

Development of Computer Assisted Instruction on AC Circuits

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Abstract- This experimental research aimed to construct a Computer Assisted Instruction (CAI). The instruction was designed to serve the purposes of the electrical circuit AC course at the vocational education level under the Vocation Education Office. The hypothesis was that this instruction could help students to study the course more efficiently or equally at the criteria of 80/80. The learning achievement after the study with the posttest should be significantly higher than that of before the study at the level of .01. The sample was a purposive group of 1st year vocational education students at the department of electrical power, Hatyai Technical College, Semester 1/2016. The sample was taken from the select sampling of 30 peoples. Tools and equipment used in this research included the pre-class assessment test, use for testing knowledge of students before teaching. The Computer Assisted Instruction, exercises of each module, pretest and a summative posttest and then the data was analyzed and summarized.

The results showed that the multimedia Computer Assisted Instruction was efficient at the level of 8 which was higher than expected 80/80. The achievement of the posttest was also significantly higher than the pretest and this multimedia Computer Assisted Instruction can be used to study the course more efficiently.

I. INTRODUCTION

Education is extremely important for humans especially in the modern world the most value resources is the talent human resource. Because of the potential of each country based on the knowledge of the nation. Countries where citizens have a good education will always have a competitive advantage. Current advances in educational technology is important to improve the ability of students and the capabilities of the technology, the people who are involved in teaching and learning have education reform into the system and can be applied to the learning process appropriately. Technologies that happen now, especially education, has developed a model for teaching that is faster learning than the normal use of the blackboard change to use any technology to support teaching, power point, whether it is technology, which is applied to the computer with instructional time or a series of computer

packages such as PLC, adopting such technology it is good to help students be successful and more effective than ever. Educational computer communications system into the role quickly help teaching good performance. The instructor was teaching creative process to fit the lessons learned with the goal of Computer Assisted Instruction (CAI) is an innovative educational content including text, images, sound, graphics and applications seamlessly.

AC Circuit subject code 2105 2003 Diploma. Office of the Vocational Education Act 2545 (Revised 2546) is one of the fundamental importance of the Department of Electrical Power which all learners must study. This course will focus on learning in the calculation to determine the answer of circuits and this subject is a balance of learning other subjects or studying a higher diploma. So the lesson on AC circuit is necessary to lay a good foundation for learning but content of this course are many and difficult to understand especially the section of the R-L-C circuits series, parallel and compound units are complicated. Teachers must focus on teaching the details, because these unit is the heart of the subject. And experience in teaching this course before, the problem of the students in the class, such as compute circuit significantly. Some students are not good at calculating, and do not understand the theory and if we cut or skip some content to simply make the students gain knowledge incomplete and this will result in a poor learner themselves. The ability to acquire knowledge of each student is different. It is difficult to teach the students to understand the content all at the same time. So the researchers think that the series CAI took part in the management of teaching and learning cycle alternating current. The RLC circuits to provide more effective learners who are able to use computer-assisted instruction to review the material at the end of the lesson. Learn more about the case or did not understand the content or to read before entering the real lesson. It will make the students understand content and improved achievement. Learners light of this, it has developed themselves. The students who already have an understanding, it will be reviewing some of their own.

II. RESEARCH METHODOLOGY

1. Population sample selection

The population sample selection was a group of 30 vocational students who are studying in 1st year of Department Electrical Power at Hatyai Technical College.

2. Research design

This research used experimental research plans. The experimental groups with one group taking the test were compared before and after study for finding learning achievement. Tools used of this research was divided into 4 parts as following

- Content Analysis
- CAI Learning Unit Design
- Test Design
- CAI Evaluation Tool Design

2.1 Content Analysis

This research was designed following contents on subject code 2104 2003 and can be divided as shown in Fig. 1.

