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

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Thesis

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

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ABSTRACT

The research objective was to create a self-directed learning package based on computer-assisted instruction (CAI) in the subject of introduction to coaching for supervisors. The samples were 30 supervisors in various organizations who had never trained in coaching before, and were able to use computers "Windows 95 operating system". Research instruments were one unit of the CAI program on "Basic Coaching", 2 tests assessing the learning achievements, a time questionnaire, and one set questionnaire. Statistical analysis was done by SPSS program. Percentage, mean, standard deviation, and Paired-Sample t test were employed for comparison within groups.

The research findings clearly showed that certain 9 steps. (1) Studying the curriculum and the target learners. (2) Defining all behavioral objectives on basic job training. (3) Analyzing the course contents. (4) Constructing the lesson. (5) Contacting a computer specialist for designing and writing the program. (6) Loading the improved lesson into the computer. (7) Examine the completeness of the lesson after the data were loaded. (8) Launching the field experiment with all 30-sample groups. (9) Following up the achievement of learners. The constructing a computer–assisted instruction module, with its efficiency at the 92.167/92.166 level. The average times of participants spent on each module were 53 minutes.

From the research findings, it is recommended that in creating a module, the presentation patterns should be diverse, and clear with easy–to–read letters and appropriate graphics in order to encourage learners to study and to facilitate learning. It is also suggested branching–programmed lessons be incorporated in the any computer–assisted instruction module.

KEY WORDS: DISTANCE LEARNING / COMPUTER – ASSISTED INSTRUCTION / COACHING / HUMAN RESOURCE DEVELOPMENT

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

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ศษ.ม. (การศึกษาผู้ใหญ่และการศึกษาต่อเนื่อง)

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บทคัดย่อ

การศึกษาการสร้างชุดการเรียนรู้ด้วยตนเองโดยใช้คอมพิวเตอร์ช่วยสอน เรื่อง การสอนงานเบื้องต้นสำหรับหัวหน้างาน มีวัตถุประสงค์ที่จะสร้างบทเรียนคอมพิวเตอร์ช่วยสอน เรื่อง การสอนงานเบื้องต้นสำหรับหัวหน้างาน กลุ่มตัวอย่างในการวิจัย คือ หัวหน้างานในหน่วยงาน ต่าง ๆ ซึ่งไม่เคยผ่านการเรียนเรื่องการสอนงานมาก่อนและสามารถใช้คอมพิวเตอร์ระบบ Window 95 ขึ้นไป จำนวน 30 คน เครื่องมือที่ใช้ในการวิจัย คือ บทเรียนคอมพิวเตอร์ ช่วยสอนเรื่องการสอนงานเบื้องต้น จำนวน 1 หน่วย ซึ่งผู้วิจัยจัดทำขึ้น แบบทดสอบวัดผลสัมฤทธิ์ทางการเรียน จำนวน 2 ชุด แบบสำรวจระยะเวลาที่ใช้ในการศึกษาบทเรียน จำนวน 1 ชุด และแบบสอบถาม จำนวน 1 ชุด

ผลการวิจัย พบว่า (1) การสร้างชุดการเรียนรู้ด้วยตนเองโดยใช้คอมพิวเตอร์ช่วยสอนมี 9 ขั้นตอน คือ 1. ศึกษาหลักสูตรและผู้เรียนเป้าหมาย 2. กำหนดวัตถุประสงค์เชิงพฤติกรรม 3. วิเคราะห์เนื้อหาเรื่องการสอนงานเบื้องต้น 4. สร้างบทเรียนคอมพิวเตอร์ช่วยสอน 5. ติดต่อผู้เชี่ยวชาญด้านคอมพิวเตอร์เพื่อออกแบบและเขียนโปรแกรม 6. การป้อนบทเรียนที่ได้ปรับปรุงแก้ไขจนถูกต้องสมบูรณ์แล้วเข้าเครื่องคอมพิวเตอร์ 7. การตรวจสอบความเรียบร้อยของบทเรียน 8. ทดลองภาคสนามกับกลุ่มตัวอย่าง จำนวน 30 คน 9. ติดตามผลการเรียนของผู้เรียน (2) ประสิทธิภาพของชุดการเรียนรู้ด้วยตนเองอยู่ในระดับ 92.167/92.166 (3) เวลาที่ใช้ในการศึกษาบทเรียนเฉลี่ย 53 นาที

สิ่งที่ได้รับจากการวิจัย คือ ขั้นตอนการสร้างชุดการเรียนรู้ด้วยตนเอง การสร้างบทเรียนควรมีรูปแบบการนำเสนอที่หลากหลาย มีกราฟฟิกต่างๆในสัดส่วนที่เหมาะสมเพื่อกระตุ้นและจูงใจผู้เรียน

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CHAPTER I
INTRODUCTION

1. Background

Human beings are a valuable resource of a country. As Thailand is regarded as a developing country, developing human resources is as important as other aspects of national development.

Providing education is another means of human resources development. Presently, modern technological and scientific media have been utilized in instructions. To a certain extent, every organization uses different kinds of media suitable for work so that their personnel are able to work correctly and efficiently. As a consequence, each organization has their personnel trained by using various training methods, such as, in – service training, meetings to discuss problems, attendance in seminars, skilled labor training, attendance in lectures, attendance in training with other organization, organizing educational plans beyond their work, self instruction by using various media and computer – assisted instruction.

Nowadays, computers are playing an important role in our daily lives, work and education. This is because our society is tending to become knowledge – based. With this ever-changing world, new knowledge is discovered at all times.

With new technology, communications have been diversified. People around the globe are communicating more through computer and they could be exploited for the benefits of knowledge enhancement of personnel in each organization, which are sufficient for the needs of these personnel.

Learning by employing computers as a means of communication is regarded as distance learning, where instructors and learners do not have to be at the same place. There are several methods of learning by this media, such as, providing learning modules, exercises, web beards, computer assisted instructions (CAI), interactions between instructors and learners or among learners themselves via e-mail, chat rooms or net meeting, web design services for organizations that are developing their personnel, and searches from Webster and electronic libraries. Distance education has its own advantages and disadvantages.

Distance education has no limitations terms of time and space. It is also economical with regard to travel expenditure and facilities of learners, providing learners an opportunity to select institutions of their choice. The education is in line with the learner – centered philosophy, creating a life – long learning process and developing computer skills of learners. Nevertheless, distance education has limitations in terms of the inability to develop skills at the fullest extent as well as attitude and values in learners. In addition, learners and instructors are unable to have direct contact when problems arise. Furthermore, there is no communication with other learners in order to exchange knowledge and experience.

Nonetheless, computer – bases education has a more increasing role in the present society where competition is high. We are living in a society where information and tele – communications systems, consisting of sound, script, graphic, still and moving pictures, could be completely brought under the same system.

Due to the advancement job science and technology and globalizes docility, industrial and economic aspects are of rotating systems with the most cost – effectiveness of natural resources utilization. Information technology system is an infrastructure of the society, where operations could be carried out in a borderline manner by using the digital network service systems. In academic terms, technological development would be rapid and diverse. Education would be less direct and face – to –face since learners would use more media as a means of

communication. Encountering face – to – face with instructors would be done as necessary.

Important characteristics of education in the information society are as follows. It would be individual – specific and education is a way of life and could transpire at any place. Individuals have freedom in their education and knowledge is no longer the ultimate goal, but to use knowledge to solve problem and livelihood for oneself, others and the society. Technological and scientific progress enables information to flow freely. The emergence of new knowledge is perpetual, while there are a large number of people needed to be developed in order to be able to catch up with new knowledge and technological advancement.

Classroom – based human resources development is not suitable to a certain extent because of many restrictions, for instance, commuting to learn and other expenses. One way to solve the problem is self – instruction, which is composed of many patterns. Instances are self – instructions from other personnel, printed materials, television and electronic media.

Self–instruction is divided into 3 types as follows : (Chaiyon Phromwong, 1993 : 55)

1. Using mainly printed material
2. Using mainly radio and television
3. Using mainly computer media

Computer is another medium used for instruction because of the tendency of training to change from classroom – baded to self – instruction. It is this interesting to investigate the utilization of computer to develop training models with the prospect that the constructed self – instruction modules would enable learners to develop their knowledge and expertise and to them at their convenience, regardless of space and time.

2. Objectives of the Research

2.1 To develop a self-directed learning package based on computer-assisted instruction in subject of for supervisors coaching

2.2 To investigate steps in constructing self – instruction modules by CAI on subject basic coaching for the chief

2.3 To examine the effectiveness of self – learning modules

2.4 To investigate the average time used for each set of the self – directed modules.

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 coaching for supervisors

3.2 Whether the mean scores of the post test after taking the modules were significantly higher than the mean scores of the pre – test at 0.05 level.

3.3 Whether the average time spent on learning each module was 70 minutes.

4. Limitations

4.1 This research study focused Ont. the computer – assisted self – learning modules in the form of tutorial lessons.

4.2 The presentation of the lessons was branching programmed.

4.3 The contents of the self- learning modules were on basin subject coaching for the chief.

5. Operation Definition

5.1 A self – learning module was the transfer of knowledge and experience from instructors to learners via different kinds of media, without learners attending classrooms but learning by themselves at their offices or homes.

5.2 A computer – assisted lesson was a program developed in a form of related and hierarchical computer programs, which enabled learners to learn by themselves.

5.3 A frame was a frame presenting a short course content on the computer screen, which was divided into :

5.3.1 The main frame was the frame of course contents which learners were to study.

5.3.2 The exercise frame was the one with exercises related to the contents in the main frame.

5.3.3 The final frame was the one which learners took knowledge from the main frame to answer.

5.3.4 The second final frame was the supplementary frame promoting better understanding and/or correcting mistakes from the final frame.

5.4 Basic subject approach was a method, which an operational development chief used for practical purposes in order to gain knowledge, understanding and practicality.

5.5 An operational chief was an individual who had organizational work accomplished by using cooperation of others to achieve the goal.

5.6 The 90/90 standard criterion was a data analysis to compare post – test scores with the standard scores, with the following interpretation:

The first 90 were the average score of the entire sample group from doing the test, which was 90% or over.

The second 90 were 90% of the sample group when an item was correctly answered (by items).

5.7 Effectiveness of computer – assisted lessons was a good constructed computer lesson by considering its effectiveness from the 90/90 standard method

6. Expected Benefits

6.1 The samples of the computer – assisted self – learning modules on basic subject approach for the chief could be obtained.

6.2 A guideline for developing computer – assisted learning models on other subjects could be derived.

6.3 The instrument for instructing and developing training models for long distance education systems could be achieved.

CHAPTER II
LITERATURE REVIEW

The self-instruction package module by Computer Assisted Instruction (CAI) has an objective to study the instruction. There are many documents and related researches such as:

1. Concept and Philosophy of long-distance studies.
2. The self-Instruction package.
3. Program Instruction
4. Computer Assisted Instruction (CAI)
5. Instruction
6. Related researches.

1. Concept and Philosophy of long-distance studies.

Generals of the long-distance studies are the open system. It means worldwide for everybody who interest to study. The learner can choose the study from a media with their handy. They can choose the time when they prompt to learn. This system gives the learner search their knowledge, which no limit no. They can learn by their characteristics with themselves.

Isarawat (1996: 9) tells about the self learning which should be characteristics such as :

1. It is willingly to self-learning.
2. Self is the source of self-data. It means that the learner can tell the things what they want to learn. They can tell the skill and data, which they want to need.

3. The learner must to know the method for learning. It means that the learner should know the step of self-learning how they go to he aim.

The concepts of the long-distance are:

1. The personal efficiency acceptation to search the new knowledge by self means the long-distance holds on the independent self-learning (Hotmbery, 1995:12). The self-leaning of adults mean that they plan the schedule by themselves and also question from the qualified person and high experiments.

2. The long-distance study is a continuing education process. It is a essential model of non-formal education that holds on the concept of the continuing education. Everybody is all of technological education and has a role to set the continuing education (UNESCO, 1975 :3) .

3. There is the equality of education means that this study is distribute and worldwide the opportunity to learn to the person who lack of the opportunity to learn including the person who want to learn. This concept is set to balance with the continuing education and educate to all of people by other media including the teleconference medial (Malitong, 1997 : 168).

