Development of Central Processing Unit Teaching Using Web-Based Learning

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Abstract. E-learning is a distance learning method that uses electronic and the Internet. The objective of this study is to help students from Faculty of Technical and Vocational Education of Universiti Tun Hussein Onn Malaysia (UTHM) to improve their understanding on the topic “Central Processing Unit.” The students consisted of third-year students in their second semester of Bachelor of Vocational Education (Multimedia Creative) programme who were taking the course “Computer System and Network.” The learning video was developed based on self-learning and contains syllabus from the topic “Network System in Communication.” The development of this online learning video followed the Hannafin and Peck Model which was deemed suitable for online learning development. The Central Processing Unit learning video was developed using Weebly software as the main platform along with the other support software such as Adobe Flash Professional CS6, Adobe Photoshop CS6, and Camtasia Studio 8. Experts were called in to attest the result, and they verified that the information design, interaction design, and interface design were appropriate. Their suggestions were also considered and improvements were made to the platform. The findings lead to some recommendations for future works and explain the multimedia software that has been developed.

1. Introduction
In the twenty-first century, information and communication technology (ICT) has expanded rapidly across the globe and reformed the education systems in various countries including Malaysia [1]. In 2016, the Ministry of Education Malaysia (MOE) outlined the programme “Toward Education Schools in Malaysia” to improve the quality of teaching and learning (T&L) with the use of information technology. Accordingly, the e-learning method has been adopted in various educational institutions to meet the evolving learning needs.

The e-learning method has proven to deliver several advantages, among which are fun learning experience and ability to increase students’ understanding of a difficult topic. Other advantages noted by [2] are that this alternative learning process:

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1. offers unrestricted learning in that students can access information from any place with internet connection;
2. can attract students with engaging learning;
3. enables students to revisit weak areas; and
4. saves the costs of books and notes.
Given the above advantages, the e-learning thus has been perceived by the ministry as a means to produce highly skilled generation by the year 2020.

Modern technology particularly the Internet has expanded education beyond classrooms. According to [3] defines e-learning as an R & D process in which electronic technology is used as a medium to create learning experiences. Therefore, this e-learning method is in line with the Malaysian education system where this method follows the learning needs from time to time according to the circulation in this modernization cycle. The existence of e-learning makes the student more independent to understand in depth about a difficult topic. Additionally, students will not rely solely on educators to master a topic.

Technology has made Malaysia's education system no longer tied to conventional teaching methods and it provides a fun new experience for students to explore the latest technologies. To take on the challenges of the Y-generation Vision 2020, actively explore this sophisticated cyberspace. According to [4] to realize the goal of 2020, Malaysia needs a highly educated generation and are skilled in various fields to advance the nation.

1.1 Theory of Learning Behaviorism

Behaviourism views that the outcome of learning process can be measured by the observation of behaviour; it depends on the close relationship between students’ attributes/attitudes (such as intelligence, social background, and ability) and learning outcomes [5]. After the learning, users are more focused on behaviourism learning theories which support the development of online-based learning related to the Central Processing Unit. As such, the behaviourism theory can ensure the behavioural change of students’ responses to line-based learning.

Based on the exercises, notes, quizzes and videos developed by the researchers, this theory can support the change of students’ perceptions about learning in front of a computer. For example, instructors can give credit to students who score their quizzes and exercises, which in turn, would motivate the students to improve their learning. In conclusion, the study of behaviourism theoretical study can occur due to the link between stimulus and response in the web-based T & L process.

2. Research Objectives

The objectives of this study are to
1. design a central processing unit for online teaching videos
2. develop a central processing unit for the online teaching videos, and
3. evaluate the functionality of the central processing unit for the online teaching videos.

3. Research Methodology

The design of the study was based on Hannafin and Peck [6] Model which illustrates the design and implementation of teaching materials as comprising three phases, namely (1) requirements assessment phase, (2) design phase, and (3) expansion phase and teaching implementation. All phases require an
assessment and review process. The models also emphasise the ability of a class to receive media-based materials.

The first phase required the researcher to assess the characteristics of the target group and determine the hardware and software for the analysis. The target audience was identified to consist of (1) instructors and (2) students who were taking the subject “Computer and Network Systems.” The hardware deemed appropriate for the study was the specification of computer systems, and the softwares used were Weebly, Adobe Flash CS6, Adobe Photoshop CS6, Adobe Illustrator CS4, and Camtasia Studio 8. These programmes were selected for their ability to facilitate the researcher to produce an online learning platform characterised by the five elements of text, graphics, audio, video and animation. Next, evaluations and checks were carried out to ensure that the hardware and software needs to develop web-based learning for Central Processing Unit Teaching was implemented to ensure that it is in line with the developer's needs. Once the needs were identified, the researcher assessed and review the platform to ensure that it meets all the requirements prior to development.

In the second phase, the developers provided storyboards to guide the creation of the teaching materials such as notes, exercises, videos, and quizzes. The contents of the material were based on the syllabus of “Computer and Network Systems” and the topic “Central Processing Unit” (CPU). Three designs–information design, interaction, and interfaces–were identified to guide the assessment of the specifications. The final phase–the expansion and implementation phase–involved translating the key elements of the design into a practical form of programming language system–a website. Formative and summative evaluations were carried out to test and review back-up web-based learning for central processing unit (CPU). Formative assessment was carried out throughout the media development and summative assessment was performed after the media were completed.

