

WEB BASED LEARNING ON KBSM CHEMICAL FORMULAE INCORPORATING SELECTED MULTIPLE INTELLIGENCES

Mohamad Bilal Ali & Divya Nair G.
Fakulti Pendidikan,
Universiti Teknologi Malaysia

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: Wawasan 2020 mengaspirasikan negara kita melahirkan satu masyarakat yang progresif dan berpengetahuan tinggi bagi menyumbang kepada tamadun yang saintifik dan berteknologi futuristik. Salah satu strategi untuk mencapai aspirasi ini adalah melalui sistem pendidikan di mana pembelajaran berasaskan web dapat dijadikan platform utama. Projek ini bertujuan membangunkan sebuah laman web bagi subtopik *Chemical Formulae* di bawah tajuk *Chemical Formulae and Equations* bagi subjek Kimia Tingkatan Empat yang berdasarkan Kurikulum Bersepadu Sekolah Menengah (KBSM). Objektif utama pembangunan web ini adalah untuk menyediakan satu platform bagi pengguna atau pelajar untuk menguasai tajuk *Chemical Formulae*. Laman web ini mengintegrasikan teori pembelajaran *Multiple Intelligences* dalam penyampaian kandungan utama. Bagaimanapun, hanya empat daripada lapan *intelligences* diaplikasikan, iaitu *Verbal Linguistics*, *Logical Mathematical*, *Visual Spatial* dan *Interpersonal*. Model rekabentuk Hannafin & Peck digunakan sepanjang proses pembangunan sebagai panduan. Fasa-fasa yang terlibat berdasarkan model ini adalah *Needs Assessment*, *Design and Development/ Implementation*. *Evaluation* pula dijalankan serentak dengan ketiga-tiga fasa. Perisian utama yang digunakan dalam pembangunan web ini adalah Microsoft Office Frontpage. Penggunaan elemen-elemen multimedia seperti grafik, video dan animasi adalah untuk meningkatkan interaktiviti dan keberkesanan dalam proses pembelajaran. Diharapkan laman web ini dapat membantu meningkatkan kefahaman bagi tajuk *Chemical Formulae* khususnya bagi para pelajar yang mempunyai empat domain *intelligence* yang diaplikasikan.

Keyword: Vision 2020, KBSM, Chemical Formulae

INTRODUCTION

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).

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. It visions 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.

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.

Scope and Limitations

The development of this website is based on the Malaysian Curriculum for *Chemistry Form 4 Chapter 3; subtopic Chemical Formulae*. It is developed based on the needs for students to have a more extensive range of resources to enhance their learning process. As for the learning theory applied in the development of this website, only selected four multiple intelligences would be used, namely the Verbal Linguistics, Logical Mathematical, Visual Spatial and Interpersonal intelligence.

METHODOLOGY

Hannafin & Peck Model

In the development of this website, the developer has chosen the Hannafin & Peck as the instructional design model of the website. This model consists of three simple steps as its guideline. The developer decided to choose this model as it has the advantage of continuous evaluation and revision, which means the developer has the freedom and flexibility to revise and make changes from time to time to ensure no major technical errors are made and discovered only at the end of the development process. The model is a three phase process which includes the *Needs Assessment* phase, the *Design Phase*, followed by the *Development/ Implementation* phase. *Evaluation and Revision* are carried out throughout all three phases of this model.