According to above concepts, the learners will decide to choose the appropriate media with self-learning. In each media will motivate the learner to intention for studying and don't interrupt them from their work and brings to the advantage in the future.

2. The self-Instruction package.

The self-instruction package means the main media program that takes the system method to present the contexts and learning activities. It is help the learners to study by self-competency and in each self-learning model (Arunrat, 1993: 85).

The self-instruction package is the source of the new learning for individual. It has an essential role in currently education. It also uses in the study materials to help the learner to success by the objectives. It is differ form the type of other instruction. It should open to the learners to study by self-method style. (Duan, 1976:169)

The self-instruction package is the new study or it calls as the continuing education. It has a many of its name example, instruction package, self-instruction packages, pack, packages of individualized learning packages. All of meaning, it means the one of many of instruments. When concluded this instrument, it is a one package. In one of the set is a complete package. If you instruct the package in the continuing subjects, it will connect with the first package, too (Pattamakorn, 1975 :10).

According to the meaning of the self-instruction package, it means that the package program for the individual learning which conclude the complete of the contents, learning activities, instrument and documents with systematic method. It opens to the learners to study by self-method style.

The concept of the self-instruction package

The concept of the self–Instruction packages are concern with such as:

1. The learners can learn with independence by their interest of need to learn by their competency (Cardarelli, 1973:150)
2. The instructor should has a role for the decision making, to limit condition, to push up interesting, to motivate and to give the convenient things to the learners.
3. The student should has a role for the independent thinking to choose, decision and respond to the self-learning.
4. The environment of the learning, it should support to construct the creative thinking, to survey the knowledge, relationship for the growth.

Principles and Theory of the Self-Instruction Packages.

The basic concept which bring to the construct the self instruction packages consist of the 5 concepts as follow (Promwong, 1991 : 105):

Concept 1 : This is the concept belong to the psychology theory about the difference of person. The educators use this concept by awareness of difference of person. They set the independent study along with the learner' ability.

Concept 2 : This concepts try to change the learning from the instructor centered to content and experience centered that appropriate to the packages of subjects. The learners can learn it by themselves.

Concept 3 : This concepts try to set the production system and use the instructing instruments to the mix media. It has an objective to shift the media from the assistance to the self-learning by those media.

Concept 4 : This concepts try to construct the relation between the instructors and learners including the learners with the environments. There is bringing the instruction media and dynamic group theory help to set the learning activities.

Concept 5 : This concept holds on the learning psychology idea to set the efficiency learning condition. It opens to the learners for those opportunities such as:

1. They participate in the learning activities by them selves.
2. They currently know their achievement.
3. They get the positive reinforcement. It made them proud of their right or wrong thinking and makes the repeat those behaviors in the future.
4. They learn by step along with their interesting and competency and nobody can't limit to them.

According to bring this concept to set the environment for learning, it will use the instrument to guideline the way to goal. This way is instruct by package

program in the process and use the self-instruction package, which is essential instrument.

The structure of the self-instruction package.

The well knows of self-instruction packages are TLU, LAP, ISU, UNIPAC and ILP. It has a likely basic structure as follow (Duan, 1973 : 169).

1. The objective and the contents for learning.
2. The content description.
3. The behavioral objective.
4. The learning activities.
5. The activities for support the good attitude.
6. The Instrument for pre-test measurement, between study measurement and post-test measurement.

The structure of the self-instruction packages consists of (Cardarelli, 1973: 150-151).

1. Topic
2. Sub-Topic
3. Rationale
4. Behavioral Objective
5. Pre-test
6. Activities and Self-Evaluation
7. Quiz
8. Post-test

According to the structure, it concludes that the structure of sale instruction package consist of the main topics as the objective, the contents, the learning activities and the test.

The process of the self instruction package

The way to construct the self instruction package have the hierarchic process as (Sukpredee, 1985 : 12)

1. Task analysis to set the Terminal objective.
2. Mission analysis to set the sub-terminal objective.
3. Setting the content to support the sub terminal objective with fine question.
4. Design the media and activities to help the learners answer those questions.
5. To make the motivate media for learning and recommendation the learners participate in the equity of learning activities.
6. The finish of the self-instruction package must be use in the teal situation. It also trysts out in the target groups.
7. To improve the self-instruction package from the target group recommendation as the materials, meaning and investment etc.
8. There is bringing the package to use in the learning and research center for update development.

The construct of the self instruction package to balance with the curriculum development should do the process like that (Lewis, 1968 :329)

1. Hold on the educational objective.
2. To limit the learning goals.
3. To set the necessary activities and classroom to support the learning for success the aims.
4. To choose and set the materials and set the convenience for working.

The model of the self instruction package

The self-instruction package had different along with the characteristic in each subject and the target groups. Media has essential to transfer the knowledge and

other experience from the instructors to the learners. In each media has both of advantage and disadvantage in its.

The characteristics of long-distance media (Kaye & Rumble, 1975: 9).

1. Printing media is the main of the long-distance study. It consists of the main idea, picture, histogram or the brief contents including the mass media as newspaper.

2. Audio media are the radio, television, Video or satellite communication. It has any detail as follow.

Radio uses for the direct study as call as school radio which send the other program as the lesson. It will directly send to the classroom for instruct the education to every body and support to comprehensive the event news, art and culture

Television is well known media who has a high efficiency. About on air, it also uses both close system and open system or on air with together.

Slide is a non-movement picture which support the comprehensive the knowledge the knowledge with other instruction.

Video is a tape for record the programs both of the knowledge and add the knowledge as call as the videotape.

Cabel T.V. is 24 hours television station. It hasn't the advertising on the show. It divides into 2 type as the one-way communication and two-way communication that the receiver can respond to the station.

Satellite communication is the communicate system by the microwave. The satellite was sent to orbit the earth to reverse signals from the earth station. It

expands the signals and sends it to ground. It is a high efficiency for long-distance connection.

3. The activity media are the exhibition, the apprentices and computer media. About the computer are consisting of CAI, responding Video, computer system for tracing, computer with CD-ROM and computer with Internet.

4. There is 2 type of communication media. One is the folk media and out of class learning. Two is the Tele-communication, fax, telex, and videotext, Tele-conference.

In the present, computer is the one media which learner chooses to study. It uses for search the data and aid for supporting other subject as the package program.

3. Program Instruction

The meaning of Program instruction

The program instruction is the normal program but the contents have variety. There is arranging from easy to difficult contents. It made the learner who can learn by themselves with step by step from the limitation (Schramm, 1964 :1).

The program instruction is a forehead program planing to support the learners to study by them. There are learning by doing. It can know the immediately recommendation. It made them proud of their success. They can go ahead with their ability, interesting and convenience (Promwing, 1973 : 11).

The program instruction is a one module of the forehead program planning for each learner. There is set an experience with hierarchy step for the learner's abilities. It holds on the relation between the stimulus and respond. The

experience is belonging to each learner who participates in the learning (Kumut, 1986: 1).

According to above of the program instruction, it can conclude that it is the individual programs that arrange the contents with forehead systematic planing. The learners can study with themselves step by step. It has a questions, answers and show the immediately attachment of learning. They will get the high or low advantage to hold on the content interesting of program and the usefulness for the job in the future. On the other hand, the program instruction has a vary meaning words as the Automated instruction, Auto instructional programming and self instructional programmed (Arunrat, 1993 : 1).

The characteristics of the program instruction

The characteristics of the program instruction consist of (Sukpreedee, 1976 :22)

1. The learners can study from the program by themselves.
2. The learners don't sit in the classroom.
3. The learners can use the out of class to study anything else.
4. It can save the expense about the numerous learners.
5. All of fields can set for the program instruction.
6. The learners can study in anywhere.
7. The learners can study in anytime by their satisfy.
8. It brings to the educational equality.
9. There is a motivate instrument to the attention to learning.

Conclusions about the characteristics of program instruction are the sub set of contents of program that arrange the knowledge step by step from unknown to know. The learners can participate is all activities. There are respond and suddenly reinforcement. The learner has independence to study both of anywhere and anytime. It can save the expense and they can learn by their ability.

The objective of program instruction

The objective of program instruction consists of (Saettler, 1971 :17).

1. For the self contained the program instruction uses for can children to study by them.
2. For the remedial instruction, it uses for support the achievement of the weak student form down to high. They should special practice for self-learning.
3. For the enrichment, it is enrich the old knowledge too high more than they receive from the instructor.
4. For the aids to regular room, there is use the program instruction in the classroom.

Type of the program instruction

There are two type of the program instruction (Green, 1962 : 147).

1. The linear programmed, the learners must to answer the question by items they don't pass the one item to the next items.
2. The branching programmed, the learners don't answer all of items. They can pass to answer the next items. Because the instructor see if learners can correct the answers, it show that the learners understand the conceptual framework

.

The dominant of the linear programmed (Stolurow, 19961 : 12).

1. There are arranging the fix conceptual framework.

. 2. The learners must to start with the first to the last conceptual framework they don't pass some frameworks.

3. Anyone must to do alike activity. The emerge different is the time to study.

The program instruction which balance with green' concept are such as (Kumut, 1976 : 14).

1. The linear programmed.
2. The Branching programmed.

About the branching programmed, it holds on the believe that the wrong respond don't delete the right learning. The responds give the advantage for the student leader. In each respond, it tests for the last communication of each learners to the success of not. The program will open the learner to choose anyway the for answer. It holds on their responding that do in each conceptual framework. The readiness of learners will show after they received the remedial instruction when they wrong the answers. It will expand when the learners coerce the mistake or they understand it. It calls as the balancing between the instruction and learners activities (Kumut, 1976 :38).

The linear programmed is arrange the step and sub-frame from easy to difficulty program. The learners will do from the first to the last frames. They don't pass frame. The first frame is a basic knowledge to the second frame. There are the open - close end questions. When the learners answered the question. They can check the answers in the next frame (Powell, 1969:196).

1. Law of Readiness. When the body prompts to do anything, it is a satisfy. If it hasn't the opportunity to do and they here forced. It was unsatisfied. In the reverse, if the bodies don't prompt to do anything and they there forced. It was unsatisfied, so, the readiness is the basic mature, experience and the mind readiness. The learning will high ability when the learners are readiness.

2. Law of exercise of repetition. When the learners do raptly activities, it enriches the secure learning.

3. Law of effect. It connects between the stimulus and respond. If it connects, the learners will satisfy with the reinforcement.

The learning psychology for the program instruction (Phumipak, 1978 : 72)

1. It is continuity between the stimulus and respond. It is the Guthrie, theory that take the stimulus, the leaders do currently.
2. Reinforcement. It knows the result wrong or right after doing. It is the Holes reinforcement concept.
3. The over responding. The learners must to over respond. It is the Skinner concept as the conditional theory.
4. The program construction also has the indicator to choose the night answer more than wrong answer and made the learners confidence. It is a motivate construction and also decrease until no the indicators.
5. There is evaluating the achievement whereas studding to show the progress and motivation.
6. There is accept the learner with their competency and bring the contrast to instruct in the classroom.
7. There is learning by doing. It makes to the long – memory.
8. There is support the self-learning
9. Learning occurs than the learners prompt and convenience. They can stop of start to learn continuity, too.
10. It alike the fix instructor and better than study in the big groups.

The concept of construction with the program instruction

The concept of construction the program instruction are the process as follow (Sukpreedec, 1976 : 69).

1. There is limit the objective of learning. Why construct the program instruction? What is the aim for this instrument? What the learners receive after they studied.
2. Mission analysis. There is verify to the goal of program instruction and think about what they start for their success.

3. The test. It's necessary to know the basic behavior in each students by pre-test.

4. There is arranging the learning after there was analyze the mission. There is limit the sub mission and the program for the goal of learning.

5. About media choosing, it should choose the appropriate media with the highly objective. The learners can highly respond along with their competency and their old experience. There is open to participate by the easy media.

6. There is construct the study frame.

7. There is try out with other people and develop the instrument again.

8. There is correct the instrument for solve the other problem as the learners responding, the discriminate of program to motivate for learning, the problem of instrument management and the instrument' prices.

9. The distribution the production, there is recheck for development. It means that the program construction must to prompt in both of obvious contents and advantage including the other expense to construct the computer Assisted Instruction.

