DEVELOPMENT OF AN INSTRUCTIONAL GAME FOR ENGLISH CRITICAL READING FOR HIGH SCHOOL STUDENTS

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The purpose of this study is to develop an instructional game concerning an English Critical Reading course as a supplementary tool for the traditional classroom. The achievements of students learning to read is assessed. The opinions of the experimental groups towards the game are also investigated.

The samples of this study consist of 60 volunteer students studying Mathayom 5 at Mahidolwittayanusorn School, Nakornpathom Province. The study was conducted during the first semester of the 2000 academic year. The research design involves two groups, an experimental and a control group. Each group consists of 30 students. Both groups are taught the regular English Critical Reading course by the researcher. Only the experimental group is assigned to play the instructional game as a supplementary practice. The game to supplement English Critical Reading is done once a week during their spare time for 4 weeks. The research instruments employed are a multiple-choice English comprehension reading test and a questionnaire. The test is used as a pretest and post-test for both groups. The scores of pretest and post-test were analyzed by using SPSS for windows. The questionnaire is administered to only the experimental group after the experimental supplementary practice to examine their opinions and attitudes towards the Instructional Game on English Critical Reading.

After using the game as a supplementary practice, the results show that the mean scores on English comprehension reading test obtained from the experimental group were significantly higher than that from the control group. In addition, all the questionnaires completed by the students in the experimental group indicate that they had positive attitudes towards this developed computer game. They are able to use the game easily and their knowledge in English reading increased.

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จิราภรณ์ โกธรรม : การพัฒนาเกมการเรียนการสอน วิชาการอ่านอังกฤษเชิงวิเคราะห์สำหรับนักเรียนชั้นมัธยมปลาย (DELVELOPMENT OF AN INSTRUCTIONAL GAME FOR ENGLISH CRITICAL READING FOR HIGH SCHOOL STUDENTS) คณะกรรมการควบคุมวิทยานิพนธ์ : ธนากร อ้วนอ่อน D.Engr., วรวิทย์ อิศรางกูร ณ อยุธยา, วท.ม., วันชัย ริ้วไพบูลย์, Ph.D. 118 หน้า ISBN 974-664-841-1.

วัตถุประสงค์ของการศึกษาครั้งนี้ เป็นการพัฒนาเกมการเรียนการสอน วิชาการอ่านอังกฤษเชิงวิเคราะห์สำหรับนักเรียนชั้นมัธยมปลาย เพื่อใช้ฝึกเพิ่มเติมจากการเรียนปกติในชั้นเรียน โดยประเมินประสิทธิภาพของเกมจากผลสัมฤทธิ์ทางการเรียนวิชาการอ่านอังกฤษเชิงวิเคราะห์ และความคิดเห็นของกลุ่มตัวอย่างที่มีต่อเกมการเรียนการสอน

กลุ่มตัวอย่างเป็นนักเรียนชั้นมัธยมปีที่ 5 โรงเรียนมหิดลวิทยานุสรณ์ จังหวัดนครปฐม จำนวน 60 คน แบ่งเป็น กลุ่มควบคุม และ กลุ่มทดลอง กลุ่มละ 30 คน กลุ่มตัวอย่างจะเรียนวิชาการอ่านอังกฤษเชิงวิเคราะห์ โดยผู้วิจัยเป็นผู้สอนในชั้นเรียนปกติ เฉพาะกลุ่มทดลองให้ฝึกเพิ่มเติมด้วยการเล่นเกมการเรียนสอน ในเวลาว่าง สัปดาห์ละ 1 ครั้ง เป็นเวลา 4 สัปดาห์ เครื่องมือที่ใช้ในการวิจัยเป็นแบบทดสอบแบบปรนัย วัดความเข้าใจการอ่านอังกฤษ และ แบบสอบถาม กลุ่มตัวอย่างต้องทำแบบทดสอบก่อนเรียน และหลังการเรียนเสร็จทำแบบทดสอบหลังเรียน คะแนนก่อและหลังการเรียนจะถูกวิเคราะห์ ด้วยโปรแกรมวิเคราะห์ข้อมูลทางสถิติ (SPSS) และกลุ่มทดลองต้องทำแบบสอบถามประเมินความคิดเห็นและทัศนคติที่มีต่อเกมการเรียนการสอน

จากผลการวิจัย พบว่า มีความแตกต่างอย่างมีนัยสำคัญทางสถิติระหว่างคะแนนก่อนเรียนและคะแนนหลังเรียน ของกลุ่มตัวอย่าง และกลุ่มทดลอง มีทัศนคติที่ดีต่อการเล่นเกมคอมพิวเตอร์ในการเรียน และสามารถอ่านภาษาอังกฤษเข้าใจได้เพิ่มขึ้น

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CHAPTER I

INTRODUCTION

Computer technology has developed rapidly and is characterized by major advances which allow individuals to perform many new tasks. Some of computer activities are enhanced communication, graphic design and production, simulation, and game playing (1). In education, there are a number of ways computers being used as an adjunct tool for the learner to take on new dimensions. Simulation and games have always been popular with teachers and students. Language games are an advantages alternative to learning in a traditional classroom setting.

This chapter introduces background and problem statement of this study, objectives of study, scope of study and steps of study. Expected result is mentioned at the end of this chapter as well.

