THE DEVELOPMENT OF A SELF-DIRECTED LEARNING PACKAGE BASED ON COMPUTER-ASSISTED INSTRUCTION IN THE SUBJECT OF BASIC WORK CONTROL FOR SUPERVISORS

ORNUMA THONGBUNTOW

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ABSTRACT

The research objectives were to create a self-directed learning package based on computer-assisted instruction (CAI) in the subject of basic work control for supervisors. The sample group were 30 supervisors in various offices who never had training in work control before and who were able to use computers with the Windows 95 operating system. Research tools were one unit of the CAI program on “Basic Work Control”, 2 tests assessing the learning achievements, a time questionnaire, and a questionnaire. Statistical analysis was done by computer with SPSS program; percentage, mean, standard deviation, and Paired-Sample t test were employed for comparison within groups.

The results were found that in order to create an effective computer-assisted instruction in the subject of basic work control for supervisors, it should consist of 11 steps, as follows:

1) Study documents and related research
2) Establish a goal for learning lesson
3) Analyze the learners
4) Analyze the content and divided the content into subunit
5) Set behavioral objectives
6) Design and produce the learning lesson program
7) Construct computer-assisted instruction
8) Write the computer program
9) Try out computer-assisted instruction
10) Introduce to use
11) Evaluate and Improve

The efficiency of this CAI was 95.833/95.833 which were more effective than the standard criteria. The posttest scores of the experimental group were higher than their pretest scores at the statistically significant level of .05, and the average time for learning package was 57 minutes.

KEY WORDS: SELF-DIRECTED LEARNING/ CAI/ ADULT LEARNING/ LEARNING PACKAGE/ WORK CONTROL/ DISTANCE LEARNING

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CONTENTS

ACKNOWLEDGEMENTS .................................................................................. iii
ABSTRACT ENGLISH ............................................................................... iv
ABSTRACT THAI ....................................................................................... v
LIST OF TABLES ....................................................................................... ix
LIST OF CHARTS ...................................................................................... x

CHAPTER

I INTRODUCTION

1. Background and the Importance of the Problem ........................................ 1
2. Objectives of the Research ........................................................................ 3
3. Research Questions .................................................................................. 4
4. Research Limitations ............................................................................. 4
5. Operational Definitions ........................................................................... 4
6. Expected Benefits .................................................................................. 5

II LITERATURE REVIEWS

1. Self - Directed Packages .......................................................................... 6
2. Program Lessons .................................................................................... 13
3. Computer - Assisted Instruction .............................................................. 21
4. Related Researches ................................................................................. 36
III RESEARCH METHODOLOGY

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Population</td>
<td>43</td>
</tr>
<tr>
<td>2. Sample Group</td>
<td>43</td>
</tr>
<tr>
<td>3. Sample Group for Trying Out Tools</td>
<td>43</td>
</tr>
<tr>
<td>4. Research Methodology</td>
<td>45</td>
</tr>
<tr>
<td>5. Research Tools</td>
<td>45</td>
</tr>
<tr>
<td>6. Research Tool Construction</td>
<td>46</td>
</tr>
<tr>
<td>7. Tool Testing</td>
<td>50</td>
</tr>
<tr>
<td>8. Field Testing</td>
<td>56</td>
</tr>
<tr>
<td>9. Data Analysis</td>
<td>59</td>
</tr>
</tbody>
</table>

IV RESULTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General Information about the Sample Group</td>
<td>63</td>
</tr>
<tr>
<td>2. Creation of a Self - Instructional Package by Computer - Assistance on Work Control</td>
<td>66</td>
</tr>
<tr>
<td>3. Finding the Program's Effectiveness</td>
<td>70</td>
</tr>
<tr>
<td>4. Comparisons between Before and After Learning Scores</td>
<td>74</td>
</tr>
<tr>
<td>5. Results of The Learning Assessment Tests (Pre-Test and Post-Test)</td>
<td>74</td>
</tr>
<tr>
<td>6. Survey of Time Used In Studying the Computer-Assisted Package</td>
<td>75</td>
</tr>
</tbody>
</table>
CONTENTS (cont.)

V DISCUSSIONS

1. The steps of preparation of the computer-assisted instruction ........ 77
2. The Effectiveness of the Computer Program ................................... 80
3. Achievement of Students after Learning the Program ....................... 83
4. Average Time Used in Studying .................................................... 86

VI CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions ................................................................................. 88
2. Research Benefits ........................................................................ 89
3. Recommendations ......................................................................... 90

BIBLIOGRAPHY ............................................................................. 93

APPENDIX ..................................................................................... 99

BIOGRAPHY .................................................................................. 134
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Displaying the Scores of the Sample Group (10 People)</td>
<td>49</td>
</tr>
<tr>
<td>2. Presentation the Result of One on One Experiment</td>
<td>52</td>
</tr>
<tr>
<td>3. Presentation of Experimental Results of Small Group</td>
<td>55</td>
</tr>
<tr>
<td>4. Sample Group in Field Testing</td>
<td>57</td>
</tr>
<tr>
<td>5. General Information of Sample Group</td>
<td>65</td>
</tr>
<tr>
<td>6. Scores Achieved and Time Used in Studying the Computer-Assisted Program on Work Control</td>
<td>69</td>
</tr>
<tr>
<td>7. Post-test Results of the Sample Group</td>
<td>71</td>
</tr>
<tr>
<td>8. Correct Answers for Each Individual Question of the Sample Group</td>
<td>73</td>
</tr>
<tr>
<td>9. Comparisons of Before and After Learning Scores of the Sample Group</td>
<td>74</td>
</tr>
<tr>
<td>10. Time Used in Studying the Computer-Assisted Instructional Program</td>
<td>76</td>
</tr>
</tbody>
</table>
## LIST OF CHARTS

<table>
<thead>
<tr>
<th>Chart</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Structure of a computer-assisted instruction tutorial</td>
<td>27</td>
</tr>
<tr>
<td>(Allessi &amp; Trollip, 1985: 66)</td>
<td></td>
</tr>
<tr>
<td>2. The flowchart of creating a computer-assisted instruction by</td>
<td>31</td>
</tr>
<tr>
<td>Pairoj Treerontanakul</td>
<td></td>
</tr>
<tr>
<td>3. Displays the Establishment of Behavioral Objectives from an</td>
<td>47</td>
</tr>
<tr>
<td>Analysis of the Content of the Basic work control for supervisor</td>
<td></td>
</tr>
<tr>
<td>Learning Package</td>
<td></td>
</tr>
<tr>
<td>4. Displays the Process in Testing the Computerized Learning Program</td>
<td>51</td>
</tr>
<tr>
<td>in One-on-One Testing</td>
<td></td>
</tr>
<tr>
<td>5. Displaying the Testing of the Learning Package for</td>
<td>54</td>
</tr>
<tr>
<td>Sub-Sample Group</td>
<td></td>
</tr>
<tr>
<td>6. Displaying the Testing of the Learning Package for Sample Group</td>
<td>59</td>
</tr>
<tr>
<td>7. Displaying the Flow Chart in Creating the Program</td>
<td>67</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

1. Background and the Importance of the Problem

At present, societal changes are wrought out quickly, as a result of technological advances. This affects individuals in the community or society in their daily living and the way they work. In order for individuals in the governmental and the private sectors to develop themselves in time to societal and economic changes, it is extremely essential that the citizen in the country must developed correspondingly (Department of Corrections, 2001). These various technological advances have changed teaching and learning methods and information receiving. For example, teaching-learning had previously been limited mainly to the classroom or lecture room as main principles. The learning atmosphere was usually also limited to the educational institution. The previous teaching-learning methods have changed; various forms of media have begun to play role education. Long-distance teaching-learning therefore has become important, with the fact that it is a teaching-learning system that has no classroom but relies entirely on combined media, such as through the post, broad casting radio, television, and supplementary teaching, including center of learning service as main with the objective being that the learner can learn by himself at home without coming into a normal classroom (Wijit Srisaarn, 1986:4). These media are the intermediaries that carry information to the learner. In addition, teaching media can help to improve the attitude of learners to become agreeable to the set objective, which is why teaching media have been implemented in response to self education (Teerachai Pooranachote, 1994:214). The important characteristics of education in the information age had important features as follows:

1. Emphasize individual education
2. Education is a part of living
3. Education can happen anywhere
4. Individuals possess educational freedom
5. Knowing a lot is not the target of individual education in the information age; the real target is to use the knowledge gained to solve problems and to live well individually, with others, and in society (Nikom Tadaeng, 1993:48).

Chaiyong Promwong (1993:55) divided self learning into 3 models:
1. Using mainly printed media
2. Using mainly radio or television media
3. Using mainly the computer media

Even though self learning had different pattern but they have one similar characteristic and that is being different from general methods of teaching-learning. This is because the process of transferring knowledge, and experiences from the instructor to the learner. For self learning depends on various media; therefore these media are a crucial part in the self learning (Chaiyong Promwong, 1991:303). Learning by computers is a popular choice, since computers have great potential (Canchit Malaiwong, 1989:69). Computers have important roles in different aspect as basic needs for basic living, developing the quality of life, developing morality, and increasing educational qualifications; it is most widely known as Computer-assisted instruction (CAI). It can be used as a method of individual learning because it can respond to individual differences well and is able to collect learning information, ask questions, receive answers, check answers, and show results of learning in form of feedback information, and the learner can control his own rate of education (Kanitta Chanon, 1989:8).

Besides this, CAIs give supportive force quickly and in a systematically; it can help teaching-learning be more effective, which is in accord with what O'Neil and Paris (1981) stated: CAIs help to increase the effectiveness of teaching-learning through quality teaching that creates long-term memory; they can also be used to facilitate learning even in remote areas. The learners are able to lower their expenses by lowering the time spent in a classroom, lowering the need of having an experienced instructor, and being able to improve the content quickly, which means the learner does not need to stay in a classroom. Therefore, long-distance learning is another method with which learners can gain knowledge.
The mentioned principles are related to the 9th National Economic and Social Development Plan, which points the direction of developing the country in a medium-ranged time that is interconnected with long-term vision and can be processed continuously from the 8th National Economic and Social Development Plan where it stated that “People are the focus of development” in every dimension as holistics. It gives special importance to the building of a good management system in every aspect of society, especially within the managing of the state, in order to limit corruption and inappropriate behavior as well as increase the abilities and the quality of life for most people in the country. This is done as a mean to achieve growth in a high-quality economy that would create sustainable development that has “people” as the true center of focus. It is also interconnected with the vision of country development, which has the aim of achieving “sustainable development and a good quality of life for Thai people,” and creating values that let Thai people become aware of needs and improve the system of thought, attitude, and work by following the principle of a “self sufficiency economy.” This philosophy leads to facilitate to change to the new administration of country that aims to effectiveness and quality, as well as being able to keep up with the world. This is consistent with the guidelines that place emphasis on becoming a society of intellect and learning, letting all Thais have the opportunity to be able to think, act, be reasonable, creative thinking, (to be able learn throughout life, be up-to-date with the world’s dealings to be ready for change, and be able to accumulate intellectual capital, keep and develop local wisdom appropriately (9th National Economic and Social Development Plan, 2002-2005).

The researcher therefore studied the process of long-distance learning that can be learn by self learning process computer media for learning, in order to become one method of development of training in the future. It is hoped that the self-directed learning package that was created will help learners develop their knowledge and abilities, and can be used at the learners’ convenience.

2. Objectives of the Research

To develop a self-directed learning package based on Computer-assisted instruction in the subject of basic work control for supervisors.
3. Research Questions

3.1 What are the steps in developing a self-directed learning package based on Computer-assisted instruction in the subject of basic work control for supervisors?

3.2 What is the average score of effectiveness of the self-directed learning package based on Computer-assisted instruction in the subject of basic work control for supervisors after learning has occurred?

3.3 What is the length of time used in studying the self-directed learning package based on Computer-assisted instruction in the subject of basic work control for supervisors?

4. Research Limitations

4.1 The self-directed learning package in this research uses computers to help teach, and the format is tutorial-based.

4.2 The branching program design was used in creating the self-directed learning package based on Computer-assisted instruction in the subject of basic work control for supervisors.

4.3 The content of the learning package will emphasize only on basic work control for supervisors.

5. Operational Definitions

5.1 The self-directed learning package means the transferring of knowledge and experiences from the instructor to the learner by the use of various media. The learner does not sit in a classroom as per general education; the learner learns by himself at home or at work.

5.2 Computer-assisted instruction means the learning program that has been developed in the form of computer programs successively and relatively that are; it is an individual learning method that lets students learn by themselves.

5.3 Frame means the frame of presenting short content on the computer screen, and is divided into the following:

5.3.1 Main frame is frame of content that let learner to learn
5.3.2 Practice frame is the frame where learners practice the information gained from the main frame.

5.3.3 Terminal frame is the frame where learners use the knowledge gained in the main frame to answer questions.

5.3.4 Sub-terminal frame is a frame adding understanding and solving misunderstandings from the terminal frame.

5.4 Work control means the process in which work is directed as per a plan and is up to the standards set. Work control is considered the last duty, and there needs to be work monitor and control all the time since if and when mistakes occur, they can be corrected in time.

5.5 Supervisor means the individual who completes work and achieves the goal set by the organization by depending on the cooperation of others who work to complete the job.

5.6 Standard 90/90 means the analysis of information in order to compare the scores after learning with the standard score. The first 90 means the average score of the sample group when it is calculated to be 90% or more. The last 90 means the 90% of the sample group that answered the question (calculated by individual question) correct.

5.7 Effectiveness of the Computer-assisted instructor mean learning programs that have good results, by considering the effectiveness value that is determined from teaching-learning media with the standard 90/90.

6. Expected Benefits

6.1 To obtain the self-directed learning package by use of computer on the subject of work control for supervisors.

6.2 Guidelines to use in developing self-directed learning packages by use of computer in other subjects.

6.3 A tool that can be used in teaching and developing training for supervisors in long-distance systems.
CHAPTER II

LITERATURE REVIEW

For this research on “The Development of a Self-Directed Learning Package based on Computer-Assisted Instruction in the Subject of Basic work control for supervisor,” the literature and researches that were relevant were studied for the following issues:

1. Self-directed learning package
2. Program lessons
3. Computer-assisted instruction
4. Related literature

1. Self-Directed Learning Packages

1.1 The Meaning of Self-Directed Learning Packages

Self-directed learning packages have many different names, such as instruction packages or self instructional packages, or learning packages, or individualized learning packages.

Duan (1973:169) stated that self-directed learning packages were supplentary learning materials that gave learners the opportunity to learn at their own learning rate and with their own method until they had achieved their objectives.

Sunan Patamakom (1975:10) explained self-directed learning packages as packages containing 1 or more pieces of equipment that, when placed together, would result in only one subject, and the equipment in each package would be prefabricated. If the subject was taught, the next package would continue where the previous one left off.
Krongkan Arunrat (1993:265) said that self-directed learning packages meant programs that integrated a system to present the content and arrange learning activities in order for the learner to learn by himself as per his ability, the subject, and the learning system for each person.

Jutawan Kacha (2000:7) stated that the packaged programs for individual learning gathered together activity content, equipment, and teaching-learning documents preparedness, as well as had a system of individual study as per the individual’s ability, rate of learning, and learning model of each learner.

Therefore, the self-directed learning package is a package of combined media for individual learning with the use of the system approach. The learner is able to study as per his own ability. In general, the self-directed learning packages will have steps in producing that are similar or closed to; the model of the self-directed learning packages will differ from general teaching-learning methods because they depend on media as one of the most important factors of learning.

1.2 Concept of Construction of Self-Directed Learning Packages

Cardarelli (1973:150) uttered stated the concept for creating self-directed learning packages as follows:

1. The learner would received learning as an individual feature by depending on individual demand, interest, and ability.

2. The role of the instructor would be as judge, setting down conditions, stimulating interest, and giving convenience to the learner.

3. The role of the learner would be as a person free to decide to accept and response for his learning.

4. The atmosphere in self-directed learning package would distribute and promote the creative thinking, investigating, exploration, and interaction, in order to let progress grow in many areas
1.3 Structure of Self-Directed Learning Packages

Duan (1973:169) clarified that self-directed learning packages had the following structural foundation:

1. Setting the objective and the content that was to be learned
2. Describing the content
3. Setting behavioral aim
4. Choosing learning activities
5. Setting activities to promote the formation of attitudes
6. Tools to measure scores before, during, and after learning

Cardarelli (1973:150-151) presented the structure of self-directed learning packages as follows:

1. Topic
2. Sub-Topic
3. Rational
4. Behavioral Aim
5. Primary testing
6. Activities and Self-Evaluation
7. Quiz
8. Last testing

From the aforementioned issues, it can be concluded that the important structure of self-directed learning packages include the topic, aims, learning content, activities during learning and testing.

1.4 Related Principles and Theories involved

The basic guidelines that result in creating self-directed learning packages consisted of 5 concepts (Chaiyong Promwong, 1991:105) as follows:

Concept 1 was a psychological one related to the theory of differences between individuals. Learners used this concept by considering the differences among
individuals, and arrange education that gave freedom to learn by themselves as per their own abilities.

Concept 2 was one that tried to change the teaching-learning from one that held the teacher as the important focus into one that arranged experiences and combined media that was pertinent to the subject content in the form of self-directed learning packages for learners to learn themselves.

Concept 3 was one that tries to arrange the system of producing and using teaching equipment in the form of combined media, by setting aims to change the media used “to help teachers teach” into media that was used “to help learners learn.”

Concept 4 was one that tried to create interaction between the teacher and the learner, the learner and other learners, and the learner and the environment by using teaching media and theories of group dynamics in the learning activities.

Concept 5 was one that adhered to the principle of learning psychology for arranging the learning environment so that learning could be effective giving learners a chance to discover different things, as follows:

1. Participate in activities of self learning
2. Know the results of tests immediately
3. Receive positive enforcement, making learners proud of what they did right or right thought, so they would do that kind of behavior again in future.
4. Learn each step as per the learners’ own ability and interest, without anyone forcing them.

Arranging an environment that encouraged learning as per the aforementioned characteristics had a need of tools to help in achieving the end goal, by arranging programs in the form of processes and using self-directed learning packages as an important tool.

1.5 Constructive Steps of Self-Directed Learning Packages

Lewis (1968:329) explained that the creation of self-directed learning packages, in order to be congruent to the development of the curriculum, needs to follow the following steps:
1. Adhere to the educational aim
2. Set specific learning goals
3. Arrange the necessary classroom environment and activities as others to support the learning of learner to achieve the set goals
4. Choose and arrange materials, separate tools, and provide convenience

Nipon Sukpreedee (1985:12) stated that the steps in creating self-directed learning packages, there were steps as follows:
1. Analyze the curriculum to set the terminal objective
2. Analyze the topic to find the sub-terminal objective
3. Arrange content that helped achieve the sub-terminal objective of each objective, with details made in the form of questions
4. Design the media and activities that the learners would study to be able to answer questions
5. Arrange a stimulating media for learning and present the activities to learners to let them have a chance of participating in activities equally, as well as receive test results, so that everyone became motivated
6. It must be certain that the self-directed learning package that was created could be used in real situations; there must be experiments with a sample group of learners who come from the target population
7. Improve the self-directed learning package from suggestions and improve the interpretation, and materials used as well as the investment, for example
8. Use in the center of learning and research media to up-date it continuously.

1.6 Models of Self-Directed Learning Packages

Chaiyong Promwong (1991:303) stated that self-directed learning from learning package had special characteristics that differed from the normal way of learning, because the transferring of knowledge and experiences from the instructor to the learner relied on various media. The learner did not sit in a classroom, but learnt at home or work by depending on various media. Therefore these media were essential element to self learning.
The structure of self-directed learning media could be divided into 3 types, as follows: Chaiyong Promwong (1991:55)

1. Using mainly printed matter meant using printed matter in the form of documents in the form of a learning program, which included content and the practice exercises. These were the main media of transferring knowledge to learners, and other media were supplementary such as using tapes, videos, movies, slides, transparencies, radios, or televisions. These other media would be produced according to studied content from printed material effectively.

2. Using mainly radio and television meant using the media of radio or television or both to distribute sound and images in order to transfer content and experiences to the selected target group. Other media were supplementary, such as printed media and audio-visual media (as per the list in #2), and telecommunication media. These other media would have the content that was congruent to the main media and to assist learner understand even more effective.