4. What is the Computer Assisted Instruction?

The computer Assisted Instruction or CAI has likely word in English language as follow (Alessi & Trollip, 1958 :59) ; Romiszowski, 1986 : 267).

CAL (Computer Assisted learning or computer Aided learning)

CBI (Computer Based Instruction)

CBL (Computer Based Learning)

CBE (Computer Based Education)

CBT (Computer Based Training)

IAC (Instructional Application of Computer)

The CAI (Armsey& Dalh, 1973 :63) is a one instrument which the learners can learn by themselves. They practice any activities on the desktop of computer and respond the question by use the key board. The data processors on the

desktop are the pictures and wordings. Sometimes it coordinates with the slide. CAI also has the control program to proceed the data for the learners. The instructor can design the program about the computer language for instruct their learners.

CAI means the computer systemic application. It responds between the learner and the command process of computer that can tell the weakness of learner when they wrong action (Sipple, 1981: 77).

It can conclude that CAI is the instruction by the computer. The program instruction was develop by steps and balance. The learner can study by himself or herself. There is respond reaction between the learner and computer in the content instruction, the question, the responding, and the revision, the evaluation and show the achievement by the revise data of the learners.

The characteristics of Computer Assisted Instruction

The character testis of Computer Assisted Instruction consist of as follow (Sawananon, 1986 : 76-79).

1. There is start to learn from known to unknown things. There is set the program by steps which start from the understanding to the new knowledge and don't to know. It should writ many frames and the learner studies it by frame to frame from easy to difficult frame.
2. It should add the a little bit of content. It looks so easy and interesting. The changing in each frame, the learners will know by themselves.
3. In each frame, it has introduced the only one new knowledge because the much introduces made the learner confused.
4. During the learning, the learner must participate in the classroom as answering, testing. Only thinking ma be bore to learn.
5. The wrong answer may bereaves to the old frame or choose the new frame that explain the correct contents. If the learner choose the right answer, they will funny to learn. The right answer also received the praising.

6. CAI made the learner to study by their competency. They can revise and answer the question as long as the time. They don't pressure about learning.

7. CAI is emphasis by individual person. There are different in each subject although the same subject, it spent the differential time.

8. The conclusion in the last lesson helps the learner to evaluate their achievement. The conclusion means the conclude the contents and achievement evaluation of the learners. How much use the time to learn? What something do they search enrichment?

9. If is makes the frame clearly, it can analyze the answer by each experience of the person. There are many different the answer. We can analyze this answer why they choose to answer it.

10. There is limit the end – objective what the learner must to know. It is help to arrange by the steps of contents.

The comparing between CAI and normal instruction has 3 characteristic as follow (Steinberg, 1991 : 2).

1. The instruction, CAI presents the alphabets, pictures. The normal instruction uses the verbal instead the alphabets, pictures, movement and posture communication.

2. The learners, CAI uses the reading, observation and listening on sometimes. The normal instruction always use together with reading, observation and listening.

3. The Response, CAI uses the keyboard to response. The normal instruction uses the conversation, writing and posture communication.

Types of CAI

Types of CAI are divide as follow (Stolurow, 1961 : 394).

1. **Drill and Practice.** This CAI' type uses after the instructor taught some lesson already. Learners' practices with computer to test for accept their competency level. It also consists of the question. Answer, respond and

reinforcement that help the learner to practice. It may add the movement pictures or communication including computation for amazing.

2. **Problem Solving.** This type emphasis to think and decision making. There is limit the Criteria to weight the score in each item as the scientific subjects mathematics subjects.

3. **Stimulation.** This type is construct the module situation as same as the real life of the learners. All of situations are in the program instruction are in the program in striation. They can change, manipulate or response with many choice to study the happening about those choice.

4. **Gaming.** The computer game for learning can highly motivate learners. It belongs to the one of stimulation. There is competition by one or the one of stimulation. There is competition by one of many playlists. There is the winner and loser and be careful the objective of learning. The contents must to appropriate with the curriculum and non-losing.

5. **Dialogue.** This type is imitating the instruction in the classroom. It emphasis the communication between instructor and learner. There is an alphabet on the desktop instead the sound. There are use the questionnaires to ask the questions.

6. **Demonstration.** It likes thee instruction of the instructor. It differs form the line and colorful. Example the instructors can demonstration the earth orbit to the universe by computer.

7. **Testing.** CAI also tests the achievement of the learner but it realized on the test construction, testing, evaluation, test analysis and the instructors random their question for the test.

8. **Inquiry.** It helps to find the conceptual reality. There is a source of the useful data install to the computer. It can immediately show when the learner want to know by presses the keyboard.

9. **Tutorial.** It is the program instruction by the instruct. There is a introduction, explanation with the theory, response and reinforcement. The learner can revise to the old lesson of shift to the next lesson. There is record the achievement for the instructor to push up the knowledge to the learners.

10. **Combination.** There are combine the other instruction. Nature of instruction must include the many way that responds the need of learner. It holds on the objective learning.

According to this research, It develops the CAI in Tutorial model. Prasithirat (1987 : 23) tells that the tutorial should instruct by construct the conceptual thinking CAI may instruct more than the instructor because it balances with the individual different and level of intelligence.

The structure and general model of Tutorial, Alessi & Trollip(1985 :66) explains that there is present the frame instruction. Ask the answers, checking and revelation. If the learner correct the question, the instructing will go on. If the wrong, there is help or remedial instruction. There are 8 components of the program structure as follow.

1. Introduction.
2. Contents.
3. Question. Answer.
4. Checking.
5. Declare the answer.
6. Remedial instruction.
7. Order the lesson.
8. The end of lesson.

CAI construction

Romiszowsski (1986 : 271 – 272) tells the 7 process of develop the program CAI as follow.

1. The specific objective.
2. Analyze the target behavior and construct the appropriate model.
3. Program design.
4. Make the program.
5. Write the computer program with appropriate language.

6. Try out to develop the program.
7. Validity evaluation both of computer technique and instruction.

Kemp (1985:248) tells the 8 process of develop the program CAI as follows:

1. Prepare the instruments.
2. Design and write the layout.
3. Develop the question for revelation and recommendation.
4. Present the concept on the desktop.
5. Write the computer program.
6. Use the sound and effect technique to motivate interesting.
7. Prepare the printing
8. Test and develop the program.

Prasithirat (1987:14) tells the 11 process of develop the program CAI as follow:

1. Select the contents and limit the general objective.
2. Analyze the learners.
3. To limit the behavioral objective.
4. Analyze the sub-contents.
5. Design the program.
6. Construct the program.
7. Write the program.
8. Key into the program.
9. Try out for Reliability.
10. Go a performance.
11. Evaluation and improvement.

Alessi & Trollip (1985 :275) tells the 8 process of develop the program CAI as follow.

1. Limit the program objective.
2. Literature reviews including the essential instruments.
3. Brain storming the ides and to construct the program.

4. Concussed to self-concept.
5. Produce the program into the paper.
6. Write the program layout.
7. Write the computer program.
8. Evaluate the quality and program efficiency.

Alessi & Trollip (1985 : 274) tells the process to develop the Tutorial program CAI as follow.

1. Limit the one objective of program.
2. Collect the source of contents instruction development and program transferring.
3. Brain storming the idea about content, instruction.
4. Set the concept system and present with delicately.
5. Produce the program into the paper.
6. Write the layout to show the program performance.
7. Write the program to the translation process to the computer.
8. Evaluate the quality and efficiency of program by holds on the interest Inage and efficiency working.

CAI construction is the perfect process that needs the careful and awareness to construction. No instructor indicates to learn.

Triranatanakul (1985 : 76) tells the 10 process of program CAI construction by the target are the curriculum and learner.

1. Limit the behavioral objective of the subjects.
2. Compare between the behavioral objective and questions to construct the complete program.
3. Content analysis and write the net work that holds on the behavioral objective and questions. There is arranging with balance.
4. Divide the contents to the sub-contents to protect the confusion.
5. In each pram, the content should easy to understand and short. There are 4 characteristics of frame of content.

5.1 Set frame. It is the frame that presents the unknown data.

5.2 Practice frame. It is the frame for practices the data from the set frame.

5.3 Terminal frame. It is the test frame and answering by brings the data from the set frame.

5.4 Sub-Terminal Frame. It is the frame that writes go on the last frame. It corrects the wrong data and supports the understanding data.

6. Decode by the program.
7. Key date to the program by arrange the control layout.
8. Checking the lesson try-out, recheck and improvement.
9. When pass the criteria, brings it to use in the target learners.
10. Follow up the achievement that is a essential factor. There is developing the CAI program for the other subject.

Alessi & Trollip (1985 :70) recommend the Tutorial CAI construction as follow.

Introduction

1. Set the closely contents.
2. Tell the behavioral objective of the program.
3. Tell the surely learning style.
4. Tell the learners what they must to know something.
5. The learner chooses the steps of learning, click to the menu again.
6. Pre-test shouldn't take in the program. It should separate from the program to test the achievement before go in the CAI

The presentation

1. Present the closely contents.
2. Design the contents with attractive.
3. Don't use the movement alphabets.
4. Emphasis the understanding content, compare or recommendation.
5. Emphasis the colorful contents.

6. Don't color in the non-important contents.
7. Easy to read the alphabet.
8. Emphasis the differential among the topics.
9. The instruction should appropriately with the contents.
10. Set the process to help the learners to join in practice.

The Question Answer.

1. Repeat the understanding questions.
2. Don't only use keyboard. They should answer from the other way.
3. The prompts, which the sign show the learner to answer the questions, it under the question nearby the left hand of the Monitor.
4. The questions should support the right answer.
5. The questions should be consisting of the main contents.
6. The learner can answer the question more than one time.
7. The multiple-choice question is difficulty to answer but it's easy to check and guess.
8. The open and question is hard to do but it protects the guess
9. The learner must to know what the question is test or make understand. They should choose the appropriately question.
10. The language in the program should appropriate with the level of learners.
11. It should avoid the brief questions of negative wording.
12. The question shouldn't be movement alphabet.
13. The question will present on the monitor when the contents were presented.

The justice

1. The problem justice, the instructors accept the words that may be vary meaning.
2. Instructor should considerate boft of the
3. It should spend the time to answer
4. Program should help the learner to pass the test.

The revision data for the answer

1. If they choose the wrong answer, say wrong answer. Then program should tell the correct answer and try it again.

2. If they choose the correct answer, it should confirm the answer again.

3. If the contents are wrong, it should revise the data for improvement.

The Remedial Instruction

1. It should present the content from easy to hard contents.

2. It should uses the Branching Programmed more than the linear Programmed.

3. The learns can control the learning by keyboard. They don't depend on the time for learning.

4. It should always set the program for revision.

The finish lesson

1. Save data for revision learning again.
2. Delete the data on monitor.
3. It should tell the finish lesson by clearly.

The CAI development must to hold on the Human Interface concept. It emphasis's to the normal to practice the computer. It likely trial and has normal characteristics are follow (Phuwan, 1988 : 126).

1. It uses a little time for learning.
2. It works rapidly and adroit.
3. It's fewer mistakes to work or no error system.
4. It made the playlist satisfied, well response and no loss the time.

Technique to design the CAI program.

Roadphotong (1988 : 75-77) tell about the technique to design the CAI as follow.

1. Amazing.

Before learning, the learners should receive the motivation for learning. It effects to interesting to learn. They should almost prepare to learn. The important things that motivate the learners as learning. So, the introduction should design on the monitor, it avoids design to the keyboard. It uses the space bar for responding.

2. Tell the objective

On the other hand to know the foreword essential content, it can tell the outline of program, it help the learner to apply the thinking that balances with the most contents. It helps to learning efficiency. The message that show on the monitor should brief and clearly about the objective and motivate to learn.

3. The revision the old knowledge

The program should present about the old knowledge before it gives the new knowledge before it gives the new knowledge. The some learners may not know the basic for those messages. The programmer should design the design the good processing about the old knowledge and new knowledge. It likely to revise the old concepts, too. About the revision the old background, it doesn't necessary to test if it is the continuing program. The revisions the old background may set for motivate the learners to think beyond the old knowledge. It uses the words or picture to help learner to understand with appropriate knowledge.

4. Presentation the new knowledge

The presentation about the content consists of the easy word and clearly. It is the heart of CAI. The presentation method will help the learner to understand about contents. The memory is better than the reading method. The picture will explain the subjective to easy for perception. Conceptual thinking is hard to design the picture presentation but it recommends for projective the conceptual by figure of statistical map. It must be balance with all of contents.

