

e-Materials Application Presentation Using Gagne Learning Theory for “Introduction to C++ Computer Programming”

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Abstract--The need to integrate multimedia in the process of teaching and learning at all levels of education is becoming more vital. Multimedia based on e-learning is seen as an effective alternative in teaching and learning process. This method is able to create a student-centered learning where students are encouraged of being independence; study at their own pace and at their own place. Nevertheless, the rapid development of information and communication technologies (ICT) in today's world has necessitate a new trend in the presentation of information in the form of Flash Video, which is more easy to understand and accessible instantly to users. The research is undertaken by introducing an e-based multimedia content by maintaining the concept of Gagne Learning Theory. An e-material entitled "Introduction to Computer Programming C++" has been developed containing learning activities that allow users to interact simultaneously with the material. The material is

expected to be an effective teaching aid to entice students in the subject of programming.

Keyword: *Gagne Learning Theory; e-learning; e-materials*

I. INTRODUCTION

The National e-Learning Policy is introduced by the Ministry of Education (MOE) of Malaysia as an innovative effort towards improving human capital development. It is focus mainly in the Malaysian Higher Education Institutions (HEIs) towards a better developed nation, henceforth Malaysia being recognizable nationally and internationally. These efforts will lay a solid foundation for producing graduates who are smart, responsible, independent and self-reliant and could compete globally. In addition, it also can provide an equitable higher education system to all in accordance with the concept of lifelong learning.

Dato' Seri Mohamed Khaled Nordin the Minister of Higher Education of Malaysia, directed the National e-Learning Policy which is designed to provide a framework and direction for implementation of e-learning in the HEIs for a period of five (5) years starting from 2011 to 2015. Through this policy, HEIs will be able to progress into better aspects of e-Learning. This new movement must be fully utilized to the maximum in improving the quality of teaching and learning. The policy is executed in three (3) phases: Beginning Phase (2011-2012), the Filling Phase (2013-2014) and the Optimal Phase (2015). This policy has an e-learning framework which encompasses five main pillars; infrastructure, organizational structure, professional development, curriculum and e-content and cultivating culture. These pillars are a key driver to implement e-learning education for all by teaching and learning using online learning pedagogy or online and distance learning supported by information and communication technology to date.

II. PROBLEMS IN TEACHING AND LEARNING OF PROGRAMMING

Problem-solving technique is one of the techniques that must be mastered by students for them to be able to learn and understand the concept of certain topics. The students are expected to provide best solution on any problems in relation to the topic that could help further understanding the concept of a given problem. There are many strategies that can be used to encourage the problem solving technique. One of the strategies is using knowledge construct through self-explanation (Norasykin Zaid, Zaidatun Tasir (2011). Self-explanation is the capability of students to fully understand what they have learned during the learning process including problem solving (Norasykin Zaid, Zaidatun Tasir (2011). The statement or explanation to show the level of understanding can be expressed verbally, in writing, graphs or tables or as their tacit knowledge.

Based on the studies that have been done, it is found that, by giving a clear training to students of using self-explanation strategies, it will improve the students' ability in problem-solving skill and lead to an effective learning process. The problem-solving skill is among the skills that are often applied by computer programmers. Thus, the novice programmers for example, are often associated with students of first year computer science courses where they are not exposed to any programming concepts. It is important to grasp the skills and knowledge to increase students' abilities as a programmer and an effective problem solver.

Learning how to develop a program is generally regarded as a difficult task to students and often

programming courses recorded high failure rates. Therefore, E-Learning Policy of Universiti Teknologi MARA Malaysia takes the initiatives to spearheads the establishments of courses in multimedia based materials as one of the approach to improve on students' performance. Lecturers who have been appointed as content expert for certain courses will develop the course's contents into interactive multimedia form; e-materials. Among the conditions that must be fulfilled is, the lecturers have involved in teaching and learning, as well as to conduct the courses that is developed into e-materials for at least two semesters. Hence, this research will also adopt this requirement for the e-material "Introduction to C++ Computer Programming" course.

Studies also found that novice programmers have experienced difficulties not in the area of understanding the programming language constructs, but to incorporate the results of each problem areas into one best solution, after the process of decomposition occurred. Most of the studies reported that a major disadvantage of novice programmer for having weak skills on planning and design (Robins, Rountree and Rountree, 2003).

