DESIGN AND EVALUATION OF CD-ROM AS A COMPLEMENTARY LEARNING TOOL

by

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ABSTRACT

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This study was carried out to evaluate the design of a CD-ROM as a complementary learning tool. Specifically, it is to investigate the aspects that are suitable to be included in the CD-ROM to enhance students' understanding. Thirty-two third year students from Cognitive Science from Universiti Malaysia Sarawak (UNIMAS) participate in this study. Generally the finding shows that most of the students have a positive relationship towards using CD-ROM as a complementary learning tool. This study also shows that CD-ROM can enhance the students' understanding.

ABSTRAK

MENGKAJI REKABENTUK CD-ROM SEBAGAI BAHAN PEMBELAJARAN TAMBAHAN.

Jamieah binti. Ameer Batcha

Kajian ini dijalankan untuk mengkaji rekabentuk CD-ROM untuk dijadikan sebagai bahan pembelajaran tambahan. Selain itu ia juga bertujuan untuk mengkaji aspek-aspek yang bersesuaian untuk dimuatkan di dalam CD-ROM supaya dapat meningkatkan pemahaman pelajar. Seramai 32 orang pelajar Sains Kognitif Tahun Tiga, Universiti Malaysia Sarawak (UNIMAS) terlibat di dalam kajian ini. Hasil keputusan menunjukkan bahawa rekabentuk CD-ROM dan pemahaman pelajar adalah signifikan. Ianya menunjukkan juga bahawa penggunaan CD-ROM dapat meningkatkan pemahaman pelajar di dalam pembelajaran.

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CHAPTER ONE
INTRODUCTION

1.1   Introduction

For generations, the traditional classroom-based learning is the basis of the education. But with the development of science and technology in education, it has given rise to the other potential learning tools. Technology such as multimedia has become an important aspect of teaching and learning. It provides more advanced instruments and methods to boost student enthusiasm towards learning. It also assists to enhances student's performance in the process of gaining the knowledge. These scenarios lead the educator to implement this new dimension on their teaching process.

According to Woolf and Hall (1995) multimedia learning environment should at least enhance and improve the quality of learning. Furthermore it should play an important role in making the information more realistic and practical, not only providing the knowledge but also a variety of media forms.

Multimedia learning gives several advantages to the students as it is similar to the face-to-face communication. Perhaps the student is not awkward when interacting with the multimedia learning environment. It is less restrictive compared to the written text; many people understand text better with the broader media support. Besides that, with the aid of multimedia, the abstract concept can be explained into a specific concept.

Multimedia also gives co-ordinate diverse external representations for different perspectives.

1.2   Problem Statement

The increasing demand of CD-ROM as a complementary learning tool for students has given a tendency to the publisher or the developer to come up with a variety of a CD-ROM. This however has to satisfy the criteria design and implementation aspect of learning though the use of CD-ROM such as providing a suitable multimedia element. The existing CD-ROM in the market is only focusing on the content without consider the most suitable criteria on the multimedia element such as sound, graphics, text, animation and photography to be include on the making of the CD-ROM

According to Larry Miller (1994), many of the early CD-ROM programs focused on the information retrieval, although these applications used the immense storage of capacity of CD-ROM disc, they seldom took advantage of the other multimedia attributes. Furthermore, this is an important aspect in encouraging the student's interest and participation in learning. This also will motivate students to achieve and excellent in their studies.

Therefore this research is done to evaluate the suitable design of the CD-ROM as a complementary learning tool to enhance students' understanding.

1.3 Research Objectives and Purposes

1.3.1 General Objectives and Purposes

This study evaluates the design of a CD-ROM as a complementary learning tool. The purpose of this study is to investigate the aspects that are suitable to be included in the CD-ROM to enhance students' understanding.

1.3.2 Specific Objective

Specifically, the aims of this study are to:
1. Evaluate the suitable design for a CD-ROM to make it more effective as a complementary learning tool.
2. Identify the proper way to include the multimedia elements such as sound, graphics, text, animation and photography to the CD-ROM.
3. Identify how to make the CD-ROM more understandable by implementing the multimedia elements.

1.4 Significance of Research

The significance of this research is to identify the suitable design criteria for developing an educational CD-ROM in the future. Another expectation is to give a conceptual framework to the developer on how to enhance the effectiveness in order to improve the student's interest in learning though CD-ROM. Besides this research is expected to be a consideration of the use of CD-ROM as one of the learning tools for the student beside the traditional that has been practice long time ago.

