

3rd International Malaysian Educational Technology Convention

BLENDED EDUCATION:
**Towards A Personalised
Learning Environment**

EDITORS

Rozhan M. Idrus
Issham Ismail
Zaidatun Tasir
Mohd. Arif Ismail
Ali Sharaf Al Musawi
Balakrishnan Muniandy



Universiti Sains Malaysia



Educational Technology Division



Malaysian Educational Technology Association



Omani Society of Educational Technology

Published in Malaysia by:
Malaysian Educational Technology Association (META)
Educational Technology Division
Ministry of Education Malaysia
Persiaran Bukit Kiara
50604 Kuala Lumpur

Copyright © 2009 META

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publishers.

The papers in this proceeding were presented at the 3rd International Malaysian Educational Technology Convention (IMETC2009) that was held at the Hydro Majestic Hotel in Batu Ferringhi, Penang, Malaysia from 24-26 October 2009.

ISBN: 978-983-43633-4-5

Cover design: Fridaos Yusoff, School of Distance Education, Universiti Sains Malaysia
Printed by: A. Sani KW Sdn. Bhd., Penang, Malaysia

32. Metaphor as a Conceptual Tool in Learning Fundamental Programming Concepts: A Pilot Study <i>Tie Hui Hui & Irfan Naufal Umar</i>	269 – 276
33. Promoting Knowledge Sharing and Training through Lab Simulation and Modeling <i>Halimi Zakaria, Syed A.Kadir AISagoff & Azizi Ali @ Ibrahim</i>	277 – 279
34. Exploring the Physical Computer Laboratory Environment: Its Relationship with Social Interaction, Teaching Style, Instructor attention and Innovation <i>Nurizah Saleh, Ahmad Fauzi Mohd Ayub & Wong Su Luan</i>	281 – 284
35. Animations in Geometry <i>Kamel Ariffin Mohd. Atan, Rustem Suncheleev & Mahendran Shitan</i>	285 – 288
36. Designing Pedagogical Module Based on Technology and Learning Style for Form 4 Physics Curriculum: A Delphi Technique <i>Norlidah Alias & Saedah Siraj</i>	289 – 296
37. Experts' Opinions in the Design of a Collaborative Mlearning Module for Form 2 Science <i>Dorothy DeWitt & Saedah Siraj</i>	297 – 307
38. Instructional Design Module for Nonlinear and Interactive Application <i>Tan King Hiyang & Hanin Falina Mohd Hashim</i>	309 – 319
39. A Comparative Study on the Features of Free Online English-Arabic Dictionaries <i>Syuria Amirrudin, Juzlinda Mohd Ghazali, Che Wan Shamsul Bahari & Khirulnizam Abdul Rahman</i>	321 – 332
40. Open Knowledge Acquisition Environment on IMS Platform <i>Sazilah Salam & Saharah Be Sahul Hameed</i>	333 – 338
41. Mobile Learning Object Design for Novice Programming Students <i>Nurhana Hashim, Sazilah Salam & Ibrahim Ahmad</i>	339 – 344
42. The Development of Interactive CD Learning for Autism Children <i>Ibrahim Ahmad & Norasiken Bakar</i>	345 – 350
43. Speech Browser Facilitates the Visually Impaired Learners in Virtual Learning Environment <i>Nurulisma Ismail & Halimah Badioze Zaman</i>	351 – 358
44. Contribution of Demographic Factors Toward ICT Readiness of Instructors in Royal Malaysian Navy Training Centres <i>Mohd Arif Ismail, Norazah Mohd Nordin & Janudin Awang</i>	359 – 365
45. Mobile and CAD Technology Integration Effects on Designing Process of Malaysian Polytechnic Architecture Student in Producing Creative Product <i>Isham Shah Bin Hassan, Mohd Arif Ismail & Ramlee Mustapha</i>	367 – 372
46. Application of Learning Theories in Designing of a Multimedia Courseware to Stimulate Learning among Slow Learners <i>Norfarhana Abdollah, Wan Fatimah Wan Ahmad & Emy Elyanee Mustapha</i>	373 – 381
47. Designing and Developing Information Literacy Training Module for Teacher Librarian Based on the Big6 Model <i>Norhayati Razali</i>	383 – 401
48. Proposal for Student Reading Evaluation System (SRES) <i>Roslina Mohd Sidek & Muhammad Azam Jamaludin</i>	403 – 408
49. An Application-Oriented Approach to Foundations of Computing Theory <i>Fatima Talib</i>	409 – 414

