WEB BASED LEARNING ON KBSM CHEMICAL FORMULAE  
INCORPORATING SELECTED MULTIPLE INTELLIGENCES 

DIVYA NAIR G. 

UNIVERSITI TEKNOLOGI MALAYSIA
DECLARATION OF THESIS / UNDERGRADUATE PROJECT PAPER AND COPYRIGHT

Author’s full name: DIVYA NAIR G.

Date of birth: 6 JANUARY 1986

Title: WEB BASED LEARNING ON KBSM CHEMICAL FORMULAE INCORPORATING SELECTED MULTIPLE INTELLIGENCES.

Academic Session: 2008/2009

I declare that this thesis is classified as:

☐ CONFIDENTIAL (Contains confidential information under the Official Secret Act 1972)*

☐ RESTRICTED (Contains restricted information as specified by the organisation where research was done)*

☑ OPEN ACCESS I agree that my thesis to be published as online open access (full text)

I acknowledge that Universiti Teknologi Malaysia reserves the right as follows:

1. The thesis is property of Universiti Teknologi Malaysia.
2. The Library of Universiti Teknologi Malaysia has the right to make copies for the purpose of research only.
3. The Library has the right to make copies of the thesis for academic exchange.

Certified by:

______________________________
SIGNATURE

860106085920

(NAME OF SUPERVISOR)

ASSOC. PROF. MOHAMAD BILAL ALI

Date: 30 APRIL 2009

NOTES: * If the thesis is CONFIDENTIAL or RESTRICTED, please attach the letter from the organisation with period and reasons for confidentiality or restriction.
I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of the degree of Bachelor of Science and Computer with Education (Chemistry).

Signature : 

Name of Supervisor : ASSOC. PROF. MOHAMAD BILAL ALI

Date : 30 APRIL 2009
WEB BASED LEARNING ON KBSM CHEMICAL FORMULAE
INCORPORATING SELECTED MULTIPLE INTELLIGENCES

DIVYA NAIR G.

A dissertation submitted in partial fulfillment of the requirements for the award of the degree of Bachelor of Science and Computer with Education (Chemistry)

Faculty of Education
Universiti Teknologi Malaysia

APRIL 2009
I declare that this dissertation entitled “Web Based Learning on KBSM Chemical Formulae Incorporating Selected Multiple Intelligences” is the result of my own research except as cited in the bibliography. This thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : ____________________________
Name : DIVYA NAIR G.
Date : 30 APRIL 2009
In dedication to my beloved parents, for believing the best in me.
ACKNOWLEDGEMENT

My heartfelt and sincere appreciation goes to my supervisor, Associate Professor Mohamad Bilal Ali for his counsel and guidance throughout the process of completing this dissertation. His flexibility and friendly nature has made the project stress free and somewhat enjoyable.

I am indebted to my parents for their unconditional love and support. Without my father’s encouraging words and my mother’s caring nature, I would not have been resilient enough to make it through the four years here. Thank you for never saying no and always allowing me to follow my heart. A very special thanks goes to my one and only little brother, for standing by my side through the good and bad times. You are indeed my sunshine.

To my dearest Thanath, a big thank you for everything. You have been my source of strength and support. With your kind gestures, the production of this thesis went on smoothly without any glitches.

I would also like to extend my utmost gratitude to my wonderful sister, Nithya. Her views, tips and favours have gone a long way in making this project a success.

I thank as well my fellow course mates and friends, especially Biha, Dayana and Shalini, for their assistance and constructive criticism throughout the development of this project. My most sincere appreciation also extends to Yau Seet Ting, for being a very kind and helpful friend. You will always be remembered.
ABSTRACT

