

## ADDIE MODEL APPLICATION FOR DEVELOPMENT OF E-NOTE (DET 1013) FOR STUDENT IN POLYTECHNIC

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**ABSTRACT.** The main objective of the learning and teaching process is that students can follow and understand the content of the subject. In order to achieve these main objectives, the learning process presented should be able to attract students and indirectly improve students' academic achievement. In addition, the learning process experienced by students can challenge the mind in order to improve problem solving skills as well as improve creative and critical thinking skills. Learning mathematics and science is an abstract learning that is difficult for some students to understand. Findings for this study show that the development of e-learning materials built involves all phases of the ADDIE model, namely analysis, design, development, implementation and evaluation. For this study, e-learning materials have obtained content validation from three experts in the field of teaching and learning. As a result of the findings of this study, researchers have successfully produced e-learning materials that can be used by students who take the subject of Electrical Technology 1 (DET1013). It is hoped that with the result of this e-learning material can help students review lessons no matter where they are and can increase interest and academic achievement.

**KEYWORDS:** Teaching and learning process; E-Learning; ADDIE model

### 1 INTRODUCTION

Technical and vocational education and training (TVET) is a long-standing phenomenon in the Malaysian education system. The development of TVET in Malaysia started since 1964 under the Department of Technical Management. It is now known as the Technical and Vocational Management Division (BPTV). The main purpose of Technical and Vocational education introduced is to prepare students to enter the field of employment because it is a government effort so that the field of economy and industry is growing and developing (Che Rus & Azman, 2016, Bhurtel, 2015). The four main aspects that have been identified as contributing to the decline in student participation in Science and Technical are curriculum, awareness and importance of science and technology, career paths and the quality of teaching and learning (Hassan et al., 2015).

Johnson & Renner, 2012 stated that a quality teaching and learning process can contribute towards quality educational institutions, which in turn has a positive impact on the existence of quality graduates. In this regard, the quality possessed by a teacher can also affect the quality of teaching and learning achievement he carries out. The role of teachers is important in educating students and in the classroom teachers as educators, facilitators and facilitators. Therefore, according to Johari et al, 2014 diversifying teaching methods, providing teaching aids and deepening the content to be taught is an effective teacher practice on the teaching and learning process (PdP).

Teaching and learning methods are at the highest level if students can overcome the most appropriate cognitive and affective learning methods to improve their own abilities (Hussin, Rasul & Abd Rauf, 2013). Teachers are expected to encourage students to improve their knowledge and skills through accurate and effective teaching and learning (Sharlanova, 2004). Therefore, Tunku Ahmad (2014) suggested that teachers need to be creative and have the ability to increase students' interest in exploring various knowledge throughout the learning process. Teachers are individuals who have knowledge and skills and are given the responsibility to provide knowledge and education to students.

Teaching and learning strategies are needed by teachers to carry out activities in the classroom effectively. McLaughlin et al (2014) stated that teaching and learning is a process of internal change that occurs in a person by forming new potential potential to generate new feedback. Therefore, teaching is defined as the delivery of information, knowledge, skills, and concepts to improve the quality of students

themselves during the activities carried out in the classroom. Learning is a change in student behavior as a result of learning experiences and not due to developments in nature.

Chua & Jamil (2014) stated that quality teaching includes a variety of teaching methods by using the latest methods and applying teaching methods hands-on. Teachers need to use ICT that suits the needs of students. According to Adedokun & Kehinde, 2014, Puteh & Abd Salam, 2011 the use of ICT in teaching and learning can help students in building their understanding and can increase students' interest in the subjects taught by educators. In this regard, the Ministry of Education Malaysia has taken several steps in integrating the use of ICT in the teaching and learning process at every level of schools and institutions of higher learning. The teaching and learning process that takes place is an important element in improving students' academic achievement.

The concept of E-Learning was introduced to provide educational knowledge to students through effective means (Yahya, 2011). Learning based on information and communication technology (ICT) is a learning method that can improve the efficiency of the process and the effectiveness of teaching and learning (Madar et al., 2009). The concept of E-Learning is a new alternative to diversify the teaching and learning media in addition to it can also provide exposure to students about the sophistication of the multimedia system that exists today. Therefore, it can increase the level of thinking and conquest of these students at a higher level (Ali & Ismail, 2011). The findings of Mohd Najib, Abu Bakar & Othman (2017) show that the effective use of E-Learning can produce students with high self-esteem can indirectly produce students who are more literate in technology and form holistic students from all things in time the same.