1.1 Background and Problem Statement

The advantages of knowing a foreign language, especially English, are clear to students. Students can find better jobs, have access to more literature and gain entrance to university. The importance of English is obviously increasing. Nuttall Christine (2) said that its importance is not only in communication, but also in national development with regard to education, business, health service, science and technology. In this era of globalization, a nation can no longer afford to remain in

isolation. A good command of English places a nation in a strong position in dealings with international contacts.

Reading is most important for students, especially in higher education. College and University work demands that students be able to read with understanding, discrimination and insight into all their subjects. In Thailand, 50% of the English entrance exam score is based on reading comprehension (3). All items in the English graduate entrance exam at Mahidol University are questions testing reading comprehension (4). However many students are not doing well in this area. They may have the ability to answer some questions correctly, but they do not really understand the content of what they are reading.

The characteristics of the students also influences on their learning. Their learning speeds and styles vary. Some students are tired of traditional lectures and practicing exercises. When they use the computer, they feel that they can learn better. Students can study in their own learning styles at their own ability level (5).

Because of the accessibility and self-paced format, computer-assisted instruction (CAI) is particularly well suited to students. A computer instructional game has potential as an instructional medium to individualize the learning process and it is fun too.

By combining what is known about the learning process with what is now "state of the art" in computing science, we are able to construct the model. This can help us find out not only what computers can do, but what teachers cannot do in the educational process. When applying the principles of instructional design presented with the case of CAI, we establish an Instructional Game.

1.2 Objectives of Study

1. To develop an Instructional Game for an English Critical Reading course as a supplementary tool for the traditional classroom.

2. To compare the difference of the achievements of students learning to read on experimental and a control sample.

1.3 Scope of Study

This study focuses on analysis, design, and development of an Instructional game using computer multimedia and application as a tool. In order to develop an Instructional Game for English Critical Reading course, the scopes are as follows:

1. The Instructional Game is designed to imitate a Board Game.

2. The content of the Instructional Game is partially the procedural content of the English Critical Reading Course (E 026). This is according to the 1996 upper secondary school English curriculum and the syllabus of the Department of Academics, Department of Education and Supervisory Unit.

3. Test the program using a volunteer group of 60 Matthayom 5 students from Mahidolwitthayanusorn School, Salaya Nakornphathom. The students have reasonably strong ability to use computer and Grade Point Average 2.00 at least.

4. Find the potential of the development of multimedia computer instructional game as supplementary practice to traditional teaching methods.

5. Develop multimedia computer instructional game by using Microsoft Visual FoxPro.

1.4 Steps of Study

The steps of study are based on the Software Development Life Cycle (SDLC) as follows :

1. Preliminary Planning for development of multimedia computer instructional game;
2. Collect Related Information on computer instructional game and the content of English Critical Reading course;
3. Requirements Analysis and Definitions;
4. Analysis and Design the computer instructional game;
5. Developing the computer instructional game;
6. Testing and Evaluation the computer instructional game;
7. Documentation.

Steps of Study	Month									
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1. Preliminary Planning	→									
2. Collect Related Information	→	→								
3. Requirements Analysis		→	→							
4. Analysis and Design			→	→	→					
5. Developing				→	→	→	→	→		
6. Testing and Evaluation						→	→	→	→	
7. Documentation										→

1.5 Expected Results

1. An Instructional Game for supplementary English Critical Reading.
2. Different result from learning English by using the game, in addition to learning English through traditional methods.

1.6 Definitions of Terms

"English Critical Reading" is defined as one of the selective courses : the English Language Improvement group . This course can be selected by high school students in any program. Altogether there are 6 courses which students can take as many times as they require. The course codes begin with E026 then the letters A , B , C, D and E are added after in association with the number of sessions the student needs to take.

"Instructional Game" is referred to as an application in which a computing system is used to drill and practice a student's English skills.

A "Board Game" has defined goals and rules as known under the name Snakes and Ladders. A slot machine is used instead of rolling dice. The bodies of the game is presented in the scene of adventure in a variety of jungles such as rainforest, stone forest etc.

CHAPTER II

LITERATURE REVIEW

The advent of computer has introduced a new task into the education of both teachers and students. It can be used in the classroom in a variety of forms as Computer-assisted instruction (CAI). The study about the use of computer technology in the classroom realized the becoming more powerful and affordable of computer instructional game as a tool to supplement learning. The purpose of this chapter is fourfold. The first one is to introduce Instructional Game theorem. The second is about Reading theorem. The third is the English Critical Reading content used in Instructional Game. And lastly is the Related Works and Studies.

2.1 Instructional Game Theorem

Games are a powerful instructional tool that are becoming more prevalent with the proliferation of computers in school. The purpose of games is to provide an environment that facilitates learning or the acquisition of skills. Games may or may not simulate reality, but they are nearly always characterized by providing the student with entertaining challenges. Games also have an instructional component.

Instructional Game is a complete game, entailing student practice and drill on a subject over a long period of time, one or more school semesters or academic terms. Progress through using the game is determined by the student's, computer-controlled, performance (6).

2.1.1 Definition

The instructional games described vary considerably in purpose, content, and target population. It is difficult to define games precisely. Consequently, it may be helpful to have games define themselves by example.