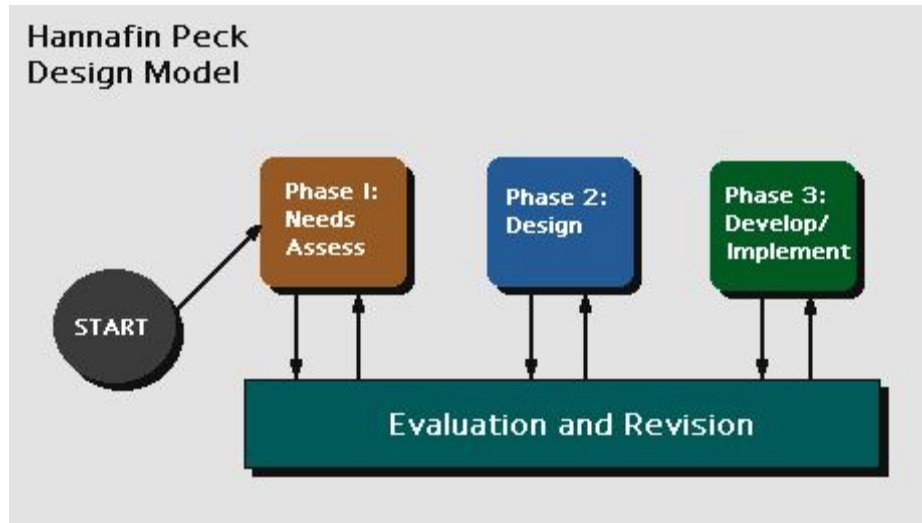


Figure 1 Hannafin & Peck Instructional Design Model

User Analysis

In developing a computer learning aid, the developer has to identify the prior knowledge of users. The target audience of this website would be Form Four students undertaking Chemistry Form Four under the KBSM curriculum, who possess at least either one of the intelligences incorporated in this website. Based on the curriculum, the developer has identified that students would have already learnt the following sub topics before learning Chemical Formulae:

- i. Relative Atomic Mass and Relative Molecular Mass
- ii. The Mole and The Number of Particles
- iii. The Mole and The Mass of Substances
- iv. The Mole and The Volume of Gas

Software Analysis

The development process of this website would utilise a number of software. Among the software that would be used are Microsoft Office Frontpage 2003, Macromedia Dreamweaver 8, Adobe Image Ready CS2 and Macromedia Flash 8

Microsoft Office Frontpage would be the primary software used to create the website. It is a professional HTML editor for designing, coding, and developing websites, web pages, and web applications. It has the flexibility of hand-coding HTML control as well as visual editing environment. The developer chooses MS Frontpage for the website building as it provides simple and helpful tools to enhance web creation and is more user friendly compared to other web building software, in the opinion of the developer. Besides that, the developer would also be using Macromedia Dreamweaver to utilise certain tools to meet the needs of integrating a few elements that are not available in MS Frontpage

As for Adobe Image Ready, it would be used for conversion of file format extensions for images that are generally used in websites such as .jpg, .gif, .png. The developer would also be able to create and modify images based on self - creativity.

Macromedia Flash is one of the software that would be used to create animations. Audio elements could be integrated to create an attractive presentation. Besides that, Macromedia Flash also has the ability to

create an interesting and eye-catching presentation when interactive elements are added. Therefore, the developer chooses this software to create animations to be integrated into the website.

Evaluation and Revision Phase

In Hannafin & Peck model, evaluation and revision are carried out constantly and/ or simultaneously with the other three steps. This is known as formative evaluation, whereby every step in the development phase is evaluated and revised to make sure the next step taken in development is better than the one before. This is also done to avoid major mistakes that would be difficult to change once the whole website is completed.

During the development of this website, evaluation would be done internally whereby the developer would carry out an evaluation process on an informal basis. The project supervisor and peers would be regarded as formative evaluators in order to improve the website through critical evaluation. Besides that, a certified and experienced senior Chemistry school teacher from Sekolah Menengah Teknik Setapak, Kuala Lumpur would be conducting a summative evaluation for the website through a checklist which consists of three main sections; *Section A: General Information*, *Section B: The Criteria being Evaluated in the website* and *Section C: Comments and Suggestions for Future Research and Development of Website*. The critical section of the website evaluation would be in Section B, which would consist of three main parts representing three main criteria as follows:

Part 1 - Information Design

Part 2 - Visual or Presentation Design

Part 3 - Interaction Design

Each part consists of 7 items or constructs with a choice of Yes / No answer provided for the evaluator. The items constructed in the checklist are in line with the objective of the project. Comments and suggestions given by the evaluator would be proposed for future research and development of websites.

DISCUSSION

Interface for *Let's Learn*

This is the main section of the website, whereby users could click on the intelligence or learning style that they want to learn from. The pictures and tab on the left are both links to each of the intelligence.

