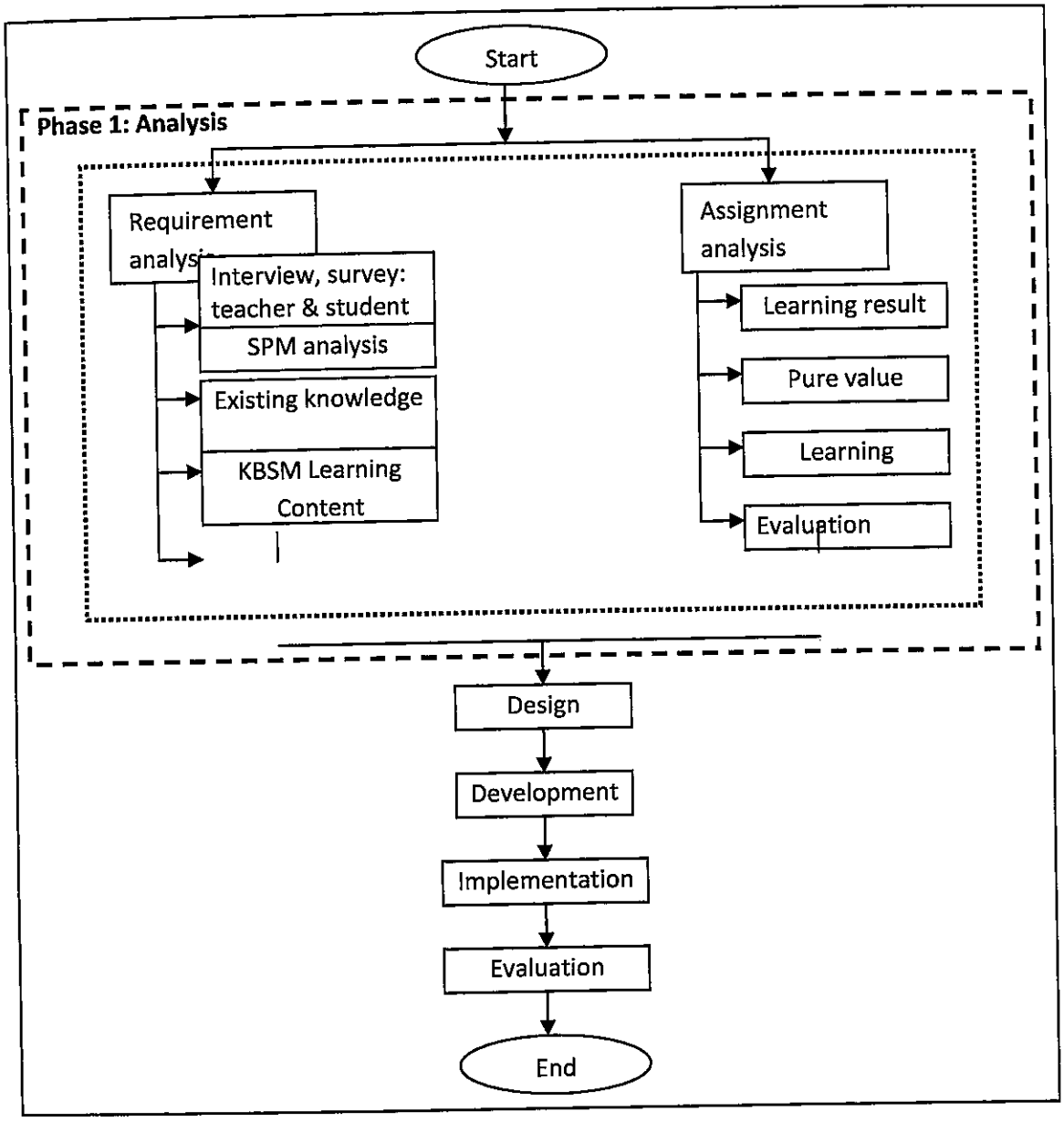

Figure 3 ADDIE: Analysis Phase

Phase 2: Design

The design phase involved elements that needed in virtual lab based on conceptual and theoretical model. Steps involved designing for the process as below:

a. Designing conceptual ID Model
b. Designing learning content

Conceptual ID Model for virtual learning involved some approach such as constructivism-contextual approach in teaching and learning process, science approach and the sequence of learning content.