Learning environment also plays an important role for students to use the CD-ROM for learning purposes. Comfortable learning environment with effective interactive multimedia will increase the interest and motivation of the student in using the CD-ROM as a learning tool.

1.5 Null Hypotheses

Based on the research objectives, the following Null hypotheses were formulated

Ho1: There is no significant relationship between the designs of a text and students' understanding.

Ho2: There is no significant relationship between the designs of a graphic and students' understanding.

Ho3: There is no significant relationship between the designs of an animation and students' understanding.

Ho4: There is no significant relationship between the designs of a sound and students' understanding.

Ho5: There is no significant relationship between the designs of photography and students' understanding.

1.6 Limitation of the Research

The main limitation of this study is the sample used. Only 32 third year undergraduate students from Faculty of Cognitive Science and Human Resource Development were used as sample for this study. Besides that the results of this research depend on the perceptions of these selected respondents. As such, the findings of this study cannot be generalized to the whole population in UNIMAS.

The CD-ROM chosen focuses on a one subject and the subject is mathematics. It is not referring to any other subject even though it focused on the design of the CD-ROM.

1.7 Conceptual Framework

The conceptual framework for this study based on the research objectives and literature review is shown on Figure 1.1
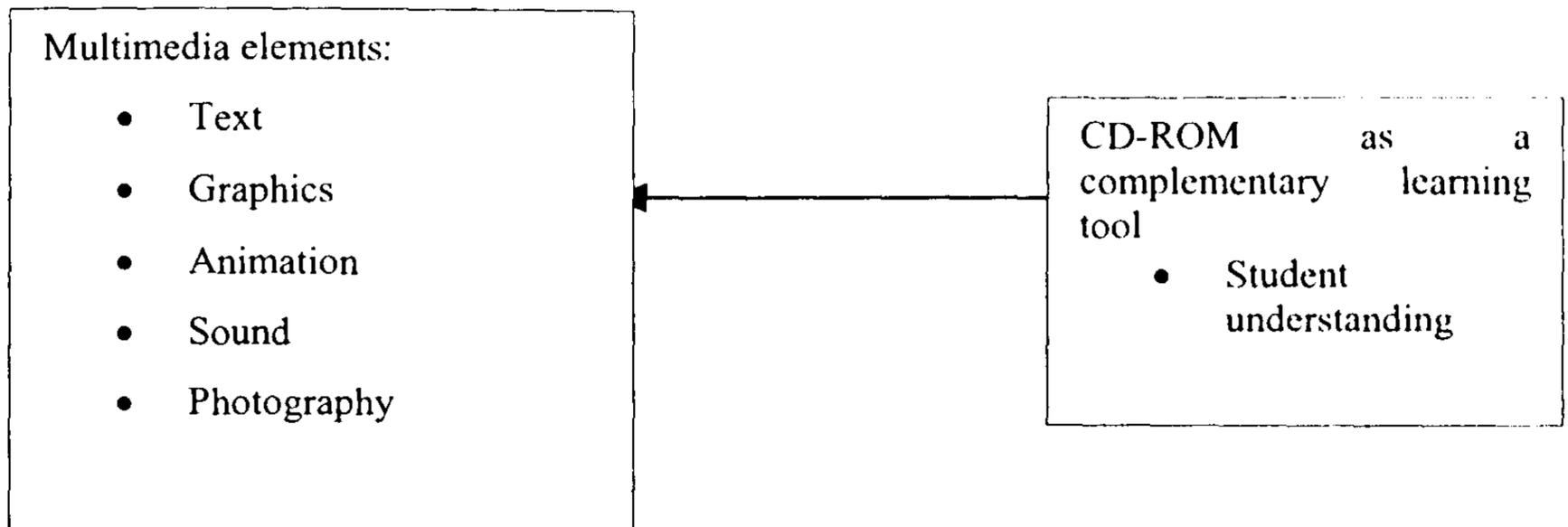

Figure 1.1: The conceptual framework.

1.8 Definition of Terms

Evaluation
Conceptual
Evaluation can be defined as a process of gathering the data about the usability of a design or product by a specific group of user for a particular activity within a specified environment or work context (Jenny Preece, 1994 p. 602). Evaluation technique is important in the usable interactive system to ensure the design meet the requirement of the user. Furthermore it is also used to identify any specific problem when the user interacts with the system. The usability testing can be used as a framework to improve the quality of the product.