The paragraph shouldn't write too over in each frame because it made the learners to be bored. They only sit on the chair and reds only. They don't anything

unless they press the space bar. So, it doesn't contain the large message in program CAI.

5. To guideline the learning

The learner has a good memory if there is a good presentation that balances with both knowledge and old experiment. It should brings the new technique to help the learner to understand all of content by the old experience. The programmer should design the CAI by the rationale concept and emphasis the learner to analyze the answer by them.

6. The responding

All of learning theories tell how much the learning has an effective, it directly holds on the level and processing data. If the learner participates with the activities as contents, thinking and answering, it effects to the memory more than the only read or the qualified person.

7. The revision data

The program will motivate the learner interesting if it tells about the clearly objective and feeds back the revise data. The picture presentation will motivate the interesting and give the positive data when the learner corrects the answer.

8. Testing

There are tests between learn and the end of learning. It opens for the test by self. It tests for collect the scores to measure the learner by criteria and study to the next program.

9. The memory and Usefulness

It is activities conclusion that only brief in the main contents including the other recommendation. It helps the learner revise and asks before CAI finishing. It should practice as follow:

9.1 Tell the learner how is the participation between the sense and familiar experiment?

9.2 Revision and program conclusion.

9.3 It should recommend the new experiment. It may be usefulness and tell the source data continuity.

5. Related Researches.

Chantawong (1994) studied about the CAI learning achievement the 2 method. The samples were the 30 diploma students comparing of Rajamangala Institute of Technology in the 1st year second semester. They had been leaned the introduction of basic computer. The research instrument was the achievement test for CAI practice program. The CAI program has 9 process as follow:

1. There is construction the CAI program between course woks and practice as follow.

1.1 Study the curriculum

1.2 Study the course works

1.3 Limit the general and behavioral objective

1.4 Analyze the CAI contents by coordinate program

2. There is construction the CAI program at the end of contents. There is 5 steps of construction likely the first.

3. There is combination both of 2 type CAI. It was test validity by the qualified person about the programming and improved it.

4. When the CAI program and achievement test were developed, they were corrected by the advisor and qualified person.

5. After finished the instrument, there was try-out to the 1 sample and corrected it again.

6. There was took the result from the 5 process to tryout with the samples and corrected it again.

7. There was took the result from the 6 process to try out with the 5 samples and corrected it again.

8. There was took the result from the 7 process to tryout with the 10 samples. They divided into 2 groups as 5 persons of Bachelor degree and 5 person of diploma and corrected it again.

9. There was took the result from the 8 process to tryout with the 20 samples. They divided into 2 groups as 10 persons of Bachelor degree and 10 person of diploma. The students did the test and the researcher analyzed the result

The result found that the students who learnt the course work and practice had a high achievement more than the students who only learnt the course work at statistical significance level 0.05.

According to summarize of CAI, It concluded that CAI development had a may concepts. In each concept had differential process but all of concepts likely contained the 6 process as follow.

1. The objectives
2. Analysis the learners and contents.
3. Design the program and write a layout.
4. Write the program and construct the program
5. Test the program.
6. Evaluation

Tunkul (1998) studied the coaching of nurse instructors, level of stress and practical achievement, and the self-esteem of the 4 senior nurse students of Ramathibodee hospital. The coaching is the heart of quality nurse production. The nurse instructors had a main role to instruct the sure students for professional development. From the literature reviews and basic problems survey found the problems between the role of nurse instructors instructing and the level and self-esteem of the nurse students.

This study was a survey research to study the relation. There was objective to study the coaching by perception of the nurse students. The results found that the level of stress had related with the coaching and self-esteem. The samples were 148 students of the 4 senior on semester 1998. The research instrument was the questionnaires. The statistical analysis was person product correlation.

The results found that the coaching of the nurse instructors by perception of the student had medium level (46.6%). The level of stress was a medium level (48.6%). The practical achievement was a medium level (70.9%). The level of self-esteem was a medium level (60.1%). About correlation, the coaching had negative relation with the stress and had positive relation with the practical achievement and self-esteem at statistical significance level 0.01. It hadn't related between the stress and practical achievement at statistical significance level 0.01.

Pothong sangarum (1994) studied the reaction between the search instruction method and explain method by CAI program with the mathematics achievement contents of the diploma students.

This research was the objective to study the relation between the search instruction method and explain method by CAI program with mathematics achievement contents of the diploma students. The trial sample was 160 students of the first year of diploma of the Rajamagala Institute of Technology Knonkaen on semester 1993. There was two method of CAI program as the search instruction and explain method. There were 4 types of contents. The criteria used the rating scale of Kolb. It translated in Thai language by Patcharee Kietnuntawimol. The results found that:

1. The students who learnt in non-differential contents hadn't different in the mathematics achievement contents with CAI program at statistic significance level 0.05.
2. The students who learnt in differential contents had different in the mathematics achievement contents with CAI program at statistic significance level 0.05.

Chotesirirat (1994) studied the sciences subject achievement comparing of the 2nd year secondary school by CAI program with picture, static picture and movement picture.

This study had objective to compare the sciences subject achievement of the 2nd year secondary school by CAI program with picture, static picture and movement picture. The samples in this research were 333 students in the 2nd year secondary school of St.John School. There was 100 students sampling as 50 male and 50 female. It had the objective to study the CAI program with picture, static picture and movement picture. After finished the study, there was tested the advisement. The statistical analysis used T-test. The results found that the static and movement picture sent the achievement with non-differential at statistical significance level 0.05

According to the results, it concluded that the Coaching was advantage in the educational system. The instructors had many ways to instruct with paten of systematic instruction. It could develop the learners by their competency. There was support the self-confidence and self-esteem for the students with a good attitude to learning.

CHAPTER III
RESEARCH METHODOLOTY

The instruction program with CAI about the basic of instruction has an objective to construct the self-learning program by CAI with basic of instruction.

Populations in this study are the foreman of head of workers instruction for the foreman and had ability to use window 98 program and others.

1. Sample

Sample in this study are 30 foreman who were selected by purposes sampling and haven't been learned about basic of instruction and had ability to use window 98 program and others. There was setting by experimental class.

Sample for try out the research instrument

Sample were 3, 10 and 30 person who worked as a foreman and had ability to use window 98 program and others and haven't been learned about the basic of instruction.

2. The research instrument

The research instrument is the instruction program about the basic instruction. There are consists of two test as follow:

1. The Pre-test, which the learners do it before, studies the program.
2. The Post-test, which the learners do it after, studies the program.

The instrument construction

1. The CAI construction with the basic instruction for the foreman holds on the process of Triranathanakul, concept (19851). There are 11 processes for construction and the researcher improves the process, which hold on Kacha's concepts. Which have 9 processes as follow:

1.1 There are studies the curriculum and target groups, limit the goal of curriculum for prepare the instruction, analyze the learners example the educational background and the instruction knowledge.

1.2 There is setting the behavioral objective about the basic of instruction.

1.3 There is analysis the contents of basic instruction, which holds on the main content and appropriate both of time to learn and contents.

1.4 There is dividing the contents of basic instruction.

1.5 There is construction the CAI program as follow:

1.5.1 To construct the instructional program by writing the sub contents in framework of program. After process, the researcher brings this instrument for the 3 of my advisors to check the validity.

1.5.2 To improve the instrument.

1.6 There is connection to the specialist of computer to design and writ the program.

1.7 There is insert the development program into the computer pentium II in Window System.

1.8 There is checking the complete of program by

1.8.1 To check by all of my advisors.

1.8.2 To improve when has a fault.

1.8.3 To test with the sample by 1 : 1

1.9 There is following the achievement of learners.

2. Pre - test, Post- test achievement construction

The test constructs for pre-test and post-test achievement. The test is a parallel, which has 7 processes as follow.

2.1 To study documentary

2.2 To analysis the contents and behavioral objectives the program and construct the pre-test, post-test which controls the behavioral objectives. There are 4 choices of 2 the test. The first tests before learning and the second tests after learning. Both of them are parallel tests.

2.3 To bring these test of my advisors and improve it by the qualified person.

2.4 To bring the complete tests to analyze reliability which try out with 10 foreman and never been learned about the instruction program. There is test the Discrimination with 27% technique. If choose the correct answer to get 1 core, choose the wrong answer to get 0 score. There is compare with the Chang Tefan's table analysis. The perfect test has a difficulty index between 0.20-0.80 and has a discrimination power between 0.20-1.0.

3. The time survey for program construction

These instruments for CAI program with the basic of instruction for foreman is hold on the time cycle of the computer. The program will record the time for study the lesson.

The aim of the test is to fine the falsest of CAI program in another parts as the correctly contents, the clearly of presentation, the quality of computer program, the clear of picture and sound and the consensus with the rarity for instruction. These reasons support to find the achievement and time for study, which has a process for testing as follows:

4. There is experiment with the sample by practice the lesson as:

4.1 To check the complete of computer, CAI program and the location for experiment.

4.2 To check the complete of computer, CAI program and the location for experiment.

4.3 There is going to Experiment by the sample with CAI program one person with on computer. The researchers observe the sample behavior

and ask for the comments of falsest from the sample. The sample fills the questionnaire after studied the program.

4.4 There is bringing the data from the behavioral observation of the sample and the time to study record in the computer program for the guideline to develop the lesson.

The one by one experimental analysis

The data from the one by one experiment is the qualitative data, which concerns with the CAI program of the researcher. The data analysis should consider about these issues:

1. The clear of presentation.
2. The quality of computer program.
3. The clear of picture and sound.
4. The consensus with the reality instruction.

The researcher improves the lesson when found the falsest in these issues along with the sample's recommendation from one by one experiment. The developed program will use in the next sample.

CAI programs, which construct by the researcher pass the checking with content validity by the qualified person and bring to experiment in the next 3 samples.

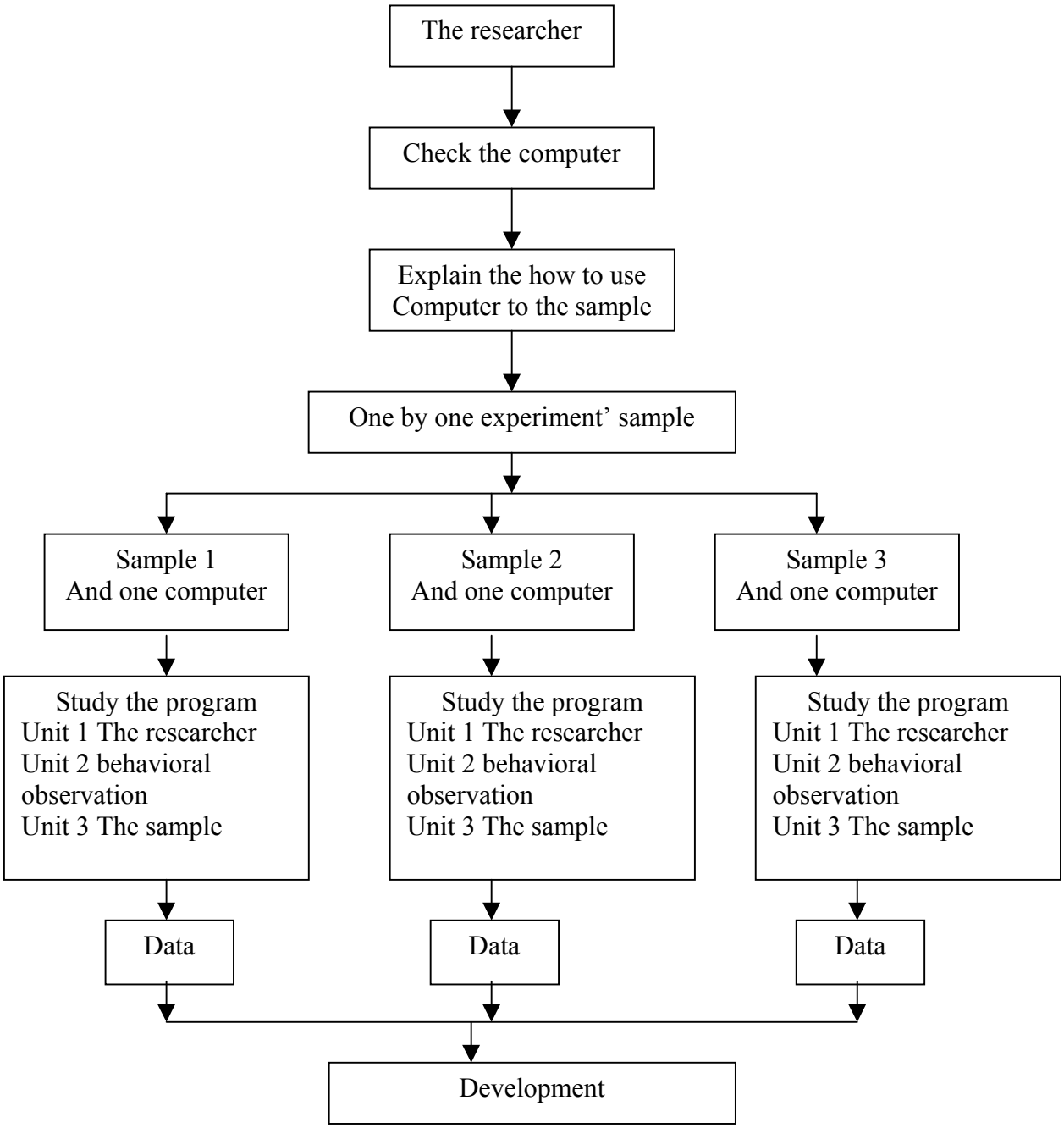

Figure 1 Show the one by one experiment process with CAI program

The test by the subgroups of sample experiment.