50. Developing Educational Computer Games Using Freeware Engine: Game Maker <i>Suzana Ahmad, Norizan Mat Diah, Marina Ismail & Mohd Izwan Bin Mahmud</i>	415 – 424
51. Conceptualizing Augmented Reality Word Games for Reading Purpose <i>Hafiza Abas & Halimah Badioze Zaman</i>	425 – 432
51. Augmented Reality Book for Deaf Students in Learning Science <i>Norziha Megat Mohd Zainuddin, Halimah Hj Badioze Zaman & Azlina Ahmad</i>	433 – 443
52. The Design and Development of Multimedia Courseware for Cell Biology <i>Che Soh Said & Irfan Naufal Umar</i>	445 – 451
53. 3D Virtual Environment Technology in Tertiary Science Education <i>Che Soh bin Said & Irfan Naufal bin Umar</i>	453 – 458
55. A Study on Trainee Teachers' Critical Thinking in Online Discussion Forum <i>Irfan Naufal Umar, Noor Hazita Ahmad, Nur Hidayah Ahmad Kamal & Nurullizam Jamiat</i>	459 – 465
56. The Effect of Designing Electronic Slides on the Development of Creative Thinking <i>Mokaram Khaled Al-Ali & Fong Soon Fook</i>	467 – 471
57. Augmented Reality Game Based Learning Approach in Basic Reading for Down Syndrome Learner <i>Roslinda Ramli & Halimah Badioze Zaman</i>	473 – 483
58. Designing a Virtual Laboratory for Chemistry Using Animated Pedagogical Agent (APA) <i>Haslinda Ab Halim, Norasiken Bakar, Ibrahim Ahmad & Faaizah Shahbodin</i>	485 – 494
59. Induction of Decision Tree from the Algebra Diagnostic Assessment Dataset <i>Suhaimi Abdul Majid, Norazah Mohd. Nordin, Mohd Arif Bin Hj. Ismail & Abdul Razak Hamdan</i>	495 – 504
60. Instructional Technology Research Trends in Malaysian Secondary Schools: A Content Analysis <i>Nurullizam Jamiat, Irfan Naufal Umar, Mona Masood & Nur Hidayah Kamal Azhar</i>	505 – 511

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

Haslinda Ab Halim, Norasiken Bakar, Ibrahim Ahmad & Faaizah Shahbodin

*Department of Interactive Media
Faculty of Information and Communication Technology
Universiti Teknikal Malaysia Melaka (UTeM)
76109 Durian Tunggal, Melaka.
haslindahalim86@gmail.com, norasiken@utem.edu.my,
ibrahim@utem.edu.my & faaizah@utem.edu.my*

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?