2.1.2 Major Characteristics of Games

It is possible for a game that is initially intended for entertainment to be used instructionally. The common features are present to varying degrees. The degree to which these are present in an instructional setting gives a good indication of how game like the instruction will be. Six Major Characteristics of Games are (6) :

1. Goals : Every game, for instance, has a goal that is either stated or inferred. This is the end to which each player strives. In some games it is scoring points; in others it is popping balloons, solving mysteries, discovering unknown lands, guessing words, or solving problems.

2. Rules : These define what actions are allowed within a game and what constraints are imposed. Their distinguishing feature is that are artificial. This is , rules are artifacts of our imagination even though they may sometimes attempt to simulate reality. Rules can be changed, an frequently are, to meet changing needs.

3. Competition : Games usually involve some form of competition, either against an opponent, against oneself, against chance or against time. Many games combine these elements in different ways.

4. Fantasy : Games often rely on fantasy for information. The degree of fantasy can range anywhere from a close representation of reality, to a more distance representation, to a totally imaginary one.

5. Safety : Games can provide a safe way of acting. This in turn encourages

the players to explore alternative approaches in the game with the knowledge that failure at worst means losing the game. There are no real consequences.

6. Entertainment : Almost all games are entertaining, although not necessarily as their primary purpose. Instructional games, while primarily intended to teach, use their entertainment appeal to enhance motivation and learning.

Although a complete and precise definition remains elusive the essence of games becomes clearer in light of each of the features described above. The presence of these features, either singly or in combination, is not sufficient to define a game. Nevertheless, the greater their presence, the more likely a program will be regarded as a game.

2.1.3 Types of Games

There have been many attempts to classify games . The categories are widely understood. In many cases a game will play several of these roles simultaneously. The following are several games classified by type. Where a game has multiple roles, it is classified in several categories (6).

1. Adventure Games : An adventure game is one in which the player assumes the role of a character in a situation about which little is known. The player must use existing information and resources to solve the problems posed for the character by these situations. The purpose of an instructional adventure games is usually to teach problem-solving skills, deductive reasoning, or hypothesis testing. *Oregon* is typical of such games. In it the student plays the role of a settler in the Wild West, travelling across America to the frontier lands. Another typical instructional adventure games is *Snooper Troops*, which is classified as an adventure game because the player takes the role of a detective who has to determine whom to accuse of the crime.

2. Arcade-Type Games : As a vehicle for instruction, arcade-type games are similar to those found in an amusement arcade. Examples of these are *Decimal Pinball*, which uses a simulation of a pinball machine to teach arithmetic facts, and *Darts*.

3. Board Games : Boards games are often computerized versions of existing games. Chess checkers, *How the West Was Won*, and *Hurkle* are examples of computerized board games. In a sense, most adventure games are similar to board games. To start the game, a Hurkle (a small, friendly creature) hides itself in a field marked as a grid. The player types in the two numbers designating where he or she thinks the Hurkle is hiding. Using the feedback, like "Go Northeast" or "Go South", the player chooses another position on the field and enters its coordinates.

4. Card or Gambling Games : These are generally characterized either by the existence of a large element of chance or by the use of money as a motivator. Any game that has random fluctuations falls into this category, as do games such as *Phizqui,* in which the student has to use money for information. Typical of such games is *Casino Reading*, a game designed to help children develop their comprehension of stories.

5. Logic Games : Logic games are those that require the player to use logical problem solving to succeed. *Rocky's Boots* is a good example. Others are Baffles, chess and most mathematical strategy grid games, such as the Battleships game, played originally with pencil and paper, *Baffles* is very much like Battleships and *Hurkle* in that the goal is to locate hidden objects.

6. Psychomotor Games : Psychomotor games are those that combine

intellectual and motor skills. Most of these are noninstructional; for example, virtually all space games and the computerized versions of popular sports like tennis, baseball, or basketball . Some instructional games do have psychomotor components, such as *Rocky's Boots*, which calls for manipulating objects on the screen, and *Moonwar,* which requires moving one's own spaceship while entering angles at which to fire one's lasers. Very often these games make use of the joystick or game paddles for input.

7. Role-playing Games : Role-playing games are those in which the student assumes the guise of a character and acts out that role. By doing so, the student learns about the character's environment and problems, and how to solve these problems. *Archeology Search, Oregon, and snooper Troops,* can be classified as role-playing games. Another is *Diffusion Game*, in which you visit an unknown village to sell a new product.

8. TV Quiz Games : These instructional games take the form of an ordinary television quiz game. Typical of these is *Meet the Presidents*. Here, the student is given clues about the identity of a president of the United States and must guess who it is.

9. Word Games : Word games either teach about words or use words as the basis of the game. Many games that teach foreign vocabulary fall into this category, as do *Four-Letter Words* and *Ordeal of the Hangman. Ordeal of the Hangman* is often used, in fact, in foreign language instruction as a vocabulary exercise.

2.1.4 The Advantages of Using Instructional Games

Games are becoming more popular in the instructional setting because teachers are beginning to appreciate their potential for motivating students to learn. Obviously, the overriding purpose of instructional games is to teach, and these can be successfully used to convey a variety of information, such as facts and principles, processes that is titration or real estate acquisition, the structure and dynamics of systems, skills of problem solving, decision making, or the formulation of strategies and attitudes.