Science and mathematics learning for some students is abstract and difficult to understand (Lindberg, 2001). Ideology from the school days that have been brought to the level of institutions of higher learning, causing them to make less effort to further enhance their understanding in understanding the learning of science and mathematics. In addition, the teaching method in the information distribution system is seen as less helpful to the students such as copying notes or formulas (Zhou, 2011, Khalid et al., 2010). Science and mathematics learning is unique because the concept of learning and teaching takes place from the most basic level to the higher level (Abdullah et al, 2018). This means that without mastery of the concepts of learning science and mathematics from the basic level will cause students not to understand more abstract and complex concepts.

Students who take the Electrical Engineering course must take and pass the subject of Electrical Technology 1 (DET 1013). This is because students who fail in the subject of DET 1013 cannot take the subject of Electrical Circuit (DET 2033) in the second semester. Problems occur when the ministry has lowered the passing rate or grade to enable students to continue their learning sessions in the next semester. The passing score set by the ministry is 40-43. Indirectly, this shows that the standard or quality of students produced is low and this cause's further unemployment among graduates produced by Malaysia is increasing. Therefore, a variety of ways in learning is important to increase students' interest and can indirectly improve students' academic achievement.

## **2 E-LEARNING**

Calculation-based learning is an important learning experience for technical students. It is an education that emphasizes the holistic development of students including cognitive, attitude and psychomotor development as well as cultivating noble values to become useful citizens in line with the goals of the National Education Philosophy (Mahfurdz & Semail, 2015). In order to develop a developed country based on science and technology, knowledge that is important for a society is basic knowledge in calculations (Cheong, 2010).

Learning based on calculations in a curriculum should be planned to achieve its goal of improving students' knowledge, skills and interests (Puteh & Abd Salam, 2011). In addition, teaching for engineering subjects, especially in institutions of higher learning, students will be taught about the theory of a sub-topic. Next, exercises or questions related to the topic will be given to further strengthen the understanding of the concept. According to Yusof, Foong & Jailnai & Chee Sern 2015, students can only process the information obtained in stages. This is because it relates to the concept of students' cognitive load.

The use of ICT in the learning and teaching process has long evolved in the education system in Malaysia (Umar, Salbani & Jamaluddin, 2007). This is in line with the vision and mission of the Government of Malaysia through the Ministry of Education Malaysia (KPTM) where the use of information technology is very important in the process of information delivery, especially in science and mathematics. In addition, cultivating the use of ICT in education to improve the quality of teaching

and learning, the effectiveness of school management and administration as well as continuous teacher competence (Puteh & Abd Salam, 2011).

The presentation of this information can be seen as well as interesting with a sound presentation that increases interest, enhances memory and improves the success rate (Buntat & Mohamad, 2010). In addition, learning at their own pace and students can master each level, besides being able to add access to education in certain subjects despite the lack of teaching staff in certain subjects. Another advantage is that the addition of control and freedom is introduced into the learning process. This is the interactivity provided in the multimedia element that allows students to control their own learning (Salter et al., 2012).

### **3 METHODOLOGY**

The five phases in the ADDIE model are Analysis, Design, Development, Implementation and Evaluation. The ADDIE model is a model that has a systematic approach to the process of designing instructions and even to carry out a structured framework process for a designer. In addition, it ensures that the products produced are more effective and efficient if used by consumers. Therefore, the development of effective e-learning materials can increase the interest of polytechnic students in the subject of Electrical Technology 1 (DET 1013) and indirectly can improve the academic achievement of students.

### **4 RESEARCH FINDINGS**

To develop e-note materials, researchers have applied five phases of the ADDIE model, namely analysis, design, development, implementation and evaluation. The findings of the study by phase are as follows:

#### **4.1 Analysis Phase**

The analysis phase performed by the researcher is to obtain information related to the study in detail. In this phase, the designer or system development will better understand about the system users, the system environment to be used, the goals and objectives that the system wants to achieve and so on. Research and reading is done on current trends or technologies, books, literacy, journals, internet and other scientific materials regarding selected research products. Planning will focus on the flow of the system that will be developed and translated into a flow chart. Once refined in all aspects and potential, only then the scope and needs of the project are determined. In this phase as well, the understanding of problems, processes and methods of problem solving are obtained and documented in the form of proposal papers. In conclusion, in the design phase of e-learning materials, researchers need to analyze the three main aspects, namely the learning objectives, teachers and students. In order to obtain relevant information, researchers need to answer some of the main questions, among them are:

- i. What is the level of mastery of students in the subject of Science and Mathematics which is the basis of the subject of Electrical Technology 1 (DET1013)?
- ii. Do students have a basic knowledge of the subject of Electrical Technology 1 (DET 1013)?
- iii. How are the appropriate notes in the subject of Electrical Technology 1 (DET 1013) that can help improve students' understanding?
- iv. What is the e-learning design that students are interested in?
- v. Are there other problems that leave an impact and interfere so that the process of learning and teaching of Electrical Technology 1 (DET 1013) fails?