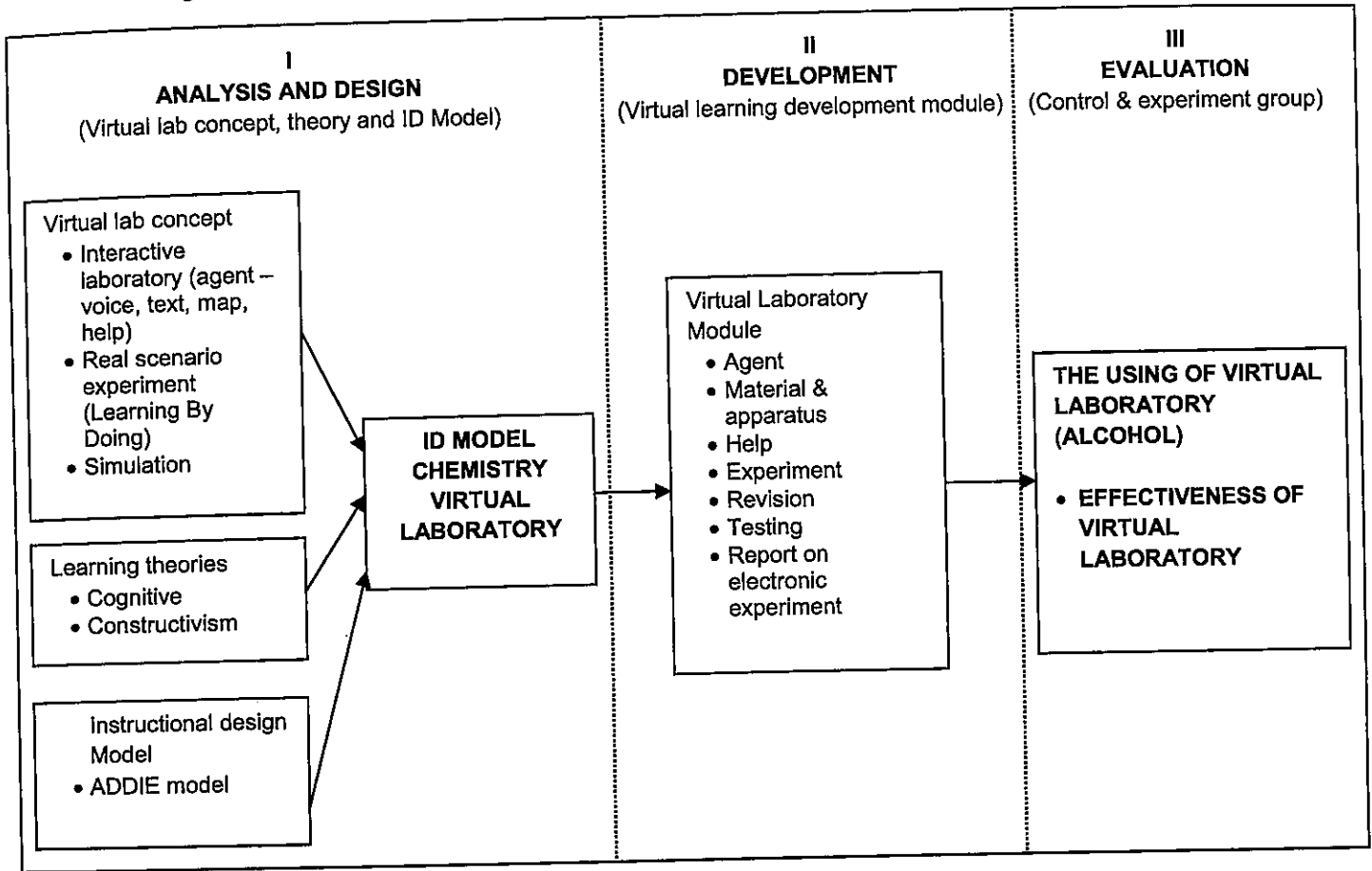


Figure 1 Research on theoretical framework model

ADDIE Model Life Cycle

The development of this virtual laboratory are based on ADDIE model

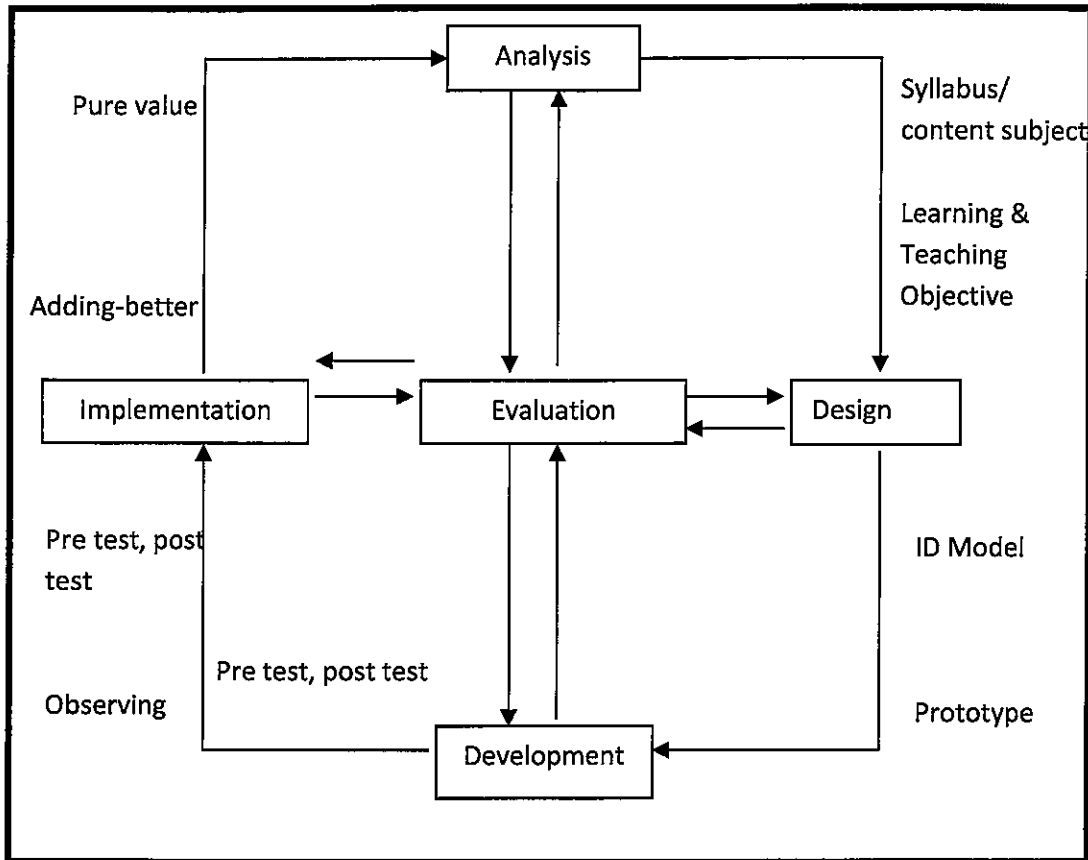


Figure 2 ADDIE Model Life Cycle

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.