Teachers find that games have advantages over most traditional instruction because games tend to motivate students and focus their attention on the goal of the game.

Maidment and Bronstein (7) also postulate that games enhance the learning environment because the teacher plays a less dominant role and is not the only judge of performance. In fact, by constructively discussing with the student how to perform better, the teacher may well perceived as an ally. This encourages many students to interact more freely with the teacher.

Of course, games should not be used just because they are games, but because they will achieve some positive outcome. An effective instructional game maintains the student's interest and encourages the acquisition and development of the desired knowledge or skills.

2.1.5 Factors in Games

Games are much like simulations in their basic structure, as can be seen by the flow of a game (figure 2.1). They can be divided into three main parts: the introduction, the body of the game, and the conclusion.

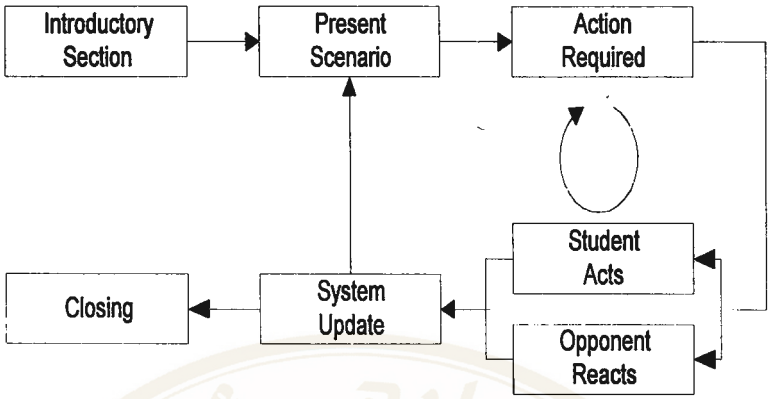

Figure 2.1 : The General Structure and Flow of Games (6)

1. *Introduction to the Game*

The purpose of the introduction is to set the stage for the game and to ensure that the student understands what to do, and how to do it. If the game is poorly introduced it may lose much of its instructional benefit, because the student may have to concentrate on solving unimportant problems rather than on playing the game. Most of introduction section consists of goal, rules, directions of use and choices.

Goal : The goal of a game is the target toward which each player aims. In most cases this goal is clearly stated. In some cases it is the same for all players; in other instances it may vary from one player to another. Sometimes the goal of the person playing the game will differ from the stated goals of the game itself.

In an instructional game, the goals needs to reinforce the intended objectives. To teach well, an instructional game should ensure that success comes about by the application of the skills or knowledge to be learned, rather than by luck, tricks, or unintended skills. Progress towards the game's goals should always follow progress towards the instructional objectives. Learning is enhanced most if progress is an immediate reward for learning and is perceived as such by the student.

Rules : The rules of a game define its nature and the role each player will take. As mentioned earlier, these rules are essentially artificial and can be changed whenever necessary. In computer-based games, however, it is usually impossible to alter the rules other than by rewriting the program. Because of this , it is rare for such games to be played differently from the way they were intended.

The rules usually define the player, the equipment used, the permissible procedures, the constraints imposed, and the possible penalties.

Players - The rules govern what role each of the players will assume (bankers, client, generals, star fleet commanders). Rules also designate, in terms of both minimum and maximum numbers, how many players of each type can participate. Also stated is whether the computer will or can play of role of one of the participants, particularly in those games that normally have two opponents. One of the advantages of many computer-based multi-player games is that an individual can still play even if alone.

Equipment - Rules always include a statement about the equipment required to play the game. For computer-based games, this is usually restricted to joysticks, game-paddles or particular hardware requirements, such as size of memory or number or disk drives. In non-computerized games it includes such items as boards, dice, and cards.

Procedures - The procedures of a game detail how to set it up, how it proceeds, how it ends, and what happens when a winner emerges. Also included are procedures for handling disagreements between players, such as instances of two players claiming that each was the first to do something or to be somewhere, or of more than one player claiming the same property or money.

Constraints - In addition to the procedures that tell what actions are allowed, there are also constraints that stipulate the boundaries and limitations of those actions, such as the number of houses one may have on a property, the number of cards one may exchange, the number of consecutive turns allowed, or the quantity of resources the one can accumulate or use.

Penalties - The penalties of a game are the actions taken if a player violates the rules or procedures. Sometimes the penalties are stated explicitly; for example, that a turn is forfeited if a player out of turn or fails to respond a given time limit. In other cases, the penalties are implicit; occasionally the players themselves make them up.

Directions For Use - Rules, procedures, and penalties tell the player what actions to take to play the game; directions inform the player about the logistics of performing these particular actions. Frequently, directions appear in an accompanying booklet rather than in the game program itself.

Choices - A player often makes many of the important choices prior to the start of the game. These choices may include whether the computer will be one of the players and if so, at what level of proficiency it should play.

Another common choice involves time, in one of two ways, Either you can select how long the game is to continue (that is , when it is to terminate), or how fast it is to take place. Speed of action is closely related to the level of difficulty, with increased rate of movement or reaction usually being associated with greater difficulty.