The aim of the test is to find the false of CAI program in a part of content correction, clear of presentation, quality of computer program, clear of picture and sound and consensus with reality instruction. These issues help to find the achievement of the learner and time to study. There is a testing process as follow:

1. Select the 10 sample in the sub experiment with purposive from the general people who have a complete qualification.
2. The sample study the program as follow :

2.1 Check the computer and CAI program with location for experiment.

2.2 Explain the sample to know the computer and notify the objectives and conditions to learning.

2.3 There is experiment, the sample studies the CAI program one person by one computer. The researchers observe the sample behavioral and ask for the comment or false including the sample fill the questionnaires after finished the lesson.

2.4 To record the data from experiment into the computer and bring it to be guideline for program development.

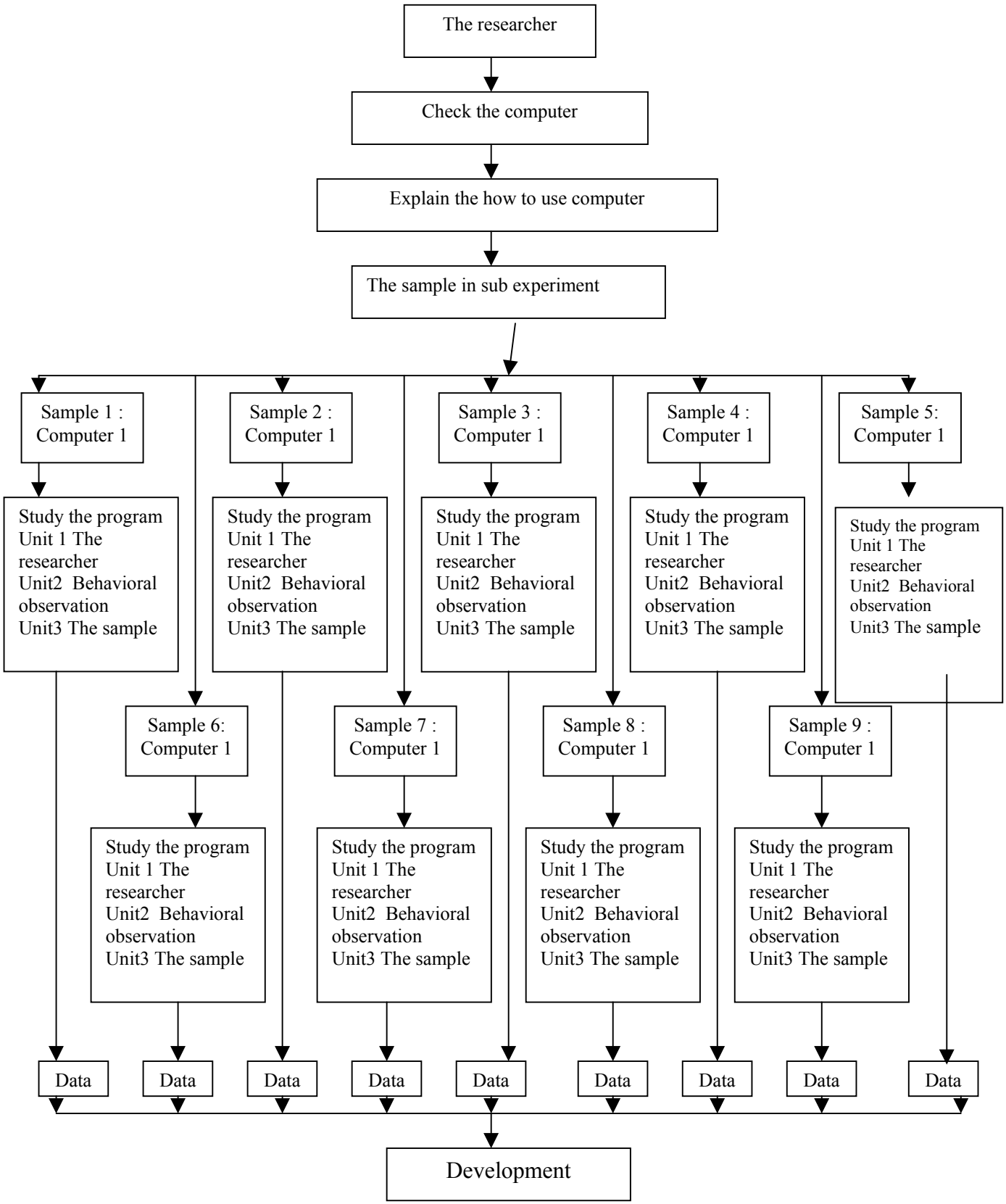

Figure 2 Show the CAI program process in the sub experimental group

3. The data analysis in the sub experiment

The data from experiment is the qualitative data, which concerns with the CAI program. The researcher analyze these issues as follow:

1. The content correction.
2. The clear of presentation.
3. The quality of computer program.
4. The clear of picture and sound.
5. The consensus with the reality instruction.

The researcher develops the program when found the something the faults which comment from the sample and bring it to experiment in the field research.

The field research

1. There is selecting the 30 sample in the field research by purposive sampling.
2. There is experiment by CAI program. The sample practice the study with these process as follow:

2.1 The researcher checks the complete of data with CAI program and send to the sample for experiment.

2.2 The samples study the CAI program in the study location and the convenience time. In each sample can study with only themselves.

2.3 The samples send the CAI program with their achievement score to the researcher.

2.4 The researchers analyze these data from the experiment.

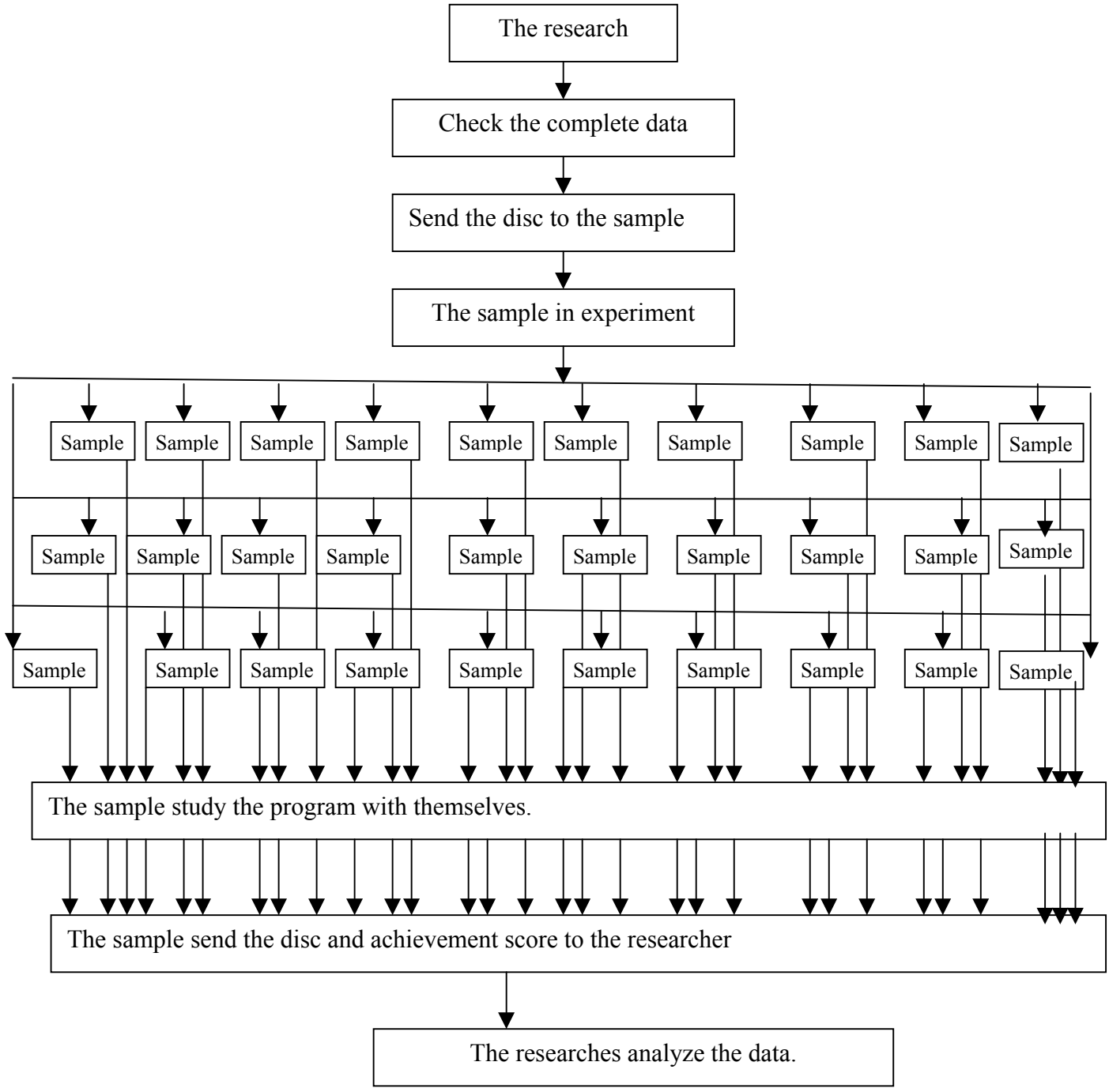

Figure 3 Show the CAI program process in the field research

4. The data analysis

The data analysis in the field research is the qualitative data. It holds on the statistical index for analysis as follow:

1. The comparative data between the score after learned with standard score. First 90 scores mean that the average score from the test of sample which computed were 90 of high than standard score by this formulary:

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

E = The quality of CAI program

$\sum X$ = The total score of samples.

N = The number of sample

A = The full score of samples.

$$E = \frac{n \times 100}{N}$$

E = The quality of CAI program

n = The learners who choose the correct answer.

N = The number of sample

2. The analysis for contrasting with statistical significance of the average scores between before and after learning with CAI program by this formula.

3. $$t = \frac{\sum D}{\sqrt{\frac{N\sum D^2 - \left(\sum D\right)^2}{N-1}}}$$

$\sum D$ = The total of contrasting scores between the pre test and post-test score.

$\sum D^2$ = The total of the setsquare of the contrasting scores between the pre-test and post-test score.

N = The total of the learners.

3. The data analysis finds the time average to study the CAI program by the formulary:

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

X = The time average to study the program.

$\sum X$ = The total of time of each sample to study the program.

N = The total of sample.

The data analysis for the pre-test and post-test

1. The data analysis for the pre-test and post-test uses this formulary:

$$R = \frac{Ru - R1}{f}$$

R = The discriminate power

Ru = The sample in high score groups who choose the right answer.

R1 = The sample in low score groups who choose the wrong answer

f = The number of sample in each groups.