3. Using mainly the computer, meaning besides the 2 ways as mentioned, there was still the using the computer media as main media. This was because computers had technology that plays a role in every aspect of work, especially in education. Computers played role in management of academia and services.

1.7 Good Features of Self-Directed Learning Packages

Nipon Sukpreedee (1975:67) wrote about the characteristics of good self-directed learning packages as follows:

1. It was an appropriate self-directed learning packages, able to help meet the set goal.

2. The materials used could stimulate learners’ interest well.

3. It included all teaching materials stated in the subject matter

4. There were detailed suggestions and instructions of use; it was easy to use

5. It was tested and improved to be continually up-to-date

6. It was durable in storage and in use
1.8 Benefits of Self-Directed Learning Packages

Sunan Patamakom (1975:13) stated the benefits of self-directed learning packages as follows:

1. The learning system was effective, since the self-directed learning packages were created by a group of individuals with knowledge and expertise in various areas, and there had been tests to ensure that these packages would bring out the desired effect before beginning their sale.

2. The self-directed learning packages would lessen the burden of instructors. When there was a package, the instructor could proceed with teaching as per the suggestions in the package. Each step would have equipment, activities, and suggestions inside; the instructor did not need to redo anything or do anything more.

3. Learners could receive the same knowledge. In the previous method, because there were many instructors for one subject, there may have been a difference in the effectiveness of teaching. The self-directed learning package solved this problem, no matter how many instructors there were.

4. There was a clear objective stated

5. There were learning activities as well as suggestions and equipment included

6. There were assessment tests in order to measure the results of learning

7. The self-directed learning packages gave learners a chance to learn as per their ability and interest; self-directed learning packages helped people achieve success in their studies according to the desire of the learner

8. The self-directed learning packages encouraged continuous education

Prueng Kumut (1976:2) summarized the pros of self-directed learning packages as follows:

1. Made the learning process of the learner more effective, since the packages have been tested and improved upon by way of systematic research

2. Made learning complete and has wide-reaching standards, because it is a complete subject course in itself
3. The learner was in charge of doing the activities and learning in accordance to appropriateness, interest, and their own want
4. Helped to solve problems of lack of teachers and quality of learning
5. Gave convenience to instructors and helps them have more confidence

From the pros that were stated, it could be concluded that self-directed learning packages have the following pros:
1. Learners would have a learning process that is both complete and effective
2. Learners would have freedom in learning and doing activities by themselves
3. The instructor was able to use these packages conveniently and at once
4. The effectiveness of learning would have the same standard

2. Program Lessons

2.1 Meaning of Program Lessons

Schramm (1964:1) explained the meaning of program lessons as a prefabricated program that had characteristics similar to the normal lessons, but the content inside had been broken down into smaller pieces and arranged from easy to hard issues, thus making the learner able to learn by going through the steps and following the advice given, until the learner had knowledge and behavior as per what was intended.

Prueng Kumut (1976:1) elucidated the meaning of program lessons and said that it is one form of teaching that has been organized in advance for the learner to learn by his own self. This means that the experiences that have been used to progress the learner to achieve success is set through integration of motivation through experiences, which the learner will have through participation in the learning process.
Chaiyong Promwong (1993:11) explicated program lessons as meaning teaching that had been programmed in advance in order for learners to have a chance to study by themselves through practical experience, which consisted of activities, and be able to receive timely feedback, have pride in their achievements, and slowly progress in accordance to their interests, abilities, and convenience, until they achieve success.

It could be summarized that program lessons were lessons that had had their content arranged in step-by-step fashion in advance, with questions and answers provided. The learner was able to study by himself as per his ability, interest, and at his convenience.

2.2 Characteristics of Program Lessons

Fry (1963:23-24) expressed the characteristics of program lessons as follows:

1. The content was divided into small units, called frames, which differed in size
2. Learners would interact by answering questions or filling in the blanks, giving them a chance to participate in the learning activities
3. Learners were given immediate motivation
4. The content frames were arranged continuously as steps
5. Learners were the focus; the lesson that was used must have passed testing by a number of learners to improve and solve problems first
6. Learners had freedom in learning in accordance to their abilities

Jacobs & Maier (1966:1) described that the characteristics of program lessons as follows:

1. It consisted of small units of knowledge that were arranged in order and able to stimulate learners’ interest
2. Learners would interact to the knowledge in each question set
3. The interactions of learners would be given motivation through immediate feedback
4. Learners would gradually learn more with each step, going from things that are known to new knowledge that has been arranged by the program lessons

5. Learners are given a chance to learn by themselves; the time spent in studying will be as much or little as the individual’s ability

Nipon Sukpreedee (1976:22) gave explanation the characteristics of program lessons as:

1. Learners could study from the program lesson by themselves with no teacher

2. Learners did not have to listen to a teacher

3. Learners might use their free time studying at other places

4. Helped to save expenses in cases where there were many learners

5. Every subject could be studied

6. Learners could learn anywhere outside the classroom

7. Learners could learn whenever satisfactory; there was no waiting for others

8. It increased equality in education; learners, no matter where, could learn

9. It motivated learning when learners knew the answers of the tests

From the researcher’s concepts, program lessons have the following important characteristics: knowledge of the subject is in small units divided into frames and arranged in order; learners will learn each step, starting from what they know till they get new knowledge; learners have participation in learning activities; there is immediate feedback and motivation; it is individual study with no need for a instructor, and the learners therefore have the freedom to learn whenever and wherever they want, in accordance to their abilities; and it is a way of making education equal and saving expenses.

2.3 Types of Program Lessons

Green (1963:147) suggested that there were 2 types of program lessons, as follows:
1. Linear programs—the learners must answer questions in each frame in succession; there was no skipping frames.

2. Branching programs—the learners did not need to answer questions in each frame in succession; learners might skip frames as per directions in the lesson. This was because the creator of the lesson program analyzed that if learners did or chose the correct answers to certain questions in some frames, this displayed an understanding of the next frame to a certain extent.

Prueng Kumut (1976:14) explained that there were 2 types of program lessons, which was consistent with Green. These were:

1. Linear programs
2. Branching programs

Stolurow (1961:12) analyzed that the unique characteristics of linear programs were:

1. Frames were arranged in a fixed way for learners
2. Learners must answer questions from the first frame until the last in order; skipping was not allowed
3. Every one, no matter what level of intelligence, needed to do the same thing. The only difference was the time used in learning.

Powell (1969:169) elucidated the characteristics of linear programs as being an arrangement of steps and units of lessons, from easy to hard. The sub units were called frames; the learners must learn each frame from the first one on, until the last. There was no skipping. Knowledge from the first frame would be the foundation for the next frame; questions in each lesson may be multiple-choice, true/false, or fill in the blank. When learners answer questions, they could check their answers immediately.

Prueng Kumut (1976:38) revealed that branching programs were programs that were based on the belief that wrong interactions did not necessarily impact the right interactions negatively. Interacting usefully was mainly to lead learners; each interaction was a test whether the last communication was successful or not. Branching
programs would give opportunities to learners who were able to answer in many ways; it was dependent on the way the learner interacts in each frame. In learning branching programs, the readiness of learners would happen when there was supplementary teaching each time they answer wrongly, and it would broaden further when the learners could solve or improve their mistakes or understand more.

2.4 Fundamental Psychology of Program Lessons

Chom Pumppak (1978:72) explained that the fundamental psychology of learning that could be used in program lessons included:

1. Occurring at the same time or close by stimulants (congruity) was a theory from Guthrie–present a stimulant and learners would interact immediately.

2. Reinforcement–when an action was done, it could be noticed immediately whether it was right or wrong, which was based on the reinforcement theory of Houle

3. High intensity of interaction–learners could interact well as per the theory of learning by Skinner, which was the theory of operant conditioning

4. With created programs, there was a tendency to let learners be able to answer many questions correctly at the beginning, in order to create confidence and become motivation; this kind of tendency would gradually disappear.

5. Assessment of studies by the self would make the learner know how much progress had been made, which would create motivation

6. Acceptance in letting the learner learns as per his ability and taking the differences between individuals to use in learning

7. Active learning would generate good understanding and had high durability

8. Emphasis was placed on self instruction

9. Learning would occur when people wanted to learn; learning could stop anytime. When the learner was ready and the time was convenient, learning could resume.

10. It was like having a personal tutor, which was better than learning in a big group
In addition, there was still the theory of learning by Thorndike, which was modified for use in creating the program lesson. The 3 factors were:

1. Law of Readiness—When the body was ready to do something and had an opportunity to do so, there would usually be a sense of satisfaction occurring. If there was no chance of doing so, dissatisfaction would occur. On the other hand, if the body was not ready but the person was forced to do something, dissatisfaction would occur. Therefore, readiness thus included readiness of situation, basics, or experience and emotional readiness. It could be stated that learning would be effective if learners were ready to learn or ready to interact.

2. Law of exercise or repetition—Letting learners repeatedly did something often would create solid learning that would endure; therefore, the learning that would happen depends on how much the learner had the opportunity to practice.

3. Law of effect—This was the integration between stimulants and interactions. If both were able to be integrated, the learner would feel satisfaction that might come from reinforcement as well.

2.5 Principles of Creating Program Lessons

Prueng Kumut (1976:12) talked about the steps of creating program lessons as follows:

1. Study the program in order to know what was needed to be taught, what the content was, and at what level. Assessing the teaching might help to know the level of teaching, and the time used in teaching can be used to limit the breadth and width of the content. Besides this, the creator could study teacher’s manuals or teaching plans and other plans for learners, or they might interview experts, who could help in giving guidelines to creating a program.

2. Set up the objective. Creating a program lesson must be done to achieve the learners’ needs. Setting an objective needed to be appropriate to the abilities of the learners. The objectives needed to be consistent with behavioral objectives that could be observed and measured.
3. Set the limits of the work or the structure. This step was very useful in creating the program lesson; it helped in arranging topics and to prevent forgetting lessons.

4. Write the program lesson. The framework needed the following features:

   4.1 Write the content in small units, with each unit giving knowledge and understanding of the next one
   4.2 Have content and explanations that are interesting to learners
   4.3 Help the learners to achieve as much as possible
   4.4 The content in each frame should refer back to the frames that the learners have already studied. Doing so will be like a revision for them.
   4.5 Let them know the correct answer as motivation. The content of each frame must be written in clear language, accurate in principle and in language use. If words appropriate to the background and age of the learner are used, the content is correct as per the subject, and there is integration between the frames, some frames may not need answers, such as the frame introducing the lesson.

Nipon Sukpreedee (1976:69) explained that the principles of creating a program lesson are:

1. Set the objective of learning. Ask why it was being created, what for, and what did the learners had to do after learning.
2. Analyze the topic in order to know where each lesson was going to start, and where it would go in order to achieve the end goal
3. Make tests, because it was necessary to know the basic background of each learner through tests before teaching
4. Arrange the levels of learning. After analyzing the topic, there was a need to set the sub-topics and content that would lead learners to the last step of learning.
5. Choosing media was dependent on 5 factors:
   5.1 Appropriateness with the set objective
   5.2 Whether the learners will interact well
   5.3 Whether it is appropriate to the level of ability and experience in the learners
   5.4 Whether it gives learners a chance to participate
5.5 It is a medium that is not hard to find
6. Make a frame for learning
7. Test the program with individuals in order to improve it
8. Improve on equipment and lessons in order to study problems in various areas, such as:
   - 8.1 Interactions that the learners express
   - 8.2 The difficulty of the lesson that will create motivation
   - 8.3 Problems in management and in the equipment used
   - 8.4 The cost of equipment
9. Distributing or selling the created product and using the results from instructors and learners to improve the lesson further.

Stolurow (1961:58) suggested principles of creating program lessons as follows:
1. Start with a learning objective
2. Make it so that the content used for learning will be dispensed in a form that is stimulating and detailed
3. Interacting must be easy
4. Arrange explanations in order to bridge problems that would occur when learners learn new things; make them clear.
5. Create paradigms of thought to cover many angles for a certain topic
6. Use participatory explanations
7. Give advice with the interactions
8. Content must be in order and be continuous
9. Always revise
10. Divide the steps of the content into smaller divisions
11. Create an overall picture of the objective by using each frame of knowledge
12. Create a relationship network continuously from the problem frame to new problems
13. Decrease the advice and suggestions gradually until gone
14. Use reasoning in order to summarize the overall picture
15. The process of the program lesson must start with the big picture and slowly steer toward the details.

It can be summarized and said that a program lesson must have been created by the following steps:

1. Study the curriculum
2. Set the objective
3. Set the structure
4. Analyze the topics
5. Arrange tests
6. Arrange the learning process, by starting from the general picture into the details
7. Choose the medium
8. Write the program lesson
9. Test it
10. Improve it
11. Use it, and the results can become a guideline for further improvements

3. Computer-Assisted Instruction

Computer-Assisted Instruction or CAI has other names as well, but they all mean the same thing (Alessi & Trollip, 1985:59; Romiszowski, 1986:267):
- CAL (Computer-Assisted Learning or Computer-Aided Learning)
- CBI (Computer Based Instruction)
- CBL (Computer Based Education)
- CBT (Computer Based Training)
- IAC (Directed Application of computer)

3.1 What Can Computers Help Teach?

Stolurow (1971:390) described that computer-assisted instruction was one way of teaching individuals by using the abilities of the computer to organize related
experiences together. There was a display of the content that differed by program lessons appropriately and the use of various media, which was the true teaching of individuals.

Armsey & Dahl (1973:63) explained that computer-assisted instruction was a tool that helped teach learners who wanted to learn by themselves as well as those who needed to do many things that were sent onto the screen. Learners would answer by using the keyboard. The things shown on screen would be both pictures and text, or sometimes would be used with slides. Computer-assisted instruction needs a controlling program so that the computer will show various information to learners; the instructor may be the one to write the program in computer language.

Spencer (1980:33) elucidated that computer-assisted instruction was the use of computers in the teaching of individuals by way of programs that taught under the control of the computer. This helped learners to progress at their own rate and was teaching that would interact to the needs of each learner.

Sipple (1981:77) explicated that computers could help teach, meaning that modifying the computer system to let it interact to learners would let it be able to tell what deficiencies the learners had when the learner made a mistake.

Padung Ariyawin (1994:41-42) stated that computer-assisted instruction meant the use of computers as teaching assistants in teaching. Learning programs would be filled with content of what the instructor would teach but instead of the instructor being the one to teach, the learners could learn by themselves through the program. Computer-assisted instruction was therefore a way to help learners teach themselves by the use of a computer instead of a instructor.

Utumporn Jamornman (1987:4) expressed the opinion that computer-assisted instruction was the use of computers as a medium that presented the lesson in an arranged way to learners and let learners have a chance to interact with the learning
material on the screen of the computer. The lessons might be numerous in form and would help learners learn various subjects.

Supaktra Wetuthai (1993:10) explained that computer-assisted instruction meant the use of computers as teaching tools so that learners were able to learn by themselves, with a focus on the learners being the center of the teaching. Computers were able to do integration with the learners by asking questions as well as giving immediate feedback; therefore, it helped learners to achieve highly and have better attitudes.

Kriangsak Poonprasit (1995:12) told that computer-assisted instruction meant the use of computers as a medium in teaching. Computers could use the lesson prepared and present it in order, and give interactions, compliments, or go back to review the content in order to stimulate interest in learning.

Therefore the computer-assisted instruction is a way of teaching-learning that utilizes computers and learning programs in the form of computer programs in a way that is integrated; it is an individual-type of learning where the learner can learn by himself and interact with the computer with the presentation of material, asking questions, receiving answers, revision, assessing results, and displaying the results of learning to the learner.

3.2 Characteristics or Features of Computer-Assisted Instruction

Taksina Suananon (1986:76-79) stated the characteristics of computer-assisted instruction as follows:

1. Start from what was known and goes toward what was not known—The content was arranged in order beginning from what the learner knew to new knowledge that was never known in many frames. The learner learnt from easy to hard frames

2. The increasing content needed to increase gradually and easily; the changes in each frame needed to be able to be learned by the learners themselves
3. Each frame must introduce only one piece of new knowledge, because introducing a lot of new knowledge would make the learner confused.

4. During the session, the learner should be able to participate in the learning, such as answering questions or doing tests, not only sitting and thinking because that would get boring.

5. Choosing wrong answers might result in having to go back and review what had been learned, or a new frame could come up to explain the misunderstanding, thus increasing content in itself. If the correct answer was chosen, the learner would be excited because correct answers would result in compliments that would give encouragement.

6. Using this method of teaching would make the learners learn according to their abilities and take as much time in reviewing or answering as they want to. The learners therefore do not feel pressured by time to wait for their friends or to catch up.

7. This method emphasized on the abilities of each individual, and since each individual was different, learning each lesson would use differing amounts of time.

8. In presenting lessons in this way, making a summary at the end of each lesson would help learners assess themselves. A summary meant to summarize the content and summarize the learners’ learning results to see how much time the learner took, the result, and whether there was a need to learn anything more.

9. If the framework for each lesson is good, then it would be possible to analyze the answers along with the experience of each learner, and result in different answers. The answers can then be analyzed to find out why the answer was chosen.

10. Setting the end goal as wanting each learner to learn something would help to divide the content that is to be taught in order.

Steinberg (1991:2) proposed comparisons between computer-assisted instruction and normal instruction methods and came up with 3 factors as follows:

1. Instruction—computer-assisted instruction will present with text and pictures whereas normal instruction will use speaking instead of text, pictures, and animation and body language instead.
2. Learner (Learner)–When learning from a computer, reading, observation, and sometimes listening skills need to be utilized whereas the usual method will utilize reading, observing, and listening in the same way.

3. Interaction–When learning from a computer, the keyboard is used along with other tools whereas in the usual methods, speaking, writing, and body language are used to respond.

3.3 Types of Computer-Assisted Instruction

Academics divided the characteristics of computer-assisted instruction into 10 types (Stolurow, 1971:394-396):

1. Tutorial–a program created as a program lesson; it is an imitation of the instructor’s teaching, with an introduction and an explanation that includes theories, rules, explanations, and guidelines. After the learner has studied these, there will be questions to ensure that they understand. Results are posted as a type of reinforcement, and the learners are able to go back and review or skip the lesson that they’ve passed. How well the learner did can also be recorded in order for the instructor to supplement knowledge to some learners.

2. Drill and Practice–a practice and drill is usually used as a supplement when the instructor has already taught a lesson, and the learners will practice at the computer to measure their level or let learners practice until at an acceptable level. These types of lessons will consist of questions and answers that the learners need to practice. Psychology can be used to stimulate learners to be excited and want to practice; there may be animations or speaking in the tests as well as competitions such as timed tests.

3. Problem-solving–this type of computer-assisted instruction will focus on thinking and decision making, with a set of regulations that the learners consider. Scores or weights are given to each condition.

4. Simulation–this type of program is a simulation of the real situation and is as close as possible to the real situation. There are many hypothetical situations in the program and the learners are able to change or interact with the changes and choices that the learners can choose in order to study the results of those choices.
Besides this, in many cases there is a need for simulation, but in many subjects experiments cannot be held, such as to see the motion of a canon or the travel of light, chemical reactions, or scientific experiments that need many days. The computer is able to simulate the real things and let learners see and understand easily.

5. Game—computer games used for education is very stimulating for learners. These programs are a special type of simulation, where there is a situation of competition that can be played by the learner himself or with other people. There are scores, winning, and losing. Nevertheless, care is needed when writing these programs, to let them have educational value, objectives, content, and be appropriate.

6. Dialogue—this is a reproduction of classroom teaching; the instructor and learner try to talk, but instead of using sounds, text will be used on the screen and teaching is done through setting problems and questions.

7. Demonstration—demonstrating by the computer is rather like the demonstration of a instructor, but computer demonstrations are more interesting because the computer can present many colors and sounds. The instructor can use the computer as a means of demonstrating about science.

8. Testing—using computer-assisted instruction usually includes testing as a means of measuring achievements of learners. The creator needs to consider various principles in the creation of the test, arrangement, testing, giving scores, analysis, making many tests, and letting learners randomly get into the tests.

9. Inquiry—computer-assisted instruction can be used in finding the truth, the overall picture, or useful information. Computer-assisted instruction will have a source of useful information that can be shown when learners need it with a simple system. The learners can access this by pressing a number or code; doing this will make the computer-assisted instruction display information that will answer the learners’ questions.