Other common choices include the name within the game depend on the game. One can frequently select the piece that represents the player, such as a car, locomotive, or stagecoach. Such choices are important, particularly in multi-player

games, to discriminate between players.

2. *The Body of the Game*

Games have a structure very much like simulation and they are just as difficult to divide into distinct parts. For purpose of discussion, however, it is convenient to deal with the following categories (7) :

1. Scenario
2. Level of reality
3. Cast
4. Role of the players
5. Presence of uncertainty
6. Presence of curiosity
7. Nature of competition
8. Relationship of learning to instructional objective
9. Skill versus chance
10. Wins and losses
11. Choices
12. Information flow
13. Turns
14. Types of action
15. Methods of interaction

1. Scenario

The scenario of a game is the "world" in which the action takes place. The scenario determines the type of game in which the instruction is embedded: an adventure, space, card, or board game, to name but a few. For example, if the object of

instruction is simple arithmetic operations, such as addition and subtraction, a variety of scenarios may be employed to teach this. *How the West Wide Won* uses a race between a stagecoach and railroad engine as the scenario. *Beehive* allows the player to let bees in and out of a hive, each time asking how many remain in it. In each of these, addition and subtraction are being used, but the scenario is different.

Scenario comprise three dimensions : realism versus simplification; concentration versus comprehensive; and emotion versus intellect. The more realistic the scenario, the harder it usually is to play the game, because of detail and complexity. On the other hand, the greater the simplification the further it is from reality, which can lower the transfer of knowledge to real life. Like wise, the more the game focuses on a topic, the less perspective the player will get of that topic on the broader context. Increasing the comprehensiveness of the scenario can lead to loss of important realism and detail. Finally, the greater the presence of emotional involvement or reward, such as in space battles where the enemy always threatens, the less likely the player is to analyze the situation from a detached perspective,. Like wise, games that have only intellectual appeal frequently are low in motivation.

Scenarios can be classified by where they fall on the relationship triangle. This has three vertices representing intrinsic, related, and arbitrary relationships between the context of the scenario and the instructional goals.

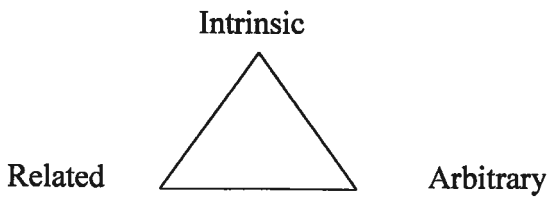

Figure 2.2 : Scenarios Relationship Triangle

An *intrinsic* scenario is an action of each student that is dependent on a reaction from the scenario. Like wise, the response from the scenario depends on where the student is within, and what questions are asked. Many role-playing games are highly intrinsic.

A *related* vertex is an action the student affects the scenario. An example of the related vertex is *Decimal Darts*, although throwing darts at balloons has nothing to do with number lines, the position of the balloon directly influences the response of the student. If the estimate of the balloon's position is accurate, the balloon pops.

An *arbitrary* scenario is one in which there is no relationship or interaction between the scenario and what is being learned. In *Ordeal of the Hangman*, for instance, the creation and the hanging of the victim have no relationship to guessing the hidden words other than to act as a motivator. Certainly, student actions affect the scenario, but the scenario, how close the victim is to death, no influence at all on future guesses.

Another measure of the arbitrariness of a games is the lack of a cause and effect relationship between the student actions and the real scenario depicted in the game.

Malone (8) claims that games with high intrinsic qualities are generally the Most interesting and instructional. This implies that clothing instruction in a game format is unlikely to improve the instruction a great deal, unless the scenario of the game is directly involved with what is being learned. So, when the scenario is used merely to provide a gaming environment, it is less likely to enhance learning.

2. Level of reality

Three basic types of scenarios-real, unreal, and fantasy-can be incorporated

into a game.

A *real* scenario is one that exist in real life. An example is the game *Pinball*, in which a child plays a simulated pinball machine in order to learn various math facts. A pinball machine, which is the context of the game, actually exists in the real world.

An *unreal* scenario represents something that exists in real life but in a different form. Many examples of these abound: chess has a board representing a battlefield and pieces representing different ranks of soldiers and nobles; Monopoly has a board representing the real estate of a city, paper money representing real money. Each of these represents s real situation , but in a detached or abstract way.

A *fantasy* game is one in which the scenario is purely a figment of the imagination. A game like *Dungeons and Dragons* is a good example. Here the player has to negotiate a passage through a complicated assortment of rambling hallways, imaginary animals, unworldly people, and impossible situations to reach an elusive goal.

3. Cast

Every game has a cast of players. In some games the cast may be one person: in others, many. In some games, all the payers may be people; in others the computer may also become a player. Sometimes a player, or the computer, or both can play several roles simultaneously. In addition, the student can choose to watch the computer play against itself.

4. Role of the Players

A Computer-based game can often define or constrain the roles of the participants more than a traditional game. For example , in a board game with computer, it is possible to police situations automatically. Because the computer rolls

the dice, for instance, it can also total their point, and move the player's token automatically, precluding illegal moves. However, programming a game on a computer can lead to an inflexibility of rules that could change the nature of the game.