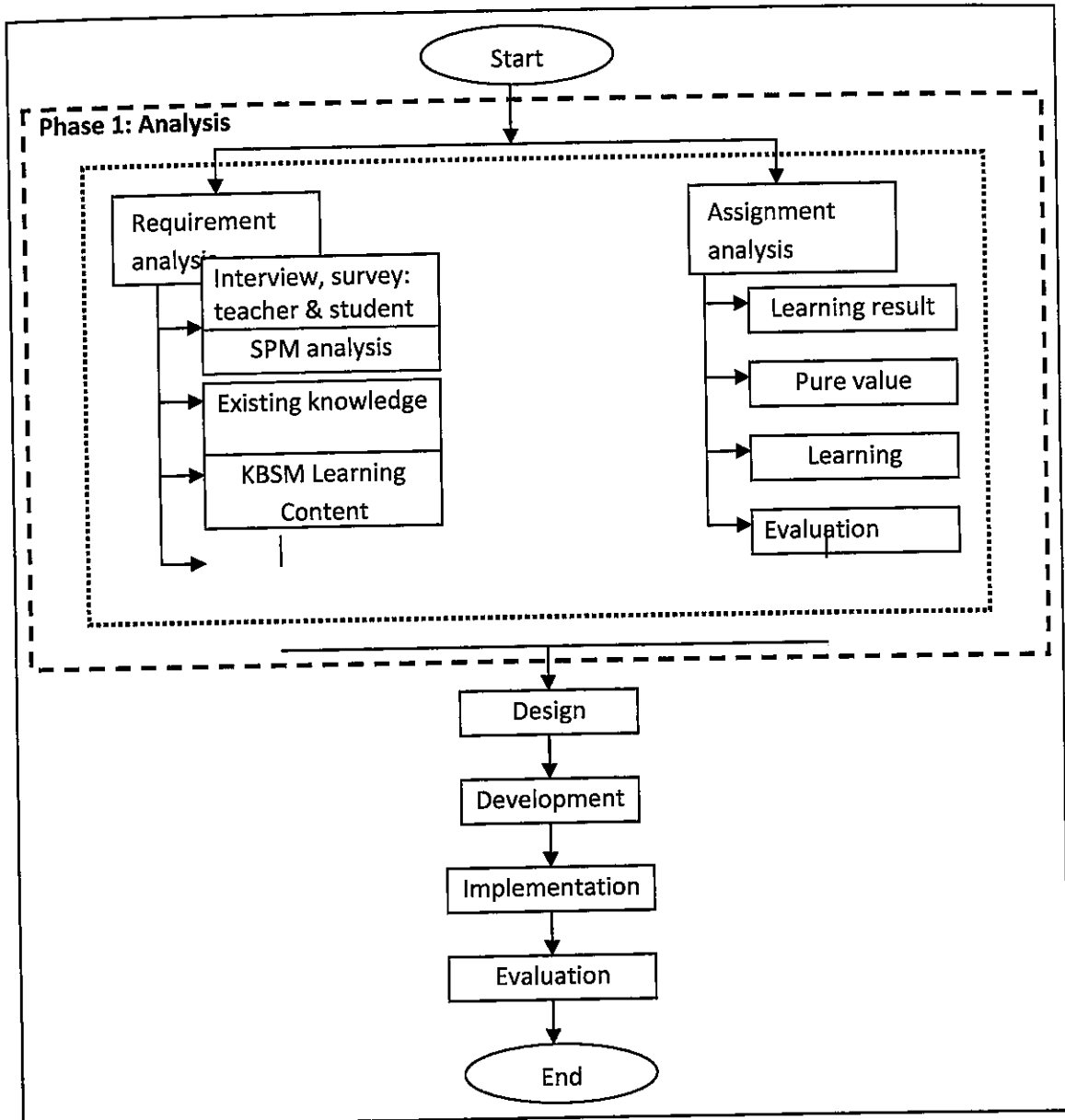


Figure 3 ADDIE: Analysis Phase

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.