Operational
Evaluation in this study refers to the way researcher assess the usability design of the CD-ROM. It focused on the data elements such as graphics, audio, video segments, animation and photography from the user's perspective.

CD – ROM
Conceptual
Compact disc read only memory (CD – ROM) is an optical disc, read by a laser-based drive. They were designed for mass storage of computer readable text. It have a high storage capacity, expensive when duplicated in quantities, easy to distribute and resilient. Each 4.72-inch disc stores approximately 650 megabytes (MB) of digital data, whether digital text, graphics, audio, or video images. (Hillman, D., 1998)

Operational
CD-ROM refers to an instrument used by researcher in this study as a complementary learning tool to enhance student understanding.

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Complementary Learning Tool

Conceptual

According to Oxford Dictionary Second Edition complementary learning tool is defined as an additional or extra learning tool that is used to enhance, support and assist in the teaching and learning process.

Operational

It refers to additional equipment used as a tool to support the process of learning and improve the students understanding.

Multimedia

Conceptual

Multimedia is defined as the combination of two or more media types, effectively creates a sequence of events that will generates an idea. According to (Yankelovich N., Smith L., Garrett N. and Meyrowitz N., 1988) "multimedia is a linked of corpus material that includes text, static graphics, animated graphics, video, sounds, music and so forth...."

Operational

Multimedia in this study refers to the elements such as text, graphic, animation, sound and photography.

Sound

Conceptual

Sound is something that can be heard. Besides that it can differentiate between an ordinary multimedia presentation and a spectacular presentation. There are three types of sound in multimedia; narration, sound effect and music. The narration is a voice recording for specific use at a predetermined time in an interactive environment. Sound effect is used for impact during a slide transition, animated sequence or in conjunction with a special visual effect. Music is used for background sound, to create mood, and demonstrate specific music tracks as appoint of interest (Lachs, 2000)

Operational

It refers to the media elements that produced something that can be heard by respondents, either voice explanations or instructions.

Graphic

Conceptual

The graphics design is the art or process of producing diagrams, drawings and graphs and the discipline of effective visual communication. (Hillman, D., 1998)

Operational

Graphic in this study refers to the images or pictures that are able to express the information without respondents' interpretation.

Text

Conceptual

Text is the basic for word processing program and the fundamental information used in the multimedia program. (Hillman, D., 1998)

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Operational

Text refers to the symbols usually in the form of letter, numbers and special character used for written communication. Text is usually used to express the information through written.

Animation
Conceptual

Animation is defined as any of movement object on the computer screen (Lachs, 2000). An animation is a way of showing what is happening rather than describing it. The animation is particularly useful of showing processes and dynamic concept.

Operational

The animation in this study refers to the image that is used to design the entire project as a movie and to keep the presentation always in motion.

Photography
Conceptual

According to the Oxford Dictionary Second Edition, photography refers to the picture taken by the camera either things or people.

Operational

Photography is the still picture that is used to deliver information in order to improve the understanding.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The literature review looks at the using CD–ROM as a learning tool, design issues of CD–ROM, characteristics of multimedia elements and benefit of using CD-ROM as a learning tool.

2.2 Using CD –ROM as A Learning Tool

CD-ROM has been used as learning methods in certain field in the education. The use of multimedia CD-ROM can accommoJate students' diverse learning styles, experiences and knowledge based. It is not only the computer-based program assisted with learning, but with the use of computer it cans also helps to increase computer literacy, as well as confidence in using the technology as a learning tool. So the education field must embrace the CD-ROM technology as a method of learning.

Furthermore it can help to improve the students' ability in learning. According to Cook (1988) on a review of Grolier's Electronic Encyclopedia a CD-ROM are able to store at least 20 encyclopedias. In fact it will encourage the students to be more independent the in process of acquiring knowledge.

A study conducted by Jeffries, P.R., Woolf, S. and Linde, B. (2003) on seventy seven nursing students, found that the basic nursing skill can be taught as effectively and potentially by using interactive multimedia CD-ROM. Besides the interactive multimedia CD-ROM offers many opportunities to practice their skills it also gives chance to applied their knowledge when running the 12-lead ECG.