A study conducted by Norasykin Zaid and Zaidatun Tasir (2011) stated that the programming language C++ is a language that is easy to learn as the basics of programming. This is proved by the analysis presented in the database of the i-Learn Centre of Academic & International Affairs Division of the Universiti Teknologi MARA. It is shown that based on the fourteen faculties under Science and Technology cluster, ten faculties offer Programming C++ as their basic programming course.

III. THE DEVELOPMENT e-MATERIALS USING GAGNE THEORY

The theory of Gagne Learning Model (1985) is used as the basis for the research phase where it is proven as a major contribution on the students' learning process. This approach contains nine phases; gain attention, inform learners of objectives, stimulate recall of prior learning, present stimulus material, provide learner guidance, elicit performance, provide feedback, assess performance and, enhance retention and transfer (Siti Hajar Halili, 2011).

In continuation of learning theory research, a multimedia developer should be able to integrate the concept of teaching and learning with multimedia applications. It is important to have such knowledge in order to develop an effective e-materials to be conveyed to students. Teaching theory of Robert Gagne is considered as a major contributor to the design approach of teaching and training. One of his most important contributions is the theory of "events

of instruction" that can be applied to produce an effective teaching presentation (Robert Gagne in <http://www.instructionaldesign.org/theories/conditions-learning.html>).

A. *Getting Attention*

Before any teaching and learning can take place, instructors need to attract the attention of students, including:

- Attract attention by presenting something new, ask questions or present interesting facts. In Sardi Janudin studies (2004) showed that the adults' focus of attention will decrease after the first ten minutes they were exposed to something that excites them.
- Use of stimulating substances such as changes in visual, audio and so on.

B. *Inform Learner of the Objectives*

The objective is very important in a learning process. Students need to know the objective for the information and knowledge dissemination. Therefore the process of learning runs smoothly.

- Please state the purpose of the presentation and why they should follow the objectives.
- Please indicate what they can do after the learning activities.

C. *Recall Prior Learning*

Before a learning is commence, stimulate student's memory by:

- Relate new information to information that has been learned.
- Recalling the concept, content and knowledge on what they have learned.

D. *Presenting the Stimulus*

Information in the normal form can be delivered more effectively and stimulate students by:

- Breaking information with important points.
- Present the contents through graphics, animation or sequence of the corresponding text.

E. *Providing Learner Guidance*

To facilitate the process of understanding, students need to be guided for them to have a smooth learning process.

- Describe the process of semantics or phrases, using symbols, signs or formulas to facilitate learning.
- Propose meaningful contents organization, such as giving examples, analogy or graphic representation.

F. *Eliciting Performance*

To measure the performance, students should be given appropriate trainings or tests that are according to their level of studies.

- Ask students to give respond.
- Ask students to do a lot of practices.

G. *Providing Feedback*

To improve performance, the instructor should emphasize:

- Testing and training during tutorials are not for formal scoring but as reinforcement activities.
- The importance of giving specific feedback on student achievement.

H. *Assessing Performance*

To complement the teaching modules, the following should be noted:

- Students must be given the opportunity to sit for the final evaluation.
- Assessment is prepared without any extra activities or feedback.
- Confirmation of skill level and certification given after achieving a certain level of score or percent

I. *Retention and Transfer*

To stimulate memory and facilitate the transfer of information, the following points should be considered.

- Training modules must have a focused performance, accompanied by a design and media that stimulate memory and transferring information.
- The concept of learning is repetition in an attempt to help the process of memory stimulation.
- Develop teaching aids in the form of electronic or online materials and reference materials. "Template" and "wizard" in the application are other methods that can improve performance. (Mohd Nor Hajar Hasrol & Mohd Nor Mamat, 2007).

IV. DATA ANALYSIS ON APPLICATION PRESENTATION

The results of the data analysis are based on a set of questions given to respondents. The researchers discussed all questions that have been analyzed in tables and charts for better understanding of each factor. This analysis only takes into account the terms of the application presentations that include the following questions.

A. Attractive Screen Designs

Based on Figure 4.1, the majority of respondents agreed that the screen design is interesting, which is at 52%, followed by the opinion strongly agree by 48% indicated that screen design is attractive.