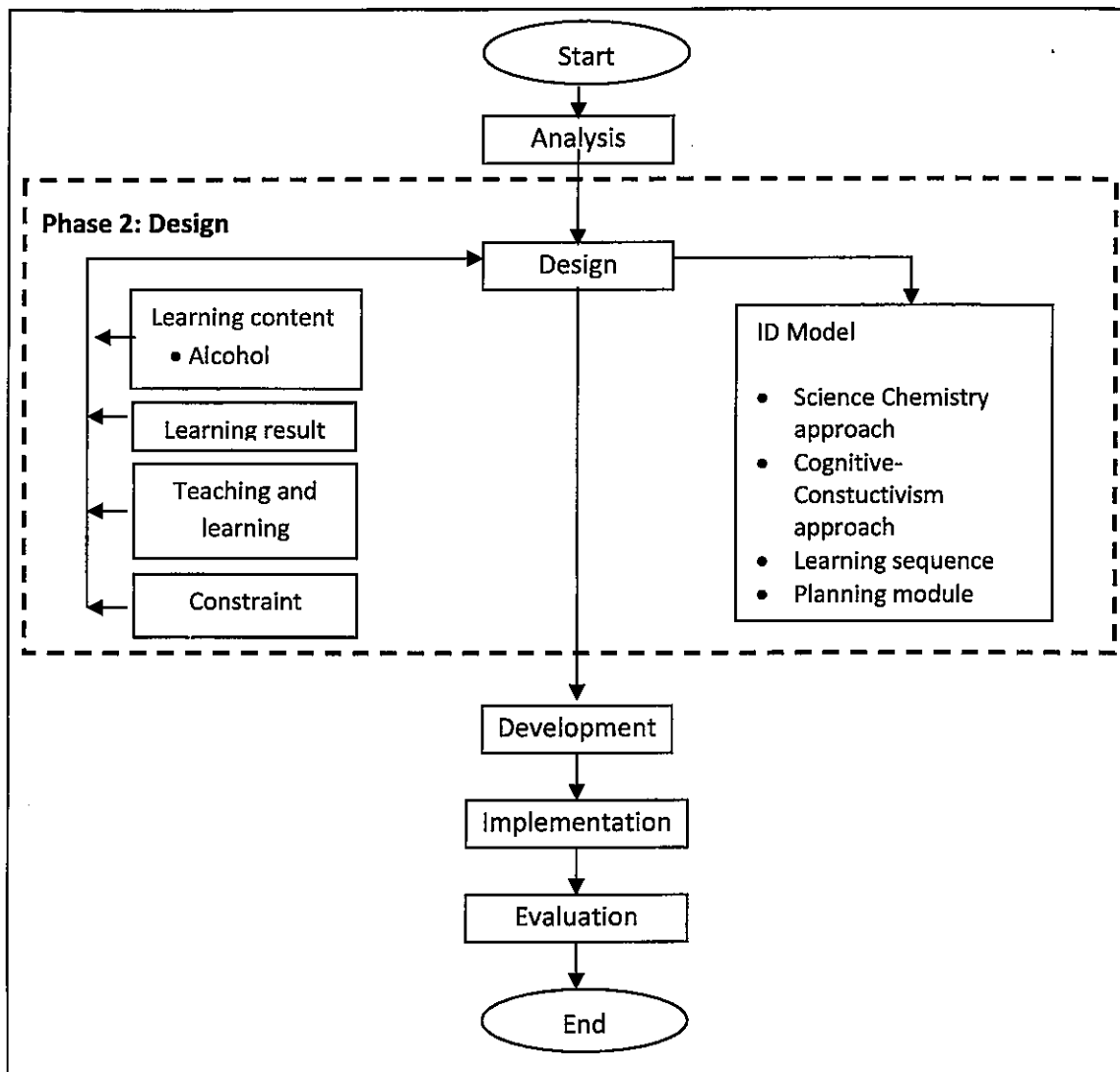


Figure 4 ADDIE: Design Phase

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