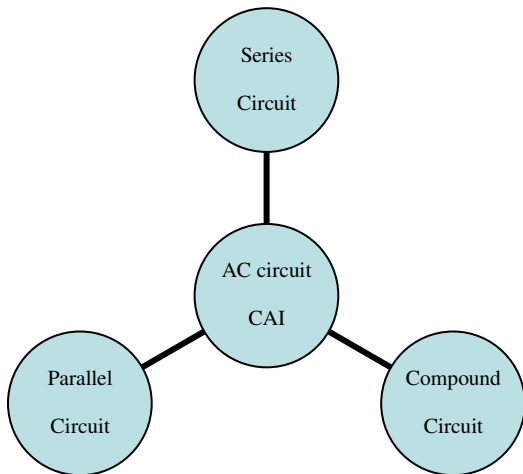


FIGURE 1. Proposed CAI of topic analysis

The content topics of AC circuit were divided as 3 parts. These parts were applied to analyze content as shown in table 1. Here, teaching points of each topic were found for defining learning content and learning point on CAI. Students can use the proposed CAI as learning media in AC circuit class and can use this CAI for self-learning after class finished. This is way for designing the proposed CAI.

TABLE I. Content Analysis

AC Circuit	
Topics	Teaching points
1. Series Circuit	1.1 Definition 1.2 RLC load performance 1.3 Impedance determination 1.4 V and I determination 1.5 Example for calculation
2. Parallel Circuit	2.1 Definition 2.2 RLC load performance 2.3 Impedance determination 2.4 V and I determination 2.5 Example for calculation
3. Compound Circuit	3.1 Definition 3.2 RLC load performance 3.3 Impedance determination 3.4 V and I determination 3.5 Example for calculation

2.2 CAI Learning Unit Design

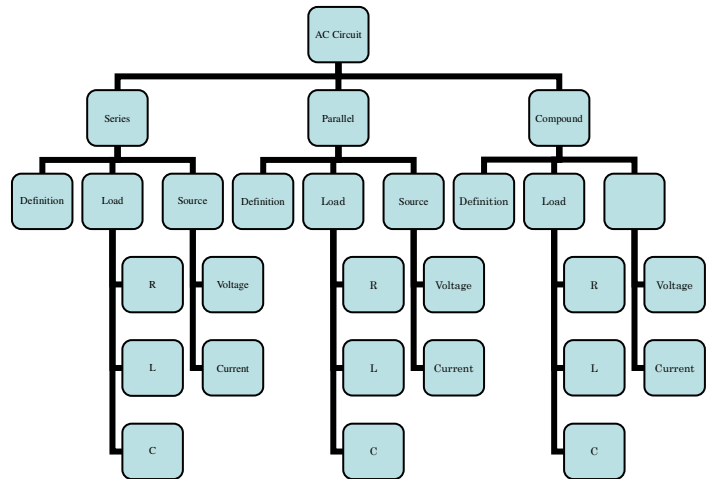


FIGURE 2. Construction of proposed CAI learning units

From the teaching point analysis results in table 1, the construction of the proposed CAI learning units can be yielded as shown in Fig.2.

2.3 Test Design

- Collect all topics and divide as following in fig.2.
- Defining behavioral objectives and content experts to review the performance again.
- Make a test by following the objectives.
- Take a test for professional determine whether accurate or not and is consistent with the objectives much.
- Take the test to sample selected. The sample must pass the class with a lesson that created it.
- After leading the experiment. It turns out that the test can actually use only 40 of the 50 questions.

2.4 CAI Evaluation Tool Design

All test scores from pre-test and post-test will be applied to find learning achievement and efficiency of the proposed CAI.

III. CONSTRUCTIONAL DESIGN

After defined main structure of the proposed CAI, operations of each chapter were designed. For example, in lesson of series circuit, before students input to the lesson, they must fill name and surname and next the pre-test will be appeared. Here, student must select answer for each question in the test. The question will be appeared sequential. After finished the test, testing score will be shown and student can learn the content inside the lesson chapter. After finished learning content in the chapter, the post-test will be appeared. The students must do this test and after finished this test, the score and learning result must be announced. If students' score do not pass, they must re-learn the same lesson chapter unit score is passed and they will be able start to study in next chapter.

When there structure of the lesson is completed, the next step would need design a lesson screen by using design principles of story board frames. The principles of clarity, the screen must not a lot too character and the message meaningful to understand as well.

After the design of screens were completed, the design of the CAI courseware using Macromedia Author ware 7.0, Macromedia Flash 8, Abode Photoshop 7 were applied for the designing a series of such lessons that will focus on the simplicity to create a friendly to student in psychological terms. The design is based on the story board was designed. All steps in Fig. 3, 4, and 5 are examples of the proposed CAI in the face of some of the buildup. After the trial was completed, the program performance test was done by bringing in a series of lessons that have been made to test the students' success prior to use.