Vision 2020 aspires our nation to establish a progressive and resourceful society that is able to contribute to the scientific and technological civilisation of the future. One of the strategies to achieve this aspiration would be through the system of education whereby web based learning would be a good platform to begin with. The aim of this project is to develop a website for KBSM Chemistry Form Four for the subtopic Chemical Formulae, which is under the topic Chemical Formulae and Equations, Chapter 3. The aim of this website is to provide a web based learning platform for students to learn Chemical Formulae. The theory of Multiple Intelligences has been incorporated in the development of this website. However, only four multiple intelligences are selected in delivering the learning contents. The four intelligences selected are Verbal Linguistics, Logical Mathematical, Visual Spatial and Interpersonal. The Hannafin & Peck Model was adapted throughout the development process, which includes Needs Assessment, Design and Development/Implementation Phase. Evaluation was carried out simultaneously during all three phases of development. The primary software used in developing this website is Microsoft Office Frontpage. Integration of multimedia elements such as graphics, video and animation are used to enhance the process of learning. It is hoped that this website would benefit students with the selected four intelligences at an optimum level in learning Chemical Formulae.
ABSTRAK

# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION</td>
<td></td>
<td>ii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td></td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td></td>
<td>iv</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td></td>
<td>v</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td></td>
<td>vi</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td></td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td></td>
<td>xi</td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td></td>
<td>xii</td>
</tr>
</tbody>
</table>

## INTRODUCTION

1.1 General 1
1.2 Background of the Problem 3
1.3 Problem Statement 5
1.4 Objectives 7
1.5 Rationale of Web Development 8
1.6 Scope and Limitations 9
1.7 Terminology 10
   1.7.1 Multimedia 10
I.7.2 Website  
1.7.3 Information and Communication Technology (ICT)  
1.7.4 Chemistry  
1.7.5 Chemical Formulae  
1.8 Conclusion  

II LITERATURE REVIEW  
2.1 Introduction  
2.2 Computer Aided Learning  
2.3 Web Based Learning  
2.3.1 Benefits of Web Based Learning  
2.3.2 Previous Researches  
2.4 Learning Chemistry Through the Web  
2.5 Multiple Intelligences Theory  
2.5.1 The Eight Intelligences  
2.5.2 Impacts of Multiple Intelligences on Teaching and Learning  
2.6 Applying Multiple Intelligences in Web-based Learning  
2.6.1 Verbal-Linguistic Intelligence  
2.6.2 Logical-Mathematical Intelligence  
2.6.3 Visual-Spatial Intelligence  
2.6.4 Interpersonal Intelligence  
2.7 Conclusion
III  WEB DESIGN
3.1 Introduction 35
3.2 Instructional Design for Web Development 35
3.3 Hannafin & Peck Model 36
   3.3.1 Needs Assessment Phase 37
      3.3.1.1 User Analysis 38
      3.3.1.2 Hardware Specifications Analysis 38
      3.3.1.3 Software Analysis 39
   3.3.2 Design Phase 40
      3.3.2.1 Application of Multiple Intelligences 40 Theory
      3.3.2.2 Website Design 41
   3.3.3 Development/Implementation Phase 42
   3.3.4 Evaluation and Revision Phase 43
3.4 Conclusion 44

IV  WEB DEVELOPMENT
4.1 Introduction 45
4.2 Interface for Home 47
4.3 Interface for Objectives 48
4.4 Interface for Let’s Learn 49
4.5 Interface for Verbal Linguistics 50
4.6 Interface for Logical Mathematical 51
4.7 Interface for Visual Spatial 52
4.8 Interface for Interpersonal 53
4.9 Interface for Let’s Play 54
   4.9.1 Interface for Quiz 54
4.9.2 Interface for Enrichment 56
4.10 Interface for Let’s Ask 57
4.11 Interface for Credits 60

4.12 Process of Summative Evaluation 61
4.13 Website Uploading to Server 61
4.14 Conclusion 62

V CONCLUSIONS AND RECOMMENDATIONS
5.1 Conclusions 63
  5.1.1 Discussion 63
  5.1.2 Advantages and Disadvantages of the Website 65
    5.1.2.1 Advantages 65
    5.1.2.2 Disadvantages 65
  5.2 Recommendations 66