5. Presence of Uncertainty

Malone believe that for a game to be challenging, the attainment of its goal must be uncertain. Malone says this can be accomplished in a number of different ways : variable difficulty level, multiple level goal, hidden information and randomness.

Variable difficulty level : Within each game there should be situations the require varying levels of effort by the player. Some situations should be easily mastered; others should be difficult. In this way the player is provided both with reward and with continuing challenge.

Multiple level goal : This means that the game has adjustable levels of difficulty, which are set either by the player or by the game itself. A game may, for example, adapt its level of difficult to the performance of the player, thus making it constantly a challenge. As a player improves, the harder the game gets. If a player is not performing well, the game becomes a little easier.

Hidden information : A game is more challenging if each player operates with incomplete or hidden information. The attraction of a game is increased if each player is uncertain about some facts needed to attain the goal.

Randomness : This involves the extent to which random fluctuations or chance play a role in the game. Games that depend on the roll of dice or the dealing of cards have a high element of randomness.

6. Presence of Curiosity

Games depend on the curiosity of the player as part of the motivation for playing. Of course, curiosity and challenge are closely related, the challenge of a game frequently being how to satisfy curiosity. Malone (8) has proposed.

"...environments (scenarios) can evoke a learner's curiosity by providing an optimal level of informational complexity. In other words, the environments should be neither too complicated nor too simple with respect to the learner's existing knowledge. They should be novel and surprising, but not completely incomprehensible. In general, an optimally complex environment will be one where the learner knows enough to have expectations about what will happen, but where these expectations are sometimes unmet."

Curiosity generally comes in two forms, *sensory* and *cognitive*.

Sensory curiosity involves ways in which the senses are aroused: sigh and hearing being the most prominent our attention, either through use of different colors or by means of changing the scene.

Cognitive curiosity is the desire to know , and it is aroused by different means. One common method is to prevent or prolong the natural ending or closure of whatever is happening. When closure is not reached, we become highly motivated to do whatever is necessary to obtain it.

7. Nature of Competition

The nature of competition in a game defined by three major components: the number of participants, whether play is individual or in teams, and against whom or what the players compete.

The number of players in a game can vary from one to many, and often

includes the computer. Usually each participant acts individually, but there are some games, in which players are encouraged to form teams. Sometimes the role of the other player or players can be taken by the computer.

Often players compete against themselves. This is particularly true of games in which some numerical measure of performance is kept. Of course, in most games the nature of the competition is determined by combinations of these various factors.

8. Relationship of Learning to Instructional objective

The learning that takes place in an instructional game can either be *intended* or *unintended.* If what is learned is intended, there is a very strong relationship between it and the instructional objectives. Conversely, if learning is unintended, there is no relationship.

In almost every educational setting it is impossible, and undesirable to have the students learn only what was specified in the objectives. Students learn all sorts of unspecified skills and knowledge as a byproduct of their formal learning; examples include social interactions.

9. Skill versus Chance

A game is more likely to be entertaining and to continue to be entertaining if there is a balance of skill and chance. Chance increases the unexpected, which can increase the challenge. However, if chance is overdone, the student may not be sufficiently skilled to overcome its effects. Similarly, if only skill is required to master the game, the uncertainty is eliminated and the game may lose its appeal.

10. Wins and Losses

There are two major ways to determine whether a player wins in a game. The

first is when a specific goal has been attained, either reaching an explicit target or defeating an opponent. Many games have a less explicit way of determining whether there is a winner. Some people , for example, regard themselves as winners if they perform better than they ever have before.

The final aspect of winning and losing is the nature of what is won or lost. This can sometimes be crucial to the success of the game. The level of the stakes is important. If too low, there is little incentive to be cautious when betting or bluffing. If too high, anxiety can detract from the pleasure of playing. Computer games are generally different in this respect. Because there are generally no material rewards or loses, winners usually only take with them the pleasure of success, while losers lose only the game, and not money or possessions.

11. Choice

There are typically four types of choices that occur in the body of a game:

Informational

Strategic

Assistance

Leaving

Informational : Many games require access to information on which strategic decisions are based. Consequently, it must be clear to the player how to access such information. Typical of such information is the necessary data and the relevant equations for solving problems

Strategic : Strategic choices are usually the central part of a game. These are the choices that a player makes to manipulate the context or to participate in the action of the game. How the various choices are to be accomplished must be easy to learn

and readily accessible. Sometimes these are discrete events, such as the entry of a number, answer, or course of action. Sometimes the choices are apparently continuous, such as when using a game-paddle or joystick to direct some moving object on the screen. Whatever the type, it must be clearly stated how to make the choice.

Assistance : It is difficult for a new player and often for seasoned players to remember how to do everything in a game, particularly when there are many variables to alter, or when players take different roles. As the number of options increase, it becomes more important to provide easy access to the directions of the game, or to help on both content and strategy. Games can be programmed to provide strategic assistance to beginners, for instance , as an instructional device.

Leaving : There are two instances when a player may want to leave a game, and two possible future actions. A player may want to leave once the game has been completed, in which case the usual choice is whether to play again or leave. A player also may want to leave the game before it is finished. This can be because the game has lost its appeal, the player does not want to lose, or the person has no more time to play.