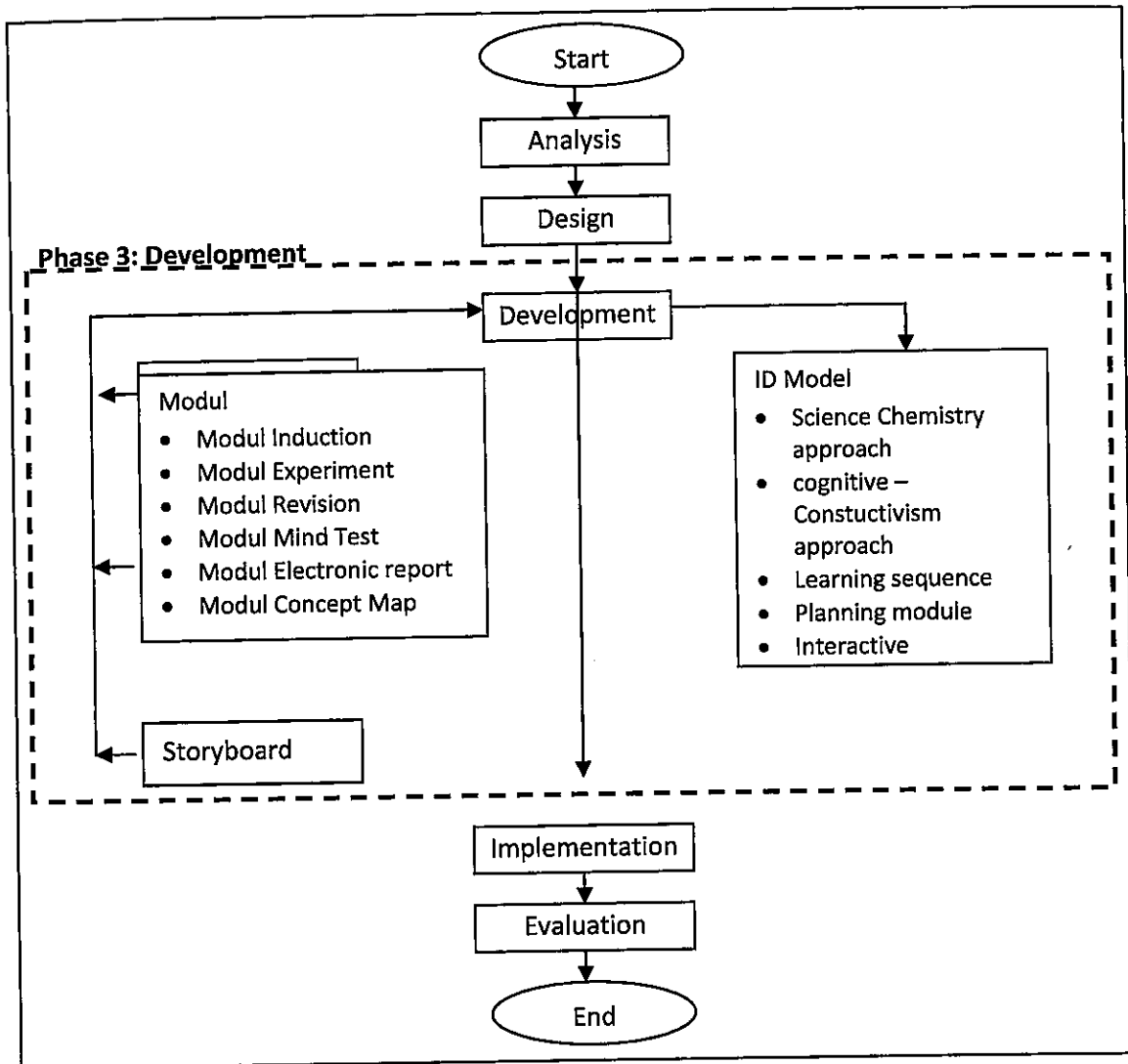


Figure 5 ADDIE: Development Phase

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.