BIBLIOGRAPHY 67
APPENDIX 72
**LIST OF FIGURES**

<table>
<thead>
<tr>
<th>FIGURE NO.</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Hannafin &amp; Peck Instructional Design Model</td>
<td>37</td>
</tr>
<tr>
<td>3.2</td>
<td>Eye Movement on the Computer Screen</td>
<td>41</td>
</tr>
<tr>
<td>4.1</td>
<td>Interface for <em>Home</em></td>
<td>47</td>
</tr>
<tr>
<td>4.2</td>
<td>Interface for Objectives</td>
<td>48</td>
</tr>
<tr>
<td>4.3</td>
<td>Interface for <em>Let’s Learn</em></td>
<td>49</td>
</tr>
<tr>
<td>4.4</td>
<td>Interface for the four subtopics in all four multiple intelligences</td>
<td>50</td>
</tr>
<tr>
<td>4.5</td>
<td>Interface for <em>Logical Mathematical</em></td>
<td>51</td>
</tr>
<tr>
<td>4.6</td>
<td>Interface for <em>Visual Spatial</em></td>
<td>52</td>
</tr>
<tr>
<td>4.7</td>
<td>Interface for <em>Chat</em> under <em>Interpersonal</em></td>
<td>53</td>
</tr>
<tr>
<td>4.8</td>
<td>Interface for <em>Quiz 1</em></td>
<td>54</td>
</tr>
<tr>
<td>4.9</td>
<td>Interface for Questions in <em>Quiz 1</em></td>
<td>55</td>
</tr>
<tr>
<td>4.10</td>
<td>Interface for <em>Quiz Evaluation Sheet</em></td>
<td>55</td>
</tr>
<tr>
<td>4.11</td>
<td>Interface for Enrichment Activity 1: <em>Tim and Moby</em></td>
<td>56</td>
</tr>
<tr>
<td>4.12</td>
<td>Interface for Enrichment Activity 2: <em>Lucy Speaks</em></td>
<td>57</td>
</tr>
<tr>
<td>4.13</td>
<td>Interface for <em>Glossary</em></td>
<td>58</td>
</tr>
<tr>
<td>4.14</td>
<td>Interface for <em>Web Links</em></td>
<td>58</td>
</tr>
<tr>
<td>4.15</td>
<td>Interface for <em>Search</em></td>
<td>59</td>
</tr>
<tr>
<td>4.16</td>
<td>Interface for <em>Contact Me</em></td>
<td>59</td>
</tr>
<tr>
<td>4.17</td>
<td>Interface for <em>Credits</em></td>
<td>60</td>
</tr>
</tbody>
</table>
# LIST OF APPENDICES

<table>
<thead>
<tr>
<th>APPENDIX</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>EVALUATION CHECKLIST</td>
<td>72</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

1.1 General

The education system in Malaysia has evolved tremendously ever since independence, some fifty years ago. This can be clearly seen in many aspects such as the language or medium used to convey teaching contents, the syllabus of subjects, the theories and approaches used in content delivery, tools used in classrooms and the merit system and such among others. For instance, the teaching and learning process which was rather teacher centred is moving towards a different path where it is more student centred. Besides that, there is the implementation of Smart Schools that utilises ICT in their teaching and learning process and also in the school administration management. In year 2003, the decision made by the Ministry of Education to use the English language as the medium of delivery for all Science and Mathematics subjects accelerated the use of ICT in the academic world whereby 5 billion ringgit was allocated for this implementation to take place. This includes the funds for supplies of ICT related equipments in schools such as LCD projectors and notebooks (Berita Harian 20 July 2002). All that has been changed from time to time is implemented to improve the quality of education in our country.

While all these changes have been made, the process of Teaching and Learning truly has not evolved very much in our country. The classic and conventional method,
‘Chalk and Talk’ is very much sustained in most schools. Although we are being widely exposed to the use of technology and multimedia in this era, not all schools have come to implementing it. This may be due to many reasons such as the availability of facilities, computer knowledge among teachers and educators and the sources available for teaching and learning incorporating multimedia. According to Jamaluddin and Zaidatun in Ahmad Kamal (2007), teachers should integrate their teaching process with entertainment, whereby this concept is known as edutainment. This approach is an evolution from the conventional method of teaching to a rather interesting process of teaching and learning. It would involve games, puzzles and multimedia elements such as audio, video and animation, which would in turn, keep students in focus and make them look forward to their lessons.

The use of computers in our daily lives has proven to be the catalyst in the vast development of the information and communication technology (ICT). It lessens our burden in completing almost any task that would otherwise take more of our time. It provides a systematic platform to organise and perform our daily tasks. By using the benefits and advantages of this powerful technological tool, we are able to save a lot of time and also money. It is no longer a luxury but rather a necessity in our fast paced lives of today. This is said in accordance with Azwan & Rozita in Ahmad Kamal (2007).