Another study conducted by Carroll (1994) towards CD-ROM based game known as Myst, found that CD-ROM are capable to enhance the students' creativity.

CD-ROM also can be in a variety of applications as a study by Woolsey (1991) presents the multimedia applications for geography, history and science that have been developed at the Apple Multimedia Laboratory.

2.3 Design Issues of CD – ROM

A study by Plowman (1989) regarding the difficulties of system design in the face of uncertainty about how people learn found that 'in spite of taking a great steps forward in cognitive psychology, we still have to admit that we still lack in terms of how people learn' and 'few programmed make any attempt to establish what the student already knows in the domain'. The question of whether a better understanding of learning aided by the multimedia systems will enable Wilde (1988) assertion to be denied.

From the perspective of learning theories (Atkins, 1993) suggests, the design issues for multimedia teaching applications where the students are motivated on learning even when the sound effect used in the multimedia system have worn off and preferred to learn from the interactive courseware rather than conventional teaching. The learning process from interactive technology can be more efficient, but the benefit is lost if the interaction is too complex. The students have better knowledge and remember more of what they have been taught from the interactive courseware. The amount of structuring and control required is different for high-ability learners. Furthermore some interactive techniques for example, the use of embedded practice questions are highly effective for learning pre-specified factual content but may hinder the learning of more complex knowledge.

An analysis by Atkins (1993) and Plowman (1989) suggests that there is no coherent model of learning to support design. Yildiz and Atkins (1993) on their review towards earlier media evaluation studies which learners are assigned to a traditional control group in order to assess the relative gains in learning concluded that the evaluators always trapped to an inadequate design. Many of the studies have shown no significant advantages of gains from the use of the new technologies. The expectations of the media designers have not been realized in practice.

However according to a test conducted by Blissett and Atkins (1993), designing the next generation of multimedia applications would be harder. Although multimedia applications can be designed to be highly motivating and entertaining, making them also educational is more of a challenge.

Schank (1994) on the use of multimedia teaching software believes that, most multimedia programs fail due to 'merely adding video and graphics to page-turning programs'. In this situation the student does not interact, the experience is passive and the program mimic to the television viewing. These studies have led the researchers to conduct a study on designs characteristics of CD-ROMs as a learning tool to enhance student perception towards learning.

2.4   Characteristics of Multimedia Element

According to Williams (1998), the application of multimedia in the education has grow and rapidly due to the increased capability of computers and the multimedia capabilities in computer-based teaching authoring systems and presentation tools. In order to develop the multimedia CD-ROM, it is important to apply suitable designs practices. It is because if the multimedia is used ineffectively it may cause a decreased in learning performance.

The effectiveness of the media depends on how it is implements the intended strategy and produces the desired learning outcome. The most important variables influencing the learning outcome are the material on the CD-ROM, task to be learned and instructional methods applied.

<u>Text and Narration</u>
When applying text in multimedia, the combination of other media has to be taken as a consideration as it may effect the whole presentation. Text and narration are often used in combination with other media. For example, an instructional video with text overlaid on the video picture and also is narrated. However, the redundant text and narratives can aid learning if it is used properly.

The text and the narrative versions of the content is useful in providing alternative sources of information particularly important for learners with perceptual difficulties and as well as learners with strong media preferences. According to (Wetzel, Radtke & Stern, 1994) text and narration should be consistent with each other and generally should coincide in time. A slight asynchrony between the two may build concurrent demands on the viewer. Besides the consistency between text and narration, the amount of excessive text on other visual material

should be taken care of since it decreases reading comprehension (Wetzel, Radtke & Stern, 1994).

Motion and Animation

Motion is suitable in the case of discriminating two situations at the same time. For example, attention directed to the relevant features that change, sequential relations clarified by providing continuity between events, and when the task is unfamiliar or difficult to express verbally. While graphic animation is a combination between graphic illusion and simulated motion object to present object, processes, or concepts. It is considered as a motion in the multimedia.

According to Lachs (2000) animations is a good way to clarify students' understanding because they will know each step of the process to be able to put in order.

Usually in multimedia application the animation is used to represent the information and it should be inserted properly and furthermore related to the instructional objective (Gonzalez, 1996). An analysis by Lee & Bowers (1997) concludes that animation has shown some benefits for some tasks. The animation used should suit the task and attract or direct the viewer's attention to particular portions of the screen. Moreover the multiple competing animations should be avoided as the animations enables to bewildered viewer's attention.