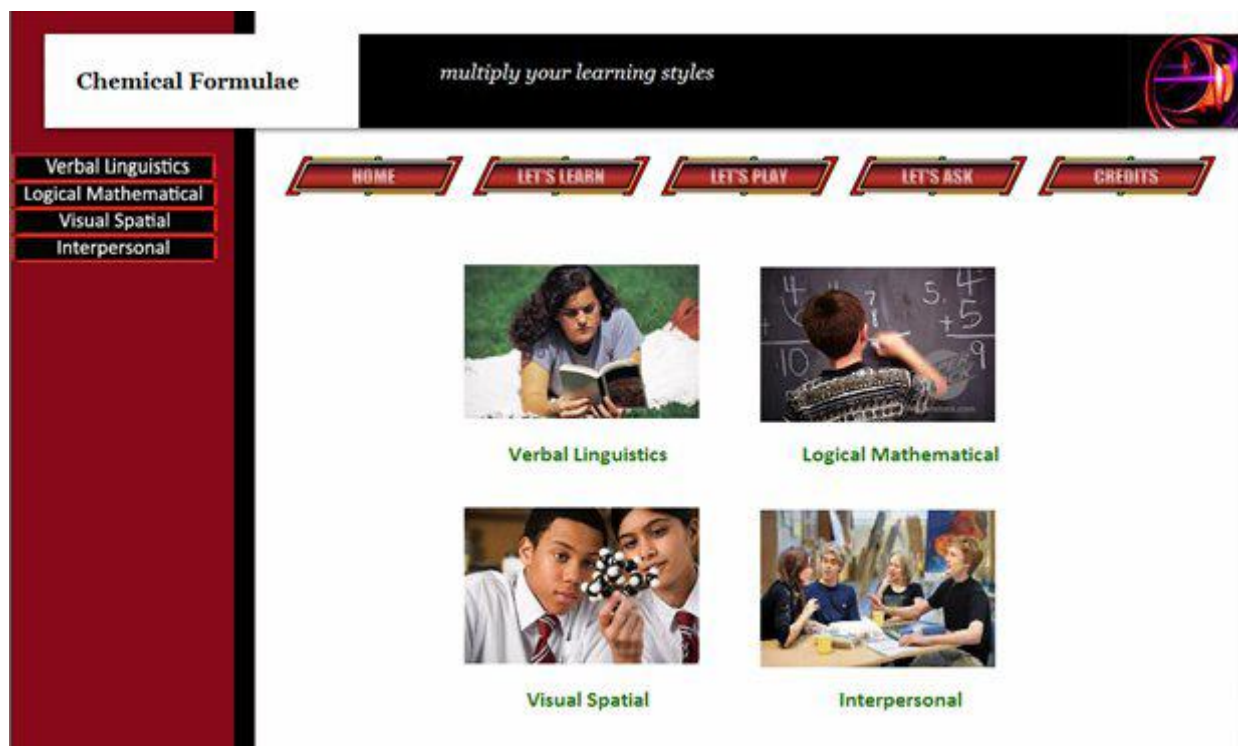


Figure 2 Interface for *Let's Learn*

Interface for *Verbal Linguistics*

Four main subtopics are provided for learning, which are *Chemical Formulae*, *Empirical Formulae*, *Molecular Formulae* and *Comparison between Empirical and Molecular Formula*. Users could click on the round red button at the far right end or on the left tab to enter the page for each subtopic. This interface is used for all four intelligences in this website.