“The vast development of Information and Communication Technology saves times and energy as well as transforms and simplifies the transfer of information, which takes place in the virtual cyber world, is becoming more of a reality by the day in the education system of Malaysia.’

The role of computers has heightened with the existence of Internet. Internet is defined as a "network of networks" that consists of millions of private and public, academic, business, and government networks of local to global scope that are linked by copper wires, fiber-optic cables, wireless connections, and other technologies. The Internet carries various information resources and services, such as electronic mail,
online chat, file transfer and file sharing, online gaming, and inter-linked hypertext documents and other resources on the World Wide Web (WWW).

The use of technology and computers aid the teaching and learning process in many useful ways. As stated by Heinich, Molenda and Rusell (1993), there are many computational software that could prove beneficial in educational aspects when used in classrooms. Computers make the teaching process more interesting and interactive with aids of multimedia elements such as graphic, audio, video and simulation. According to AB. Rahman B. Darus et al. in Nor Ilyani (2007), the use of computers could enrich effective teaching methods. Saholtz (1992) in Nor Ilyani (2007) stated that the use of multimedia technology would simplify the teaching and learning process. The emphasis given in schools should be diverted from techniques of memorising to gaining knowledge and creative thinking using latest technologies In line with this proposal, the use of multimedia in education should be fully utilised (Nur Hudha, 2007).

1.2 Background of the Problem

Students are introduced to Chemistry in Form Four. It is an elective subject for science stream students in SPM. It is a subject or rather a field that needs much thinking. When studying Chemistry, students often face problems because the contents of this subject consist of difficult concepts, complicated concept relativity and problem solving skills (Aziz, 1992; Frazer, 1982 in Husna Hariani; 2007) that require high level of thinking. Thinking here does not confine to being able to think of answers to solutions, but to understand the concepts in a creative and critical manner in order to completely digest the gist of it.

But sadly, there are many students who despise studying chemistry. A research carried out by Gussarsky and Gorodetsky (1998) shows that many students are not able
to understand the concepts in Chemical Formulae and Equations. According to Husna Hariani (2007), this Form Four topic involves calculations and concepts that need understanding and memorising chemical symbols and formulas that are rather abstract. In solving the problems, students face situations whereby there is no one correct method of solving. To be able to find the correct solution and answer for a particular question, proper planning of steps and strategy is required. The process of thinking and rationalising a step in problem solving is vital (Husna Hariani, 2007).

In order to possess this skill, systematic, methodological and logical thinking is needed. This chapter; Chemical Formulae and Equations, contains many basic concepts for the overall understanding of Chemistry. Problem solving would not make much sense without the concrete understanding of a concept. The ability of a student to recall and choose the correct formula for a particular problem in chemistry could be a great challenge. A research conducted by Berquist (1990) shows that students who are taught the Chemical Formulae and Equations topic are still not able to solve the problems in chemical equations although they are given simple questions. McIntosh in Husna (2007) suggests that students should be allowed to practice and apply their problem solving skills time and again before they are given questions and are expected to answer correctly. Students often use logic without having a proper grasp of the overall concept in this topic. Another research conducted by Frazer in Husna (2007) lists down the contributing factors toward the inability to solve problems in this chapter. Among them are:

i) Failure to begin problem solving process due to low self-confidence, lack of motivation and inability to detect keywords in questions when information is provided within the question itself.

ii) Failure to complete the solution – due to inability to recall required knowledge, inability to use information given, incorrect method and incorrect understanding of a concept.
iii) Ability to complete solution, but with wrong answer. This could be due to mistakes in calculation steps or a mistake in the magnitude or unit of the answer.

This topic contains a variety of basic concepts that each chemistry student must have knowledge of in order to understand the principles and concepts in Chemistry as a whole. In general, students are not able to solve problems systematically whereby they do not begin with a basic step and move on to further steps in order to obtain the answer. Therefore, it is the responsibility of the teacher to introduce suitable models or approaches to brush up students’ problem solving skills in this topic. To deepen students’ understanding in this topic, a proper strategy is needed. A variation of teaching methods and proper teaching strategy in line with individual areas of strength is required to attain a more effective teaching and learning process.