10. Combination—computer-assisted instruction creates many new ways of teaching. These many different methods come from setting objectives in learning, the learners, or the factors and various topics. The computer-assisted instruction may have features of tutorial, game, inquiry, and problem solving.
3.4 Tutorial

This research is concerned with developing a computer-assisted instruction program in the form of a tutorial. Orapan Prasittirat (1987:23) stated that this form of teaching was suitable to teach the overall picture in various areas, which a computer may be able to do better than a instructor. The teaching is integrated with the distinguishing characteristics among the learners because the learners are able to learn by themselves according to their ability and intellect level.

The structure and general design of tutorials was explained by Alessi & Trollip (1985:66) to show a frame of teaching with questions, answers, and previous information. If the learner answers correctly then teaching continues but if the learner answers wrong there will be help or a review of the finished session, then the learner has to answer the question again. The structure for a tutorial includes 8 parts:

1. Introduction
2. Presentation of content
3. Question and answer session
4. Checking of answers
5. Display of results
6. Supplementary information
7. Arranging the order of lessons
8. End of lesson

Structure of computer-assisted instruction tutorial has details as per Chart 1

![Chart 1](image-url)
3.5 Creating a Computer-Assisted Instruction Lesson

Romiszowski (1986:271-272) presented the following 7 steps of developing a computer-assisted instruction lesson:

1. Set the specific objectives
2. Analyze the behavioral objectives of the learners and the rules to create a structure
3. Design a lesson
4. Create the designed lesson
5. Write the computer program with a suitable computer language
6. Test it to develop a lesson
7. Assess the results for accuracy in both computer technique and teaching

Kemp (1985:248) summarized developing a computer-assisted instruction lesson into the following 8 steps:

1. Organize the tools and materials that would be used
2. Develop a flow chart according to the steps and processes
3. Develop questions to be used for review and suggestions
4. Set the structure of presentation on the computer screen
5. Write computer programs
6. Add interesting things to the lesson by using pictures and sounds
7. Organize the supplementary print-out materials
8. Test and improve the lesson

Alessi & Trollip (1985:275) concluded that developing a computer-assisted instruction lesson into the following 8 steps:

1. Set the objective of the lesson
2. Collect documents and materials that are needed
3. Accumulate topics from various sources to make into the lesson
4. Summarize into a lesson
5. Produce the lesson as a picture frame on paper
6. Write the lesson plan
7. Write the computer program
8. Assess the quality and effectiveness of the lesson

Jutawan Kacha (2000) summarized the steps in the creation of a computer-assisted instruction lesson, the implementation process included 11 steps, as follows:

1. Selecting the content and defining the general objective
2. Analyzing the learner
3. Defining the behavioral objectives
4. Analyzing the content through separation into the subunit
5. Designing lesson program
6. Constructing the lesson program as designed
7. Writing the computer program
8. Entering data to computer
9. Testing the efficiency
10. Use
11. Evaluating and Improving

Paioj Treerontanakul (1985:76) stated that the creation of a computer-assisted instruction lesson was a process that was a perfect system. It needed careful detail sand conscience in a systematic approach. The writer needs to remind himself that the writing will be placed up on the screen without a instructor for the learners; there will not be any directed teaching except for what is in the program that was planned. The creation of a computer-assisted instruction lesson has the following 11 steps:

1. Study the course and the targeted learners to know details about the subject as per the curriculum’s set content to see how it is, what level, how long does it take to teach, what kind of background do the learners have, the readiness of the instructor, and other information that can be used in planning.

2. Set the behavioral objective of the subject; it should be considered important and should be written from scratch. Most curriculums do not set this, or will set only general objectives. Behavioral objectives need to be written as detailed as possible in all manner of desirable behavior.
3. Compare the behavioral objectives with the leading questions. The behavioral objective set need to be continuous and support each other; the writing of these objectives need to be in a good system and the questions need to be appropriate.

4. Analyze the content and make it into a network by using the behavioral objectives and questions in the analysis. Arrange the content in a systematic way that is continuous and supportive of each other by writing the topics into a flow chart that completely shows the before and after topics.

5. Cut the content into smaller divisions. Because there is no teacher while using a computer-assisted instruction lesson, there may be problems if too much information is presented. Therefore, it is necessary to prune content into manageable chunks so that the learners can follow the content without any confusion.

6. Write simple messages in each frame following the content; the message should be short and easy to understand. The messages in various frames need to be interconnected with each other. Generally each frame will include the following:
   6.1 Set frame is the knowledge frame that learners learn
   6.2 Practice frame is the frame where learners practice the knowledge gained in the set frame
   6.3 Terminal frame is the frame where learners use the knowledge gained in the set frame to answer questions
   6.4 Sub-terminal frame is a frame adding understanding and solving misunderstandings from the terminal frame

7. Enter code as per the program’s settings. Entering code means converting the created program into code such as generative or frame (authoring system), which is a simple lesson-creation program. The content does not need to go into the code; it can be fed in immediately in this step.

8. Feed content into the computer. Instructions must be followed without worrying whether it will come out as one thinks because the arrangement of content will be controlled by other parts of the program.

9. Check the content after the feeding is finished; test the content’s arrangement with what the learners need to learn. Test and make improvements, if necessary.

10. After passing tests, let the targeted learners use it.
11. Following-up on the results of the target learners is considered a very important matter in the computer-assisted instruction lesson. It is to see what the results are, where the program should be improved and such. Information should be collected in order to develop the computer-assisted instruction lessons for other subjects.

It was presented in the chart 2.

Chart 2 The flowchart of creating a computer-assisted instruction by Pairoj Treerontanakul
3.6 Suggestions in Creating a Tutorial

Alessi & Trollip (1985:70) have given suggestions in creating a tutorial as follows:

**Introducing the lesson**
1. Make it short and simple
2. Explain the behavioral objectives of the lesson
3. Explain the way of learning
4. Explain before teaching what knowledge the learner would need to have
5. Let the learner choose his own learning level by choosing from a menu.

When finished with that, the program should come back to the menu again.

6. The pre-test should not be placed in with the content; it should be separated in order to measure the knowledge that the learners have.

**Presenting the content**
1. Make it short and simple
2. Design the presentation to make it interesting
3. Do not use text that runs from top to bottom or bottom to top
4. Highlight what the learner needs to understand or compare.
5. Use color for stimulation or to emphasize important parts
6. Avoid using color to emphasize general text that is not important
7. Use easy-to-read font for the text
8. Differentiate between topics clearly
9. Use an appropriate teaching method with the content
10. Arrange a system of learning that will help learners learn easily

**Question–Answer**
1. Frequently ask questions, especially those related to understanding
2. Find ways to let the learner answer the question without using the keyboard
3. Prompts show the learners they have to answer the question; it is located under the question in the left-hand side of the monitor
4. The question should be one that encourages the finding of the right answer
5. Ask questions about the important parts of the content
6. Let the learner answer more than once for each question
7. Multiple-choice questions are hard to write but easy to correct and can be guessed.
8. Essay questions are easy to write but hard to check and can prevent guessing
9. Know beforehand whether to test memory or understanding, and choose the one that best fits the content
10. The language used in the content should be appropriate to the target learners
11. Avoid asking short questions or negative questions
12. Questions should not be text that moves from top to bottom or vice versa
13. Questions will appear only after the content is presented

Checking answers
1. In checking IQ questions, the instructor must accept some words that have the same meaning, are spelled the same, or other special words
2. Both the correct and incorrect answers should be considered
3. Give learners time to answer questions
4. Let learners have help until they can pass

Retracing information for answers
1. If the answer is wrong, say it is wrong and give the right answer. Then let the learner answer again
2. Confirm a correct answer
3. Let the program go back to correct a wrong answer

Supplementary Information
1. Arrange the content from easy to hard
2. Avoid linear tutorials by using branching tutorials
3. Let the learners control the lesson with the keyboard; time should not be wasted controlling the lesson
4. Let learners go back to the beginning of the lesson if they want

End of lesson
1. Save the information for next time
2. Erase the information on the screen
3. Tell the learner about the end of the lesson very clearly

Yuen Puwonwan (1988:126) stated that the development of computer-assisted instruction needs to emphasize a human interface; it needs to emphasize the easy use of computers and the characteristic of trial and error. Features of a good computer-assisted instruction in the area of human interface are:
   1. Uses little time in learning how to be used; users can use it immediately
   2. Able to be used quickly and efficiently
   3. Has few errors or no matter which keys are pressed there are no errors
   4. Gives the user satisfaction; gives quick feedback; the user does not have to wait; it is composed of beautiful and appropriate colors

Hannafin & Peck (1988:49) proposed 11 principles of designing and developing computer-assisted instruction lessons as follows:
1. Develop the lesson to make it consistent with the process of learning of the learners as per the guideline proposed Gagne, et al. (16-17), which is divided into the following 9 steps:
   1. Alertness
   2. Expectation
   3. Retrieval to working memory
   4. Selective perception
   5. Semantic perception
   6. Retrieval and interacting
   7. Reinforcement
   8. Cueing retrieval
9. Generalized

2. Design the computer-assisted instruction lesson as an individual learning experience.

3. Design the computer-assisted instruction lesson to interact with learners a lot. Interaction results in a variety of results:
   1. Create confidence that the learner is receiving information and will increase studiousness
   2. Interaction helps in connecting the learners' knowledge
   3. Able to supplement when the learner answers incorrectly
   4. Interaction will lessen the time needed to learn

4. Design the computer-assisted instruction lesson so that it displays results as effectively as possible

5. Design a computer-assisted instruction lesson that can achieve the set objectives successfully

6. Design a computer-assisted instruction lesson that has relevant objectives, teaching, and assessment

7. Design the computer-assisted instruction lesson so the learner has easy control

8. Consider what appears on the screen and assess the results effectively in order for the lesson to be interesting, the pictures that appear to be sharp, there is little text, messages are short, and motion techniques are used to stimulate the learner

9. Assess the computer-assisted instruction lesson frequently by adhering to the guideline for curriculum testing as well as program writing, which are:

   **Step 1** One by one testing—The evaluator will observe the results of the learner, note down any deficiencies in the design, and improve them

   **Step 2** Small group testing—A small group is representative of the target population, which needs to be large enough to give confidence that the lesson achievement results of the small target group has statistical significance for the target population. The evaluator notes down deficiencies and improves them

   **Step 3** Field testing—The objective is to assess the lesson in the field during normal use. The objective is also to confirm whether the lesson is as planned, by analyzing these factors:
- Is the lesson and objective relevant?
- What is the attitude toward learning?
- Is the program writing good?

11. Design the computer-assisted instruction lesson meticulously. Jay (1983:22) suggested the process of presenting content on the computer-assisted instruction as follows:

1. Use only one point that is 1-2 lines long each time
2. Give the learner time to control the monitor
3. Pictures should be moved when text is used as communication
4. Equipment should be used to help when text is used
5. Use tangible language instead of intangible
6. Frames, colors, and highlights should be used to emphasize important areas

12. There should be more media put in for appropriateness, such as supplementary books, in order to make the content clearer; there should be summaries between lessons as well.

4. Related Researches

In the year 1987, Hooper & Hannafin tested the effectiveness of the computer-assisted instruction lesson that interaction of students and learner ability of 500 occupational students.

The results of experiment found that when there was individual learning and group learning, those who have low abilities will have high scores when in groups than when alone, whereas those with high abilities would have better scores when alone than in groups.

In the year 1988, Eichel studied the effects of using computer-assisted instruction lessons for learners who are bilingual in 38 community colleges. It was found that from the ALFA test of grammar proficiency, the Mann-Whitney U Test, and the T-test, learning with computer-assisted instruction lessons was no different
than normal learning, which was statistically significant. Spanish and Chinese students also did not differ, in a statistically significant way, in their English abilities.

In the year 1993, Yanee Chantrasartpong studied the results of interaction between the model of classification of learner according to personality and the model of setting the progress rate of CAI toward learning. The sample group included 120 first year vocational students of Meanburi College, Meanburi District, Bangkok. Research tools were test form about personal expression, test of learning achievement for pretest/posttest, and constructed CAI program that setting the progress rate of CAI toward learning by learners and it was constructed as following steps:

1. Content analysis
2. Defining the target
3. Setting the behavioral objectives
4. Analyzing the contents through separating the subunit according to behavioral objective by beginning with easy to difficult
5. Bringing the content to make story board
6. Bringing story board for major advisor and expert to examine for the correctness.
7. Bringing the improved story board to be written as CAI lessons
8. The constructed CAI was examined by the advisory committee and experts and it was improved and corrected.
9. The improved CAI lesson was tested with 3 learners who were not the sample group.
10. The improved CAI lesson was tested with 10 learners who were not the sample group.
11. The improved CAI lesson was tested with 10 learners who were not the sample group in order to test and counting time.
12. Calculate the average time using per round

In the year 1994, Supoj Jantawong did research on the academic achievements of studying computer by using a practice computer-assisted instruction lesson that was made up of 2 methods of learning. The sample group consisted of 30
students from the Ratchamongkol Institute of Technology in the 2nd term of their 1st year, earning a high certificate and a bachelor’s degree, and having passed basic computer courses. Research tools included a test to assess the learners’ learning achievements in practice. The computer-assisted instruction lesson also implemented practice sessions during the content, and the computer-assisted instruction lesson had a practice session at the end. The computer-assisted instruction lesson had 9 creation steps, as follows:

1. Create the computer-assisted instruction lesson with training during the content, which was done by the following 5 steps:
   1.1 Study the curriculum
   1.2 Study the content
   1.3 Set the general and behavioral objectives
   1.4 Analyze the content and divide into 3 parts
   1.5 Use the content to create a computer-assisted instruction lesson

2. Create the computer-assisted instruction lesson with the practice session at the end by using the 5 steps outlined above

3. Take both the computer-assisted instruction lessons and let qualified experts check their accuracy and make improvements as necessary.

4. Take the improved computer-assisted instruction lessons and give it to the qualified experts again, and make any necessary improvements

5. Take the computer-assisted instruction lessons for initial testing with 1 student not in the sample group, and make adjustments as necessary

6. Take the computer-assisted instruction lessons to test with 3 students not in the sample group and make necessary improvements

7. Take the computer-assisted instruction lessons to test with 5 students not in the sample group and make necessary improvements

8. Take the computer-assisted instruction lessons to use with 10 students not in the sample group, divided into 5 bachelor’s degree and 5 higher certificates, and make necessary changes

9. Take the computer-assisted instruction lessons and use them with 20 students not in the sample group, divided into 10 bachelor’s degree and 10 higher
certificates, and let the learners take the practice test. Analyze the information to find out the effectiveness of the program.

In the year 1998, Chatree Jindamanee did a research on the development of computer-assisted instruction lessons about "Kids and Creative Ideas about Helping the Environment" for junior high school students. The sample group consisted of 60 students in junior high school at Banham Jaem Sai Witaya School 5, Amphur See Phi Nong, Supanburi. The research tool used was a computer-assisted instruction lesson on "Kids and Creative Ideas about Helping the Environment" as well as a questionnaire to measure learning achievements. The computer-assisted instruction lesson had 8 steps of creation, as follows:

1. Set the general objective, choose content, and divide the content into units
2. Analyze the junior high school learners
3. Set behavioral objectives and design the questionnaire by utilizing Bloom's analysis table of curriculum principles
4. Design the computer-assisted instruction lesson as a branching program
5. Give the completed lesson to qualified experts to check; if there are suggestions, improve the lesson
6. Create the computer-assisted instruction lesson
7. Test the computer-assisted instruction lesson in order to find its initial effectiveness by testing them with 5 students not in the sample group. Take the information gained from testing to improve on the lesson. Once finished, use the lesson on 10 students not in the sample group and improve on it once again.
8. Make a manual for the computer-assisted instruction lesson.

In the year 2000, Ekachai Phumduang researched "The Development of Computer-Assisted Instruction on Biodiversity for Students at Upper Secondary School Level", with the sample group including 192 students at upper secondary school level who learn according to the Curriculum of High Schools 1981 (revised 1990) under the first construction of an Art branch that studies Physical and Biological science, and physical geography under the Department of General,
Ministry of Education. The research tool used was Computer-Assisted Instruction (CAI) on “Biodiversity” in the achievement form and satisfactory assessment form. There were 14 steps for CAI construction process as follows:

1. Defining the scope of content
2. Defining the learning objective in term of behavioral objective
3. Defining the learner attributes such as age, education level, and knowledge
4. Preparing the outline of learning content
5. Considering the suitable lesson content
6. Preparing storyboard for content
7. Writing lesson scripts on how to present
8. Selecting teams to assist for lesson preparation
9. Collecting the using material
10. Designing computer flow charting
11. Constructing the frame of content to be presented on monitor
12. Preparing the picture to have on monitor
13. Implementing to construct the CAI
14. Testing and improving

In the year 2000, Jutawon Kacha investigated “The Development of Self-Directed Learning Package Based on Computer-Assisted Instruction in the Subject of Principles of Speaking for Resource Persons”, with the sample group including 21 persons interested to be trainers or expected to be trainers, who had never studied this topic before. Also, they would have to be able to use the Windows 95 system and willing to be a part of the study. The research tools were 3 units of the CAI in the subject of principles of speaking for resource persons, two achievement tests, a time recording form, and a questionnaire. The implementation process included 11 steps, as follows:

1. Selecting the content and defining the general objective
2. Analyzing the learner
3. Defining the behavioral objectives
4. Analyzing the content through separation into the subunit
5. Designing lesson program
6. Constructing the lesson program as designed
7. Writing the computer program
8. Entering data to computer
9. Testing the efficiency
10. Use
11. Evaluating and Improving

In the year 2002, Jittiya Sriya conducted a research topic in developing a course of computer-assisted instruction (CAI) on “Conservation of Marine Resources” issue for students at lower secondary school level, and to examine the quality of study and knowledge achievement of students who have taken the course constructed by researcher. The experimental group was 30 students from Ban Dongklang, Amphur Ongkarak, Nakornnayok Province, and control group was 30 students from Ban Thadan Amphur Nakornnayok Province. The objectives of this study were to develop a course of computer-assisted instruction (CAI) on “Conservation of Marine Resources” issue, and to examine the quality of study and knowledge achievement of students who have taken the course constructed by researcher. The research procedures included 2 steps: firstly, to construct the lessons for course of computer-assisted instruction (CAI) on “Conservation of Marine Resources” through the examination by 3 experts and trying 3 times with 3, 6, 9 students consequently. The second step was to determine the effectiveness of lessons of computer-assisted instruction (CAI) on “Conservation of Marine Resources”. The measurement was done by pretest-posttest with control group design. The construction of CAI had the process of construction with 11 steps as follows:

1. Defining the targets of lessons
2. Analyzing the learners
3. Defining the behavioral objectives
4. Analyzing the contents and dividing into subunits
5. Designing the program
6. Constructing the program as designed
7. Writing the computer program
8. Entering to computer
9. Testing for the efficiency
10. Using
11. Evaluating and improving

Therefore self-directed learning packages by using computer-assisted instruction, it had steps and method of construction systemically and effectively that would assist the learner to be able to learn by himself as his convenience.
CHAPTER III

RESEARCH METHODOLOGY

This research was on “The Development of a Self-Directed Learning Package based on Computer-Assisted Instruction in the Subject of Basic work control for supervisor”.

1. Population

The population used in this research consisted of individuals who are supervisors in various offices who never had training in work control before and who are able to use computers with the Windows 95 operating system.

2. Sample Group

Sample group selection was done by selective choice, by asking 30 supervisors with certain characteristics for their cooperation.

3. Sample Group for Trying Out Tools

The sample group that tried out tools was divided into 3 intervals:

Sub group 1: It was the one to one testing

Sample Group was the supervisors who were able to use the window 95 system up and had never learned on the topic of “work control”. They were 3 supervisors from the following work departments:

- Revenue Department Ministry of Finance
- Bangkok Airport
- Thai Rung Union Car PCL
Sub group 2: It was the experiment of small group
Sample Group was the supervisors who were able to use the window 95 system up and had never studied on the topic of "work control". They were 10 supervisors from the following work departments:
- Queen Sirikit National Institute of Child Health
- Taksin Hospital
- Department of Registration and Measurement, Office of the President Mahidol University
- Surin Provincial Public Health office
- Department of Training, The Port Authority of Thailand
- The Government Lottery Office
- Bangkok Metropolitan Bank PCL
- Thai Farmer Bank PCL
- Siam Asahi Techno Glass Co; Ltd.