The questions that have been stated as above are very important to get an initial overview in developing teaching materials.

#### **4.2 Design Phase**

The design phase covers the process of determining how the learning process can be carried out. System designers or developers will focus more on how a title will be presented to users, system specifications and system storyboards. In this phase, an overview of the implementation of the system will be shown using visual methods. This is done by setting the system content, interface design, storyboard and flow chart for the system being developed. This design covers the communication of

the system in general as well as the specific sequence of processes and facilitates the relevant parties to understand the course of the system and then assess the suitability and potential for further development.

#### **4.2.1 Audio**

According to Halili, Sulaiman & Abd Rashid (2011), the increase in the number of students as well as the change in current triggered by information technology requires efficient and systematic handling so that each student benefits fully. Audio is a medium that is often used by teachers during the learning and teaching process. This is because the audio element is able to convey information more effectively, create a more vivid atmosphere and attract attention to convey what is to be conveyed.

Audio plays several important roles according to Harun & Tasir, 2002. Among the main roles of audio is to serve as a sign of something happening and the audio element can help the presentation process so that it is more robust and effective. In addition, audio is able to increase motivation among users to be more interested when following the information delivery process for example from the user's cognitive point of view, which is aspects related to mental processing such as knowledge, memory, assessment, perception and so on. The use of audio also not only affects the aspect of knowledge but also from the inner aspect of the user as well as emotions and feelings.

#### **4.2.2 Text**

The use of text in a multimedia system is undeniably important. Although there are various other multimedia elements and are considered interesting and dynamic, text is still needed as one of the key elements in the delivery of information (Othman & Expert, 2013; Umar et al., 2011). Texts generally refer to letters arranged to form a meaning that can be understood or carry a specific meaning. Text refers to all types of symbols, letters, alphabets, numbers, statistics and various types of writing and fonts that are the main basis for the transmission of information past and present (Aris, Shariffudin & Subramaniam, 2002). According to Mohamad Ham & Ahmad, 2017, text is a static thing and can not attract students who have various learning styles in a classroom.

In an interactive multimedia system, text also plays an important role in conveying information to users. The use of text will also be more interesting if it is combined with other multimedia elements and the combination of the use of this media promises a more interesting, accurate and comprehensive presentation of information. Although text is one of the best sources for conveying information, sometimes it fails to disseminate information at a fast pace. For example, if a person is only given 3 seconds to attract the attention of the user in a presentation session, the text is quite difficult to deal with this situation effectively. In addition, there are some guidelines and things to pay attention to when doing work using this text element, among them is that the text should be simple and concise, using the appropriate typeface and fonts, the text can be read by the user, color selection and writing style should be appropriate, the selection of fonts is done consistently and the fonts used are already available on other computer systems (Harun & Tasir, 2002).

In addition, hypertext is widely used in multimedia systems because hypertext can avoid a screen full of text. The provision of hypertext will give users the opportunity to click on hotwords if they need additional information (Aris et al., 2002).

#### **4.2.3 Graphic**

Graphics can be referred to various images of images or visual displays that do not move such as pictures, drawings, sketches, photographs, illustrations and so on (Madar & Butat, 2006). It is one of the most important multimedia elements to emphasize in a process of delivering information faster and more accurately as it is presented in visual form.

In addition, the use of graphics is very helpful in explaining information accurately and effectively. The use of graphs or charts for example can display an increase or decrease in sales volume for a company more effectively than the use of text or tables alone. Graphics are also able to make a presentation or presentation of information more interesting and able to focus the user's attention on the information to be conveyed.

#### 4.2.4 Interactivity

According to Ahmad & Tasir (2019) 'interactivity' is a process that allows the processing of deep information in the minds of students. Ahmat Miskam and Mohamad (2017) say that 'interactive' is closely related to individual feedback or control. Interactive multimedia in teaching and learning is defined as a teaching program that is connected to the instructor via computer using a system. This program is designed to provide information to users and facilitate through visual instruction tools (Mohamad Hanafiah, Mat Noor & Mohamed 2019).