Attention Getting Devices

Attention getting devices are those aspects of media that are used to attract the learner's attention or to motivate learners towards the content of the CD-ROM. Research indicates that learning is not significantly affected by the devices that temporarily draw attention (Wetzel, Radtke, & Stern, 1994). The rapid between shots, sudden noticeable changes, special visual or sound effect, are unable to give an impact to the learners when using the CD-ROM. Furthermore these elements are usually included merely for realism or in other word showing the motion, color and image accurately express in the real world object in detail.

Besides, Wetzel, Radtke, and Stern (1994), also found that sound effects attracting the viewer's attention should be avoided. As this can affected the viewer's attention towards the information contained on the CD-ROM. Even though sound effect can increase viewer interest in the presentation, it has shown no effect in learning. Besides sound effect, music also plays an important role in multimedia, as it creates a more interactive CD-ROM.

The Used Of Video

Video has the capability to represent either real or simulated still image or moving object, people and events with or without the audio component. According to Wetzel, Radtke and Stern (1994), the used of the video capabilities of motion, sound and color in presentation should be in a selective ways. In addition to their study, overly realistic features of visual, motion or complex tasks that provide irrelevant detail in excess of those skeletal elements should not be in one particular presentation, as it is critical to an instructional objective.

Besides that other element such as the special visual effects inserted between scenes should be avoided. For example wipes, fades and complex visual patterns. Although there is study argued that all of above techniques have no apparent effect on learning retention, freeze frames have an effect on recall (Wetzel, Radtke and Stern, 1994).

2.5 Benefit of Using CD –ROM as a Learning Tool

Thousand of CD –ROM titles has been published throughout the year, worldwide containing variety of digital information. The successful marketing attributed to the reduction in the production and distribution costs compared to the traditional print format. Despite an impressive growth rate, CD –ROM technology has being challenged by a new technology. The advent of the Web is an alternative way of getting the information. Despite the staggering growth of the Web sites, there are several factors that contribute to the survival and continuing success of the CD –ROM.

The limited bandwidth has affected the efficient transmission of large quantities of information over the Internet. This problem due to the information consists of not only digital texts, but also audio sequences and moving images. While the CD-ROM are able to store around 650 megabytes of information, in contrast, can be very rapidly accessed through the current drive technology regardless of format. According to East and Leach (1998) in a study on the used of CD-ROMs in academic library "despite challenges from alternative modes of delivery, CD-ROM retains its popularity as a format for the storage and retrieval of electronic data". With the introduction of DVD technology, the storage capacity has increased; making laser discs even more attractive storage devices than in the past.

The CD-ROM is also one of the most versatile and durable media for archival and preservation purposes, the information must be permanently stored. Early fears of short-term physical degradation have not proven justified, and CD-ROM provides as a minimum a medium-term storage capability. Although the same information contained on a CD may be made available at very little or no cost on the Internet, lack of permanency would prevent storage of sensitive materials on the Web. Archives, libraries, museums and other information environments can use CD-ROM technology to preserve their valuable collections and present them to their clients in an efficient and effective way (Large et al., 2000).

The CD-ROMs also can be bought and sold like printed books and journals. Charging for the information on the Web has proven difficulties to the user, but with the CD-ROM technology user can simply get particular information.

Beside that the manufacturing costs also contribute to the growth rate in the CD-ROM publication. CD-ROMs are now mastered and mass-produced at an estimated cost, compared to the cost of equivalent print publications.

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CHAPTER THREE
METHODOLOGY

3.1   Introduction

This chapter describes the development of this research. It specifies the research design, instrument that are used, selection of the subject and the procedure of data collection and the statistical analysis of the study.

3.2   Research Design

This research was a quantitative research. The relationship between the independent variables and dependent variables were studied without any attempt to influence them. The objective of this research was to evaluate the design of the CD-ROM as a complementary learning tool. A CD-ROM of linear algebraic was shown to the respondents during the experiment of this research. After the exploration, the respondents were asked trough the questionnaire regarding the design of the CD-ROM.

3.3   Location of the Research

The study was conducted in Universiti Malaysia Sarawak, Kota Samarahan.

3.4   Selection of Subjects

The respondents this study consists of 32 Third Year Cognitive Science students from UNIMAS. The selected subject represents both gender and are from different ethnic groups. The average age for the respondents is between 19 to 30 years old.