Questionnaires were distributed to the students with the aim to improve the quality of online learning and to meet the needs of consumers in information design, interaction, and interface. The respondents consisted of 30 third-year students of Vocational Education (Creative Multimedia) who were taking the course “Computer and Network Systems” for the second semester of 2016/2017. There are two sections in the questionnaire: Section A, which queries respondents’ demographics, contains 4 items, and Section B contains 19 items with regard to information design, interaction design, and interface design. A five-point Likert scale was used with the options very disagreeable (STS), disagree (TS), disagree (KS), agree (S), and strongly agree (SS). The content and designs of the web-based learning were evaluated by experts in web-based development.

4. Research Findings

Three experts (lecturers) from the Creative Multimedia programme of the Faculty of Technical and Vocational Education (FPTV) commented that the font size of the teaching notes was too small. The experts also looked at the development of web-based learning for the topic “Central Processing Unit” (CPU). All these comments were considered and changes were incorporated into the finalised set of questionnaire. Table 1 shows the mean values for the level of user ratings on the aspects of information design.
The highest mean value for information design is item 6 (web-based learning information is not too shallow or deep) (4.53). The lowest mean value is recorded for item 7 (information in teaching notes is easy to understand). The overall mean for information design is 4.45. Table 2 shows the mean values for the level of user ratings on the aspects of interaction design.

Table 1. Mean for the Level of User Ratings on Aspects of Information Design

| Item | Statement                                             | Mean |
|------|-------------------------------------------------------|------|
| 1    | The purpose of the learning content is clearly stated  | 4.47 |
| 2    | The type of writing used in this line-based learning is appropriate | 4.47 |
| 3    | The writing size used in this line-based learning is appropriate | 4.43 |
| 4    | Information is communicated in a way that is easy to understand | 4.43 |
| 5    | The language presented in the form of text is easy to understand | 4.47 |
| 6    | These web-based learning information are not too shallow or deep | 4.53 |
| 7    | Information in teaching notes is easy to understand | 4.30 |
| 8    | The tutorial video view can be clearly understood | 4.53 |
|      | **Overall Mean**                                      | **4.45** |

Table 2. Mean for the Level of User Ratings on Aspects of Interaction Design

| Item | Statement                                             | Mean |
|------|-------------------------------------------------------|------|
| 9    | Users do not encounter any problems while using this web-based learning | 4.40 |
| 10   | Each button/icon menu in this web-based learning works well | 4.53 |
| 11   | Hyperlink /link works fine                            | 4.50 |
| 12   | Quiz and practice activities can be easily reached     | 4.53 |
|      | **Overall Mean**                                      | **4.49** |
The highest mean value of 4.53 obtained for the interaction design is for item 10 (each button/icon menu in this web-based learning works well). Item 9 (users do not encounter any problems while using this web-based learning) receives the lowest mean of 4.40 for interaction design. Table 3 shows the mean values for the level of user ratings on the aspects of interface design.

| Item | Statement                                                                 | Mean |
|------|---------------------------------------------------------------------------|------|
| 13   | The video tutorial size display used in this web-based learning is appropriate | 4.50 |
| 14   | The text display of teaching notes in this web-based learning is easy to read | 4.50 |
| 15   | The background music/audio used in the tutorial video is appropriate       | 4.33 |
| 16   | The length of video display is appropriate                                 | 4.47 |
| 17   | The graphical interface used is appropriate                                | 4.47 |
| 18   | Elements of animation are developed in harmony                            | 4.40 |
| 19   | The use of animated elements can attract users’ attention                 | 4.37 |
|      | Overall Mean                                                              | 4.43 |

The highest mean value (4.50) for the interface design was noted for item 13 (video tutorial size display used in this web-based learning) and item 14 (the textbook display in teaching notes in this web-based learning is readable). The lowest mean value (4.33) was recorded for item 15 (the background music/audio used in the tutorial video is appropriate). The overall mean value for interaction design is 4.49, followed by information design (4.45) and interface design (4.43). This findings indicate that the users accepted the design of information, interaction, and interface of the web-based learning, and thus attesting that the platform meets all the three criteria.

5. Discussion

As a result, after evaluating experts has been commented on, developers have improved the development of web-based learning where developers have expanded the size of texts in the teaching notes so that they can be read by the users clearly. Additionally, the font type used has also been fixed so that it is appropriate to the user's age level and the topic presented. Furthermore, the use of text color has also been changed so that it does not affect the user’s views in exploring the learning activities provided.

For consumer assessment, item 6, which is online-based learning information, is not too shallow or deepest to record the highest mean for the information design of 4.53. This shows that the developed online learning is agreed upon that it meets the level of understanding of the students which is not too difficult to understand by students. According to [7], learning that meets the needs of students where it can attract students because the content presented is easily understood according to the level of students' understanding. It is also supported by content experts whose content has been reviewed by lecturers who teach subjects related to the Central Processing Unit topic specifying the appropriate content and according to the syllabus of the teaching set by the faculty.

Additionally, the mean of item 2 of the type of writing used in this web-based learning corresponds to the mean 4.47. This shows that the user agreed that the type of writing used is
appropriate according to the user level. According to [8], majority students agree that the form of writing used in a multimedia application should be clear and easy to read so that it is appropriate to their learning.

6. Conclusion

In conclusion, the development of web-based learning is expected to have a positive impact on the students as it can be used at any time without being bound by the traditional T&L process which is in lecture alone. Furthermore, it is expected to help improve understanding after using web-based learning. Lecturers or teachers can also use this web-learning tool as a Teaching Assistant Tools as an alternative if lectures cannot be conducted face-to-face as students are able to browse online to understand any information related to this Central Processing Unit topic.

7. Acknowledgements

This research was supported by Short Term Grant (STG) at Universiti Tun Hussein Onn Malaysia (U647).

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