2. The difficulty index analysis of each items use this formulary:

$$P = \frac{Ru + RI}{2\,f}$$

P = The difficulty of each items

Ru = The sample in high score groups who choose the right answer.

R1 = The sample in low score groups who choose the wrong answer

f = The number of sample in each groups.

The researcher selected the items, which has a difficulty index between 0.20-1.00 and a discriminate power between 0.20-0.80. After selected the items, it brought to find the reliability by KR-21 of Kuder & Richardson (Kuder & Richardson, 1939:681) as formula:

KR-21

$$r_{tt} = \left[\frac{n}{n-1}\right]\left[1 - \frac{\bar{x}(n-\bar{x})}{n(S_X^2)}\right]$$

$$r_{tt} = \left[\frac{30}{30-1}\right]\left[1 - \frac{10.87(30-10.87)}{404.7}\right]$$

$$r_{tt} = 1.03\left(1 - \frac{207.94}{404.7}\right)$$

$$r_{tt} = 1.03(1-0.51)$$

$$r_{tt} = 1.03(0.49)$$

$$r_{tt} = 0.50$$

CHAPTER IV
RESEARCH RESULTS

The objective of the research on constructing a computer-assisted self-instruction package on basic job training was to construct a computer-assisted instruction lesson on basic job training. The sample group involved in this investigation was composed of 30 chiefs who were interested in knowledge on basic job training, had never been trained on the subject, were able to operate the Windows 95 system, and were willing to participate in this experiment. The research instrument included 1 unit of the computer-assisted instruction lesson on basic job training, 2 sets of a learning achievement test and 1 set of a survey on time spent on studying the lesson. The research results were as follows.

1. The computer-assisted instruction lesson on basic job training

1.1 The results of constructing the computer-assisted lesson

The constructed lesson was written onto one CD-ROM. The lesson ran by itself chronologically, which was controlled by the program. There was only one subject content: basic job training.

There were 9 steps in constructing the lesson.

1. Studying the curriculum and the target learners by defining the goals of the curriculum used in the lesson and analyzing learners, such as, their educational background, knowledge on job training and other relevant issues.
2. Defining all behavioral objectives on basic job training
3. Analyzing the course contents based on what contents should be provided how much time should be spent and what types of contents should be appropriate to learners.

4. Constructing the lesson

4.1 Creating messages in each content frame as a branching programmed lesson. When the instrument was completed, it was verified for content validity by 3 advisors.

4.2 Improving the lesson as suggested

5. Contacting a computer specialist for designing and writing the program. The specialist was Mr. Phakphum Asawathep, a programer of Gosoft Co.Ltd.

6. Loading the improved lesson into the computer, 486 Dx2 66 MHz Model, with Windows 95 operating system by following the program directions.

7. Examine the completeness of the lesson after the data were loaded by using the steps in testing the instrument as follows:

7.1 Being verified by all advisors

7.2 Improving the lesson again, if necessary

7.3 Having it tried out with the sample group on a one-by-one and small group basis

8. Launching the field experiment with all 30 sample group

9. Following up the achievement of learners

1.2 Results of the field experiment of the computer-assisted lesson

After having been improved, the lesson on basic job training was launched on the field experiment with the 30 samples. The sample group studied the lesson by themselves at places and time of their convenience. After having been through the lesson, the lesson and their study results were submitted to the researcher.

Table 1 Demographic data of the sample group

Demographic data	Number (person) N = 30	Percentage
Gender		
Male	15	50.00
Female	15	50.00
Age		
Lower than 20 years	1	3.33
21 – 30 years	10	33.33
31 – 45 years	9	30.00
46 – 60 years	8	26.67
60 years and over	2	6.67
Educational level		
Bachelor degree	19	63.33
Diploma	5	6.67
Certificate	6	20.00
Present position		
Chief	25	80.00
Higher than chief	6	20.00
Working experience		
Lower than 5 years	12	40.00
5 – 10 years	10	33.33
11 –20 years	5	6.67
21 years and over	3	10.00
Organization		
State	11	36.67
State enterprises	6	20.00
Private	3	43.33

The field experiment revealed that the learning scores and time spent on learning the lesson of the sample group were deliberated in Table 2.

Table 2 Test scores and time spent on learning the computer-assisted lesson on basic job training of the 30-sample group from the field experiment

Sample group with Bachelor's				Sample group with Diploma				Sample group with Certificate			
No.	Score (20)		Time Spent (minute)	No.	Score (20)		Time Spent (minute)	No.	Score (20)		Time Spent (minute)
	Pre-test	Post-test			Pre-test	Post-test			Pre-test	Post-test	
1	12	18	45	1	8	17	52	1	4	17	69
2	11	17	50	2	11	19	44	2	11	18	78
3	8	19	55	3	9	18	53	3	14	17	90
4	9	17	46	4	13	20	65	4	5	20	65
5	13	20	50	5	6	17	63	5	8	17	84
6	16	19	48					6	10	19	55
7	17	19	62								
8	6	17	50								
9	14	20	63								
10	10	20	40								
11	11	18	45								
12	18	19	35								
13	14	17	32								
14	13	20	45								
15	9	19	37								
16	10	18	30								
17	17	18	62								
18	13	20	48								
19	6	19	41								
Total	227	354	884	Total	47	91	277	Total	52	108	441
Mean	11.95	18.63	46.53	Mean	9.40	18.20	55.40	Mean	8.67	18.00	73.50
Total	Pre-test scores = 326			Post-test scores = 553				Time spent = 1,602 minutes			
Mean	Pre-test scores = 10.87			Post-test scores = 18.43				Time spent = 53.40 minutes			

Table 3 Posttest scores of the 30-sample group

Question No.	No. of sample group with correct answers (n)	$E = \frac{n \times 100}{N}$
1	28	93.333
2	28	93.333
3	27	90.000
4	28	93.333
5	26	86.666
6	29	96.666
7	29	96.666
8	27	90.000
9	29	96.666
10	27	90.000
11	28	93.333
12	25	83.333
13	28	93.333
14	27	90.000
15	28	93.333
16	27	90.000
17	28	93.333
18	28	93.333
19	28	93.333
20	28	93.333
Total	553	1843.327
Mean	27.650	92.166

Regarding the efficiency of the computer-assisted lesson, it was revealed that the efficiency of the lesson was 92.167/92.166, which was higher than the pre-determined standard criterion of 90/90.

1.3 Comparison of the mean pre-and post-test scores

The sample group was required to conduct the pre-test before studying the computer-assisted lesson, and after they had completed the unit of the lesson, they were given the post-test. The results of the two tests revealed that pre-test mean score ($\overline{X}$) was 10.87 with the standard deviation of 3.61. The post-test mean score was 18.43 with the standard deviation of 1.15. After t-test (one-group design) was applied, the t score was 11.77, indicating that the post-test mean score significantly increased at a .01 level. This showed that the knowledge of the sample group actually increased after studying the computer-assisted lesson. Details were shown in Tables 4 and 5 and in Appendix A.

Table 4 Comparison of the pre-test and post-test mean scores before and after studying the computer-assisted lesson

Study group	N	$\overline{X}$	S.D.	t
Pre-test	30	10.87	3.67	11.77**
Post-test	30	18.43	1.16	

** Significant at a .01 level

2. Learning achievement test (pre-and post-tests)

The learning achievement test contained 40 question items and each item had 4 alternatives. The content of each unit was used as a guideline for constructing the test questions, which covered the behavioral objectives. After the test was constructed, it was verified for content validity by specialists. Then it was administered with 30 chiefs who had never been trained on basic job training previously. The results were analyzed for levels of difficulty and differentiation. Then 20 items were selected, based on the difficulty levels of .30 - .80 and differentiation of .20 - .80. After that the test was analyzed for its reliability and it was found that its reliability was significant at a 0.85 level.

The survey for time spent on studying the computer-assisted lesson

The test was administered to 30-sample group, consisting of 19 bachelor degree holders, 5 Diploma holders and 6 Vocational Certificate holders. It was revealed that the amount of time spent on studying the lesson of each group was different. When the average time was analyzed, it was equal to 53 minutes as shown in Table 5 below.

Table 5 Time spent on studying the computer-assisted lesson on basic job training of the sample group.

Sample group with bachelor degree		Sample group with Diploma		Sample group with Vocational Certificate	
Person. No.	Time spent (minute)	Person. No.	Time spent (minute)	Person. No.	Time spent (minute)
1	45	1	52	1	69
2	50	2	44	2	78
3	55	3	43	3	90
4	46	4	65	4	65
5	50	5	63	5	84
6	48			6	55
7	62				
8	50				
9	63				
10	40				
11	45				
12	35				
13	32				
14	45				
15	37				
16	30				
17	62				

Table 5 (Cont.)

Sample group with bachelor degree		Sample group with Diploma		Sample group with Vocational Certificate	
Person. No.	Time spent (minute)	Person. No.	Time spent (minute)	Person. No.	Time spent (minute)
18	48				
19	41				
Total	884	Total	277	Total	441
Mean	46.53	Mean	55.40	Mean	73.50
Total time spent = 1,602 minutes			Mean = 53.40 minutes		

When analyzing research studies on constructing computer-assisted lessons for adult learners by Yanee Chanthasatphong (1993) and Suphot Janthawong (1994),it was found that there were between 9-12 construction steps and when the details were further analyzed, it was revealed that most of the steps were similar to those in this study. For instance, there were steps on studying the curriculum, defining behavioral objectives, analyzing the content and verifying the instrument. Other steps were similar in the procedures but using different names, such as, studying contents, writing programs, defining goals, making a story board, verifying the story board and programs by specialists, and verifying the accuracy of the lessons.

For constructing computer-assisted lessons for students, research studies on the topic were conducted by Phisan Phothongsaengarun (1994), Karuna Sueb-udom (1993), Chatchawan Chumraksa (1994), Wiphabun Chotsirirat (1994), Thanai Aphichatsenee (1986), Pitichai Tampiti (1993), Suksan Joicharoen (1991), Damnoen Yathuam (1994), Somprathana Wongbunnak (1994) and Prasit Singhadet (2001). It was revealed that steps of constructing the lessons ranged from 6 to 13. There were 7-13 steps in constructing computer-assisted lessons for certificate vocational students, and lower secondary school students, and there were 6-8 steps in constructing computer-assisted lessons for high school students. When those studies

were compared with this investigation, it was found that the steps were similar. They consisted of studying the curriculum, defining behavioral objectives, verifying content validity by specialists, verifying the instrument, trying out with target learners, studying course contents and course objectives, defining general objectives and behavioral objectives of the contents, studying program-writing principles, laying out the order of course contents, designing the lessons, and constructing the story board.

It could be summarized that in general the steps in constructing computer-assisted lessons for various target groups were similar.

Learning achievement of learners from studying the computer-assisted lessons

2.1 From analyzing the data to obtain learning achievement results, it was found the average post-test scores were significantly higher than the average pre-test scores at a 0.01 level. This indicated that after studying the computer-assisted lessons on basic job training, the knowledge of learners actually increased. The post-test scores being higher than the pre-test scores might be due to the following factors.

2.1.1 The lessons were constructed according to the principle and theory of the system approach (Pruang Kumut:2). The contents were highly detailed and the presentation was done from easy to difficult and step-by-step, enabling learners to get more understanding and knowledge. Furthermore, the contents were ordered systematically so they were able to get more correct answers.

2.1.2 The lessons was designed in a way that enabled learners to learn step-by- step according to their ability and interest. Moreover, they were free to learn without obligation or pressure. Consequently, they could spend as much time on it as they pleased, which was in line with the concept of Mc Clusky's (1997:12).

2.1.3 The computer-assisted lessons explained learners why their answers were right or wrong. When their answers were right, they could proceed to the following step. However, when their answer were wrong, they could turn back to the content again. Such a practice was in accordance with the law of exercise (Chom

Phumiphark: 74). When learners repeated their lessons, there would be reinforcement and their learning would be stable.

2.1.4 Pre-test and post-test were used to evaluate learning achievement of learners before and after they studied the computer-assisted lessons. The tests were designed in a parallel aspect, using the objectives to define the question contents. The levels of difficulty between the two tests were closely similar. As a consequence, post-test scores were higher than pre-test scores and the post-test was used to assess understanding of learners after they had gone over the lessons.