In the case when the player leaves while playing , two other possibilities arise. Either the player wants to end involvement in the current game, or wishes to be able to return to the same point and continue. When the player wants to return later, the nature of the game will dictate whether this is possible. Games in which there is only one player usually pose no problem. The game may be frozen and restarted later. In such a case all the relevant information must be stored from one session to another to allow this to happen.

12. Information Flow

In all games the player needs information on which to make choices. The information is discussed about the type of information given, sources of information, when it must be provided, and how it can be given.

Types of information given : Throughout the game, each player obtains information either automatically or on request. What the type of information is can directly influence the progress of the game and the chances of the player's success. There are several types: accurate, misleading, partial, and false. Each can be embodied into pictorial, textual, or audible modes.

Sources of information : Most information a game comes from the computer and includes directions on how to play, the results of each player's actions, questions or problems to be answered, and feedback on performance. Most computer games supply all the necessary information to play. There are some , however, that also provide information in a manual or booklet supplied with the game. Sometimes this information is a duplicate of that contained in the game itself; sometimes it is new information that cannot be obtained from anywhere else, such as maps or charts. Most frequently it is initial information on how to load the program into the computer.

When information is provided : Some information is always supplied at the beginning of a game. This includes the rules, directions, and any other information necessary to start the game. As the game progresses there is a constant flow of information. Sometimes it is provided immediately in response to a player's action, the passage of time, or as a result of a player failing to act. At other times, information about an action is delayed in the same way as feedback can be delayed in simulations.

At the end of a game, the student may know how well he or she performed, but may have to wait to obtain information about performance relative to other players.

How information is provided : Information can be provided either explicitly, such as in a message to the player, or implicitly, as in the relative movement of various pieces or tokens. Furthermore, information can be transmitted by means of words, sounds, movements, pictures, color, or the actions of opponents. It can also be provided from both off-line or on-line sources.

13. Turns

Players can interact in different ways in games. They can take turns in a specified sequence. They can react at will to another player's actions. They can react simultaneously, an in many conflict games; or they may do nothing at all.

In many games each player completes an entire game at a time, awaiting completion by other players for information on relative standing. In other games, players can act independently of each other, with each action potentially influencing future actions of other players. As with all possible player involvement, it must be made clear what the various options are so that the player is not penalized by the difficulty of manipulating the system.

14. Types of Action

Playing a game involves a variety of differently actions on the part of a player. In instructional games, the most common are moving things on the screen, answering questions, choosing from options, attacking or defending, turning machines or switches on or off, and seeking information. Most games use combinations of these, employing different types at different points in the game, and for different reasons.

15. Modes of Interaction

Given the types of action that will occur in a game, a number of possible modes can be used to implement each action. The usual modes available are through the keyboard, by touching the screen, by means of a joystick or game-paddle, or with increasing frequency through speech recognition. Each has advantages and disadvantages with respect to each action.

If the game requires the student to answer questions about a topic, the student can recall the answer and type it in using the keyboard, or can choose using either keyboard or joystick, one of the several multiple-choice alternatives. The advantage of the former is that the student has nothing on the screen that acts as a prompt or hint. The drawback, however, is that it assumes the student can type with some proficiency. Selecting among alternatives is easier for a student to do, but this may not elicit the same information. Touch panels have the advantage over keyboards in that people of all typing skills can use them, and that one does not have to look away from the screen in order to respond or act. Disadvantages include the fact that not all computers have touch panels and less reliable than keyboards.

3. *Conclusion of the Game*

Games are a powerful instructional tools if used appropriately. It is clear that they have a strong motivating influence on children and adults alike. However, it is important to remember that instruction clothed in game format does not necessarily make the instruction effective. It is not the game format itself that appeals to people; it is the challenge or enjoyment of a particular game. If a game satisfies your instructional requirements, it is likely to be successful and popular.

The four factors associated with the conclusion of a game are:

Recognizing the winner

The reward

Providing information

The final message

Recognizing the winner

At the end of a game it is important to recognize the winner, if there is one. In most games this is accomplished by a verbal message or an appropriate graphic display seen only by the current players. In some games, however, this is taken further. If a person's score or performance ranks in the top 10 or 20 of all previous games, this is recognized by being placed on a scoreboard containing the best scores. If this is automatic rather than at the winner' s choice, mention should be made of it before the game starts, particularly if the player's real name is being used. This can prevent embarrassment for someone who does not want to appear on such a list.

It is motivating for all players if the computer not only recognizes the winner but also congratulates all players whose score exceeded their previous best. Of course, this requires storing data on performance from one session to another.

The Reward

The reward for winning a game varies greatly. It can be specific, such as money, goods, or free additional games; or more subtle, such as when a player merely knows that performance was improved. Whenever possible the reward should not become the end in itself; rather, it should be another factor that can be manipulated to creates a good instructional environment. The promise of a detrimental effects of an

uninteresting game. If the game piques curiosity, external rewards are often totally unnecessary.

Providing information and the final message

It is appropriate once the game has ended to provide feedback to each player on the progress of the game and on individual performance. It is also a good time to supply information about better ways to play the game or to solve the problems embedded in it. Some games, such as *green Globs*, which is a two-dimensional version of *Decimal Darts*, save the entire game when the score is high so others can review the strategies of better players. There are also times when the strategic solution or the answer to the puzzle can be given, although this is usually only done if the player will not return to the game.