The advantages of interactive multimedia in self-directed learning of various media can be used, but multimedia computer software is the most effective (Mohamad & Mohamad, 2017). Interactive consists of two categories where the categories are linear multimedia and non-linear multimedia. The difference between linear multimedia and nonlinear multimedia is that linear multimedia users cannot control the flow of multimedia content. Apart from that it also does not have interactive where examples of this element can be said such as live video and drama. Non-linear multimedia gives users the freedom to explore or control the flow of content and in terms of non-linear multimedia interactivity is more interactive. Examples of these elements are video games, websites and E-books.

To ensure that users are active in learning using multimedia software, elements of interactivity need to be applied. Multimedia allows users to be more active by providing interactivity facilities at a wider level. Users are also able to control what content is to be presented, when it is presented and how it is presented. According to Hamzah et al, 2018, learning based on interactivity is able to attract students and at the same time can provide real experience to students. This is because of this concept of interactivity.

#### 4.2.5 Animation

According to Che Hat et al. (2013), animation is one of the multimedia elements that are able to attract the attention of students, this is because the use of animation is able to reveal a human fantasy to the realm of reality. The selection of teaching and learning materials is one of the important aspects to increase the effectiveness of the R & D process. This is in line with the statement made by Vebrianto & Osman (2012), where instructors are asked to be diligent in making the selection of effective teaching media because this action will be able to support the effectiveness of the R & D process.

The word animation is derived from the Latin word "anima" which means soul, spirit or life. The features of this animation are divided into two, namely 2D animation and 3D animation. According to Mamat et al (2014), animation uses a combination of several moving graphics to convey information. This animation also has the ability to abstract a visual into a more schematic presentation.

### 4.3 Development Phase

The next phase is the development stage where the process of developing and producing materials is done. In this phase, things are explained about the construction of the content that is related to the criteria that need to be there as well as the steps of composing or programming the title. Prototypes will be developed based on information obtained from previous phases especially from the design phase. The system development process is implemented using a variety of appropriate software.

Table 1: Proposed Development of Teaching Material Based on Multimedia:

No.	Activity	Objective	Topic
1	Audio	<ul style="list-style-type: none"> <li>Students receive information more effectively, as well as be interested in the information presented.</li> <li>Student motivation can be enhanced and make students more interested in teaching materials.</li> </ul>	<ul style="list-style-type: none"> <li>Standard symbols for electrical components and the difference between cells and batteries.</li> <li>The effects of different cell connections (Series, Parallel and Series-Parallel).</li> <li>Electric current and quantity of electricity (Current, Charge,</li> </ul>

2	Text	<ul style="list-style-type: none"> <li>• Students can read the information they want to convey according to the student's ability and can help students repeat the reading in order to remember the teaching materials according to the wishes of students.</li> </ul>	<ul style="list-style-type: none"> <li>• Potential Difference and Resistance).</li> <li>• Main effects of electric current (Heat effect, Magnetic effect and Chemical effect).</li> <li>• Resistance and Resistivity</li> <li>• Ohm's Law.</li> </ul>
3	Graphic	<ul style="list-style-type: none"> <li>• Students can increase their interest in continuing to explore teaching materials until the completion of the PdP process.</li> <li>• Students are attracted to teaching because of the cheerful colours used</li> </ul>	<ul style="list-style-type: none"> <li>• Series Circuit (Equivalent Series Resistance and Voltage Divider).</li> <li>• Parallel Circuit (Equivalent Parallel Resistance and Current Divider).</li> <li>• Combination of Series and Parallel Circuit.</li> </ul>
4	Interactivity	<ul style="list-style-type: none"> <li>• Students can explore teaching materials more easily without having to go through a long process.</li> </ul>	<ul style="list-style-type: none"> <li>• Delta –Star Transformation</li> <li>• Star – Delta Transformation</li> <li>• Electrical Power and Energy</li> </ul>
5	Animation	<ul style="list-style-type: none"> <li>• Students can follow the teaching materials more effectively as well as can stimulate the senses.</li> </ul>	<ul style="list-style-type: none"> <li>• Kirchoff's Current Law</li> <li>• Kirchoff's Voltage Law</li> <li>• Thevenin's Theorem</li> <li>• Norton's Theorem</li> <li>• Superposition Theorem</li> <li>• Maximum Power Transfer</li> </ul>

#### 4.4 Implementation Phase

This phase is carried out after the development phase is completed. In the early stages of this phase, the teaching materials produced should be tested on students. This is to find out the strengths and weaknesses of the teaching materials developed. This phase is to find out the effectiveness and suitability of the material produced for students so that students can master the topic well (Harun, Aris and Tasir, 2001). Students who have the criteria set at the beginning of the study are required for the implementation process to be carried out. The results obtained after the completion of this phase are implemented, improvements and restorations will be made before the actual e-notes are used. The ADDIE model used to produce this e-note is intended to provide a solution encountered during the design process provided. This is because the ADDIE Model is a model that has a systematic process in designing teaching materials. The elements tested in this implementation phase are intended to make improvements after the process is measured, tested and implemented. It is as follows:

- i. Learning style that students are interested in where it is different for everyone. Learning styles that students are interested in are active, reflective, visual and auditory. In addition, the soft skills needed by students are like critical and creative thinking skills.