3.5   Instrumentation

The research instrument used was a questionnaire. It was developing based on the objectives of the research that have been set earlier.

There are three parts in the questionnaire. Part A of the questionnaire consists of personal particular of respondents, background of the respondent. It looks at respondent's age, gender and their race. It also consists of respondent's experience of using CD-ROM in learning process.

Part B consists of Likert-type rating scale. This part are designed to find out respondent's understanding regarding the use of CD-ROM and also the multimedia characteristics that suitable to be included on the CD-ROM. The items are scored on scale are illustrated below:

1 = Strongly Disagree
2 = Disagree
3 = Neither Agree nor Disagree
4 = Agree
5 = Strongly Agree

There are five sections in the Part B including sound, text, animation, graphic and photography. Each of the sections consists of six questions about the respective characteristics design. The respondents were asked to indicate the level of agreement for each statement by choosing the appropriate number on the scale.

Part C consists of open-ended questions. Respondent were required to write down the problem they encountered when using the CD-ROM. The respondents were also required to state the advantages and disadvantages of using the CD-ROM, their comment and recommendations were analyzed descriptively (percentage).

3.6 Data Collection

The data collection of this study involved of 32 respondents. The questionnaire was distributed to the respondents after the exploration of the CD-ROM. The researcher gave a briefing about the objectives of this study and the focus of the study. It also consists of some explanation about the designs and the multimedia elements in order to give a clearer understanding about the purposes of this study. Finally the respondents are required to fill in the questionnaire form.

3.7 Data Analysis

The data collected are analyzed using the Statistical Package For the Social Sciences (SPSS) program version 11.0 for Windows.

Data from part A are analyzed using descriptive statistics (frequency and percentage). It is used to describe the personal particular and background of the respondent

Data from part B are analyzed using the Pearson Correlation test regarding the relationship between the designs of sound, text, animation, graphic and photography towards students' understanding.

For part C, the respondents are asked about their opinions and ideas. These parts are analyzed by examining the respondent's thought and the finding are presented descriptively.

Table 1
Approximate Translations of Value of the Correlation Coefficient

Value of Coefficient, r (+/-)	Relation between variables
1.0	Perfect correlation
0.9	Very strong correlation, close straight-line relationship between variables
0.7 – 0.8	Strong correlation, reasonably close straight-line relationship between variables
0.5 – 0.6	Strong degree of correlation, not a close relationship between variables

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0.3 – 0.4	Weak correlation, very low degree of relationship between variables
0.1 – 0.2	Very weak correlation, no relationship between variables
0	Nil or random relationship

CHAPTER FOUR
FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the analysis and discussion of the findings from this study. The findings are presented according to the objectives and hypotheses of the study. The main purpose of this study was to evaluate the design of the CD-ROM as a complementary learning tool. The factors investigated were on the text, graphics, animation, sound, photography elements and the student's demographic characteristics such as age, gender and race.

4.2 Data Analysis Result
4.2 1 Respondents' Demographic Characteristic

Respondents' demographic characteristics of interest in this study are age, gender and race.

<u>Age</u>

As shown in Table 2, all the respondents were in the age range from 19 years to 21 years, from 22 years to 24 years, 25 years to 27 years and from 28 years to 30 years. 8 (25%) of the respondents were in the age category of 19 years to 21 years. 22 (68.8 %) of the respondents were in the age category of 22 years to 24 years and 1 (3.1%) of the respondents were in the age category of 25 years to 27 and 28 years to 30 years.

Table 2
Distribution of Respondents by Age

Age	Frequency	Percent (%)
19 – 21	8	25
22 – 24	22	68.8
25 – 27	1	3.1
28 – 30	1	3.1
Total	32	100

<u>Gender</u>

As shown in Table 3, 11 (34.4%) of the respondents were male students and 21 (65.6%) were female students.

Table 3
Distribution of Respondents by Gender

Sex	Frequency	Percent %
Male	11	34.4
Female	21	65.6
Total	32	100

Race

As shown in Table 4, majority of the respondent was Malay 23 (71.8%). 2 (6.3%) of the respondents was Indian and Kadazan. 1 (3.1%) of the respondent was Iban and 4 (12.5%) of the respondents were from other race such as Bidayuh. none of the respondents was from Chinese.