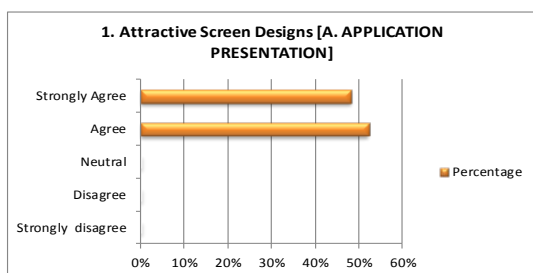


Fig 4.1. Attractive screen designs

B. Clear and Readable Text

The text is referred to the text used in the development of e-materials and in the content of e-materials. Figure 4.2 shows that the respondents strongly agreed that the text is clear and readable with the highest percentage of 62%, followed by agree by 38%.

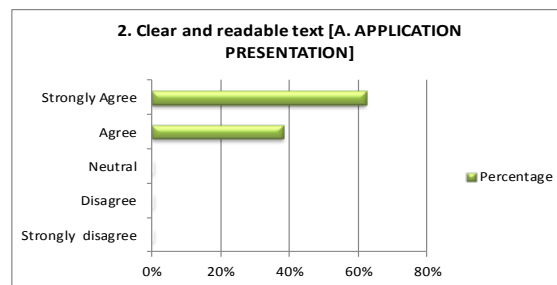


Fig 4.2. Clear and Readable Text

C. Effective use of Graphics

Graphics are included other than text in the contents such as icons, buttons and symbols. Based on Figure 4.3 below, 50% of respondents strongly agree that graphics are attractive, 50%, followed by the agreed opinion of 39%, and 11% was neutral about the graphics in software is attractive and effective.

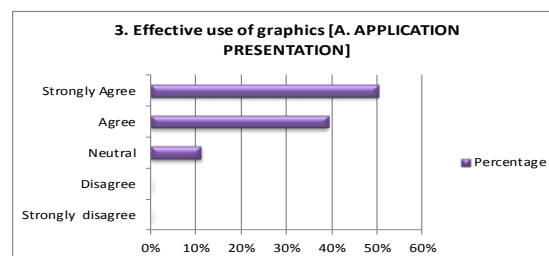


Fig 4.3. Effective use of Graphics

D. Effective use of Colours

Colours play a role in the development of multimedia to attract users to use the e-material. Figure 4.4 shows that the respondents strongly agreed and agreed that the colors used are effective with the highest percentage of 41%, and then it is followed by neutral by 17%.

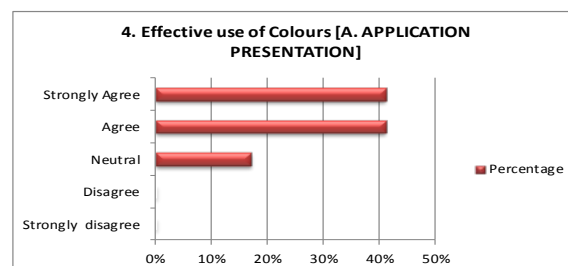


Fig 4.4. Effective Use of Colours

E. Effective use of Audio

Audio used includes sound effects, music and voice recordings. The majority of respondents agreed that the audio used is effective, that is 52% as shown in

Figure 4.5. Percentage of strongly agreed stood at 45%, and 3% was neutral with the question.

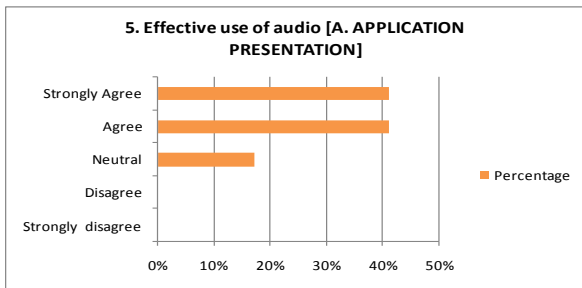


Fig 4.5. Effective use of Audio

F. Interactivity

The software provides interactivity elements such as mouse roll over and mouse click. The majority of respondents agreed that the elements are simple and adequate to be used by 52%, as shown in Table 4.6. Percentage who strongly agreed is 41%, and neutral by 7%.