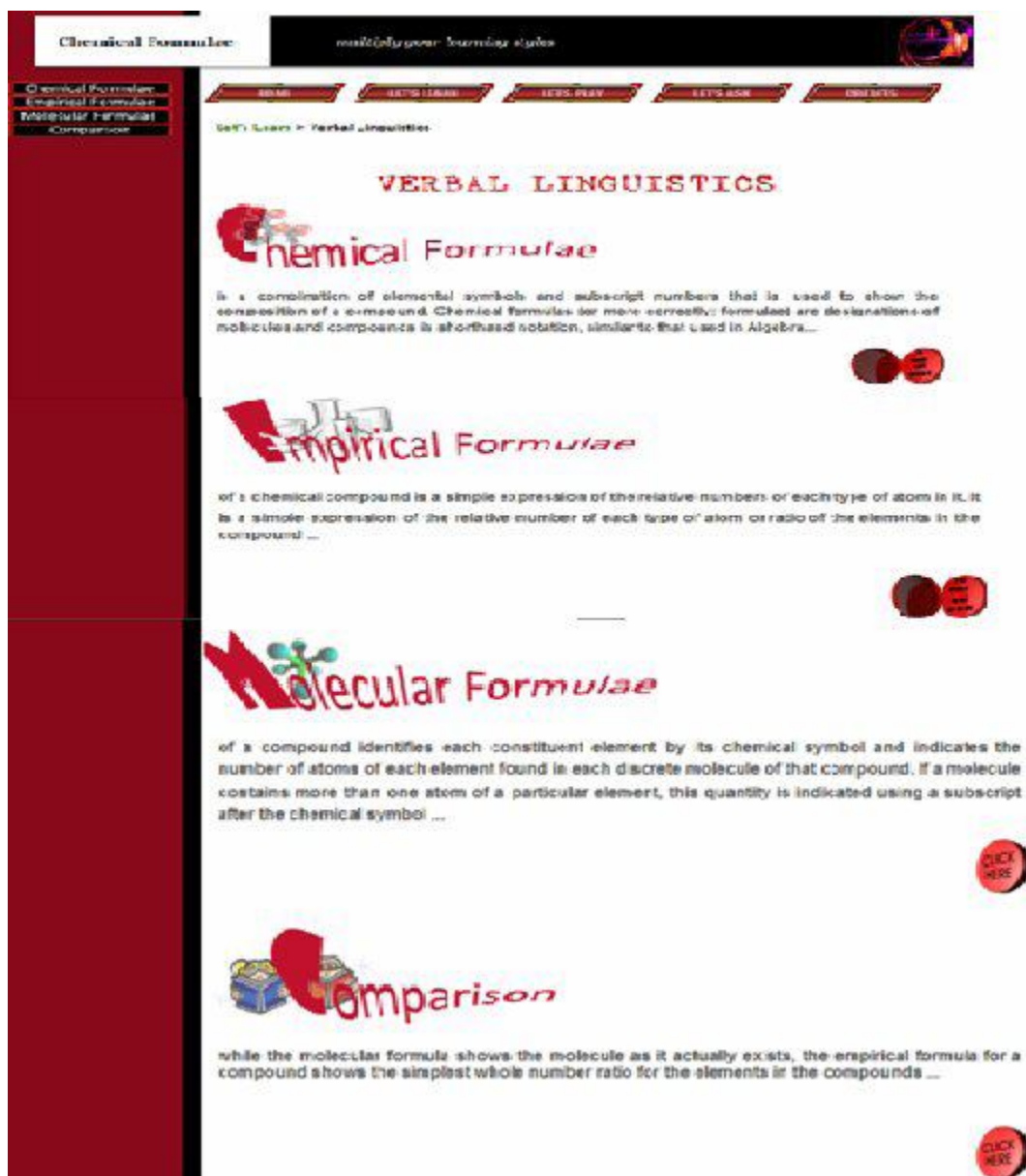


Figure 3 Interface for the four subtopics in all four multiple intelligences

The development of this website was designed specifically for users who possess at least either one of the four domain intelligences applied in this website. The simple structure of this website is user-friendly and enables smooth navigation. It is hoped that this website developed is at par with good quality educational websites available and would be beneficial to the target users.

CONCLUSION

This website was developed with careful thoughts and considerations. The developer had to master three main skills which are the content knowledge, the knowledge of the learning theory used and knowledge on web designing. It was a rather challenging task but with persistence and determination, the developer managed to come up with this website.

The learning theory applied in the website is the Multiple Intelligences Theory. However, only four multiple intelligences were selected as this was within the scope of the objectives of this project. The four intelligences selected were Verbal Linguistics, Logical Mathematical, Visual Spatial and Interpersonal. Therefore, only users with this domain as part of their intelligence could utilise this website.

Hannafin and Peck was used as the instructional design model throughout the development of this website as a guide to ensure the development process went on smoothly and the website achieved the goals it had set out. In the Needs Assessment Phase, the developer had done a research on the problems faced by Form Four students in the topic Chemical Formulae and Equations. Students' prior knowledge were taken into account and the subtopic Chemical Formulae was chosen, as it was found to be the main problem area whereby students are generally not able to derive a chemical formula before writing a chemical equation.

In the Design Phase, the developer chose a learning theory that could prove helpful in enhancing students' understanding in this topic. Four multiple intelligences were applied to enhance understanding of students with these domain intelligences. Besides that, the layout, navigation structure and colour scheme was decided upon before the development and implementation phase.

Finally, in the Development/ Implementation Phase, the website was developed using appropriate software and media that would result in the best quality of a web based learning system for Chemical Formulae using the selected four intelligences.

Throughout the three phases in the Hannafin and Peck Model, evaluation and revision were constantly and/ or simultaneously carried out. The developer carried out formative evaluation, whereby every step in the development phase was evaluated by peers and the project supervisor. Besides that, a summative evaluation was carried out at the end of the project by a senior Chemistry teacher. These steps for evaluation were indeed useful as the developer received critical feedbacks and was able to make certain amendments and come up with a website of good quality that is up to the par with the standards of good educational websites.

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