- ii. Student environment where it covers areas that can access the internet, learning equipment such as laptops and so on.

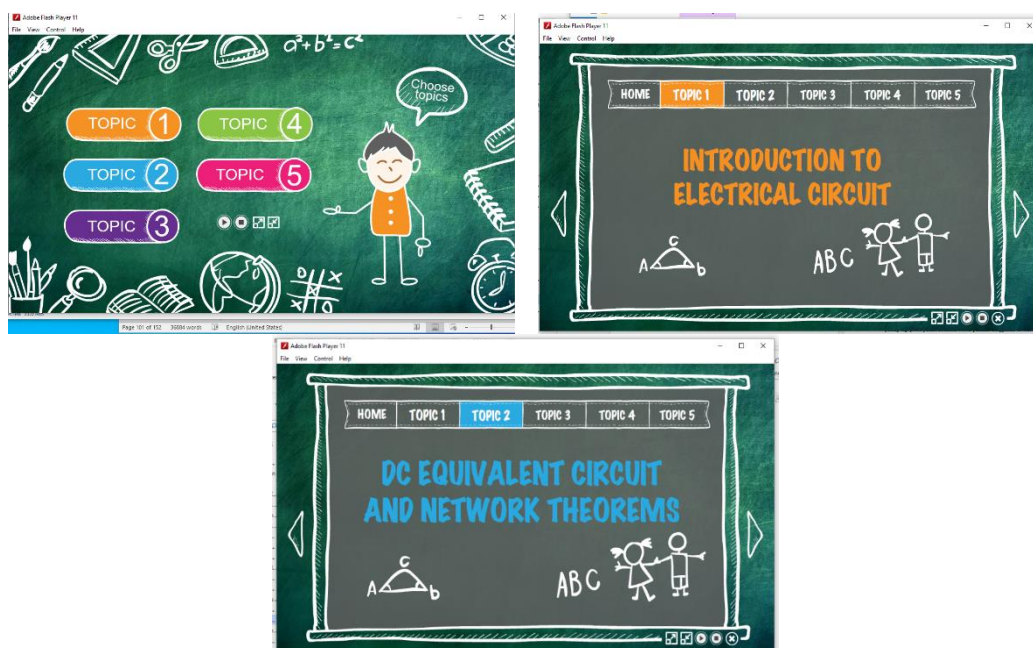


Figure 1: E-note display for DET 1013 subjects

#### 4.5 Evaluation Phase

This phase is the final phase of the ADDIE Model. In this phase, the teaching materials produced are evaluated for their ability and effectiveness in line with the objectives that have been stated in the analysis phase. This teaching material can also be measured by the results of feedback received by students. For the evaluation phase there are two assessments that are directly involved, namely formative assessment and summative assessment. Formative assessment is an assessment that is done throughout the process while summative assessment is done at the end of the learning process. In addition, formative assessment refers to the effectiveness of the design of teaching materials and the development of teaching materials. Summative assessment refers to the effectiveness of teaching by lecturers, achievement of learning objectives and learning outcomes. By getting information results, improvements during the process of planning the teaching of the same or different topics for other similar courses.

The feedback received by students related to this e-note is also important for the improvement process. The assessment process uses a set of questionnaires as well as a set of questions related to the topic of the lesson. To continue the teaching and learning process, data obtained from summative assessment will be used. The ADDIE model used in the construction of teaching materials is intended to design good teaching materials. This is because when there are problems throughout the process, the researcher can identify the problems and can improve from time to time.

#### 5 CONCLUSION

Through the discussions that have been conducted, this ADDIE Model covers five main phases, namely the phase of analysis, design, development, implementation and evaluation is a model of teaching material design that can be used to increase students' interest and academic achievement. This can be proven because the phases found in this ADDIE Model have a comprehensive and systematic process. The researchers found that the e-note teaching materials produced were successful because they emphasized on the main components of multimedia, namely text, animation, audio, graphics and interactivity. It is hoped that with the construction of this e-note teaching material can improve academic achievement and students' interest in this subject.

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