Table 4
Distribution of Respondents by Race

Race	Frequency	Percent (%)
Malay	23	71.8
Chinese	0	0
India	2	6.3
Iban	1	3.1
Kadazan	2	6.3
Others	4	12.5
Total	32	100

4.2.2 Hypotheses Test Using Pearson Correlation

4.2.2.1 Ho1:   there is no significant relationship between the designs of a text towards students' understanding.

Table 5
Correlation between the designs of a text towards students' understanding.

Variables	p	Pearson, r
Designs of a text towards students' understanding		
	1	0.032

Level of significance = 0.05

The Pearson Product Moment Correlation Coefficient was used in this study to determine the relationship between the designs of a text towards students' understanding. As shown in Table 4.4, there was no significant relationship between the designs of a text towards students' understanding $r=0.032$, $p=1$ level of significance $p=0.05$.

As a result, the **Null hypotheses** that stated there is no significant relationship between the designs of a text towards students' understanding were **accepted**. Respondents did not show strong relationship result regarding the designs of a text towards understanding.

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4.2.2.2 Ho2: there is no significant relationship between the designs of a graphic towards students' understanding.

Table 6
Correlation between the designs of a graphics towards students' understanding.

Variables	p	Pearson, r
Designs of a graphics towards students' understanding.		
	1	0.186

Level of significance = 0.05

The Pearson Product Moment Correlation Coefficient was used in this study to determine the relationship between the designs of a graphics towards students' understanding. As shown in Table 6, there was no significant relationship between the designs of a graphic towards students' understanding r=0.186, p=1 level of significance=0.05.

Therefore, the **Null hypotheses** that stated there is no significant relationship between the designs of a graphics towards students' understanding were **accepted**. The result indicated that the students' understanding towards learning using the CD-ROM have a weak relationship with the designs of a graphic.

4.2.2.3 Ho3: there is no significant relationship between the designs of an animation towards students' understanding.

Table 7
Correlation between the designs of an animation towards students' understanding.

Variables	p	Pearson, r
Designs of an animation towards students' understanding.		
	1	-0.143

Level of significance = 0.05

The Pearson Product Moment Correlation Coefficient was used in this study to determine the relationship between the designs of an animation towards students' understanding. As shown in Table 7, there was no significant relationship between the designs of an animation towards students' understanding r=-0.143, p=1, level of significance=0.05

The **Null hypotheses** of this study that stated; there is no significant relationships between the designs of an animation towards students' understanding were **accepted**. The result indicated that the students' understanding has a negative relationship with the designs of an animation.

4.2.2.4 Ho4: there is no significant relationship between the designs of a sound towards students' understanding.

Table 8
Correlation between the designs of a sound towards students' understanding.

Variables	p	Pearson, r
Designs of a sound towards students' understanding.		
	1	-0.076

Level of significance = 0.05

The Pearson Product Moment Correlation Coefficient was used in this study to determine the relationship between the designs of a sound towards students' understanding. As shown in Table 8, there was no significant relationship between the designs of a sound towards students' understanding r=-0.076, p=1 level of significance =0.05

The **Null hypotheses** of this study that stated there was no significant relationship between the designs of a sound towards students' understanding were **accepted**. The result indicated that the students' understanding have shown a weak and negative relationship towards the designs of a sound.

4.2.2.5 Ho5: there is no significant relationship between the designs of photography towards students' understanding.

Table 9
Correlation between the designs of photography towards students' understanding.

Variables	p	Pearson, r
Designs of photography towards students' understanding		
	1	-0.111

Level of significance = 0.05

The Pearson Product Moment Correlation Coefficient was used in this study to determine the relationship between the designs of photography towards students' understanding. As shown in Table 9, there was no significant relationship between the designs of photography towards students' understanding r=-0.111, p=1 level of significance=0.05

The **Null hypotheses** of this study that stated there is no significant relationship between the designs of photography towards students' understanding were **accepted**. The result indicated that the students' understanding have shown a negative relationship towards the designs of a photography.

4.3   Results of Part C Questionnaire

Section C
Table 10 results in Part C

Question	Yes	No	Comment
What are the problems when learning trough CD-ROM?	34.4%	65.6%	▪ Computer hang ▪ Its hard to find a suitable CD-ROM ▪ Material not interesting
What are the advantages of learning trough CD-ROM? Please list down the advantages.	100%	0%	▪ Can use anytime ▪ Reduce human energy for teaching ▪ Increase interest towards computer