Modules include in this virtual learning consists of Experiment Module, Revision Module and Mind Test Module. Figure below shows design phase of virtual learning.

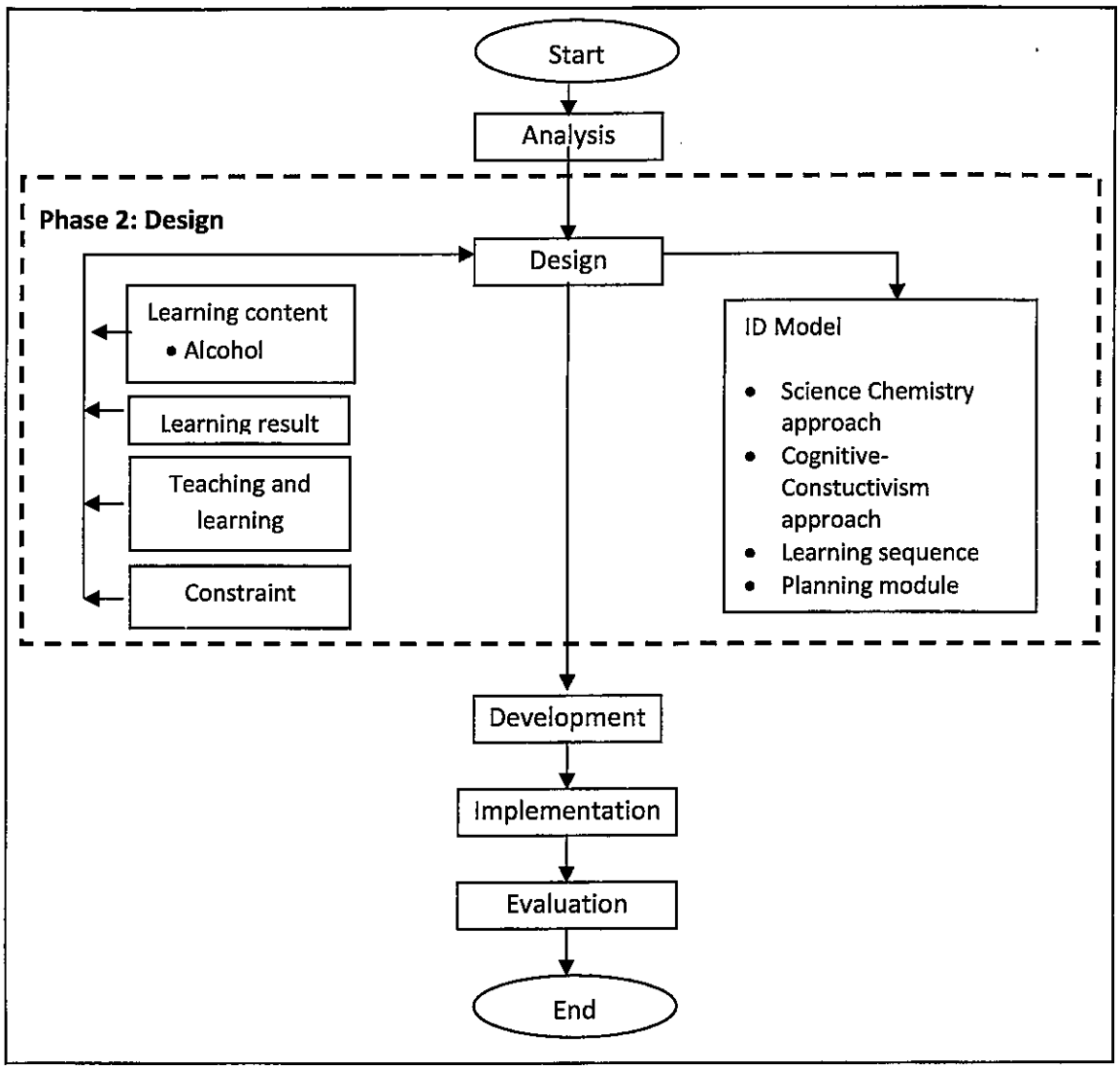

Figure 4 ADDIE: Design Phase

Phase 3: Development

The development phase of virtual learning involving 2 main elements:

- The development of virtual lab
- The development of software

During development phase, subjects that involved are:

- Storyboard development
- Authoring
- Graphics arrangement
- Recording and editing
- System integration

Figure 5 showed the development phase of virtual learning

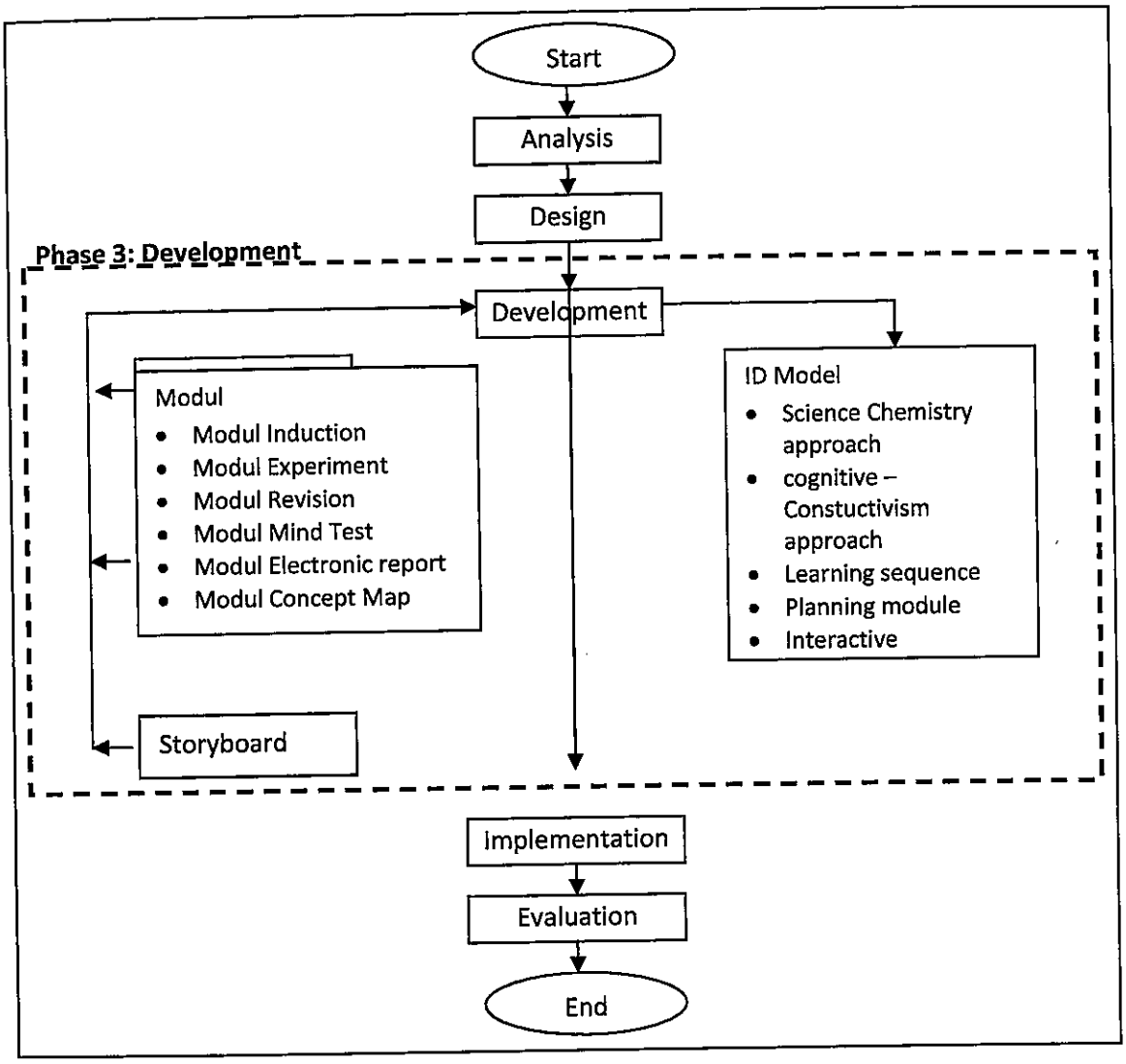

Figure 5 ADDIE: Development Phase

Phase 4: Implementation
Implementation phase involve testing for each unit that had been develop. During this phase, a prototype will be build and enable teacher to integrate their teaching by using computers.