Sub group 3: It was the experiment of small group
Sample Group was the supervisors who were able to use the window 95 system up and had never studied on the topic of "Basic work control for supervisor". They were 30 supervisors from the following work departments:
- Administration Department, Soldier Development Command Unit, Royal Thai Supreme Command Headquarters
- Soldier Movement Unit 32, Amphur Chiangdao, Chiangmai Province
- Department of Equipment, Ramathibodi Hospital
- Siriraj Hospital
- Ratchaburi Provincial Public Health office
- Samutsonkham Provincial Public Health office
- Department of Plan, Srinakarintarawirote University
- Highly Navy Academics Institute, Amphur Budhmonthon, Nakornprathom
- Office of Accelerated Rural Development Ministry of Interior
- Office of the Civil Service Commission
- Government Housing Bank, Chiangrai Province
- Bank of Ayudhya PCL
4. Research Methodology

1) Study documents and related research
2) Establish a goal for learning lesson
3) Analyze the learners
4) Analyze the content and divided the content into subunit
5) Set behavioral objectives
6) Design and produce the learning lesson program
7) Construct computer-assisted instruction
8) Write the computer program
9) Try out computer-assisted instruction
10) Introduce to use
11) Evaluate and Improve

5. Research Tools

Tools used in this research included:

1. A computer-assisted instruction lesson on "Basic work control" which the researcher created from one subject content, which is initial knowledge in controlling work
2. 2 tests assessing the learning achievements, involving:
   2.1 A pre-test before training
   2.2 A post-test after training
3. A time questionnaire used in studying lessons, which is a questionnaire that will give the time that each person used to study each lesson, by using the computer to record the time.

6. Research Tool Construction

6.1 Creating a computer-assisted instruction lesson

The steps in the creation of a computer-assisted instruction lesson in this research, the implementation process were 11 steps, as follows:

1) Study documents and related research
2) Establish a goal for learning lesson
3) Analyze the learners
4) Analyze the content and divided the content into subunit The details was presented in chart 3.

5) Set behavioral objectives
6) Design and produce the learning lesson program
7) Construct computer-assisted instruction
8) Write the computer program
9) Try out computer-assisted instruction
10) Introduce to use
11) Evaluate and Improve
Chart 3 Displays the Establishment of Behavioral Objectives from an Analysis of the Content of the Basic work control for supervisor Learning Package.

6.2 Creating Pre-test and Post-test

Creating pre- and post-tests was done to use in testing the learning experience. The tests were parallel, and had been created with 8 steps:

1. Study and research methods of creating them from books and documents

2. Analyze the content and behavioral objectives of the created lesson; then create the pre-test and post-test to cover the behavioral objectives set. The test is of multiple choice questions, and the researcher made 2 sets: 1 pre-test, and 1 post-test. Both have parallel characteristics.

3. Take the tests and let guidance counselors examine, then the qualified experts (total of 5) check them; improvements were made as the experts recommendation; then the counselors checked the paper again.

4. Take the improved tests to analyze per individual question, by testing them with 10 individuals who are not supervisors and never went through work control training.
5. The questionnaire was determined the reliability in order to prepare the test questionnaire for pre-test and posttest. It was presented in table 1.

6. Take the results of the test and analyze the Difficulty level (p) and the Discrimination (r) of each question while using the 27% technique. A correctly answered question gets 1 point while an incorrect answer gets 0 points. The good questions will have a difficulty value of between .20 - .80 and have a discriminatory value of .20 - 1.00 (Sproull, N.L., 1988).

7. Choose questions that have a difficulty value of between .38 - .63 and have a discriminatory value of .56 - .75 and analyze them for reliability with the Kuder-Richardson (KR-21) test. The results showed that the value was .651

8. Take the questions to divide into content groups to use in pre-tests and post-tests.
Table 1 Displaying the Scores of the Sample Group (10 People)

<table>
<thead>
<tr>
<th>Question</th>
<th>Number Correct</th>
<th>Number Wrong</th>
<th>Percentage Correct</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>5</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>2.</td>
<td>5</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>3.</td>
<td>2</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>4.</td>
<td>7</td>
<td>3</td>
<td>70</td>
</tr>
<tr>
<td>5.</td>
<td>3</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>6.</td>
<td>7</td>
<td>3</td>
<td>70</td>
</tr>
<tr>
<td>7.</td>
<td>8</td>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>8.</td>
<td>7</td>
<td>3</td>
<td>70</td>
</tr>
<tr>
<td>9.</td>
<td>6</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>10.</td>
<td>6</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>11.</td>
<td>6</td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td>12.</td>
<td>5</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>13.</td>
<td>5</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>14.</td>
<td>3</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>15.</td>
<td>4</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>16.</td>
<td>8</td>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>17.</td>
<td>4</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>18.</td>
<td>3</td>
<td>7</td>
<td>30</td>
</tr>
<tr>
<td>19.</td>
<td>5</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>20.</td>
<td>2</td>
<td>8</td>
<td>20</td>
</tr>
</tbody>
</table>

It can be seen from the table that the questions passing the test included those at the easy, middle, and hard range, which would be used in creating a pre-test and a post-test.

6.3 Creating a Time Questionnaire

A time questionnaire is a computer program used in this research to record the time that each learner uses in learning the lessons.
7. Tool Testing

7.1 One-on-One Testing

The objective of testing is to find out any deficiencies in the computer-assisted instruction lesson in various areas such as the accuracy of the content, the clarity of presentation, the quality of the computer program, the clarity of pictures and sound, and the relevancy to real work environment, in order to find the achievements of studying and the time that learners use to study. The steps are as follows:

1. Set the sample groups in one-on-one testing by choosing selectively 3 supervisors who possess all criteria
   - Revenue Department Ministry of Finance
   - Bangkok Airport
   - Thai Rung Union Car PCL

2. Doing the test by letting the sample group study the lessons included the following steps:
   2.1 Check the completeness of the computer to be used and the location
   2.2 Explain the method of using the computer and the objectives to the group to let them know
   2.3 Go on with the testing, by letting the sample group study with the computer with one person to one computer. The researcher observes their behavior and asks their opinions. The group answered the questionnaire after they were done
   2.4 Take the information gotten from observing their behavior, the results of the study, as well as the time questionnaire and analyze for improvements. The detail was illustrated in chart 4.
Chart 4 Displays the Process in Testing the Computerized Learning Program in One-on-One Testing

7.1.1 Analyzing Data from One-on-One Testing

The data from one-on-one testing is qualitative in nature and is about the learning program the researcher created. Analyzing the information lets the researcher...
improve the learning package through the discovery of errors and through suggestions from the sample group. The improved learning package would be tested with the sub-sample group. The factors considered would include the testing results for the one-on-one testing, the lessons in the learning package and whether the content and methods pass the evaluation of thesis advisors and qualified experts, and then testing it again on the sample group that consists of 3 people with a Bachelor’s degree education, with each person at his own computer. The researcher observed their behavior, as well as asked them their opinions in regards to the program. The results were as demonstrated in table 2.

Table 2 Presentation the Result of One on One Experiment

<table>
<thead>
<tr>
<th>Considered Issues</th>
<th>Opinion of Sample Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Content correctness</td>
<td>Correct content</td>
</tr>
<tr>
<td>2. Clearness of Presentation</td>
<td>The presentation of content was not clear</td>
</tr>
<tr>
<td>3. Quality of Program</td>
<td>Not continuously</td>
</tr>
<tr>
<td>4. Sharp of Pictures and Sound</td>
<td>Some part of sound was skip over</td>
</tr>
<tr>
<td>5. The congruence to the Real teaching situation, Time use for studying (minutes)</td>
<td>The feedback action was very slow 90</td>
</tr>
</tbody>
</table>

7.2 Small Group Testing

The objective of testing was to find out any deficiencies in the computer-assisted instruction lesson in various areas such as the accuracy of the content, the clarity of presentation, the quality of the computer program, the clarity of pictures and sound, and the relevancy to real work environment, in order to find the achievements of studying and the time that learners use to study. The steps are as follows:

1. Set the sample groups in small group testing by choosing selectively 10 supervisors who possess all criteria:
   - Queen Sirikit National Institute of Child Health
   - Taksin Hospital
2. Do the test by letting the sample group study the lessons, as follows:

2.1 Check the completeness of the computer to be used and the location.

2.2 Explain the method of using the computer and the objectives to the group to let them know.

2.3 Go on with the testing, by letting the sample group study with the computer with one person to one computer. The researcher observes their behavior and asks their opinions. The group answered the questionnaire after they were done.

2.4 Take the information gotten from observing their behavior, the results of the study, as well as the time questionnaire and analyze for improvements. The detail was showed in chart 5.
Chart 5 Displaying the Testing of the Learning Package for Sub-Sample Group

7.2.1 Data Analysis of Testing with a Small Group

The data from a small group testing is qualitative in nature and is about the learning program the researcher created. Analyzing the information lets the researcher improve the learning package through the discovery of errors and through suggestions from the sample group. The improved learning package would be tested with the
sample group. The factors considered would include the testing results for the one-on-one testing, the lessons in the learning package and whether the content and methods pass the evaluation of thesis advisors and qualified experts, and then testing it again on the sample group that consists of 10 people with a Bachelor’s degree education, with each person at his own computer. The researcher observed their behavior, as well as asked them their opinions in regards to the program. The program would then be improved further in order to be used in later testing with the sample group of 30. The experimental result of sample details presented in table 3.

Table 3 Presentation of Experimental Results of Small Group

<table>
<thead>
<tr>
<th>Considered Issues</th>
<th>Opinion of the Sample Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.1</td>
</tr>
<tr>
<td>1. Content Correctness</td>
<td>⬠</td>
</tr>
<tr>
<td>2. Clearness of Presentation</td>
<td>⬠</td>
</tr>
<tr>
<td>3. Quality of Program</td>
<td>⬠</td>
</tr>
<tr>
<td>4. Sharp of Pictures and Sound</td>
<td>⬠</td>
</tr>
<tr>
<td>5. The congruence to the Real teaching situation</td>
<td>⬠</td>
</tr>
<tr>
<td>Time use for studying (minutes)</td>
<td>58</td>
</tr>
</tbody>
</table>
8. Field Testing

The 3 objectives of this testing were to test the effectiveness of the computer-assisted instruction lesson, find the development in learners, and find the average time used in study. The steps were as follows:

1. Set the sample group of field testing by selectively choosing 30 supervisors who fit the criteria as presented in table 4.
### Table 4 Sample Group in Field Testing

<table>
<thead>
<tr>
<th>Department of Work</th>
<th>Sample Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soldier Development Command Unit, Royal Thai Supreme Command Headquarters</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 2</td>
</tr>
<tr>
<td>Soldier Movement Unit 32, Amphur Chiangdao, Chiangmai Province</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Ramathibodi Hospital</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Siriraj Hospital</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Ratchaburi Provincial Public Health office</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Samutsonkham Provincial Public Health office</td>
<td>Bachelor: -</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Department of Plan, Srinakarintarawirote University</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Highly Navy Academics Institute, Amphur Budhmonthon, Nakornprathom</td>
<td>Bachelor: -</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Office of Accelerated Rural Development Ministry of Interior</td>
<td>Bachelor: -</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Office of the Civil Service Commission</td>
<td>Bachelor: -</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Government Housing Bank, Chiangrai Province</td>
<td>Bachelor: -</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Bank of Ayudhya PCL</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>The Port Authority of Thailand</td>
<td>Bachelor: 2</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 2</td>
</tr>
<tr>
<td>Metropolitan Electricity Authority</td>
<td>Bachelor: 2</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 2</td>
</tr>
<tr>
<td>Petroleum Authority of Thailand</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 2</td>
</tr>
<tr>
<td>Electricity Office Area 2, Region 4, Nakornsrithamarach</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Monetary Advisory Center for small size and middle size of public company</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 2</td>
</tr>
<tr>
<td>Airport Authority of Thailand</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: 1</td>
</tr>
<tr>
<td></td>
<td>Total: 2</td>
</tr>
<tr>
<td>Siam Commercial Bank PCL</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Government Savings Bank (Head Office)</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Phatra Insurance PCL</td>
<td>Bachelor: 2</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 2</td>
</tr>
<tr>
<td>Thai Airways International PCL</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
<tr>
<td>Siam Cement PCL, Rayong Province</td>
<td>Bachelor: 1</td>
</tr>
<tr>
<td></td>
<td>Master: -</td>
</tr>
<tr>
<td></td>
<td>Total: 1</td>
</tr>
</tbody>
</table>
2. Do the test by letting the sample group study the lessons, as follows:

2.1 Check the completeness of the computer to be used and the location, then giving the group the program

2.2 The sample group would study the computer-assisted instruction lesson in the time and place that the group was convenient to make. Every person was able to proceed with the learning.

2.3 The sample group sent the computer-assisted instruction lesson as well as their results to the researcher

2.4 The information was analyzed further, its detail showed in chart 6.
Chart 6 Displaying the Testing of the Learning Package for Sample Group

9. Data Analysis

9.1 Data Analysis of Field Testing

The data from the field test was quantitative data. The analysis therefore depended on statistics, which included:

1. Analysis of data to compare post-test scores with the standard score (Walter R. Borg & Meredith Damien Gall, 1983:656-657):
The first 90 means the average score of the test of the sample group when calculated by percentage and resulting in 90% or higher by the formula -

\[ E = \frac{\sum X \times 100}{N \times A} \]

- \( E \) = The quality of the computer-assisted instruction lesson
- \( \sum X \) = The total score of the entire sample group
- \( N \) = Number of sample group members
- \( A \) = The full score of the sample group

The last 90 means the 90% of the sample group who answered the questions (calculated per question) correctly, by using the formula -

\[ E = \frac{n \times 100}{N} \]

- \( E \) = The quality of the computer-assisted instruction lesson
- \( n \) = Number of people who answered that question correctly
- \( N \) = Sample group size

2. Analysis of data to test differences, in a statistically significant way, of the average score of the pre-test and post-test by the computer-assisted instruction lesson (Walter R. Borg & Meredith Damien Gall, 1983:543-549), with the formula -

\[ t = \frac{\sum D}{\sqrt{N \sum D^2 - (\sum D)^2 \over N - 1}} \]

- \( \sum D \) = Total sum of the difference between average scores of pre-test and post-test
- \( \sum D^2 \) = Total sum of the difference between average scores of pre-test and post-test, squared
- \( N \) = Total number of learners
3. Analysis of the average value of the time used in study of the computer-assisted instruction lesson (Walter R. Borg & Meredith Damien Gall, 1983:291), with the formula:

$$
\bar{X} = \frac{\sum X}{N}
$$

$\bar{X}$ = Average value of time used in study

$\sum X$ = Total sum of time used by entire sample group in study

$N$ = Total number of learner

9.2 Analysis of Information from Pre- and Post-Tests

1. Analysis to find the discriminatory value (Walter R. Borg & Meredith Damien Gall, 1983:603-604) by the formula -

Discrimination Power (r) = $\frac{P_H - P_L}{n}$

r = Value of discriminatory power of each question

$P_H$ = Number of people in the high group who answered correctly

$P_L$ = Number of people in the low group who answered correctly

n = Equal number of people in each groups

The discriminatory power was between .20 – 1.00

2. Analysis of difficulty value (Walter R. Borg & Meredith Damien Gall, 1983:290-299,370) by the formula -

$$
p = \frac{P_H + P_L}{2n}
$$

p = The difficulty value in each question

$P_H$ = Number of people in the high group who answered correctly

$P_L$ = Number of people in the low group who answered correctly

n = Equal number of people in each groups
The selection of questions were done for those with a discriminatory (r) value of .20 – 1.00 and a difficulty (p) value between .20 – .80. Afterwards, the selected questions were measured for their reliability by use of the KR-21 formula of Kuder & Richardson (1939:681) (Walter R. Borg & Meredith Damien Gall, 1983:290-299,370), with the formula -

\[ r_{ni} = \left( \frac{n}{n-1} \right) \left( 1 - \frac{\bar{X} n - \bar{X}}{nS^2} \right) \]

- \( r_{ni} \): Value of reliability of questionnaire
- \( n \): Number of questions
- \( \bar{X} \): Average score for the scores of the entire test
- \( S^2 \): Standard deviation of the entire test

The questions that passed the discriminatory, the difficulty, and the reliability selections were used in the pre-tests and post-tests.
CHAPTER IV

RESULTS

The research on the topic of “The Development of a Self Instructional Package by Computer-Assisted Instruction for Supervisors” had objectives to develop computer-assisted instruction on the subject of basic work control.

The research results were as follows:

1. General information about the sample group
2. Creation of a self instructional package by computer-assistance on work control
3. Finding the program’s effectiveness
4. Comparisons between before and after learning scores
5. Results of the learning assessment tests (pre-test and post-test)
6. Survey of time used in studying the computer-assisted package

1. General Information about the Sample Group

It was found that the sample group, which consisted of 30 supervisors from various departments who had never learned work control, was divided into 15 males and 15 females. Most of the people (16 in total) were in the 36–45 age group, followed by (10 people) with ages between 31 – 35 and 51 – 55 years, while the remaining (4 people) were in the 46 – 50 age range.

Education Level

The majority of the group (21 people) graduated with a Bachelor’s degree, while the rest (9 people) possessed a higher degree.
Present Position
Most people in the group (25) were supervisors whereas the remaining (5) were in higher positions.

Work Experience
In the sample group, 10 people had 21 – 25 years of experience; 6 people had 5 – 10 years of experience; 5 people had 11 – 15 years of experience; and 5 people had 26 – 30 years of experience.

Work Unit
In the sample group, 15 people were civil servants, 11 people were government workers, whereas the remaining 4 people worked in the private sector.

Details are shown in Table 5.
Table 5 General Information of Sample Group

<table>
<thead>
<tr>
<th>General Information</th>
<th>No. of People (n = 30)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>Female</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 – 35 years</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td>36 – 40 years</td>
<td>9</td>
<td>30.0</td>
</tr>
<tr>
<td>41 – 45 years</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>46 – 50 years</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>51 – 55 years</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td><strong>Education Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>21</td>
<td>70</td>
</tr>
<tr>
<td>Higher than Bachelor’s degree</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td><strong>Present Position</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisor</td>
<td>25</td>
<td>83.3</td>
</tr>
<tr>
<td>Higher than supervisor</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td><strong>Work Experience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 –10 years</td>
<td>6</td>
<td>20.0</td>
</tr>
<tr>
<td>11 – 15 years</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td>16 – 20 years</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>21 – 25 years</td>
<td>10</td>
<td>33.3</td>
</tr>
<tr>
<td>26 – 30 years</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td><strong>Work Unit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Governmental worker</td>
<td>11</td>
<td>36.7</td>
</tr>
<tr>
<td>Civil servant</td>
<td>15</td>
<td>50.0</td>
</tr>
<tr>
<td>Private sector worker</td>
<td>4</td>
<td>13.3</td>
</tr>
</tbody>
</table>
2. Creation of a Self Instructional Package by Computer Assistance on Work Control

2.1 Work Control Package Creation

The instructional package that the researcher created was burned onto 1 CD-Rom. The lessons proceeded in an orderly structure, with the learning content being 1 major part that consisted of the following 9 sub-topics:

1) Definition of work control
2) Objective of work control
3) Importance of work control
4) Type of work control
5) Methods of work control
6) Techniques of work control
7) Tools of work control
8) Improving the system of work control effectively
9) Problems of work control

The steps in creating the instructional package used in this research were as follows:

1) Study documents and related research
2) Establish a goal for learning lesson
3) Analyze the learners
4) Analyze the content and divided the content into subunit
5) Set behavioral objectives
6) Design and produce the learning lesson program
7) Construct computer-assisted instruction
8) Write the computer program
9) Try out computer-assisted instruction
10) Introduce to use
11) Evaluate and Improve
Flow Chart

Start

Explain the program

Objectives

Pre-test

Meaning of Work Control

↓ Quiz

Not

Pass

Objective of Work Control

↓ Quiz

Not

Pass

Importance of Work Control

↓ Quiz

Not

Pass

Types of Work Control

↓ Quiz

Not

Pass

Methods of Work Control

↓ Quiz

Not

Pass

Techniques of Work Control

↓ Quiz

Not

Pass

Guidelines and Tools in Work Control

↓ Quiz

Pass

Suggestions on Improvement

↓ Quiz

Not

Pass

Problems of Work Control

↓ Quiz

Not

Pass

Post-test

Summary

End

Chart 7 Displaying the Flow Chart in Creating the Program
2.2 Results of Using the Computer-Assisted Instructional Program on Basic Work Control for supervisor.