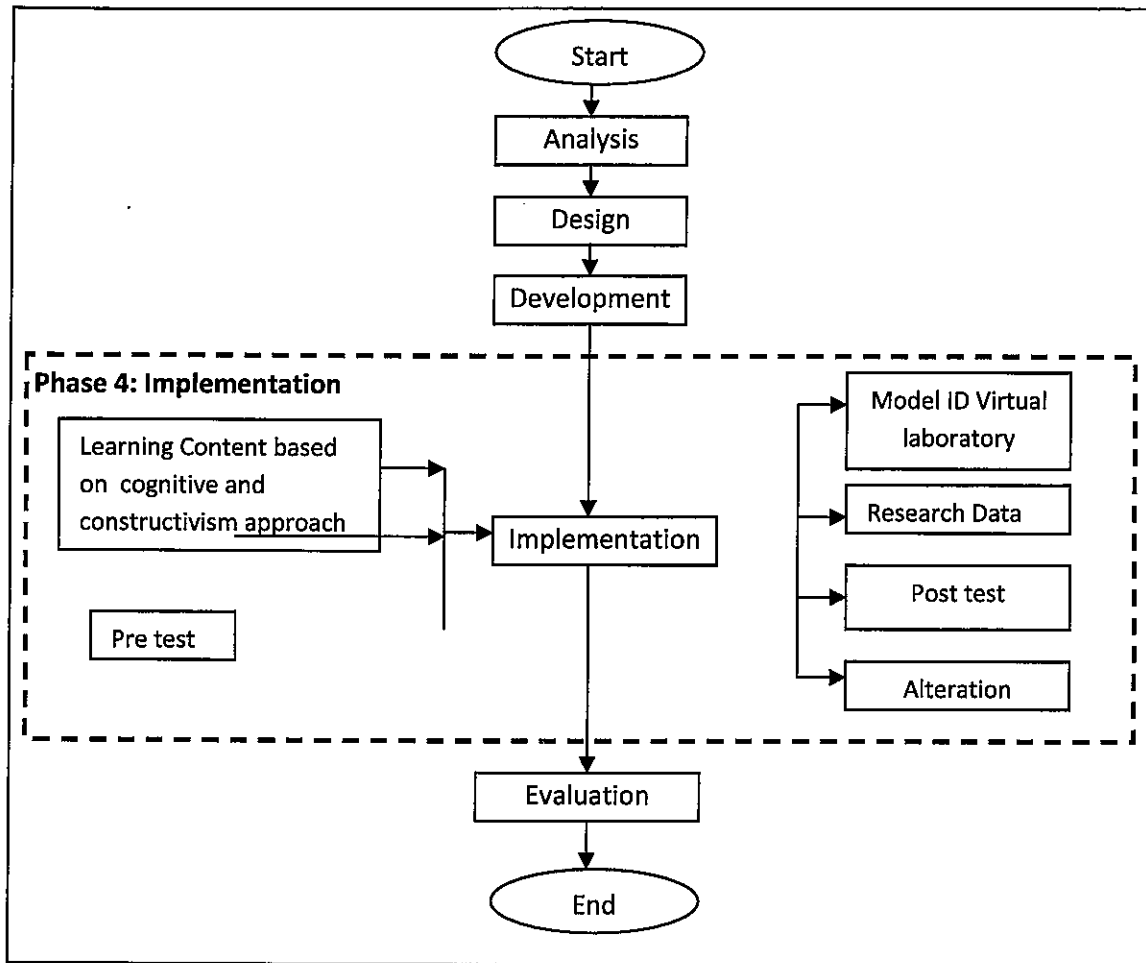


Figure 6 ADDIE: Implementation Phase

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.