2.2 The investigation further revealed that learners with different levels of education had different post-test scores, as shown in Table 6.

Table 6. Comparison of average test scores of the sample group with different educational levels

Educational levels	Average test scores	
	Pre-test	Post-test
Bachelor	11.95	18.63
Vocational diploma	9.40	18.20
Vocational certificate	8.67	18.00
Total	**10**	**18.27**

When the scores of the sample group in Table 6 were ranked from high to low, it was found that both pre-and post-test scores of the sample group with bachelor degree were the highest, followed by those of the group with vocational diploma. The group with vocational certificate had the lowest pre-and post-test scores.

Learning achievement of the group with higher education was better. This might be because they had more opportunity to practice from their institutions than their counterparts with lower educational levels. Moreover, the focus of vocational

diploma and certificate was more on vocational practices than academics, enabling them to have less academic skills and expertise than bachelor degree holders.

3. Average time spent on studying the computer-assisted lessons

3.1 Comparison of average time with specified time

From analyzing data to find out average time spent on studying the computer-assisted lessons on basic job training, it was found that the average time was 53 minutes, 17 minutes less than the criterion of 70 minutes. This might be because the time criterion was derived from that when trying out with the experimental group, which turned out to be a poor group (spending the longest time). When the actual fieldwork experiment was administered, learners were of a combination of good, fair and poor groups, resulting in spending less time.

3.2 Time spent on studying the lessons by educational levels

The investigation revealed that the sample group with high education spent less time than those with lower educational levels, as shown in Table 7.

Table 7 Average time spent on studying the computer-assisted lessons by educational levels

Educational level of the sample group	Average time (minute)
Bachelor degree (19 persons)	46.53
Vocational diploma (5 persons)	55.40
Vocational certificate (6 persons)	73.50
Total (30 persons)	53.40

As Table 7 showed, it was found that learners with bachelor degree spent the least average time on studying the lessons, followed by those with diploma and certificate respectively. The difference might be because those with bachelor degree had more opportunities to practice in classroom longer, resulting in them having more reading skills and better understanding. Furthermore, they might have more

learning ability so they spent less time. In addition, the contents of the lessons were based more on social sciences and social science courses in vocational colleges were fewer than vocational courses. This might be another reason that they required more time to do the lessons than those with bachelor degree.

CHAPTER V
DISCUSSION

This study has a objective to construct the instruction program with CAI about the basic of instruction. The ample in this study are 30 foreman who had never been to study about the basic of instruction and they can use the computer program window 95. They've willing to try out the CAI program with the basic of instruction. The result found that:

1. The efficiency of CAI program

1.1 From analysis of the efficiency of CAI program about the basic of instruction found that it had efficiency with 92.167/92.167. It had a high score more than the standard criteria as 90/190. The CAI program had a high efficiency more than the standard criteria, it might be support by some factor as follow.

1.1.1 The CAI program instruction had a 9 steps.

1. Studying the curriculum and the target learners by defining the goals of the curriculum used in the lesson and analyzing learners, such as, their educational background, knowledge on job training and other relevant issues.

2. Defining all behavioral objectives on basic job training

3. Analyzing the course contents based on what contents should be provided how much time should be spent and what types of contents should be appropriate to learners.

4. Constructing the lesson

4.1 Creating messages in each content frame as a branching programmed lesson. When the instrument was completed, it was verified for content validity by 3 advisors.

4.2 Improving the lesson as suggested

5. Contacting a computer specialist for designing and writing the program. The specialist was Mr. Phakphum Asawathep, a programer of Gosoft Co.Ltd.

6. Loading the improved lesson into the computer, 486 Dx2 66 MHz Model, with Windows 95 operating system by following the program directions.

7. Examine the completeness of the lesson after the data were loaded by using the steps in testing the instrument as follows:

7.1 Being verified by all advisors

7.2 Improving the lesson again, if necessary

7.3 Having it tried out with the sample group on a one-by-one and small group basis

8. Launching the field experiment with all 30 sample group

9. Following up the achievement of learners

In each step, the researcher analyzed and synthesized with delicate method. The program preparing might be balance with the learner and concerning factors.

1.1.2 This CAI program brought the Reinforcement theory of Skinner (Stimson, 1994 : 27) to apply with the positively reinforcement when the learner correct the answer. It made them to feel proud and needed to learn continuing.

1.1.3 The learner could assessment the achievement by this CAI program. They can know the learning progress by themselves. They are a components to motivate to learn (Phromwong, 185).

1.1.4 This CAI program is the active learning (Phumipak:72). The learner can operate to find the talent in the next step. It makes them funny to learn.

1.1.5 This CAI program, the learner can learn when they have readiness to learn. It's balance with the law of Readiness (Phumipak :72). The learning will be efficiency with the learner readiness. On the other hand, the learner calls to use the time to learn by unlimited. It the results balance with the concept of Mcclusky who told that adult can learn with successfully under no pressure the time to learn

1.1.6 This CAI program is a branching programmed. It can show the description when the learner choose the wrong answer in each items and it checks the understand recently before past to the next frame.

1.1.7 This CAI program construct balance with the law of Effect from the question to the answer. It is connection between the stimulating and response. When it can connect, the learners satisfy and interest to learn. There is bring the concept of Jay and Rodphothong to present the consent as only use one idea and it has 1-2 sentences. The learners have a time to learn appropriately. About the monitor controlling, there are shift the picture when connect by the alphabetic. It should help by the accessory instruments. It should take the tangibles more than intangibles write the color frame of use the special hi-light for important contents. Certainly, these CAI programs bring these concepts to construction. It made the program interesting and the learner satisfy for an achievement.

1.2 The result found that the 9 process in the CAI program instruction balance with the concept of Treeranathanakul who tells 10 processes of program instruction. The researcher cuts the processes that not concern with the research as the coding process. The concept of this research agrees with the program instruction as the basic instruction. Because in each process has delicate, clearly with order and correctly system belong to the developmental concept, example: the behavioral objective, hold on the target group, etc.

According to analyze the research of Chantasartpong (1993) and Chantawong (1994), they construct the CAI program for adult. The results found that there were 9-12 processes of instruction. When analyzed in each process, most of its liked this research as curriculum study process, limit the behavioral objective, analyze the content and verify the instrument. On the other hand, there were namely with difference as content analysis, write the program, limited the goal, made the story board, the qualified person verified the story broad, the qualified person verified the program and my advisors verified the program.

Certainly, the CAI program instruction which the target group are the student, there are 6-13 processes to construction (Photonysaengarun, 1994; Seubudon, 1993; Chumraksa, 1994; Chotesirirat, 1994; Apichartsanee, 1986; Tunpiti,1993; Soychareun, 1991; Yatouim, 1994: Wongbonnak, 1994; Sighadet, 2001). The process were 7-13 steps of the CAI program for the student of diploma, upper secondary

school. There were 28 processes of the CAI program for the student of high school. When compare with this study, there are likely process as the curriculum study. The behavioral objective, the qualified person verify the content validity, reliability, test with the target group, content analysis, the objective of curriculum, general objective, specific behavioral objective writing the program, layout the story for sequence, design the program, make story board, etc.

According to the process to construct the CAI program for the vary occupation of target group, there is the same process to construction.

The analysis the CAI program by content characteristics by research of Chindamance(1998) and Chantasartpong(1993) found that there were agreement this process.

Certainly, about the CAI program, even if the another subjects as sciences, social sciences made it, it had agreement process, too.

2. The achievement of learner from CAI program

2.1 From the analysis of the achievement of the learner from CAI program about the basic instruction found that the post test score was higher than pre test score at statistical significance level of 0.01. It showed that the CAI program truly helped the learner. The factors that helped the high score from the pre test might be from these factors as follows:

2.1.1 The program instruction is constructs by the system approach theory (Kumut :2). The content has a delicate and present along with step by step from easy to difficult. It made the learner to easy understanding and they can order the important sequence of content and correct the right answer.

2.1.2 The CAI program about the basic instruction is the program to help learner studying with step by step along with their interesting. The learner has freedom to learn and they don't be force and pressure. So, the learners spend the time to learn by their satisfaction. It agrees with the Mcclusky concept (Mcclusky, 1997:12)

2.1.3 The CAI program explains the reason when the learners choose right or wrong the answer. When the learner correct the answer, they can learn to the next frame. If they choose the wrong answer, they will back to repeating. It agrees with the law of Exercise (Phumipak:74). When the learner repeat the exercise, it help to reinforcement the learning.

2.1.4 The CAI program measures the learner achievement by the posttest examination. The questionnaire is construct with the parallel by she objective. The test has a level of discrimination so, the posttest scores are higher than the pretest score. It uses test the level of understanding of the learner after they finished the program.

2.2 On the other hand, the result found that the learner who had the difference of education had differently from the posttest score. The detail presented in table7.

Table 8 The comparing with the average score of the different education sample

Level of education	**Average Score**	
	Pretest	**Posttest**
Bachelor degree	11.95	18.63
Higher diploma	9.40	18.20
Diploma	8.67	18.00
Total	10	18.27

According to the table 8, when the researcher sorts the both of pretest and posttest score of the Bachelor degree sample. They had high score both of protest and posttest. The higher diploma and diploma sample had a lower score both of pretest and posttest score.

Certainly, the sample who has high achievement score because the higher educating learners can practice and learning from the famous institutes more than the lower education learners. On the other hand, the higher diploma and diploma learners emphasis to learn with the vocational education. It may be the skill and expert less than the Bachelor degree

3. Average time to study the program

3.1 Compare the average time with the standard time. The result of the average time to learn with the CAI program about the basic instruction found that they spend the time only 53 minutes that less than the standard time as 17 minutes. For this cause may be explain that the 70 minutes of standard time which is the criteria from the try out-group which spend the time longer than another groups. When test in the real situation, there are cover the groups. So, the average time is less than standard time.

3.2 The time to study categorize by the level of education

The result found that the sample that had a higher education spent the time to study the program less than the sample that had a lower education. The detail present in the table 8.

Table 9 The average time in each sample to study the CAI program

Level of education	Average time(Miuntes)
19 of Bachelor degree	46.53
5 of higher diploma	55.46
6 of diploma	73.56
30 of total	53.40

From the table 9 found that the Bachelor degree sample spend the average time less than another groups as the higher diploma as diploma sample, respectively. There are different to spend the time because the Bachelor degree samples have an opportunity to practice more than the other. It made them to understanding and practices their reading skill and they have ability to learning more than the others. On the other hand, the CAI programs about the basic instruction emphasis the social sciences contents. The curriculum of higher diploma and diploma have this subject less than the technical subjects. It may be one cause that they spend the time more than the Bachelor degree.

CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

Technological and scientific advancement of present days enables communication among the global population beyond geographical boundaries. There is a huge amount of knowledge and evolution in the outside world while there are a large number of people needed to be developed. Consequently, personal development by conventional means is no longer adequate. One possible way is for learners to learn by themselves.

The objective of this investigation was to construct a computer-assisted self-learning package on basic job training. The research questions were whether the computer-assisted lessons were up to the 90/90 standard, whether the lessons had an efficiency in making post-test scores higher than pre-test scores, and how much average time spent on studying the lessons was. The sample group was the general public who were interested in basic job training, had never previously been trained on the subject, and were able to operate Windows 95 program. The sample group was specifically selected by asking for cooperation from administrators or related individuals to select their chiefs to participate. The requirements were that they must not have been trained on the topic previously, be able to operate Windows 95 program and be willing to experiment the computer-assisted lessons on the topic.

There were 30 participants involved in the field experiment. The research instrument included 1 unit of the computer-assisted lessons on basic job training, 2 sets of the achievement test and 1 set of a survey form for time spent on studying the lessons.

Conclusions

1. The efficiency of the computer-assisted lessons on basic job training was 92.167/92.167. This was interpreted that the average test score of the sample group was 92.167% and the correction of the tests by question item was 92.167%, which was higher than the 90/90 standard criterion. The result indicated that the computer-assisted lessons had the efficiency according to the criterion.

2. The post-test scores of the lessons were significantly higher than the pre-test scores at a 0.1 level. The result indicated that the computer-assisted lessons could actually enhance the knowledge of the learners.

3. The average time spent on studying the lessons on basic job training was 53 minutes.

Recommendations from the research findings

1. It is recommended that 9 steps should be taken in constructing a computer-assisted lesson for self-directed learning. Every step is important and necessary for constructing the lesson.