FIGURE 3. First page of the proposed CAI

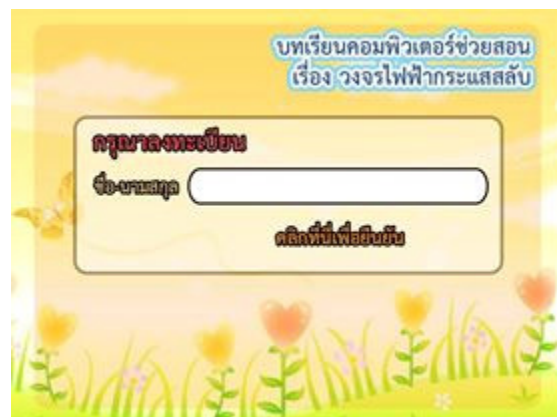


FIGURE 4. Page for student's name filling.



FIGURE 5. Page of content of the proposed CAI

IV. EVALUATION

Computer Assisted Instruction created by using the program Macromedia Author ware 7.0, Macromedia Flash 8, Abode Photoshop 7 and were applied to 30 students in 1st year of program of vocational certificate study on electrical power field of Hatyai Technical College to test for learning achievement.



FIGURE 6. Proposed CAI tryout for learning achievement

The sample was divided as 2 groups having 15 students per group and was selected by purposive sample. The hypothesis was set at 80/80. The post-test sheets in each learning unit were designed following designed objectives. The test sheets will be tried out to the students on after study with the proposed CAI. The statistical analyses for the data from the post-tests were summarized in table 2. From the table, the percentages of score were over 80% and having 84.92% in average. The student learning achievement test was applied to this sample. For the score was shown in table 3. Here, the learning achievement was 83.25%. The proposed CAI efficiency was determined by using results of post-test and learning achievement as shown in table 4. The efficiency of the proposed CAI was found as 84.92/83.25 that following the hypothesis at 80/80, implying the proposed CAI can be used effectively.

TABLE 2. Summary of post-test scores

Details	Number of students	Scores	Average	Total	%
Post test for 1 st unit	30	35	29	870	82.86
Post test for 2 nd unit	30	35	31	930	88.57
Post test for 3 rd unit	30	30	25	750	83.33
Total		100	85	2,550	84.92

TABLE 3. Student learning achievement

Details	Number of students	Scores	Average	Total	%
Learning Achievement test	30	100	83.25	2,497.5	83.25

TABLE 4. Proposed CAI efficiency

Details	Full Score	Average	%
Scores from post test (E1)	100	84.92	84.92
Scores from learning achievement test (E2)	100	83.25	83.25

IV. CONCLUSION

Computer Assisted Instruction on AC circuit was proposed. The topic analysis was applied to define learning content of the proposed CAI. After got the content topics, the teaching point analysis was used to define the learning unit of CAI. All learning units were designed for covering the CAI teaching points and were divided as 3 units. Each learning unit was consisted of definition, load performance, and source. Students can use this proposed CAI as learning media in classroom and self-learning after finished class.

To evaluate the proposed CAI, the efficiency determination method was applied for 30 students. The efficiency of the proposed kit was found as 84.92/83.25 that following the hypothesis at 80/80, implying the proposed CAI can be used effectively.

REFERENCES

- [1] Black Beverly and others, "Guidebook for Teaching Labs for University of Michigan Graduate Student Instructor," Center for Research on Learning and Teaching: http://www.erit.umich.edu/gsis/lab_guide_book.html
- [2] Punsak Puttipan Manit Phong, 2547, Electronic Devices and Circuits, Technical Promotion Center
- [3] Bunserb PhoSri, Komon Sirisomboowet and Kittiphop Pan Kanin, 2545, Electrical and Electronic Knicks forward basic, vocation publishers Center
- [4] Choosak phenphu, in 2548, teaching Laboratory Instruction, documentation of teaching ETE 523 Workshop and Laboratory Instruction System, Department of Electrical. Faculty of Industrial Education King Mongkut's University of Technology Thonburi