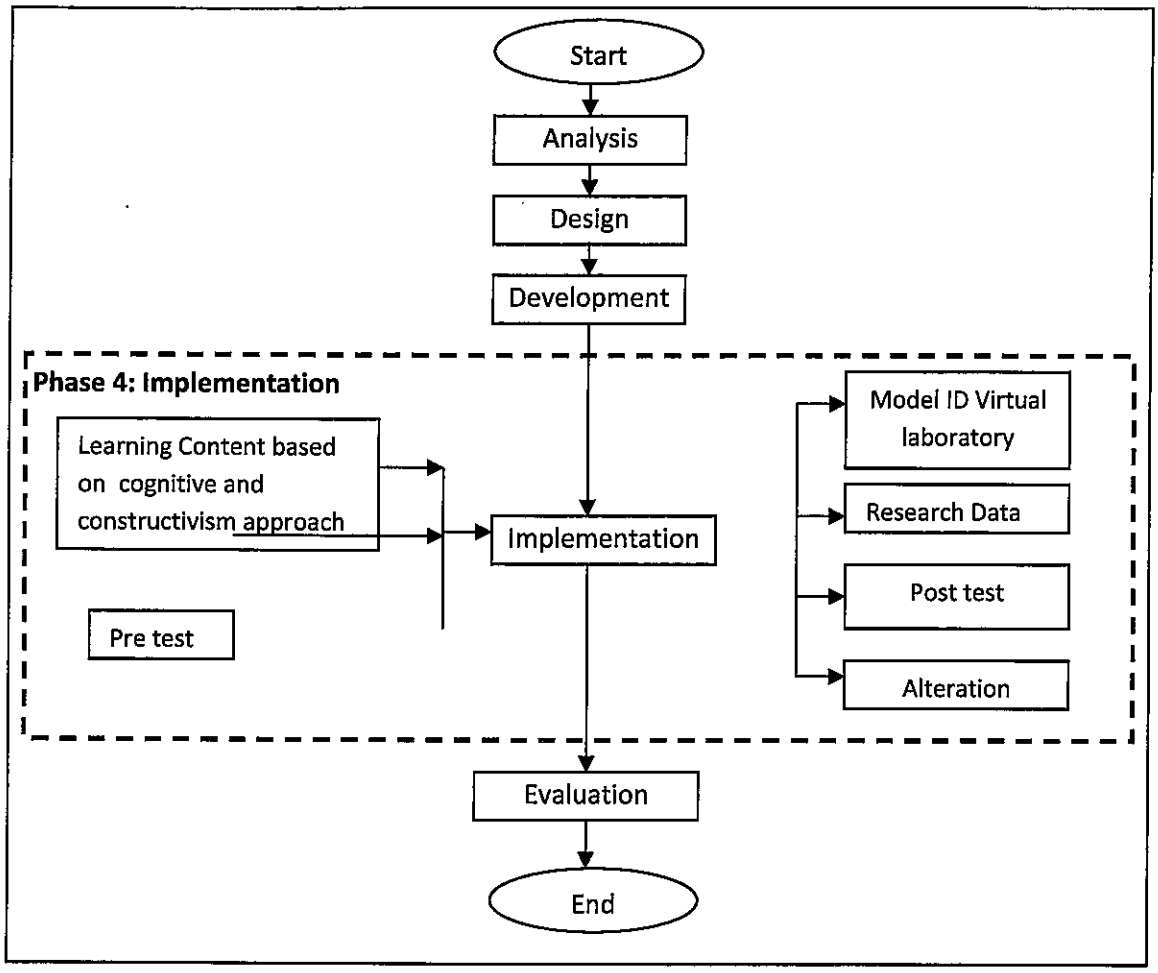

Figure 6 ADDIE: Implementation Phase

Phase 5: Evaluation

This is the last phase where researcher will get their result. This phase is the most important phase as it involves testing the effectiveness of virtual learning. Testing will be done at MRSM Alor Gajah. Figure shows that evaluation phase for this virtual learning.