2. The presentation of a computer-assisted lesson should be proportionately and appropriately diverse in order to motivate learners, such as, easy-to-read letters, distinct sound, explanation and graphics.

3. In constructing a computer-assisted program, the presentation of the lessons in a branching programmed form is considered suitable

Recommendations for conducting the research

1. Recommendations for a computer-assisted lesson designer

1.1 A lesson designer should consider the content to be presented. It should not be too cramped because it would bore learners.

1.2 The language used should be in line with and suitable for the knowledge level of the target groups.

1.3 There should not be too many lines of letters in each content frame. Furthermore, the size and shape of the letters should be clearly seen.

1.4 Sound should be clear, suitable and in line with the objectives of use.

1.5 A lesson designer should be conscious of differences of learners because different learners have different learning interests and needs. As a consequence, computer-assisted lessons should serve various interests and needs of learners as well.

1.6 If a lesson designer is skillful in both course contents, presentation and computer techniques in constructing computer-assisted lessons, the lessons derived would be of the optimal quality. On the other hand, if a lesson designer is specialized in only certain aspects, he/she should work closely with other specialists in order to obtain a lesson that best benefits learners.

2. Recommendations for further studies

2.1 A computer-assisted self-directed learning package on basic job training should be constructed by using other techniques, such as, Internet or teleconference.

2.2 There should be a comparative study on learning outcomes of learners using computer-assisted media with other conventional media, for instance, printed media, cassette tapes or videotapes.

2.3 A comparative study on learning achievement of learners studying basic job training with other learners whom is not the control group.

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APPENDIX A

PRE-POST TEST

ตารางแสดงคะแนนความก้าวหน้าทางการเรียนของกลุ่มตัวอย่างในการทดลองภาคสนาม

กลุ่มตัวอย่าง	N	$\sum D$	$\sum D^2$	$(\sum D)^2$	t
ก่อนการเรียน	30	227	2077	51529	11.77**
หลังการเรียน					

แทนค่าในสูตร

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

$$t = \frac{227}{\sqrt{\frac{30(2077) - 51529}{30-1}}}$$

$$t = \frac{227}{\sqrt{\frac{62310 - 51529}{29}}}$$

$$t = \frac{227}{\sqrt{\frac{10781}{29}}}$$

$$t = \frac{227}{\sqrt{371.76}}$$

$$t = \frac{227}{19.28}$$

$$t = 11.77$$

APPENDIX B

ตารางแสดงคะแนนการทำแบบทดสอบก่อนการเรียน (คิดเป็นรายข้อ) ของกลุ่มตัวอย่างจำนวน 10 คน

คนที่	***แบบทดสอบข้อที่***																				คะแนนรวม
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	1	0	1	1	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	1	8
2	0	1	0	1	0	1	0	1	0	0	1	0	1	0	1	1	0	1	1	1	11
3	1	0	0	0	1	0	0	1	0	0	1	0	0	0	1	0	1	0	1	0	7
4	0	0	0	0	1	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	5
5	0	1	1	1	0	1	0	1	0	1	1	0	1	0	0	1	1	1	1	1	13
6	1	0	0	0	1	1	1	0	1	0	0	1	1	0	0	1	1	0	0	1	10
7	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	0	1	1	15
8	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	6
9	1	0	1	0	0	1	0	1	0	0	1	0	1	1	0	0	0	1	0	1	9
10	0	1	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0	1	0	0	6
ตอบถูก	5	4	5	4	5	6	3	5	3	3	6	3	5	3	6	4	5	5	4	6	$\sum X = 90$
ตอบผิด	5	6	5	6	5	4	7	5	7	7	4	7	5	7	4	6	5	5	6	4	$\sum X^2 = 428$

ตารางแสดงคะแนนการทำแบบทดสอบหลังการเรียน (คิดเป็นรายข้อ) ของกลุ่มตัวอย่างจำนวน 10 คน

คนที่	***แบบทดสอบข้อที่***																				คะแนนรวม
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	17
2	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
3	1	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1	17
4	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	16
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
6	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	18
7	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
8	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	0	1	1	1	17
9	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
10	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	1	18
ตอบถูก	9	9	7	9	9	9	10	9	10	9	9	8	8	9	9	10	7	10	10	10	$\sum X = 180$
ตอบผิด	1	1	3	1	1	1	0	1	0	1	1	2	2	1	1	0	3	0	0	0	$\sum X^2 = 1636$

+

ตารางแสดงคะแนนการทำแบบทดสอบก่อนการเรียน (คิดเป็นรายข้อ) ของกลุ่มตัวอย่างจำนวน 30 คน

คนที่	***แบบทดสอบข้อที่***																				คะแนนรวม
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	1	1	1	0	1	0	1	0	1	0	1	1	1	0	0	1	1	0	1	0	12
2	1	0	1	1	1	1	0	1	1	0	1	0	0	1	0	1	0	1	0	0	11
3	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	1	1	1	8
4	1	0	1	1	1	0	0	0	0	1	0	0	1	0	1	1	1	0	0	0	9
5	1	0	1	0	0	1	1	1	1	0	1	0	1	0	1	0	1	1	1	1	13
6	1	1	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	0	0	16
7	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	17
8	1	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	1	0	1	6
9	1	1	0	1	1	0	0	1	1	0	1	1	1	0	1	0	1	1	1	1	14
10	1	0	1	1	0	1	0	0	1	0	1	1	1	0	0	1	0	1	0	0	10
11	1	1	0	0	1	0	1	1	0	1	0	1	0	1	1	1	0	0	0	1	11
12	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	18
13	0	1	1	0	1	0	1	1	1	1	1	0	1	0	1	0	1	1	1	1	14
14	1	0	1	1	1	1	1	0	1	0	1	1	1	0	1	0	1	0	1	0	13
15	1	0	1	0	1	0	0	1	0	1	0	0	1	1	0	0	1	0	1	0	9
16	1	0	1	1	1	0	0	1	1	0	0	1	0	1	1	0	0	1	0	0	10
17	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	17
18	1	1	0	0	1	1	1	1	0	0	1	1	1	0	1	1	0	1	0	1	13
19	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	6
20	0	1	0	1	1	0	0	1	0	0	0	1	0	1	0	1	1	0	0	0	8
21	1	0	0	1	0	1	0	0	1	1	1	0	1	1	0	1	0	1	1	0	11
22	1	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	1	1	1	1	9
23	1	1	1	1	0	1	1	1	0	1	1	1	0	1	1	0	0	0	1	0	13
24	0	1	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	0	1	6
25	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	4
26	0	1	1	1	0	1	0	1	1	0	1	0	1	1	0	1	0	0	1	0	11
27	1	0	1	1	0	1	1	1	0	0	1	1	1	0	1	0	1	1	1	1	14
28	1	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	5
29	0	1	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	1	1	1	8
30	1	0	1	0	1	0	1	0	1	0	0	0	1	0	1	0	1	0	1	1	10
ตอบถูก	23	14	18	15	20	13	15	17	17	10	18	15	19	13	16	14	19	18	16	16	$\sum X = 326$
ตอบผิด	7	16	12	15	10	17	15	13	13	20	12	15	11	17	14	16	11	12	14	14	$\sum x^2 = 3034$

ตารางแสดงคะแนนการทำแบบทดสอบหลังการเรียน (คิดเป็นรายข้อ) ของกลุ่มตัวอย่างจำนวน 30 คน

คนที่	***แบบทดสอบข้อที่***																				คะแนนรวม
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	18
2	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	17
3	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	19
4	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	17
5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
6	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
7	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	19
8	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	17
9	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
11	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	18
12	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	19
13	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	0	1	17
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	19
16	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	18
17	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	18
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
19	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	19
20	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	0	1	0	17
21	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	19
22	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	18
23	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
24	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	17
25	1	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	0	1	17
26	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	18
27	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	17
28	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	20
29	0	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	17
30	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	19
ตอบถูก	28	28	27	28	26	29	29	27	29	27	28	25	28	27	28	27	28	28	28	28	$\sum X = 553$
ตอบผิด	2	2	3	2	4	1	1	3	1	3	2	5	2	3	2	3	2	2	2	2	$\sum x^2 = 10233$

หาค่าเฉลี่ยของคะแนน (Pre-test)

สูตร $$\overline{X} = \frac{\sum X}{n}$$

$$\overline{X} = \frac{326}{30}$$

$$\overline{X} = 10.87$$

หาความแปรปรวน (Pre-test)

สูตร $$S_X^2 = \frac{n\sum X^2 - \left(\sum X\right)^2}{n\left(n-1\right)}$$

$$S_X^2 = \frac{30\left(3934\right) - \left(326\right)^2}{30\left(30-1\right)}$$

$$S_X^2 = \frac{118020 - 106276}{30\left(29\right)}$$

$$S_X^2 = \frac{11744}{870}$$

$$S_X^2 = 13.50$$

หาค่าเฉลี่ยของคะแนน (Post-test)

สูตร $$\overline{X} = \frac{\sum X}{n}$$

$$\overline{X} = \frac{553}{30}$$

$$\overline{X} = 18.43$$

หาความแปรปรวน (Post-test)

สูตร $$S_X^2 = \frac{n\sum X^2 - \left(\sum X\right)^2}{n\left(n-1\right)}$$

$$S_X^2 = \frac{30(10233) - (553)^2}{30(30-1)}$$

$$S_X^2 = \frac{306990 - 305809}{30(29)}$$

$$S_X^2 = \frac{1181}{870}$$

$$S_X^2 = 1.36$$

APPENDIX C

ตารางแสดงค่าความยากง่ายและค่าอำนาจจำแนกของแบบทดสอบ (คิดเป็นรายข้อ)

แบบทดสอบข้อที่	ผู้เรียนที่ตอบถูกใน		ค่าความยากง่าย (P)	ค่าอำนาจจำแนก (D)
	กลุ่มสูง	กลุ่มต่ำ		
1	4	3	0.7	0.2
2	4	1	0.5	0.6
3	5	1	0.6	0.8
4	4	0	0.4	0.8
5	4	3	0.7	0.2
6	3	0	0.3	0.6
7	5	1	0.6	0.8
8	4	1	0.5	0.6
9	4	3	0.7	0.2
10	4	0	0.4	0.8
11	5	1	0.6	0.8
12	3	0	0.3	0.6
13	4	2	0.6	0.4
14	4	1	0.5	0.6
15	4	2	0.6	0.4
16	4	0	0.4	0.8
17	5	3	0.8	0.4
18	5	2	0.7	0.6
19	3	0	0.3	0.6
20	4	3	0.7	0.2

หาค่าความเชื่อถือได้ของแบบทดสอบ

สูตร KR-21 $$r_{tt} = \left[\frac{n}{n-1}\right]\left[1 - \frac{\bar{x}(n-\bar{x})}{n(S_x^2)}\right]$$

$$r_{tt} = \left[\frac{30}{30-1}\right]\left[1 - \frac{10.87(30-10.87)}{404.7}\right]$$

$$r_{tt} = 1.03\left(1 - \frac{207.94}{404.7}\right)$$

$$r_{tt} = 1.03(1 - 0.51)$$

$$r_{tt} = 1.03(0.49)$$

$$r_{tt} = 0.50$$

APPENDIX D

แบบสอบถามความคิดเห็น
เกี่ยวกับชุดการเรียนรู้ด้วยตนเองโดยใช้คอมพิวเตอร์ช่วยสอน
เรื่อง การสอนงานเบื้องต้น

ชื่อ .....

หน่วยงาน .....

ระดับการศึกษา ☐ ป.ตรี สาขาวิชา.....

☐ ปวส. สาขาวิชา.....

☐ ปวช. สาขาวิชา.....

ประเด็น	ความคิดเห็นของผู้เรียน		หมายเหตุ
	ดี	ควรปรับปรุงแก้ไข (โปรดระบุสิ่งที่ต้องแก้ไขในช่องหมายเหตุ	
1. ความถูกต้องของเนื้อหา			
2. ความชัดเจนของการนำเสนอ			
3. คุณภาพของภาพและเสียง			
4. ความชัดเจนของภาพและเสียง			
5. ความสอดคล้องกับสภาพการเรียนการสอนจริง			

BIOGRAPHY

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