Computer-Assisted Instructional Program on Basic Work Control for supervisor, it was passed the improvement. The researcher brought to try out in the field with 30 persons of sample group who were the supervisors they had never learnt on the subject of basic work control for supervisor, and bachelor degree or above. The sample group had study by self instruction in the place and convenient time. After the sample group had finished the lesson, the sample group sent the Computer-Assisted Instruction, and they had finished the study. The sample group sent the CAI and learning results back to the researcher.

The results of field experiment, it was found that learning scores of Computer-Assisted Instruction that was used in the for the sample group as presented in table 6.
Table 6  Scores Achieved and Time Used in Studying the Computer-Assisted Program on Work Control

<table>
<thead>
<tr>
<th>Sample Group</th>
<th>Score (Full Score = 20)</th>
<th>Time used in learning (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Number</td>
<td>pre - test</td>
<td>post - test</td>
</tr>
<tr>
<td>1.</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>2.</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>3.</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>4.</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>5.</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>6.</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>7.</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>8.</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>9.</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>10.</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>11.</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>12.</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>13.</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>14.</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>15.</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>16.</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>17.</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>18.</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>19.</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>20.</td>
<td>17</td>
<td>20</td>
</tr>
<tr>
<td>21.</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>22.</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>23.</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>24.</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>25.</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>26.</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>27.</td>
<td>9</td>
<td>20</td>
</tr>
<tr>
<td>28.</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>29.</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>30.</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>446</td>
<td>575</td>
</tr>
<tr>
<td>Average</td>
<td>14.86</td>
<td>19.17</td>
</tr>
</tbody>
</table>

TOTALS:  pre - test = 446  post - test = 575  time used = 1,695 min.

AVERAGE:  pre - test = 14.86  post - test = 19.17  time used = 56.50 min.
3. Finding the Program’s Effectiveness

The researcher used the test results of the 30 people in the sample group in calculations to find the effectiveness of the test through a 90/90 standard score comparison (Walter R. Borg & Meredith Damien Gall, 1983: 656-657):

The first 90 means the average score of all respondents in the sample group when calculated into percentages and getting 90 or higher, by using the following formula (Walter R. Borg & Meredith Damien Gall, 1983: 656-657):

\[
E = \frac{\sum X \times 100}{N \times A}
\]

- \(E\) = Quality of the computer-assisted program
- \(\sum X\) = Total score of all respondents
- \(N\) = Number of respondents
- \(A\) = Total score of sample group

With values substituted:

\[
E = \frac{\sum X \times 100}{N \times A}
\]

\[
E = \frac{575 \times 100}{30 \times 20}
\]

\[
E = 95.833
\]

The test results after using the program for the sample group showed that the average post-test score of all respondents was 95.833%, as shown in Table 7.
Table 7 Post-test Results of the Sample Group

<table>
<thead>
<tr>
<th>Respondent Number</th>
<th>Score (Total Score = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>19</td>
</tr>
<tr>
<td>2.</td>
<td>19</td>
</tr>
<tr>
<td>3.</td>
<td>18</td>
</tr>
<tr>
<td>4.</td>
<td>19</td>
</tr>
<tr>
<td>5.</td>
<td>19</td>
</tr>
<tr>
<td>6.</td>
<td>20</td>
</tr>
<tr>
<td>7.</td>
<td>19</td>
</tr>
<tr>
<td>8.</td>
<td>19</td>
</tr>
<tr>
<td>9.</td>
<td>20</td>
</tr>
<tr>
<td>10.</td>
<td>19</td>
</tr>
<tr>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>12.</td>
<td>19</td>
</tr>
<tr>
<td>13.</td>
<td>19</td>
</tr>
<tr>
<td>14.</td>
<td>19</td>
</tr>
<tr>
<td>15.</td>
<td>20</td>
</tr>
<tr>
<td>16.</td>
<td>18</td>
</tr>
<tr>
<td>17.</td>
<td>19</td>
</tr>
<tr>
<td>18.</td>
<td>20</td>
</tr>
<tr>
<td>19.</td>
<td>19</td>
</tr>
<tr>
<td>20.</td>
<td>20</td>
</tr>
<tr>
<td>21.</td>
<td>18</td>
</tr>
<tr>
<td>22.</td>
<td>19</td>
</tr>
<tr>
<td>23.</td>
<td>19</td>
</tr>
<tr>
<td>24.</td>
<td>19</td>
</tr>
<tr>
<td>25.</td>
<td>20</td>
</tr>
<tr>
<td>26.</td>
<td>19</td>
</tr>
<tr>
<td>27.</td>
<td>20</td>
</tr>
<tr>
<td>28.</td>
<td>19</td>
</tr>
<tr>
<td>29.</td>
<td>19</td>
</tr>
<tr>
<td>30.</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>575</td>
</tr>
</tbody>
</table>
The 2nd 90 means the 90% of the group who responded correctly to each question (calculated individually) using the following formula (Walter R. Borg & Meredith Damien Gall, 1983: 656-657):

\[
E = \frac{n \times 100}{N}
\]

- \(E\) = Quality of the computer-assisted program
- \(n\) = Number of respondents correctly answering the question
- \(N\) = Number of respondents

With values substituted:

\[
E = \frac{29 \times 100}{30}
\]

\[
E = 96.67
\]

The total score of the quality of the computer-assisted program for all 20 questions equaled 1,916.67 and the average score for the entire program was 95.833.

The respondents who correctly answered each question (calculated individually) had an average of 95.833 for all 30 respondents, as shown in Table 8.
Table 8 Correct Answers for Each Individual Question of the Sample Group

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Number of respondents correctly answering the question (n)</th>
<th>Substituting n in the formula $E = \frac{n \times 100}{N}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>2.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>3.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>4.</td>
<td>28</td>
<td>93.33</td>
</tr>
<tr>
<td>5.</td>
<td>28</td>
<td>93.33</td>
</tr>
<tr>
<td>6.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>7.</td>
<td>27</td>
<td>90.00</td>
</tr>
<tr>
<td>8.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>9.</td>
<td>28</td>
<td>93.33</td>
</tr>
<tr>
<td>10.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>11.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>12.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>13.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>14.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>15.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>16.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>17.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>18.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>19.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td>20.</td>
<td>29</td>
<td>96.67</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>575</td>
<td>1916.67</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>28.75</td>
<td>95.833</td>
</tr>
</tbody>
</table>
In finding the quality of the computer-assisted program, it was found that the program had effectiveness equaling to 95.833 / 95.833, which is a value higher than the standard of 90 / 90.

4. Comparisons between Before and After Learning Scores

The researcher established that the sample group would do a pre-test before commencing the study and a post-test after the content had been studied. After the experiment, it was found that the average pre-test score ($\bar{X}$) was 14.86 with a standard deviation (S.D.) of 3.22, whereas the average post-test score ($\bar{X}$) was 19.17 with a standard deviation (S.D.) of 0.59. From a t-test (one-group design), it was found that the value of $t = 7.198$, which meant that the post-test score increased in a statistically significant way at the level .05. This showed that the sample group's knowledge had increased after receiving training through the computer program. Details are shown in Table 9, and Appendix A.

Table 9 Comparisons of Before and After Learning Scores of the Sample Group

<table>
<thead>
<tr>
<th>Group Studied</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
<th>$\Sigma D$</th>
<th>$\Sigma D^2$</th>
<th>$(\Sigma D)^2$</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>30</td>
<td>14.86</td>
<td>3.22</td>
<td>129</td>
<td>865</td>
<td>16,641</td>
<td>7.198**</td>
</tr>
<tr>
<td>Post-test</td>
<td>30</td>
<td>19.17</td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Significance level = .05

5. Results of The Learning Assessment Tests (Pre-Test and Post-Test)

The researcher created an assessment test that consisted of 40 questions divided into 20 pre-test and 20 post-test questions, which were based on the learning content and covered the behavioral objectives set. The format was a 4-choice multiple choice test that was checked and approved by qualified experts. Once the test's
content, design, and questions were approved, it was given to 30 supervisors of various departments who had never learned about work control and possessed at least a Bachelor's degree. The results were analyzed to find the difficulty value and the discriminatory power, with questions that pass analysis being those with a difficulty value between .20-.80 and a discriminatory power between .20-1.00. These 20 questions were analyzed for their reliability in the test's entirety, which was found to be equal to 0.651.


The researcher tested the computer-assisted program on work control with a sample group of 30 supervisors of various departments who had never learned about work control and possessed at least a Bachelor's degree. It was found that the time used in studying the program varied from person to person; the longest time taken was 60 minutes, the fastest time was 45 minutes. The time used by all 30 respondents was calculated to find the average, which equaled 57 minutes as shown in Table 10.

The average time used by all 30 respondents in studying the program was discovered to be 56.50 minutes, or 57 minutes, which was less than the standard of 70 minutes set. The sample group used 10 minutes less time.
Table 10 Time Used in Studying the Computer-Assisted Instructional Program

<table>
<thead>
<tr>
<th>Person Number</th>
<th>Time Used (Minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>50</td>
</tr>
<tr>
<td>2.</td>
<td>55</td>
</tr>
<tr>
<td>3.</td>
<td>55</td>
</tr>
<tr>
<td>4.</td>
<td>55</td>
</tr>
<tr>
<td>5.</td>
<td>58</td>
</tr>
<tr>
<td>6.</td>
<td>58</td>
</tr>
<tr>
<td>7.</td>
<td>45</td>
</tr>
<tr>
<td>8.</td>
<td>55</td>
</tr>
<tr>
<td>9.</td>
<td>59</td>
</tr>
<tr>
<td>10.</td>
<td>56</td>
</tr>
<tr>
<td>11.</td>
<td>50</td>
</tr>
<tr>
<td>12.</td>
<td>56</td>
</tr>
<tr>
<td>13.</td>
<td>60</td>
</tr>
<tr>
<td>14.</td>
<td>58</td>
</tr>
<tr>
<td>15.</td>
<td>60</td>
</tr>
<tr>
<td>16.</td>
<td>55</td>
</tr>
<tr>
<td>17.</td>
<td>60</td>
</tr>
<tr>
<td>18.</td>
<td>60</td>
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<tr>
<td>19.</td>
<td>53</td>
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<tr>
<td>20.</td>
<td>58</td>
</tr>
<tr>
<td>21.</td>
<td>56</td>
</tr>
<tr>
<td>22.</td>
<td>54</td>
</tr>
<tr>
<td>23.</td>
<td>60</td>
</tr>
<tr>
<td>24.</td>
<td>58</td>
</tr>
<tr>
<td>25.</td>
<td>60</td>
</tr>
<tr>
<td>26.</td>
<td>55</td>
</tr>
<tr>
<td>27.</td>
<td>58</td>
</tr>
<tr>
<td>28.</td>
<td>60</td>
</tr>
<tr>
<td>29.</td>
<td>58</td>
</tr>
<tr>
<td>30.</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,695</strong></td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>56.50</strong></td>
</tr>
</tbody>
</table>

Total time used = 1,695 minutes; Average time used = 56.50 minutes
CHAPTER V

DISCUSSIONS

For the research "The Development of a Self-Directed Package by Computer-Assisted Instruction with the Objective of Studying Basic Work Control for Supervisors," the sample group included supervisors in various departments who had never studied work control, who had at least a Bachelor's degree, who had proficiency in using a computer with at least a Windows 95 operating system, and who were voluntarily participating in the usage of a computer-assisted instruction package. This chapter will address the following 4 issues:

1. The steps of preparation of the computer-assisted instruction
2. The effectiveness of the computer program
3. Achievement of students after learning the program
4. Average time used in studying

1. The steps of preparation of the computer-assisted instruction

The steps in the creation of a computer-assisted instruction lesson in this research, the implementation process were 11 steps, as follows:

1) Study documents and related research
2) Establish a goal for learning lesson
3) Analyze the learners
4) Analyze the content and divided the content into subunit
5) Set behavioral objectives
6) Design and produce the learning lesson program
7) Construct computer-assisted instruction
8) Write the computer program
9) Try out computer-assisted instruction
10) Introduce to use
11) Evaluate and Improve

For this study, the computer-assisted instruction was created by following the guidelines set by Pairoj Treerontanakul (1985:76), Jutawan Kacha (2000:48), Kemp (1985:248), Alessi & Trollip (1985:275), Romiszowski (1986:271-272), all of which had similar steps in creating a computer-assisted instruction, but lacked in assessing the effectiveness of the program in order to make it as beneficial as possible to students. It can be seen that after the program’s development, there are no tests run to find the effectiveness in making the sample groups understand the content. After testing the program with the large sample group, both Pairoj and Jutawan did not improve the program’s effectiveness further.

From this research it was found that the steps in creating the program were different from Pairoj Treerontanakul (1985:76), Jutawan Kacha (2000:48), Kemp (1985:248), Alessi & Trollip (1985:275), Romiszowski (1986:271-272), such as:

1) The program tests the learner’s understanding in each chapter through quizzes; if the student does not pass he will re-learn the topic again.

2) The program’s effectiveness was evaluated by the researcher and the sample groups when testing one-on-one for 3 people and testing with the small group of 10, in order to find the program’s effectiveness before testing it with the sample group of 30.

3) There were improvements made to the program after the 30-person sample group in order to make the program more effective.

For creating computer-assisted instruction for high school students, college graduates, and the general public, Supot Jantawong (1994:50) studied the achievements of computer learning through 2 methods. The sample groups in the research included Ratchamongkol Technology students with certificates for high skills and Bachelor degree students with a total of 9 steps in creating the lessons. Yanee Chantsartpong (1993:46) had 11 steps in creating programs and Jutawant Kacha (2000:29) did research on “Speech Techniques for Speakers” with the target group
being people who had an interest in being a speaker or expected to become one.

Jutawant Kacha's program was done in 11 steps. When these researches are compared with this one, it was found that the creation process is very similar, such as the step for studying the curriculum and establishing behavioral objectives, the step for letting qualified experts approve the content, the step for evaluating tools, the step for testing the program with the target group, for studying content, for creating goals, general goals, behavioral goals for each lesson, the theories of program writing, setting up a structure, designing, and making a story board. In addition, when comparing the work of Chatree Jindamanee and Ekachai Pumduang, who had the same target group of high school students, there were many similarities noted in the creation of a lessons program. Chatree Jindamanee (1998:44) researched the development of a lessons program to teach about solving environmental problems with 8 steps; Ekachai Pumduang (2000:33) researched the development of a lessons program on biological diversity for high school students with 14 steps; the research of Jittiya Sriya on developing a lessons program for "Conservation of Oceanic Resources" for high school students was done with 11 steps. It can be seen that the steps involved in developing computer-assisted learning programs for high school students and for adults were similar and differed with the following:

1. Establishing goals or objectives of learning
2. Analyzing the learner
3. Establishing goals or objectives for each lesson
4. Behavioral objectives were set, which was a part of Jittiya Sriya's research, whereas in the researches of Chatree Jindamanee and Ekachai Pumduang there were only general objectives set for the computer-assisted instruction.
5. Establishing the limits and content to be taught, with the content divided into topics or steps
6. Checking the content by qualified experts
7. Making a story board in this, Jittiya's, and Ekachai's researches; for Chatree's research there was only a structure
8. Testing the program on a group with similar characteristics as the target group.
9. In the field experiment, after improving the program with suggestions from qualified experts accordingly

10. Testing the program and summarizing results

For creating computer-assisted instruction for high school students, college graduates, and the general public, there was a principle of creating computer-assisted instruction was similar such as establishing goals or objectives of learning, analyzing the learner, establishing behavioral objectives, dividing content into topics or steps, checking the content by qualified experts, making a story board, testing the program on a group with similar characteristics as the target group and the improving the program with suggestions from qualified experts accordingly, and testing the program and summarizing results in the creation of a computer-assisted instruction were all stated in this research, in Jutawan Kacha and Yanee Chansartpong’s researches but were not stated in Supoj Jantawong’s research.

2. The Effectiveness of the Computer Program

1. In finding the quality of the computer-assisted instruction, it was found that the program had effectiveness equaling to 95.833 / 95.833, which is a value higher than the standard of 90 / 90. The reasons for the test having an effectiveness that is higher than the standard may be from the following:

   1.1 In the 11 steps in creating the program, the researcher had analyzed and studied all the details in order to integrate it better with the students and all issues involved in work control, which made the content of the program achieve a higher effectiveness than the standard. In addition, the learning program was developed as a computer-assisted instruction computer-assisted instruction by following integrated steps. The program is one that could be used for self instruction, and interaction between student and computer is possible in the content through questions, answers, reviews, assessments, and results that could be used as feedback for the student.

   1.2 The computer-assisted instruction that the researcher created had a foundation in the Reinforcement Theory of Skinner (Skinner, B.F., 1974). This theory came from the theory of conditioned learning. The basic premise of the theory is that
behavior is a result of the environment; behavior will be better as a result of reinforcements, and behavior will lessen because of punishment. Therefore, if positive reinforcements (such as praise) are used in learning, the learners will take pride in their work and want to study further. This research used the same theory in the computer program designed for work control: for every correct answer, the respondent will be praised.

1.3 The computer-assisted instruction let the respondent see his assessment at intervals, which let the student know of his progress. This is a factor that stimulated and motivated respondents, which was consistent with the characteristics of good computer-assisted instruction for learning that Taksina Sawananon (1986:76-79) had stated.

1.4 The computer-assisted instruction created consisted of active learning, which followed the theory of learning through stimuli, which was a modification of the S-R Learning Theory by Pavlov, Mowrer, and Miller (Chapman et al., 1973:240 – 263). The computer-assisted instruction is considered to be the direct stimulus for learners, which would enable them to participate in active learning and would help them have the opportunity to take part in learning in a challenging way. Students therefore have fun in learning.

1.5 The computer-assisted instruction includes lessons that learners could learn whenever they want; it is voluntary learning. In this research, the program created was to teach work control for supervisors, all of whom are adults in managerial positions and thus have a desire to learn specifically about work control. This is especially true for those in the sample group because none of them had been through this kind of study before and would be eager to learn a necessary skill in their daily job in order to more effectively manage and control work effectively, as well as meet goals established. This is consistent with the theory of students' readiness to learn, which Somkid Isarawatana stated as follows: adults have more readiness to learn than children, which is because adults can see how the studied issue can be applied to real life and is beneficial (Somkid Isarawatana, 2000:25). Learners will learn best if they possess a readiness to learn. In addition, learners can take as much time to study as they want, which is consistent with the theory of McClusky
(McClusky, 1974: 97-98) who proposed that adults would learn better if there were no time pressures.

1.6 The computer-assisted instruction created for this study featured branching programming, or a type of program where the learner does not have to learn all framework topics in order, since the frame orders are not fixed. The learner is able to jump from one frame to another if the student answers questions correctly; the student is also able to return to previous lessons, which can be considered reviews for the learner. Also, for every question there is an explanation of what the learner got wrong, as well as a second test to verify their understanding before going on to the next frame, which is consistent with what Pruang Kumut (1976:38) stated in regards to branching program lessons: it is not necessary to go back to the beginning for a tedious repetition like in linear-based programs, since the learner can go on if he answered questions correctly. As for wrong answers, they do not impact the correct answers. The learner is able to choose their answers in many ways, depending on the responses of the learner each framework of learning. Readiness of learning will be developed when the learner is taken through more preparations every time he answers incorrectly and will be broadened when the learner corrects the wrong answer or develops understanding. It is a balance between teaching the learner and letting the learner take part in active learning.