Dorothy and Diane in Husna (2007) stated that misunderstandings of concepts are due to inappropriate teaching strategies. Students should be actively involved in teaching and learning activities to encourage and guide them on proper thinking methods and techniques that would help them remember concepts and at the same time understand the concept as a whole. The level of problem solving skills in each student differs, whether greatly or not. To overcome this, discussion sessions should be held to solve problems within groups consisting of students with different levels of problem solving skills.

1.3 Problem Statement

Malaysia is one of the earliest countries in the world, and clearly the first developing country to have spelled out the development aspiration and goals within a 30 year development perspective. Our fourth Prime Minister, Tun Dr. Mahathir Mohamad conceived of Vision 2020 and inspired all Malaysians to share this Vision.
The Vision sets new and higher goals for national aspiration, and dramatically changed the way Malaysians view themselves and the direction of their shared destiny. Itvisions Malaysia to achieve an industrialised and a fully developed nation status by sustaining growth at 7 per cent per annum and initiating structural changes in the economy as well as within the manufacturing sectors. By the year 2020, Malaysia can be a united nation, with a confident Malaysian society, infused by strong moral and ethical values, living in a society that is democratic, liberal and tolerant, caring, economically just and equitable, progressive and prosperous, and in full possession of an economy that is competitive, dynamic, robust and resilient.

Malaysians were urged by the then Prime Minister to strive to be the best and not settle for the second best. There is nothing that we are not capable of doing, if we are prepared to work hard and use our ingenuity and resourcefulness. The key to the attainment of a fully developed nation is overcoming the nine strategic challenges. The sixth strategy in Vision 2020 states;

“Establishing a scientific and progressive society, a society that is innovative and forward-looking, one that is not only a consumer of technology but also a contributor to the scientific and technological civilisation of the future.”

In order to realize this vision, Malaysian needs to produce more scientists and technologists. However, it seems like there is much difficulty in order for science subjects to be understood and to attract interest in students (Ahmad Kamal, 2007).

These problems are faced mainly by students who are bound to take the SPM examinations. They seem to have an impression that Chemistry is a tough subject because they are unable to understand and master certain topics in the syllabus (Ahmad Kamal, 2007). This could be due to the fact that Chemistry itself is abstract. Students are not able to see with their naked eye how a chemical equation is obtained, for instance. They can only predict the formula and reactants through steps given or by
following a systematic and efficient procedure. These are challenges, or rather problems faced by students who are weak in this subject.

There are many Chemistry websites available in the Internet. However, the sources of information found in these sites are not in accordance with the KBSM Chemistry syllabus. Teachers should first be assigned to make evaluation of these sites to make sure the information provided matches our chemistry curriculum. Besides that, the websites found on the Internet are mostly based on foreign curriculums (Nur Hudha, 2007). Therefore the language used is of higher level of English, which could complicate matters further for students who do not already understand even the contents.

A research conducted by Idris (1996) shows that students in 20 secondary schools in Malaysia criticise the teaching methods used by teachers, which are traditional methods that are boring, autocratic and have no sense of creativity. The concepts used are difficult to grasp especially for low achievers, basing on the fact that teachers only use facts to deliver concepts without any suitable and interesting teaching aids. Aids such as websites would simplify the teaching and learning process for both teachers and students as they would be able to obtain reliable information based on the curriculum, with addition of interesting and fun activities to attract students’ attention.

1.4 Objective

As a whole, the function of this website is to be used as a teaching and learning aid for teachers as well as students in learning Chemical Formulae. The objective of this project is:
To develop a website in accordance with the KBSM Form Four Chemistry curriculum for Chapter 3 – Chemical Formulae and Equations; subtopic: Chemical Formulae with the following considerations:

i. Incorporation of selected four Multiple Intelligences which are Verbal Linguistics, Logical Mathematical, Visual Spatial and Interpersonal to present the contents of the website using English as the medium of delivery.

ii. Application of multimedia elements such as videos, flash animations and graphics to enhance the visual presentation of the website.

iii. Use of simple navigation structure while retaining interactivity in the website.