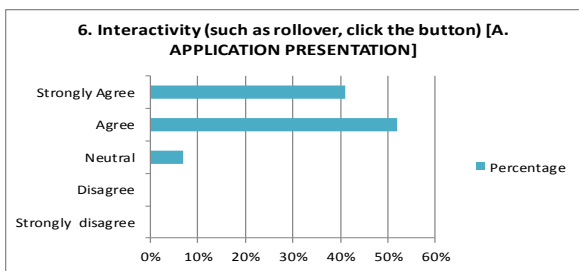


Fig 4.6. Interactivity

G. Effective use of Links

Link is one of the techniques in hypertext and hypermedia. Majority of respondents strongly agreed that the link to each topic and the desired site is simple, ie by 48% as shown in Figure 4.7. It is followed by agreed percentage by 34%, and neutral by 17%.

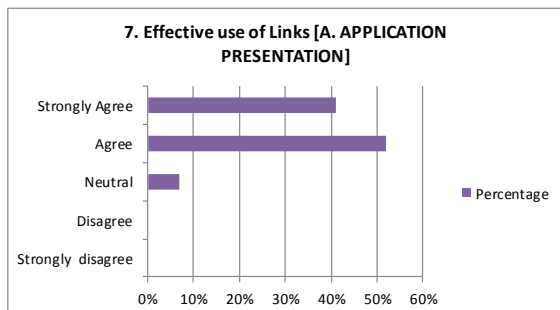


Fig 4.7. Effective use of Links

H. Effective used of Icons and Symbols

Icons, buttons and symbols are the elements that are used to navigate the software. The majority of respondents agreed that the elements are clear and easy to understand, which 59% as shown in Figure 4.8 is. Percentage agreed respondents are 38%, and neutral only by 3%.

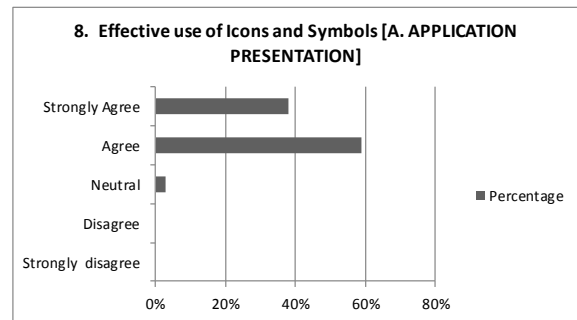


Fig 4.8. Effective used of Icons and Symbols

I. Effective use of Application Guide

User applications available to users are clear and easy to understand. Based on Figure 4.9, respondents agreed that the guide is easy to understand by 55%, followed by the strongly agree by 38%, and neutral recorded by 7%.

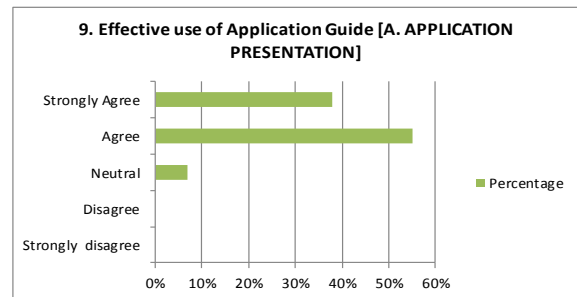


Fig 4.9. Effective use of Application Guide

J. Overall Application Performance

The questions concluded the overall satisfaction on the performance of applications. Based on Figure 4.10, the respondents agreed that the overall performance of the applications with the highest percentage at 52%, followed by the strongly agreed by 45%, and neutral just posted a 3%.

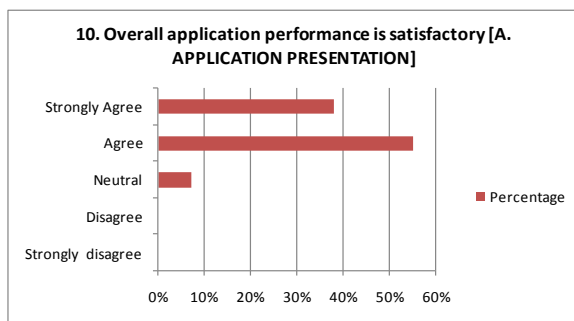


Fig 4.10. Overall Application Performance

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V. CONCLUSIONS

It can be concluded that the results shown that the e-materials produced is at an acceptable level and meets the requirements of the targeted users. However, the findings of the analysis resulted from the existing results and do not mean the application is as a result of its best. Opinions expressed responded on the results of disagreement definitely shown dissatisfaction with the application developed. Therefore, continuous improvement is necessary in order to be reproduced better quality products and meet the requirements of all users.

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