1.7 The computer-assisted instruction is consistent with the theory of Gagne Wager et al (1981:17-26) in regards to the creation of the program in accordance to the theory of skill development, following the process of learning for learners that includes 9 periods: 1. awareness period; 2. expectations and desire period; 3. remembrance period; 4. reception period; 5. coding period; 6. interaction period; 7. supporting period; 8. instructing period; 9. summary. An important factor is that the process is continuous and enables the student to develop the desired knowledge so that the learner sustains interest and effectively learns something. In addition, this research followed the theory of Jay (Jay, T.B., 1983:22) in presenting the content: 1. Use only one topic at a time; 2. Give the learner sufficient time; 3. Supporting tools should be used when using language; 4. Language should be more tangible; 5. There should be highlighting or emphasis used on important parts. All these factors were put into practice for this research program, making it complete and
interesting to learners. Students thus had a desire to learn, which increased their knowledge about work control, and enabled the established goals in program creation to be met. This is consistent with the framework of Alessi & Trollip (1985:274), who stated the steps of creating a computer-assisted learning program had the following 8 steps: 1. establish only one study objective; 2. collect content resources in regards to development and instruction of learners; 3. think of creative ways and methods of teaching; 4. organize a system of thinking that utilizes order and shows details; 5. print the lessons on paper; 6. write out a plan for the program; 7. write the computer program in the process style; 8. assess the quality and effectiveness of the lessons with considerations about interesting features and effectiveness. Therefore, it may be summarized that the computer-assisted instruction created for this research was interesting and able to meet the goals of teaching established. It is also a collection of thoughts in regards to topics that should be taught and the methods of teaching for the topic of work control.

3. Achievement of Students after Learning the Program

From an analysis of information to find the learning achievements of learners from the program on work control, it was found that the average score after learning was higher than the average score before learning, which was statistically significant at the level of .05 Therefore, after learning with a computer program on work control, the learners received more knowledge, thus increasing their scores after learning with the program. This may be because of the following reasons.

1. The lessons created were done so by following the principles and theories of a system approach. Pairoj Treetanakul (1985: 76) stated that the creation of a computer-assisted instruction is a complete system that needs careful attention to detail and an attitude of system approach. The writer must always remember that the lessons written will be taught without a instructor present and no human interaction for each lesson besides what is being written. The content should be easily read and should go from easy to hard topics, which would create understanding in the students. The system approach is a way of going step-by-step through planning, establishing goals, and deciding what objectives and goals should be made in order to assess and improve on the effectiveness of the program.
Therefore, the program would be complete because of the use of a system approach in its creation.

2. computer-assisted instruction developed can explain to the learner the reasons why the learner answered questions correctly or wrongly. If the learner answers correctly he will be able to advance; when he answers wrongly, he will have to study again. This characteristic is consistent with the law of exercise (Thorndike, R.L., 1969), or letting students repeat or go over a lesson again in order to create a stable foundation of learning. Therefore, whether the learner learns much or little depends on giving the students a chance to practice what he learned. Repetitions will make the learner learn, because each lesson will help him improve and develop knowledge as well as skills until he is sufficient in that topic, which would stay with the person. Training sets into motion a process that results in knowledge important to humans, thus making humans develop their knowledge and making progress in all 5 senses and in skills the more they practice.

3. The computer-assisted instruction on work control is a course that students can learn one level at a time whenever convenient; they have freedom in learning without pressure and thus can learn whenever they want to. This is consistent with the research of McClusky (1970) who stated that all adults have equal ability to learn but that the abilities of some people are superior due to their accumulated experience and knowledge, as well their genetics, and is up to the physical characteristics of each person.

4. The computer-assisted instruction on work control assessed the achievement of students through a pre-test and post-test. These tests were created in parallel, used the objectives established in setting questions, and they all had similar difficulty levels. The results after learning are therefore higher than before learning. Nevertheless, McClusky (1974: 97-98) stated that all adults have equal ability to learn but that the abilities of some people are superior due to their accumulated experience and knowledge, as well their genetics, and is up to the physical characteristics of each person. Also, even though the supervisors had differing age ranges, the computer-assisted instruction on work control consists only of basic principles in work control. All supervisors, therefore, probably already had some knowledge and experience in the issue, thus making it so that after learning from the program the students' understanding was much better, making the post-test score higher.
5. In the sample group, some had differing knowledge and skills in using computer technology, thus making the time used in learning different. The younger people have had more opportunities to study these technologies during school since the technologies became important when they were still studying. This is consistent with the research results that found that people aged more than 41 years had a higher score than those aged 31-40 years but used more time in learning. The older people may have had higher scores because of more experience in work control in their jobs.

6. Some people in the sample group scored low, which may be due to the following reasons, which are consistent with Somkid Isarawatana’s research (2000:107-113) who stated:

- Past experience in adults may be an obstruction or a support to learning. For example, those who have not done academically well in the past may dislike computers and are afraid to learn new things. Past experience therefore influences present learning of adults.

- Attitudes of the student in regards to the following: thinking they already know the issue; thinking it is old and nothing new; thinking it is a waste of time or unnecessary to the job; or thinking that “old dogs can't be taught new tricks” may all be obstacles to learning and make adults uncooperative in testing the computer program.

- Time period, such as an inconvenient time or using too little time

- Interruptions may occur because of many things such as the telephone or other people walking into the room

- Priorities of the people in regard to learning; some may think it has little importance

- Lack of information, such as not studying supplementary information in order to make learning more effective

- Ability to adjust such as when thinking they are doing badly, they might not lack determination to do something further

- Readiness of the location and equipment, such as some of the people not having a computer or not connecting speakers so there is no sound.
4. Average Time Used in Studying

1. Comparison of average time and established time – From an analysis of information to find the time used in learning with the computer in regards to work control of sample group included supervisors in various departments who had never studied work control, who had at least a Bachelor's degree, and had work experience, found that the average time used in studying was 57 minutes, which includes the pre-test and post-test. This figure is less than the established 70 minutes given. Given that all respondents had similar knowledge and 24 people had more than 10 years of work experience (80%), everyone's time was very similar and therefore averaged 57 minutes.

2. It was found that the time used in studying the program varied from person to person; the research results found that older people used more time in learning, but because there were no time pressures, these older people had higher scores because of more experience in work control in their jobs, which is consistent with the theory of McClusky (1974: 97-98) who proposed that adults would learn better if there were no time pressures.

3. For time used in learning, the person who took the least time finished in 45 minutes. This may be because he was a person with much work experience and a high education. There were 8 out of 30 people who used 60 minutes, which may have been due to the fact that they lacked computer skills and therefore made the group slower than all the others. The average mode was at 60 minutes.

4. In designing the post-test, if students begin the post-test immediately after having finished with the program, they will be able to remember the program clearly and ace the test. Therefore, it was arranged so that the student would take the test 1 hour or 1 day after they finished learning, which would create better results. However, the controlled and the experimental groups would have to be large.

Although e-learning has been introduced as a way of learning by oneself and attracting students, making those who would use computer tutorials fewer, but it can be seen that with e-learning it is necessary to study new things, such as the internet. Older people are not very comfortable with using the internet, combined with the fact that learning through the net uses up time and money. Also, there might
be blitzes occurring in the internet, which would make the learner waste time in connecting. Computer learning tutorials is therefore still an option that would help students use them immediately, through the use of interactions. If a mistake is made, the student can go through the chapter once again for a better understanding without any costs.
CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Self-learning is one way of developing oneself in the present time. Self-learning includes many formats, such as using complete lessons, e-learning, Web Based Learning, using Computer-Assisted Instruction (CAI). Constructing a self-directed tutorial will help teach individuals who would like to learn for themselves or go through distance study.

The research "The Development of a Self-Directed Learning Package based on Computer-Assisted Instruction in the Subject of Basic Work Control for supervisor", had an objective in creating a Self-directed learning package on work control for supervisors. Questions that needed answering in the research included: Do the Computer-assisted instruction have the standard 90 / 90 features established? Will the computer lessons be effective enough to make post-test scores higher than pre-test scores? What is the average time used in learning this way? The sample group included supervisors in various departments who had never studied work control, who had at least a Bachelor's degree, who had proficiency in using a computer with at least a Windows 95 operating system, and who were voluntarily participating in the usage of a Computer-assisted instruction package. The researcher selected the group by choosing 30 supervisors and those who were volunteered their cooperation in using the computer program. The tools used were the computer learning program on work control, a pre-test and post-test (2 tests), and an assessment of the time used in studying the Computer-assisted Directed package (1 test).

1. Conclusions

1.1 The steps in the creation of a Computer-assisted instruction lesson in this research, the implementation process were 11 steps, as follows:

1) Study documents and related research
2) Establish a goal for learning lesson
3) Analyze the learners
4) Analyze the content and divided the content into subunit
5) Set behavioral objectives
6) Design and produce the learning lesson program
7) Construct Computer-assisted instruction
8) Write the computer program
9) Try out Computer-assisted instruction
10) Introduce to use
11) Evaluate and Improve

1.2 The Computer-assisted instruction on work control had step of construction 11 steps, and it was an effectiveness equal to 95.833 / 95.833. The average score for the sample group for the test was 95.833% and for each question, 95.833% answered correctly. In finding the quality of the Computer-assisted program, it was found that the program had effectiveness equaling to 95.833 / 95.833, which is a value higher than the standard of 90 / 90.

1.3 It was found that the post-test score increased in a statistically significant way at the level .05, meaning that learners had increased knowledge on work control.

1.4 The average time used in the computer learning program on basic work control for supervisors was 57 minutes.

2. Research Benefits

2.1 The steps in the creation of a Computer-assisted instruction lesson in this research, the implementation process were 11 steps, as follows:

1) Study documents and related research
2) Establish a goal for learning lesson
3) Analyze the learners
4) Analyze the content and divided the content into subunit
5) Set behavioral objectives
6) Design and produce the learning lesson program
7) Construct Computer-assisted instruction
8) Write the computer program
9) Try out Computer-assisted instruction
10) Introduce to use
11) Evaluate and Improve

2.2 Computer-assisted instructions that are interesting should have a varied presentation format, such as a fade background color, large text size, sounds, and lecturing in an appropriate proportion.

2.3 The Computer-assisted instruction for this study featured branching programming, or a type of program where the learner does not have to learn all framework topics in order, since the frame orders are not fixed. The learner is able to jump from one frame to another if the learner answers questions correctly; the learner is also able to return to previous lessons, which can be considered reviews for the learner. This type of program was considered very appropriate for the topic of work content.

3. Recommendations

3.1 Recommendations for creators of computer learning programs
3.1.1 The creator should make sure the amount of content to be presented is not too much
3.1.2 The language used should be appropriate for the level of knowledge and experience of the learners
3.1.3 Each framework for content should not contain too much text; also, the text and pictures should be clearly seen
3.1.4 The pictures used must convey the meaning correctly, clearly, and accurately according to the lesson's objectives
3.1.5 If the creator is experienced in the content of presentation and in creation techniques, this would make the created program become a high quality and complete design. If the creator has experience in only one particular area, he must elicit the help of those experts around him who can help with the other areas.
3.2 Recommendations for further research

3.2.1 A Self-directed learning package based on Computer-assisted instruction on work control should be created using Flash and Dream Weaver.

3.2.2 A Self-directed learning package based on Computer-assisted instruction on work control should be created using other techniques such as Web Based Learning.

3.2.3 A Self-directed learning package based on Computer-assisted instruction on work control should be created by integrating various formats such as the computer and tapes, documents, or videotapes.

3.2.4 For answering the research question, most of them, the researcher was interested only in the effectiveness of time, therefore it should study on the use method that was appropriate for the target group or not, and how to use the method appropriately.

3.3 Suggestions for Using the Program Authorware in Creating Computer Tutorials

There are many programs to choose in order to create CAI, such as Macromedia Director Asymetrix Toolbook. However, one important reason for using Macromedia Authorware is because it can be used for learning and creating CAI in a relatively short time, because the creation process of Authorware is similar to creating a flow chart, enabling communication with the learner easier than other programs. Authorware has the following pros and cons.

Pros

1. Able to create levels in learning through systematic steps for the reception of both still and motion pictures.

2. Creating lessons are done easily; the developer needs no programming knowledge.

3. Creating effects in Authorware can be set by the program itself; there is no need to create them by oneself like in Macromedia Flash.

Cons

1. Authorware is characteristic of stand-alone studying, making it necessary to use CD-Roms in the distribution of information.
Therefore it can be summarized that CAI is a medium of learning that helps teachers teach. The content of the program would be sub-topics of those topics, and the learners would be able to use it for their own revision and self-study.

3.4 Research Limitations

For this research, since Authorware was used, the learner must go through the entire program until the end before being able to get out of the tutorial.

For this research, Authorware was used because of its simple interface. There was a script for various components, be it the motion pictures, so that it would be more convenient to improve or correct later on in order to make the tutorial truly complete and effective.
BIBLIOGRAPHY


กรองกฤษณ์ อยู่'label'. (2536). ชุดการเรียนการสอน. เขียนใหม่ : ภาควิชาเทคโนโลยีทางการศึกษา คณะศึกษาศาสตร์ มหาวิทยาลัยเทคโนโลยี)


ศรีชัย มาลัยวงศ์. (2532). คอมพิวเตอร์กับการศึกษา. คอมพิวเตอร์แมกซ์ไชน์, 1 (4) : 69.

จาตุรนท ฉลาด. (2543). การสร้างชุดการเรียนรู้ด้วยตนเองโดยใช้คอมพิวเตอร์ช่วยสอนเรื่อง หลักฐานการพัฒนาวิทยากร. วิทยานิพนธ์ปริญญาศึกษาศาสตร์มหาวิทยาลัย, สำนักการศึกษาฝ่ายใหม่และการศึกษาต่อเนื่อง บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล.
Ornuma Thongbuntow

Bibliography / 96

(2541) การพัฒนาบทเรียนคอมพิวเตอร์ข้ามสอน เรื่อง วัฒนธรรมศิลปะยุคดิจิทัล สำนักพิมพ์มหาวิทยาลัยธรรมศาสตร์. มหาวิทยาลัยธรรมศาสตร์.

(2536). ประมวลสาระสำคัญวิชาเทคโนโลยีและสื่อสารการศึกษากับการพัฒนาทรัพยากรมนุษย์. นนาทวี : โรงพิมพ์มหาวิทยาลัยศรีอุทิศธรรมราช.

(2534). ระบบสื่อการสอน. กรุงเทพมหานคร : โรงพิมพ์จุฬาลงกรณ์การเกษตรแห่งประเทศไทย.

ชัย อุปภาค. (2521). สร้างแบบโปรแกรมกับภาษาไทยกิจสิทธิ์. วารสารการศึกษา, 14 (11), 72.

(2536). ภาษาไทยคัมภีร์คู่มือสรุปเกี่ยวกับภาษาไทยของผู้เรียนระดับปริญญาตรี. มหาวิทยาลัยกิจสิทธิ์.

(2536). ภาษาไทยคู่มือสรุปเกี่ยวกับภาษาไทยของผู้เรียนระดับปริญญาตรี. มหาวิทยาลัยกิจสิทธิ์.

กนกชัย สมนึก. (2529). คอมพิวเตอร์ข้ามสอน. คอมพิวเตอร์วิทยา, กันยายน 3.

กุฎิชัย ปุณณโชค. (2535). "วิธีการสร้างและวางเนื้อหาหนังสือการเรียนการสอน" สำนักพิมพ์สัมฤทธิ์. หน้า 151.

กุฎิชัย ปุณณโชค. (2536). ระบบสื่อการสอนด้านวิชาการบริหาร. หน้า 15.

(2529). ภาษาไทยกิจสิทธิ์. มหาวิทยาลัยกิจสิทธิ์.

(2537). ภาษาไทยกิจสิทธิ์. มหาวิทยาลัยกิจสิทธิ์.

(2536). ประมวลสาระสำคัญวิชาการจัดระบบทางการศึกษา. นนาทวี : โรงพิมพ์มหาวิทยาลัยกิจสิทธิ์.

(2528). การวิจัยเพื่อพัฒนาด้านการเรียนคอมพิวเตอร์ด้วยเครื่องมือสร้างองค์ความรู้. สำนักงานคณะกรรมการวิจัยแห่งชาติ.


(2543). การบริหารการผลิตและการปฏิบัติการ. ฉบับมาตรฐาน. กรุงเทพมหานคร : ค้งงามสมัย.

(2537). การบริหารการผลิต. กรุงเทพมหานคร : ไอเดียนสาร.
ปรีชา ศรีวัลลย์. (2536). กลยุทธ์ในการเตรียมพยาบาลศาสตร์. ส้านักพิมพ์โชติยืนสวัสดิ์.
ปรีชา ศรีมา. (2519). การศึกษาเพื่อขับเคลื่อนโปรแกรม. กรุงเทพผ่านการศึกษ. มหวิทยาลัย
ศรีนครินทร์วิโรฒ.
ผลจิต อาevityชณี. (2537). ไมโครคอมพิวเตอร์เพื่อด้านศึกษา. กรุงเทพผ่านการศึกษ. โรงเรียน
ศูนย์ส่งเสริมการเกษตร.
สิน ภูริธรรม. (2531). “การใช้คอมพิวเตอร์ช่วยสอนในการเรียนการสอน” วารสารจับสมทบท.
189 (มีนาคม—เมษายน 2539) : 126.
ยุทธชัย ไวรารักษ์. (2541). ขั้นตอนการผลิตและระบบการผลิตในงานอุตสาหกรรม.
กรุงเทพผ่านการศึกษา : ศูนย์ส่งเสริมการเกษตร.
วิจิต ศรีสะอาด. (2520). “เทคนิคการการการศึกษา”ในการพิจารณาส่วนนวัตกรรมและ
เทคโนโลยีการปรับปรุงสู่การประยุกต์การศึกษา. รายงานสัมมนา กรมวิชาการ
การตรวจสิทธิบัตร. หน้า 150.
วิชัย ศศิริโชติศัย. (2540). นักวิจารณ์การผลิตยุค 2000. กรุงเทพผ่านการศึกษา : สมาคมส่งเสริม
เทคโนโลยีไทย (ไทย-ญี่ปุ่น).
วันปี ทรงประทุม. (2535). การวางแผนและควบคุมงาน. สำนักพิมพ์ : สถาบันบัณฑิต
พัฒนาวิชาการ.
วันปี สงครามศรีศรี. (2531). การวิจารณ์บรรณานุเคราะห์. สำนักพิมพ์พัฒนาชีวิต จังกัด.
วันปี สงครามศรี. (2533). องค์การและองค์การจัดตั้งองค์การ. กรุงเทพผ่านการศึกษา : ระเบียบทองการพิมพ์.
พิมพ์เรื่องที่ 7 : กรุงเทพผ่านการศึกษา : สมาคมส่งเสริมเทคโนโลยีไทย (ไทย-ญี่ปุ่น).
ศรีทวี พงศ์ศรีผิน. (2540). องค์การและองค์การจัดตั้งองค์การ. กรุงเทพผ่านการศึกษ.
มหวิทยาลัย
ศรีศรี
สิ่งหาน เชิงศิริ. (2530). ระบบควบคุมการบริหารงานแบบญี่ปุ่น. กรุงเทพผ่านการศึกษ.
สถาบัน
บัณฑิตพัฒนาวิชาการ.
สุนันทา ปิยมงคล. (2518). ชุดการสอน. เอกสารทางวิชาการ. การประชุมปฏิบัติการจัดทำชุด
การสอนภาษาไทย ชั้น ม.ศ.1.
สุพจน์ จันทร์แสง. (2537). ผลัพธ์ที่ดีจากการเรียนวิชาคอมพิวเตอร์เพื่อการปฏิบัติใน
คอมพิวเตอร์ช่วยสอนโดยวิธีเรียนแบบ 2 แบบ. วิทยานิพนธ์เรื่องฐานทางบัณฑิต มหวิทยาลัย
ศรีนครินทร์วิโรฒ ประสานมิตร.