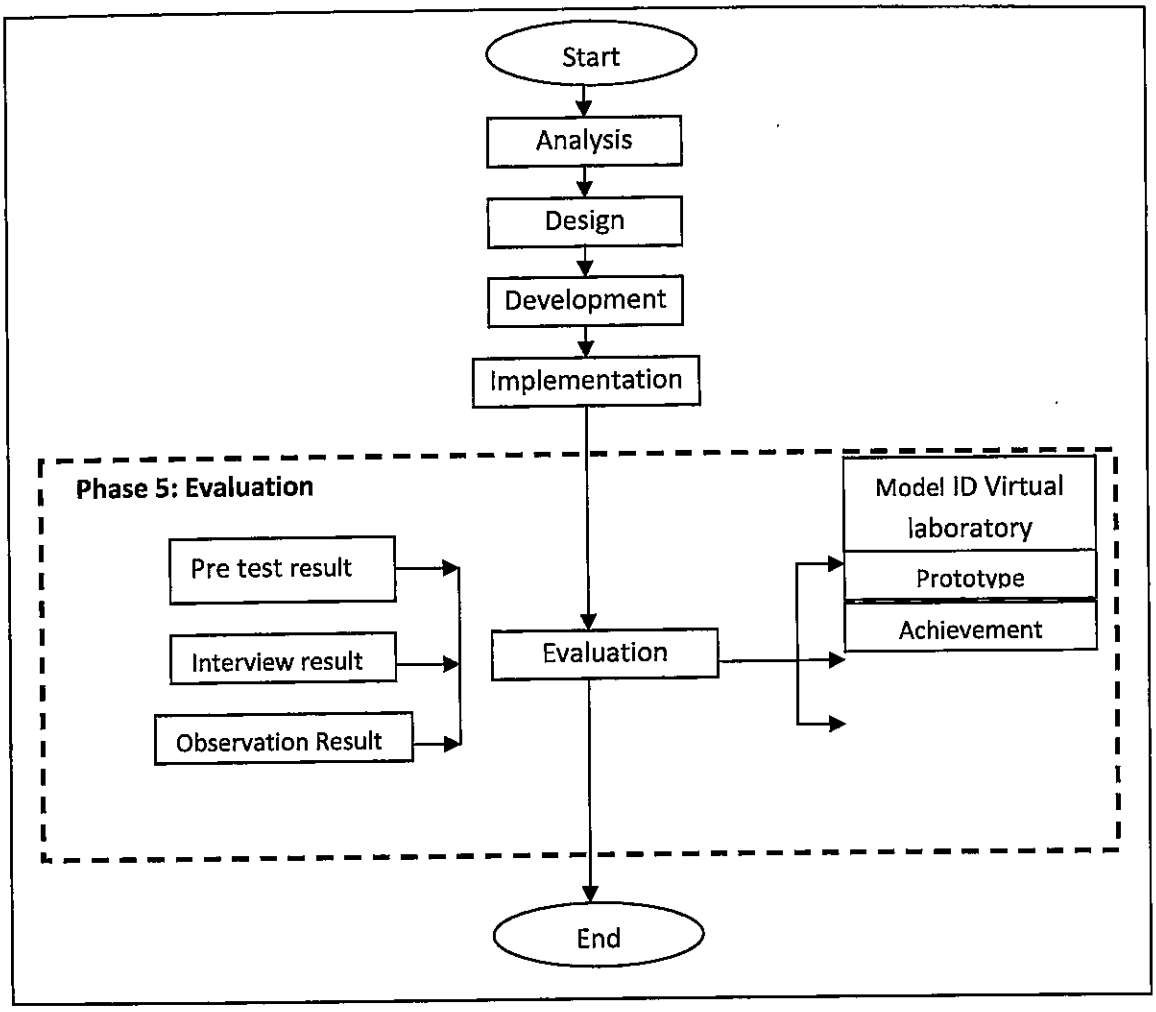

Figure 7 ADDIE: Implementation Phase

Conclusion

This paper presents the research methodology that will be the basis of development of virtual laboratory. The model use is derived from ADDIE model which is suitable for online virtual learning. Detail description phases involved in the development.

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