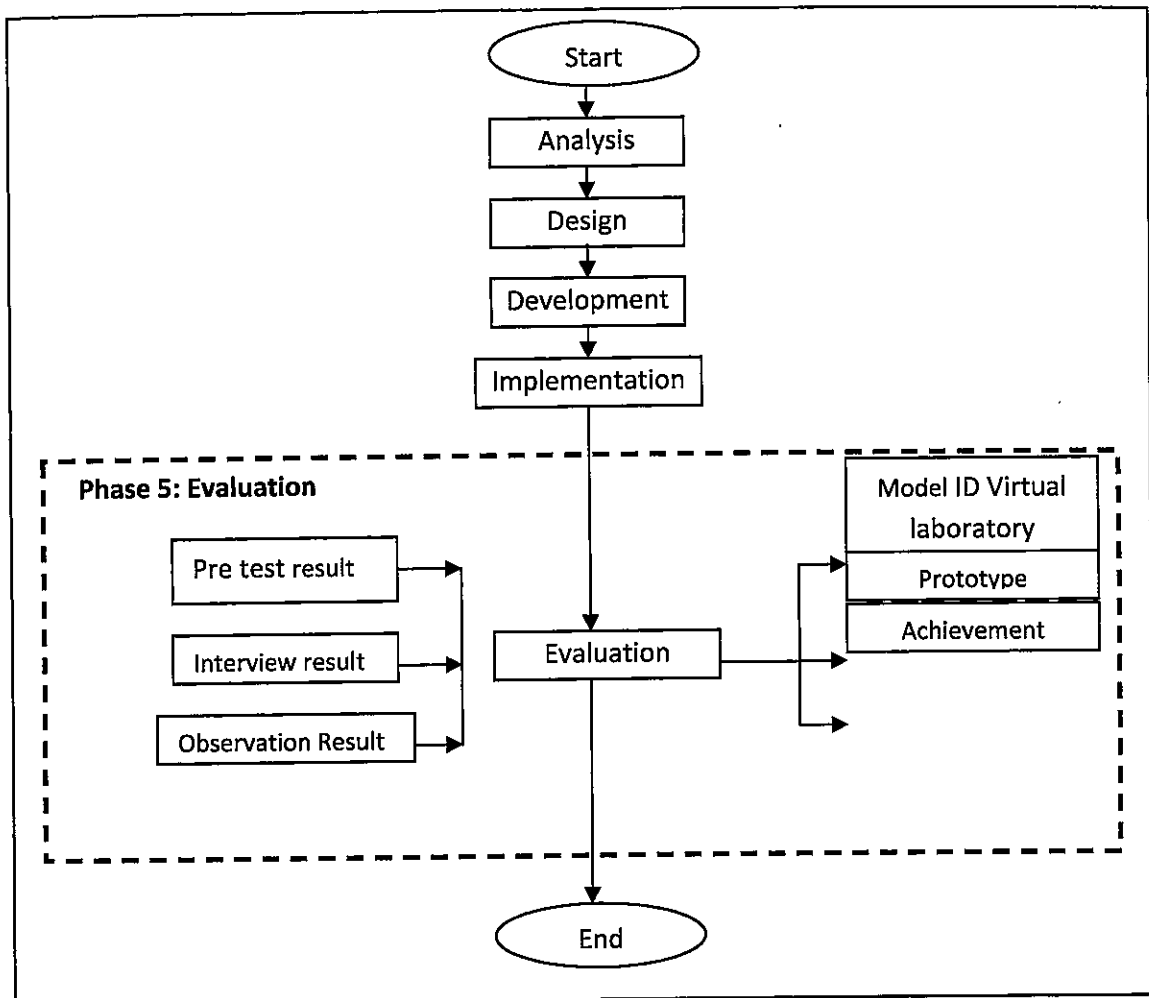


Figure 7 ADDIE: Implementation Phase

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.

References

- Bakar, N., Zaman B.H., (2005). *Analisis Awal Makmal Maya Bagi Pengajaran Kimia (Asid, Bes dan Garam)*. *Inovasi Teknologi Instruksional Dalam Pengajaran dan Pembelajaran. Konvensyen Teknologi Pendidikan ke-18*, hlm. 809-816. Terengganu: Persatuan Teknologi Pendidikan Malaysia.
- Bakar, N., (2008). *Makmal Maya Kimia Berasaskan Pendekatan Kognitivisme, Konsruktivisme, dan Kontekstual (VLAB-CHEM)* (Doctoral dissertation). Universiti Kebangsaan Malaysia, Malaysia.
- Emigh, W. & Herring, S.C. (2005). Collaborative authoring on the Web: A genre analysis of online encyclopedias. In *Proceedings of the IEEE Hawaii International Conference on System Sciences*, 4 (pp. 99.1).
- Holmes, J. (2005). Designing Agents to Support Learning by Explaining. *Journal of ScienceDirect, Computer & Education* 48 (2007), 523-547.
- Junaidi, J. (2007). Assisting Learning Using Computers Through the Application of Animated Pedagogical Agents (APA) or Intelligent Agents. 1st International Malaysian Educational Technology Convention.

- Hajah Norasiken Bakar & Halimah Badioze Zaman: Analisis Awal Kimia bagi Pengajaran Kamia (Aisd, Base, dan Garam). Konvensyen Teknologi Pendidikan Ke-18. Inovasi Teknologi Pembelajaran (2005), 809-816.
- Jonassen, D.H. Thinking Technology. Educational Technology (1994).
- Lynn, S., Michael, G. & Jeffrey, S. (2005). Delivering Laboratory Based Courses Via Distance Education. Department of Engineering Technology, New Mexico State University.
- Mahdavi, A., Metzger, A. & Zimmermann, G. (2002). Towards a Virtual Laboratory for Building Performance and Control. Journal R. Trappl (Ed.) Cybernetics and Systems 2002. Vol. 1. Vienna: Austrian Society for Cybernetic Studies, 2002, 281–286.
- Morozov, M., Tanakov, A., Gerasimov, A., Bystrov, D. & Cvirco, V. (2004). Virtual Chemistry Laboratory for School Education. The 4th IEEE International Conference on Advanced Learning Technologies (ICALT). IEEE Computer Society 2004, ISBN 0-7695-2181-9, pp. 605-608.
- Roziah Abdullah. Pembangunan dan Keberkesanan Pakej Multimedia Kemahiran Berfikir Bagi Mata Pelajaran Kamiah. Ph.D diss., Universiti Kebangsaan Malaysia (2004).
- Oliver, K.M. Methods for Developing Constructivist Learning on the Web. Educational Technology (2000), 40(6): 5-18.
- Simonson, M.R. & Thomson, A. (1990). *Educational Computing Foundations*. Ohio: Merrill Publishing Company.