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สมศักดิ์ อินทร์สวัสดิ์. (2543). ด้านแรกสู่การเป็นวิทยากร. กรุงเทพมหานคร: ส้านักศึกษาพิพิธภัณฑ์.
สมาคม อัครพันธ์. หัวหน้าสูรย์บริหารระบบคุณภาพ. 2545 (10 กันยายน). การสืบคำ.
สานักงานคณะกรรมการพัฒนาเศรษฐกิจและสังคมแห่งชาติ สานักงานธุรวิทยา. (วางแผนพัฒนา
เศรษฐกิจและสังคมแห่งชาติ ฉบับที่ 9 พ.ศ. 2545-2548).
อุทัย ชัยสุทธิเลิศ. (2531). พลศการบริหารงานบุคคล. กรุงเทพมหานคร: โรงพิมพ์และห้าปกครอง.
อุทัย รามนำน. (2530). รายงานการวิจัยผลกระทบของคอมพิวเตอร์เพื่อการศึกษาต่อสถาบัน
การศึกษาในประเทศไทย. กรุงเทพมหานคร: คณะครุศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย.
เอกชัย ฤทธิเดช. (2543). การสร้างบทเรียนคอมพิวเตอร์ช่วยสอน เรื่อง ความหลากหลาย
สีสัน การสร้างบทเรียนนักเรียนพิเศษที่กังคก薄弱. วิทยาลัยพลเอกวิชญาศึกษาศาสตร์
มหาบัณฑิต, สำนักงานเลขาธิการ มหาวิทยาลัยพิทยาลัย.
อรณรัช ธรรมยุทธ์และฮีโร. มีนบุรี (2530). การบริหารการผลิต. กรุงเทพมหานคร:
มหาวิทยาลัยรามคำแหง.
อรพิน ประสิทธิ์เรือง. (2530). คอมพิวเตอร์เพื่อการเรียนการสอน. กรุงเทพมหานคร:
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APPENDIX A
PRE-TEST SCORES
POST-TEST SCORES
LEARNING PROGRESS
ตารางแสดงคะแนนความถ้วนหน้าทางการเรียนของกลุ่มตัวอย่างในการทดลองภาคสนาม

<table>
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<th>หลังการเรียน (เฉลี่ย 20)</th>
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\[
t = \frac{\Sigma D}{\sqrt{N \Sigma D^2 - (\Sigma D)^2}}
\]

\[
t = \frac{30 \times 865 - 16,641}{\sqrt{29}}
\]

\[
t = \frac{25,950 - 16,641}{\sqrt{29}}
\]

\[
t = \frac{129}{\sqrt{1321}}
\]

\[
t = \frac{129}{17.92}
\]

\[
t = 7.198
\]
APPENDIX B

VARIANCE OF LEARNING ACHIVEMENT TEST
ตารางแสดงผลการทั้งหมดทดสอบผ่านการเรียน (ข้อมูลเป็นรายข้อ) ของกลุ่มตัวอย่างจำนวน 30 คน

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สูตร \( \bar{X} = \frac{\sum X}{N} \)

\( \bar{X} = \frac{446}{30} \)

\( \bar{X} = 14.86 \)

การหาความแปรปรวน

สูตร \( S^2 = \frac{n \sum X^2 - (\sum X)^2}{n(n-1)} \)

\( S^2 = \frac{30 \times 7,225 - 446^2}{30(30-1)} \)

\( S^2 = \frac{216,750 - 198,916}{870} \)

\( S^2 = \frac{17,834}{870} \)

\( = 20.49 \)
APPENDIX C
DIFFICULTY VALUE DISCRIMINATION POWER
RELIABILITY
ตารางแสดงค่าความยากง่ายและค่าอ่านผิดหมบSnippet of the text
การหาค่าความเชื่อถือได้ของแบบทดสอบ

สูตร Kuder & Richardson, (KR-21)

$$r_n = \left( \frac{n}{n-1} \right) \left( 1 - \frac{\overline{X}(n - \overline{X})}{nS^2} \right)$$

$$r_n = \left( \frac{30}{29} \right) \left( 1 - \frac{14.86(30-14.86)}{30*20.4} \right)$$

$$r_n = (1.03) \left( 1 - \frac{224.98}{612.00} \right)$$

$$r_n = (1.03) \left( \frac{387.02}{612.00} \right)$$

$$r_n = 0.651$$
APPENDIX D
PRETEST-POSTTEST QUESTIONNAIRES
แบบทดสอบก่อนการเรียน

1. ข้อใดคือการควบคุมงาน
   ก. การเปรียบเทียบระหว่างผลการปฏิบัติงานที่สามารถวัดได้และมาตรฐานที่กำหนด
   ข. การควบคุมหรือกำหนดให้งานเป็นไปตามแผนที่กำหนด
   ค. การดูแลตรวจสอบขั้นตอนต่างๆ ในการทำงาน
   ง. การกำหนดคุณภาพของการงานให้มีประสิทธิภาพ

2. ข้อใดคือวัตถุประสงค์ของการควบคุมงาน
   ก. เพื่อวัดงานต่างๆ ที่ปฏิบัติต่ำงเป็นไปตามที่กำหนดหรือไม่
   ข. เพื่อเป็นการแสดงระดับความพึงพอใจในผลงานที่ได้ร่วมทั้งการพิจารณา
      ในด้านความรวดเร็ว ลูกค้า นิยมประสิทธิภาพ และประหยัด
   ค. เพื่อชี้แจงรายละเอียดเกี่ยวกับขั้นตอนการทำงาน
   ง. เพื่อควบคุมให้งานมีประสิทธิภาพสูงสุด

3. การควบคุมงานมีความสำคัญอย่างไร
   ก. ปรับทักษะด้านการทำงานในแนวทางเดียวกัน
   ข. ออกแบบให้ทราบถึงปัญหาที่อาจเกิดขึ้น
   ค. เร่งรัดการทำงาน
   ง. ประเมินผลการทำงานที่ปฏิบัติต่ำงเป็นไปตามแผนที่กำหนด

4. เมื่อตรวจสอบการทำงานในรอบ 1 เดือน ของพนักงานในแผนก จำนวน 30 คน พว่ำ
   ในรอบ 1 เดือนที่ผ่านมา มีพนักงาน 5 คน ขาดงานเป็นประจำ มาตรฐานเป็นประจำ
   จำนวน 7 คน ทำให้งานในแผนกนั้นไม่เสร็จตามกำหนดเวลา ทั้งนี้ควรจะควบคุม
   ลูกจ้างในลักษณะใด
   ก. การควบคุมผลงาน
   ข. การควบคุมเวลา
   ค. การควบคุมการทำงาน
   ง. การควบคุมพฤติกรรม
5. ในการผลิตหนังสือไปให้ กำหนดสิ้นจ้างในวันที่ 31 พ.ค. วันที่ 29 พ.ค. ท่านพักผู้ฯ งานสิ้นเสร็จสิ้นจะถึง 70 จาก ข้อมูลดังกล่าวข้างต้นเป็นการควบคุมประการใด
ก. การควบคุมผลงาน
ข. การควบคุมเวลา
ค. การควบคุมค่าใช้จ่าย
ง. การควบคุมพฤติกรรม

6. เครื่องจักรผลิตกระดาษ Double A มีกิจกรรมมาตรฐานกำหนดไว้ใน 1 วัน พักงานจะต้องผลิตกระดาษ A4 ขนาด 100, 80,70และ 60 เก้า โดยเฉลี่ยเท่ากันให้ได้ 4,000 รีมต่อครึ่ง จากการตรวจสอบพบว่า มีเครื่องข้ามเล็กและเกิดข้อผิดพลาดระหว่างทำให้สามารถผลิตกระดาษได้เพียง 3,800 รีม เมื่อเปรียบเทียบกับเกณฑ์มาตรฐานจึงไม่เป็นไปตามเป้าหมายที่กำหนดการควบคุมประการนี้เป็นการควบคุมประการใด
ก. การควบคุมผลงาน
ข. การควบคุมค่าใช้จ่าย
ค. การควบคุมเวลา
ง. การควบคุมพฤติกรรม

7. บริษัท K&S ได้ตั้งเป้าใช้จ่ายในการพัฒนาบุคลากรย่อยละ 5 ของงบประมาณการลงทุน หลังจากจบโครงการที่ 2 พบว่า ผลผลิตของบริษัทไม่เป็นไปตามที่กำหนด ทำให้ผู้บริหารเห็นว่าบริษัทจำเป็นต้องลดค่าใช้จ่ายในแต่ละหมวดหลัก 10% โดยมีข้อจะว่าพละงานนี้จะต้องทำเพิ่มการควบคุมดังกล่าวเป็นการควบคุมงานประการใด
ก. การควบคุมผลงาน
ข. การควบคุมค่าใช้จ่าย
ค. การควบคุมเวลา
ง. การควบคุมพฤติกรรม

8. สิ่งที่จะช่วยให้การควบคุมงานเป็นไปตามพิสฐานเดิมกัน ทัวร์บินงานเจ้าเป็นต้องทำอย่างไร
ก. กำหนดมาตรฐานในการทำงานที่ได้รับการยอมรับ
ข. กำหนดเครื่องมือในการปรับปรุงงาน
ค. ได้รับค่าแนะน้าจากผู้เชี่ยวชาญ
ง. ได้รับความพึงพอใจจากผู้บริหาร
9. บริษัทแห่งหนึ่งคาดว่าพนักงานจะหาสูญภาษีในเดือนที่ wrong ให้ได้ 400 ราย แต่ผลที่เกิดขึ้นจริงนั้น พนักงานจะหาสูญภาษีได้ 170 ราย ไม่ตรงกับข้อมูลที่กำหนดไว้เป็นที่ผนวกในงานความดีในการอย่างไรจึงจะดีที่สุด
ก. การกำหนดมาตรฐานในการปฏิบัติงาน
ข. การปรับปรุงเพื่อบรรจุงานที่เกิดขึ้นจริงกับมาตรฐานที่กำหนด
ค. การตรวจสอบผลการปฏิบัติงานจริงเพื่อไม่ให้เกิดข้อผิดพลาด
ง. การดำเนินการปรับปรุงแก้ไขวิเคราะห์สาเหตุและทำการควบคุมงานให้ได้ผลงานตามที่กำหนด

10. ในกระบวนการผลิตขึ้นส่วนประกอบต่างๆของบริษัทแห่งหนึ่ง สามารถประกอบต่างๆของระบบจัดการต่อไปได้ตามคลังความรู้ที่กำหนดไว้ มีความสัมพันธ์กับบริการควบคุมงานในข้อใด
ก. การกำหนดมาตรฐานในการปฏิบัติงาน
ข. การปรับปรุงเพื่อบรรจุงานที่เกิดขึ้นจริงกับมาตรฐาน
ค. การวัดผลจากการปฏิบัติจริง
ง. การดำเนินการปรับปรุงแก้ไข

11. ให้เรียงลำดับวิเคราะห์ความคุมงานที่ถูกต้องและเหมาะสม
ก. มีการกำหนดมาตรฐาน → วัดจากผลการปฏิบัติ → ปรับปรุงเพื่อบรรจุงานที่เกิดขึ้นจริงกับมาตรฐาน → ดำเนินการปรับปรุงแก้ไข
ข. ศึกษาวิเคราะห์บริการปรับปรุงงาน → กำหนดแนวทางการปรับปรุงงาน → ดำเนินการปรับปรุงแก้ไข → ประเมินผล
ค. กำหนดมาตรฐาน → กำหนดแนวทางการปรับปรุงงาน → ปรับปรุงงาน → เปรียบเทียบผลการปฏิบัติงาน
ง. กำหนดแนวทางการปรับปรุงงาน → ปรับปรุงงาน → เปรียบเทียบผล → กำหนดมาตรฐาน
12. ข้อใดคือการกำหนดมาตรฐานในการควบคุมงาน
   ก. ให้ผู้ช่วยราชการกำหนด → ตรวจสอบการยอมรับจากผู้ปฏิบัติ → ปรับปรุงแก้ไข → กำหนดมาตรฐาน
   ข. ศึกษาแนวทางการปฏิบัติจากผู้มีการดำเนินงาน → ตรวจสอบความทันสมัย ό กำหนดมาตรฐาน
   ค. ให้ทุกคนเข้ากับคิดวิธีการที่ดีที่สุด จัดทำเป็นคู่มือ → ให้ผู้ช่วยราชการตรวจสอบที่มา ปรับปรุงแก้ไข กำหนดมาตรฐาน
   ง. กำหนดแนวทางการทำงานที่ถูกเป็นไปได้ ให้ผู้ช่วยราชการตรวจสอบ กำหนดมาตรฐาน

13. หลังจากที่ทราบว่าควบคุมงานที่สูญที่สุดอยู่ปฏิบัติแล้ว พบว่า ผลผลิตไม่เป็นไปตามเป้าหมาย ที่กำหนด ทำการดำเนินการทำอย่างไร
   ก. สอบงาน
   ข. ให้ค่าปรับ
   ค. สับเปลี่ยนงาน
   ง. ไหลออก

14. การควบคุมงานจะได้ผลก็ต่อเมื่อใด
   ก. ผู้ปฏิบัติงานเข้าใจตามวัตถุประสงค์ของการควบคุมงาน
   ข. ผู้ควบคุมงานมีความเข้าใจในตัวผู้ปฏิบัติงาน
   ค. ผู้ควบคุมงานมีความเหมาะสมมือตะขอผู้วินิจฉัย ทั้งหมดวิษнуและข้อขัดข้อง
   ง. มีการสร้างวัตถุประสงค์การควบคุมงาน

15. เหตุผลใดซึ่งสำคัญที่สุดที่ทำให้ผู้ปฏิบัติงานไม่ให้ความร่วมมือในการควบคุมงาน
   ก. วิธีการในการปฏิบัติงานไม่สามารถปราณและเปลี่ยนแปลงให้เหมาะสมกับสภาพแวดล้อมของงานที่ทำ
   ข. ผู้ปฏิบัติงานก็ไม่เข้าใจเกี่ยวกับเรื่องและไม่เป็นอยู่หรือในการปฏิบัติงาน
   ค. งานที่ปฏิบัติไม่ตรงกับความรู้ความสามารถของผู้ปฏิบัติงาน
   ง. การกำหนดระเบียบวิธีการควบคุมอย่างจริงจังครั้ง
16. ในการเดินนั้นเกี่ยวกับในความคุ้มค่าและประสบการณ์ที่สิ้นที่ใด
 ก. ความพร้อมในการดำเนินงาน
 ข. ลักษณะของงาน
 ค. ขั้นตอนและขั้นตอนของการดำเนินงาน
ง. มาตรฐานในการปฏิบัติงาน

17. เพื่อให้การควบคุมงานมีประสิทธิภาพชัดเจน หัวหน้าควรจะทำการอย่างไร
 ก. สร้างทักษะที่ดีของลูกน้องต่อการควบคุมงาน
 ข. เปิดโอกาสให้ผู้ปฏิบัติงานมีอิสระในการทำงาน
 ค. มีการติดตามงานอย่างกระชับ
ง. มีการลดการควบคุมให้เหมาะสมกับวิธีการต่างๆ

18. ข้อใดเป็นสิ่งสำคัญที่สุดที่จะช่วยให้การควบคุมงานประสบผลสำเร็จ
 ก. มีเทคนิคในธุรการข้อมูลข่าวสาร และการติดต่อดอกสารที่สะดวก รวดเร็ว
 ข. มีระบบการควบคุมที่ถูกต้อง เหมาะสมกับวิธีการและประกาศอัตรา พร้อมที่จะนำ
ไปใช้ได้แม้การเปลี่ยนแปลงแผนงาน หรือสถานการณ์เปลี่ยนไป
 ค. การให้รางวัลตอบแทนแก่ผู้ปฏิบัติงานได้ตรงตามเป้าหมาย
ง. หัวหน้ามีการสอนงานลูกน้องเพื่อโอกาสในความก้าวหน้า

19. การควบคุมงานที่หัวหน้าควรดำเนินการ
 ก. ควบคุมในขั้นเริ่มต้น
 ข. ควบคุมเฉพาะจุดสำคัญ
 ค. ควบคุมในขั้นสร้างตาย
 ง. ควบคุมทุกขั้นในเวลาเดียวกัน

20. สิ่งที่ควรหลักเลยเมื่อทำการควบคุมงาน
 ก. การให้รางวัลตอบแทน
 ข. การให้ข้อแนะนำแก่ผู้ปฏิบัติงาน
 ค. การทำให้ผู้ปฏิบัติเกิดความเครียด
 ง. ลูกทุ่งข้อ
#### เฉลยแบบทดสอบก่อนการเรียน

<table>
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แบบทดสอบหลักการเรียน

1. ข้อใดเป็นความหมายของการควบคุมงานได้ถูกต้องมากที่สุด
   ก. การบุคคลปฏิบัติงานให้เป็นไปตามกระบวนการที่กำหนดไว้
   ข. การสร้างข้อกำหนดต่าง ๆ อย่างมีหลักเกณฑ์
   ค. ข้อบังคับในการปฏิบัติงานในที่ทำการเดียวกัน
   ง. กฎหมาย ข้อบังคับให้เป็นการจัดการอุตสาหกรรม

2. การควบคุมงานมีวัตถุประสงค์เพื่ออะไร
   ก. เพื่อจัดระเบียบการทำงาน
   ข. เพื่อให้งานมีมาตรฐานตรงตามที่กำหนด
   ค. เพื่อกระตุ้นการทำงานให้รวดเร็ว
   ง. เพื่อสร้างความพร้อมในการทำงาน

3. ความสำคัญของการควบคุมงานสำหรับหัวหน้าหน่วยงานคืออะไร
   ก. การกำหนดคุณภาพของงาน
   ข. การมอบหมายและกระจายงานให้ถูกต้องอย่างทั่วถึง
   ค. รายงานแบบแผนการทำงานในแนวทางเดียวกัน
   ง. เป็นการประเมินผลการทำงานที่ล่วงมา

4. นายหนึ่ง (พนักงานชั้นเป้า) ได้รับมอบหมายจากหัวหน้าให้ช่วยรอบหน่วยงานไปสู่งานต่างสาขาในครั้งนี้ที่บังคับ ถือเกี่ยวกับนายหนึ่ง นายหนึ่งกับหน้าที่พนักงานเกี่ยวข้องช่วงเวลาที่มีขั้นตอนที่ผิดเกี่ยวกับการที่นายหนึ่งเรื่องอะไรจึงจะทำให้งานไม่เกินกว่าและไม่เกิดความเห็น
   ก. การควบคุมเวลา
   ข. การควบคุมเวลาชั่วคราว
   ค. การควบคุมพุทธิกรรม
   ง. การควบคุมผลงาน
5. บริษัทผลิตหลอดไฟแห่งนี้มีพนักงานทั้งหมด 70 คน ได้รับใบเบี้ยลูกจ้างประจำ 200,000 ชุด อยู่ในเวลา 20 วัน เมื่อตรวจสอบพบว่าพนักงานสามารถที่จะผลิตหลอดไฟได้เพียง 1,000 ชุด/วัน ทำให้ผลผลิตที่ได้ไม่เป็นไปตามจำนวนที่กำหนด ทำหน้าที่สื่อสารกับพนักงานและดันให้ระบบการทำงานให้เร็วขึ้นเพื่อผลผลิตการที่งานให้เนื้อเนื้อโดยกำหนดให้พนักงานแต่ละคนกระดับมีการทำางานออกเวลากิจกรรมตามผลผลิตต่อวันเพิ่มขึ้นเป็นจำนวน 3,000 ชุด/วัน การควบคุมงานประเภทนี้ของหัวหน้าเป็นการควบคุมงานประเภทใดเพื่อให้งานเสร็จตามกำหนด

g. การควบคุมผลงาน
h. การควบคุมเวลา
c. การควบคุมค่าใช้จ่าย
d. การควบคุมพฤติกรรม

6. โรงงานผลิตหลอดไฟได้กำหนดแผนพื้นฐานไว้ใน 1 วัน จะต้องสามารถผลิตหลอดไฟในชุดสะท้อนให้ได้เป็นจำนวน 100 ชุด เมื่อตรวจสอบพบว่าพนักงานผลิตได้เพียง 80 ชุด เมื่อส่งพนักงานเป็นหน้าก็ไม่ จึงทำให้มีข้อผิดพลาดเกิดขึ้น ดังนั้นหัวหน้าจึงต้องดำเนินการแก้ไขอย่างรวดเร็วเพื่อให้สามารถผลิต ชุดสะท้อนได้ตรงตามจำนวนที่กำหนด การควบคุมประเภทนี้เป็นการควบคุมประเภทใด

g. การควบคุมค่าใช้จ่าย
h. การควบคุมงาน
c. การควบคุมเวลา
d. การควบคุมพฤติกรรม

7. ในการปราบพนักงานไปพักค่อนประจีปัน 6 ชั่วโมง บริษัทจะต้องช่วยจ่ายรับประจำสัปดาห์มี 15 คน ได้รับค่าจ้าง 30,000 บาท ต่อคน ต่อ 2 วัน แต่ถ้าหากช่วยจ่ายนี้จะเสียค่าใช้จ่ายจำนวน 10,000 บาท ต่อคน ต่อ 2 วัน (5,000 บาท ต่อวัน) โดยบริษัทสามารถจะประทัดจ่าย ได้ถึง 300,000 บาท การควบคุมประเภทนี้เป็นการควบคุมประเภทใด

g. การควบคุมผลงาน
h. การควบคุมเวลา
c. การควบคุมค่าใช้จ่าย
d. การควบคุมพฤติกรรม
8. เพื่อให้การควบคุมงานเป็นไปตามที่กำหนดในแผนงาน ผู้ที่ช่วยตรวจดูการดำเนินการอย่างไร

ก. กำหนดมาตรฐานในการทำงานที่ได้รับการยอมรับ

ข. กำหนดเครื่องมือในการบริหารงาน

ค. ได้รับคำแนะนำจากผู้เชี่ยวชาญ

ง. ได้รับความเห็นชอบจากผู้บริหาร

9. จากการคิดค่าผลการดำเนินงานของงานแห่งหนึ่ง พบว่า งานมีอุปสรรคที่เกิดขึ้น adel เต็อนและ 2 ครั้ง แต่ปรากฏว่าในเดือนที่ผ่านมาได้เกิดอุปสรรค 6 ครั้ง นับรวมเพิ่มขึ้น 3 ท่าดี เมื่อทำการวิเคราะห์บุคลากรผู้ได้รับอุปสรรคพบว่าเป็นหน่วยงานที่พึงปรารถนา และยังไม่เคยต่าง การอบรมเชิงความปลอดภัย กรณีที่กล่าวว่าที่หวังนี้ควรดำเนินการอย่างไร

ก. การกำหนดมาตรฐานในการปฏิบัติงาน

ข. การปรับเปลี่ยนแผนงานที่เกิดขึ้นจริงกับมาตรฐาน

ค. การตรวจสอบผลการปฏิบัติงานจริงที่ไม่ให้เกิดข้อผิดพลาด

ง. การดำเนินการปรับปรุงแก้ไขและแพร่กระจายวิธีให้เกิดข้อผิดพลาด

10. จากการวางแผนของบริษัทขุดเสาธ์กรรมแห่งหนึ่ง บริษัทคาดว่ายอดขายในเดือนหน้าจะมี 15,000,00 บาท แต่ยอดขายจริงเก็บสูงสุดที่ 10,000,000 บาท ความเปลี่ยนแปลงหรือผลลัพธ์ของยอดขายทั้งหมดมี 5,000,000 บาท จากการวิเคราะห์สาเหตุพบว่า บริษัทได้เปลี่ยนมีการทุ่มทุนในการโฆษณาอย่างมากเพื่อให้มียอดขายสูงขึ้น จึงขออนุญาตให้เป็นวิธีใดใน

ก. การกำหนดมาตรฐานในการปฏิบัติงาน

ข. การปรับปรุงแผนงานที่เกิดขึ้นจริงกับมาตรฐานที่กำหนด

ค. การตรวจสอบผลการปฏิบัติงานจริงที่ไม่ให้เกิดข้อผิดพลาด

ง. การดำเนินการปรับปรุงแก้ไขไม่ให้เกิดข้อผิดพลาด

•
11. หัวหน้างานตรวจสอบข้อใดเป็นแนวทางในการปรับปรุงงาน
   ก. ศึกษาวิธีการปรับปรุงงาน → กำหนดแนวทางการปรับปรุงงาน → ดำเนินการปรับปรุงแก้ไข → ประเมินผล
   ข. มีการกำหนดมาตรฐาน → วัดจากอุปกรณ์ → เปรียบเทียบผลงานที่เกิดขึ้นจริงกับมาตรฐาน → ดำเนินการปรับปรุงแก้ไข
   ค. กำหนดแนวทางการปรับปรุงงาน → ปรับปรุงงาน → เปรียบเทียบผล → กำหนดมาตรฐาน
   ง. กำหนดมาตรฐาน → กำหนดแนวทางการปรับปรุงงาน → ปรับปรุงงาน → เปรียบเทียบผลการปฏิบัติงาน

12. วิธีกำหนดมาตรฐานในการควบคุมงานคือข้อใด
   ก. ศึกษาแนวทางการปฏิบัติจากผู้มีการดำเนินงาน → ตรวจสอบความทันสมัย → กำหนดมาตรฐาน
   ข. ให้ผู้เชี่ยวชาญกำหนด → ตรวจสอบกรอบวันจากผู้ปฏิบัติ → ปรับปรุงแก้ไข → กำหนดมาตรฐาน
   ค. กำหนดแนวทางการทำงานที่อาจเป็นไปได้ → ให้ผู้เชี่ยวชาญตรวจสอบ → กำหนดมาตรฐาน
   ง. ให้ทุกคนร่วมกันคิดวิธีการที่ดีที่สุดจัดทำเป็นผู้มี → ให้ผู้เชี่ยวชาญตรวจสอบ → ปรับปรุงแก้ไข → กำหนดมาตรฐาน

13. จากการควบคุมงานพบว่า งานที่ถูกน้องปฏิบัติถูกส่งเสริมขึ้นกว่า 50% เนื่องจากคุณภาพของสินค้าไม่ได้มาตรฐานตามที่กำหนด หัวหน้าควบคุมทำอย่างไร
   ก. วางแผนการผลิต
   ข. ให้คำปรึกษา
   ค. สอนงาน
   ง. ปล่อย
14. เมื่อเริ่มต้นการควบคุมงานควรเลือกข้อใด
ก. วิสัยและยุทธศาสตร์
ข. ศึกษาแผนและด้ำมนิยาม
ค. วิชาระบบแผนงาน
ง. เครื่องมือที่เหมาะสมกับงานแต่ละประเภท

15. การควบคุมงานจะมีผลต่อความประสบการณ์ที่สูงไม่น้อยกว่าข้อใด
ก. ส่งเสริมให้เกิดการเรียนรู้ โดยนำประสบการณ์มาเป็นประโยชน์ในการทำงาน
ข. มีการปรับสภาพแวดล้อมของหน่วยงานให้เหมาะสมกับการเปลี่ยนแปลง
ค. ผู้บริหารแผนกิตติการและเทคโนโลยีใหม่ ๆ มาใช้ในการบริหารงาน
ง. มีการวางแผนในการควบคุมงานส่วนหน้า

16. เมื่อเลือกให้เครื่องมือในการควบคุมงานแต่ละประเภท ควรพิจารณาเรียงใดเป็นลำดับแรก
ก. ทรัพยากรและงาน
ข. ปริมาณงาน
ค. คุณภาพของงาน
ง. อัตราว่างของงาน

17. ถ้าผู้ปฏิบัติงานไม่ต้องใช้ตัวประเมินในการควบคุมงานจะเกิดผลดีกว่าหรืออย่างไร
ก. ทำให้ผู้ปฏิบัติงานมีทักษะเสมอ
ข. ทำให้ผู้ปฏิบัติงานเกิดความตื่นเต้นในการทำงานด้านอื่น
ค. ทำให้ผู้ปฏิบัติงานเกิดความตื่นตัวและไม่ให้ความร่วมมือ
ง. ทำให้ผู้ปฏิบัติงานเกิดความเจ้าใจคิดในขั้นตอนของการดำเนินงาน

18. การปรับปรุงให้ระบบการควบคุมมีประสิทธิภาพ ควรพิจารณาสิ่งใดเป็นลำดับแรก
ก. มาตรฐานที่ใช้ในการควบคุมเหมาะสมและคุณธรรมสำหรับการวัดผลงานของผู้ปฏิบัติงาน
ข. กำหนดวันเวลาที่เหมาะสมที่สุดรักษา เพื่อให้งานสำเร็จตามเป้าหมาย
ค. มีระบบการติดต่อกับหน่วยงานที่ต้องกระทำร่วม
ง. มีการกระจายงาน และมีการทำงานร่วมกันเป็นทีม
19. วิธีการควบคุมงานที่ทำหน้าที่ควบคุมด้านการ
 ก. ควบคุมผู้จุดในเวลาเดียวกัน
 ข. ควบคุมในจุดเริ่มต้น
 ค. ควบคุมในจุดสุดท้าย
 demands.
ง. ควบคุมเฉพาะจุดสำคัญ

20. ข้อใดที่ทำหน้าที่ควบคุมปฏิบัติการควบคุมงาน
 ก. การให้รางวัลตอบแทนเมื่อมีผลการปฏิบัติงานตรงตามที่กำหนดไว้
 ข. การให้สาระที่ละเอียดปฏิบัติงาน
 ค. การไม่ทำให้ผู้ปฏิบัติเกิดความเครียด
 ง. ถูกทุกข์ชั่ว
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APPENDIX E

EXPERT NAMES
รายนามผู้เข้ารายงาน

1. นาง พงษ์ตา ธรรมติคี
   ตำแหน่ง หัวหน้า分行การพยาบาลสุตินรีเวช
   สถานที่ทำงาน โรงพยาบาลศิริราช
2. นางสาวฉลาด สุทธิกรเกียรติภูชัย
   ตำแหน่ง ผู้ช่วยการฝึกควบคุมการผลิต
   สถานที่ทำงาน บริษัทไทยแอร์วอ (บางพลี)
3. นางกัลยา นั่นคง
   ตำแหน่ง ผู้ช่วยผู้อำนวยการศูนย์พัฒนาบุคคล
   สถานที่ทำงาน การท่องเที่ยวแห่งประเทศไทย
4. นายวิชิต กรรณพนันท์ชัย
   ตำแหน่ง ผู้ช่วยผู้จัดการฝ่ายพัฒนาความรู้
   สถานที่ทำงาน บริษัทไทยรุ่งเรืองเนียนคาร์ จำกัด (มหาชน)
5. นางสุริยา ธนกิจ
   ตำแหน่ง ผู้ช่วยการงานการพยาบาลคลัสเตอร์
   สถานที่ทำงาน โรงพยาบาลรามาธิบดี
APPENDIX F

APTITUDE QUESTIONNAIRE
แบบสอบถามความคิดเห็น
เกี่ยวกับการเรียนรู้ด้วยตนเองโดยใช้คอมพิวเตอร์ช่วยสอน
เรื่อง การควบคุมงานเบื้องต้น

ชื่อ ........................................................... นามสกุล ...........................................................
เพศ □ชาย □หญิง
อายุ ...........................................................ปี
ระดับการศึกษา ปริญญาตรี สาขาวิชา .............................................................
ระดับการศึกษา ปริญญาโท สาขาวิชา .............................................................
ระดับการศึกษา ปริญญาเอก สาขาวิชา .............................................................
ปัจจุบันต้องการตั้งหน่วย ............................................................. ปี
ประสบการณ์การทำงาน ............................................................. ปี
สังกัดหน่วยงาน .............................................................

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ผู้วิจัยขอขอบคุณพระคุณค่า
APPENDIX G
THE MANUAL FOR PACKAGE BASED ON
COMPUTER-ASSISTED INSTRUCTION
IN THE SUBJECT OF BASIC WORK CONTROL
ผู้อธิบายการใช้งาน
บทเรียนคอมพิวเตอร์ช่วยวสอน การควบคุมงานเบื้องต้น

1. การติดตั้งโปรแกรม

เมื่อลากไฟล์ใน Compact Disk (CD) ลงใน CD-ROM Drive แล้วเข้าโปรแกรม จะปรากฏเ.setdefault ที่เรียกได้ว่า Run โปรแกรมแบบ Manual ได้ โดยการเลือกโฟลเดอร์ที่อยู่ใน Folder ดังต่อไปนี้

[CD-ROM Drive]:RUN.EXE

โดยการเลือก Double Click ไฟล์ดังกล่าว จากนั้นโปรแกรมก็จะสามารถทำงานได้ตามปกติ

2. ส่วนประกอบของโปรแกรม

2.1 Introduction

ส่วนประกอบของ Introduction จะประกอบด้วยหน้าจอแสดงผลตั้งต่อไปนี้

2.1.1 Splash Screen

ภาพที่ ก-1 แสดง Splash Screen

เมื่อปรากฏหน้าจอในภาพที่ ก-1 กรุณาระลึกสู่เพื่อให้โปรแกรมทำการโหลดส่วนประกอบของโปรแกรม หลังจากโปรแกรมทำการโหลดส่วนประกอบเรียบร้อยแล้ว ก็จะปรากฏหน้าจอต่อไปดังแสดงในภาพที่ ก-2
2.1.2 ข้อบทเรียนคอมพิวเตอร์ช่วยสอน

ภาพที่ ก-2 แสดงข้อบทเรียนคอมพิวเตอร์ช่วยสอน

จากภาพที่ ก-2 แสดงชื่อโปรแกรม และสถาบันการศึกษาที่ผู้จัดทำวิทยานิพนธ์ศึกษาอยู่
เมื่อปรากฏหน้าจอวันนี้ ครูเรียนหลักสูตรโปรแกรมจะทำการเปลี่ยนไปสู่หน้าจอต่อไป ดังแสดงในภาพที่ ก-3

2.1.3 คณะกรรมการควบคุมวิทยานิพนธ์

ภาพที่ ก-3 แสดงคณะกรรมการควบคุมวิทยานิพนธ์
จากภาพที่ ก-3 แสดงคณะกรรมการควบคุมวิทยานิพนธ์ ซึ่งจะประกอบด้วยประธานและคณะกรรมการควบคุมวิทยานิพนธ์ เมื่อปรากฏหนังสือ ครูสามารถสัครุ้งโปรแกรมจะทำการเปลี่ยนไปใช้ หน้าจอต่อไป ดังแสดงในภาพที่ ก-4

2.1.4 ผู้วิจัย

ภาพที่ ก-4 แสดงรายละเอียดผู้วิจัย

จากภาพที่ ก-4 แสดงรายละเอียดผู้วิจัย ซึ่งจะประกอบด้วยสถาปนา ภาคี คณะและ สถาบันการศึกษาที่ผู้วิจัยจ่ายเงินค่าสื่อและเมื่อปรากฏหนังสือ ครูสามารถสัครุ้งโปรแกรมจะทำการเปลี่ยนไปใช้หน้าจอต่อไปอีกในกรณี

2.2 Registration

ภาพที่ ก-5 แสดงการแสดงทะเบียนเรียน

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เมื่อปรากฏหน้าจอสัมผัสในภาพที่ k-5 กรุณาระบุชื่อและนามสกุลของผู้เรียน เพื่อใช้ในการเก็บเป็นประวัติการเรียน ซึ่งในประวัติการเรียนจะประกอบด้วยคะแนน Pretest, Posttest และระดับเวลาในการเรียน ของผู้เรียนแต่ละคน จากนั้นให้ผู้เรียน Click ปุ่ม “ด้วย” โปรแกรมก็จะแสดงชื่อและนามสกุลของผู้เรียน แล้วแสดงในภาพที่ k-6

ภาพที่ k-6 แสดงการลงทะเบียนเรียนเรียบร้อย

เมื่อปรากฏหน้าจอสัมผัสในภาพที่ k-6 แสดงว่าผู้เรียนได้ลงทะเบียนเรียนเรียบร้อยแล้ว จากนั้นให้ผู้เรียน Click ปุ่ม เพื่อเข้าสู่หน้าจอต่อไป

2.3 User Guide

User Guide เป็นส่วนที่แสดงคำอธิบายวิธีการเรียนแบบออนไลน์ของคอร์สช่วยสอนชุดนี้ ซึ่งจะประกอบด้วยคำอธิบายดังนี้

2.3.1 ส่วนประกอบของเนื้อหาในบทเรียนขั้นตอนพื้นฐานชุดนี้คั่งแสดง

ในภาพที่ k-7
ภาพที่ ก-7 แสดงรายละเอียดของเนื้อหาในบทเรียนคอมพิวเตอร์ช่วยสอน
เมื่อปรากฏหน้าจอแสดงในภาพที่ ก-7 ซึ่งเป็นหน้าจอที่แสดงรายละเอียดของเนื้อหาใน
บทเรียนคอมพิวเตอร์ช่วยสอน เมื่อผู้อ่านทำความเข้าใจเรียบร้อยแล้วให้ผู้เรียน Click ปุ่ม เพื่อเข้าสู่
หน้าจอต่อไป

2.3.2 วิธีการเรียนบทเรียนคอมพิวเตอร์ช่วยสอน

ภาพที่ ก-8 แสดงวิธีการเรียนบทเรียนคอมพิวเตอร์ช่วยสอน

จากภาพที่ ก-8 เป็นหน้าจอที่แสดงวิธีการเรียนบทเรียนคอมพิวเตอร์ช่วยสอน เมื่อผู้เรียน
ทำความเข้าใจเรียบร้อยแล้วให้ผู้เรียน Click ปุ่ม เพื่อเข้าสู่หน้าจอต่อไป หรือถ้าหากผู้เรียน
ต้องการกลับไปทำความเข้าใจกับหน้าจอตอนนี้ให้ผู้เรียน Click ปุ่ม เพื่อโปรแกรมจะย้อนกลับไปยังหน้าจอตอนนั้นที่ผู้เรียนผ่านมาแล้ว

2.3.3 กิจกรรมที่ผู้เรียนต้องทำในการศึกษาบทเรียน

จากภาพที่ k-9 เป็นหน้าจอที่แสดงกิจกรรมที่ผู้เรียนต้องทำในการศึกษาบทเรียน เมื่อผู้เรียนทำความเข้าใจเรียบร้อยแล้วให้ผู้เรียน Click ปุ่ม เพื่อเข้าสู่หน้าจอต่อไป หรือถ้าหากผู้เรียนต้องการกลับไปทำความเข้าใจกับหน้าจอตอนนี้ให้ผู้เรียน Click ปุ่ม โปรแกรมจะย้อนกลับไปยังหน้าจอตอนนั้นที่ผู้เรียนผ่านมาแล้ว

2.4 Pretest

ภาพที่ k-10 แสดงแบบทดสอบก่อนเรียน
2.5 Pretest Summary

เป็นการสรุปคะแนนของผู้เรียนในการทำแบบทดสอบก่อนเรียน เพื่อเป็นการวัดความเข้าใจในบทเรียน เมื่อนำมาเปรียบเทียบกับคะแนน Posttest

2.6 Description and Quiz

เป็นการสะท้อนถึงรายของบทเรียนในแต่ละหัวข้อ เพื่อให้ผู้เรียนทำความเข้าใจกันเบื้องต้น และเมื่อผู้เรียนเข้าใจในเนื้อหาแล้วให้ Click ปุ่ม โปรแกรมจะแสดงคำถามท้ายบท เพื่อวัดความเข้าใจของผู้เรียน ถ้าหาอบผู้เรียนตอบคำถามไม่ถูกต้อง โปรแกรมจะขออีกครั้ง โปรแกรมจะให้ผู้เรียนตอบคำถามท้ายบทขออีกครั้ง เพื่อให้ผู้เรียนทำความเข้าใจใหม่ และโปรแกรมจะให้ผู้เรียนตอบคำถามท้ายบทขออีกครั้ง แล้วผู้เรียนตอบคำถามไม่ถูกต้องอีก โปรแกรมจะขออีกครั้ง โปรแกรมจะใช้ผลลัพธ์กระบวนการเดิมจนกว่าผู้เรียนจะตอบคำถามท้ายบทถูกต้อง

2.7 Posttest

เป็นการทดสอบความเข้าใจในเนื้อหาทั้งหมด ซึ่งแบบทดสอบก่อนเรียนจะประกอบด้วยแบบทดสอบทั้งหมดจำนวน 20 ข้อ หากตอบแบบทดสอบถูกต้องจะได้คะแนนข้อละ 1 คะแนน

การตอบคำถามแบบทดสอบก่อนเรียน สามารถทำได้ด้วยการเลือก Click ที่ปุ่ม “ก”, “ข”, “ค”, “ง” เพื่อเลือกคำถามที่ถูกต้องที่สุดได้เพื่อคำตอบเดียวเท่านั้น และเมื่อผู้เรียนเลือกคำถามแล้ว โปรแกรมจะแสดงแบบทดสอบข้อต่อไปให้โดยอัตโนมัติ

2.8 Posttest Summary

เป็นการสรุปคะแนนของผู้เรียนในการทำแบบทดสอบหลังเรียน เพื่อเป็นการวัดความเข้าใจในบทเรียนทั้งหมด และเมื่อผู้เรียนทำโปรแกรมเสร็จสิ้นโปรแกรมจะให้ผลกลับกับแบบทดสอบก่อนเรียน ที่จะทราบว่าผู้เรียนได้มีความเข้าใจในเนื้อหาของบทเรียนคอมพิวเตอร์ขั้วสอนมากน้อยเพียงใด
# BIOGRAPHY

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<tr>
<th>NAME</th>
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<td>Master of Education</td>
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<td>(Adult and Continuing Education).</td>
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