2.1.6 Board Games

Board games are one of the best games that rarely die. They spread, and are difficult to stop. Their goals , rules and the bodies are as everybody knows under the name Snakes and Ladders (9). Board games are taken for granted, specially at Christmas, when the whole family might be dragooned into a round table battle but to the historian, the archaeologist, the anthologist or the geographer who cares to look beneath the gaudy outer wrapping, games can be astonishingly informative.

Board games are very ancient indeed. The earliest examples, from the Middle East, date from as early as 8,000 BC and today, there is hardly anywhere in the world where some kind of game or other is not played.

Many often world's most successful board games originated in India; chess for one, and probably backgammon, both in the first millennium AD. Backgammon is

now played in a number of versions, but varieties of the modern game of chess, principally limited to the Far-East, are less numerous.

Other games, developed in more recent times, are less - acknowledged as imports into the West. Snakes and Ladders, for example, began life in India. It was a game of a moral instruction, where each square was labeled with a specific quality such as "generosity" or "hypocrisy". Good behavior led up to nirvana, while bad behavior sent players down, via the backs of life-like snakes.

Board games were encountered by the British and Americans in the 19th century, imported and simplified for commercial production. In recent times, the watered-down English version of both games have been imported back to India.

Other games were conscious inventions of the 20th century, although their histories can likewise contain unexpected twists.

Figure 2.3 : First English version of Snakes Board and Ladders

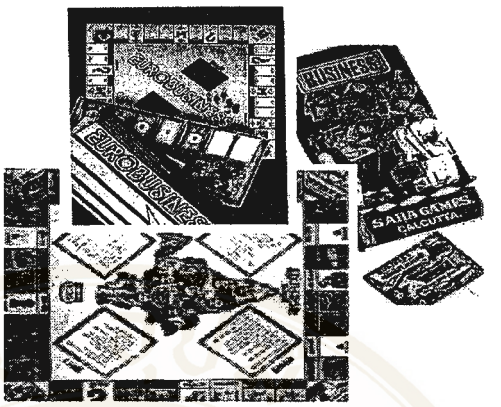

Figure 2.4 : Other versions of Games

2.2 Reading Theorem

Reading ability increases in importance as society becomes more complex and industrialized. As technology advances, more occupations require higher levels of education or specialized training in which a good reading ability is vital.

Many foreign language learners have a specific need – dealing with entrance examination or further studying, keeping up to date with new research, and so on. They need to read for meaning. Language is simply the vehicle conveying the message which is important to them, whereas in language classrooms the message is too often the vehicle conveying the language. Language improvement is a nature by-product of reading, and a highly desirable one. Reading widely is a highly effective means of extending language.

2.2.1 Definition of Reading

Many linguists have given various definitions of reading. Not only intellectual meaning may be involved; feeling of considerable intensity may be aroused and

emotional may be profoundly altered throughout reading. Different people use the term reading in different ways. Some example definitions are as follows :

"To enable students to enjoy or at least feel comfortable with reading in the foreign language, and to read without help unfamiliar authentic texts, at appropriate speed, silently and with adequate understanding (10)."

"Reading is defined as the act of responding with appropriate meaning to printed or written verbal symbols (11)."

"The complete reading act is Perception + Understanding + Interpretation + Use. This means that an efficient reader must be able to recognize the word read and the letters which make up each word, understand what the word stands for in relation to the other words, or to its context, react to his part experiences, and apply what he had read in appropriate situations (12)."

"Reading (comprehending) is a result of the interaction between the perception of graphic symbols that represent language and the reader's language skills and knowledge of the world. In this process the reader tries to re-create the meanings intended by the writer (13)."

The previous Prime Minister Anan Panyarachun (14) states : " English is the great opportunity. A better knowledge of English provides greater opportunities for acquiring the latest, first-hand information about new discoveries, new ideas and the latest research finding which may be beneficial for one's own use and reference. It enables a person to have instant access to an international network of information."

Dr.Surin Pitsuwan (15) states : " English is a tool. A tool that can be used to sculpture the future. With the English language, you can travel and see the

world and get out of your environment. Often times you can qualify for a scholarship."

2.2.2 Objectives of Reading Instruction

When teachers of reading are asked to state their objectives, the answers are frequently very general. Many teachers do not get beyond the statement that their aim is to help children become better readers. This praiseworthy desire is much too vague to be helpful in the specifics of teaching. There are many varieties of objectives in Reading Instruction as follows :

"To illustrate, the general objective ,evaluate what is read is a complex aim that calls for the use of critical thinking in reading. A number of more specific learning outcomes can be listed under this general objective (16) :

1. Distinguishing between facts and opinions
2. Distinguishing between facts and inferences
3. Identifing cause-effect relations
4. Identifing errors in reasoning
5. Distinguishing between relevant and irrelevant arguments
6. Distinguishing between warranted and unwarranted generalizations
7. Formulating valid conclusions from written material
8. Specifying the assumptions needed to make just conclusions."

"A major objective of Reading Instruction is the development of a love for reading and as a form of recreation (17)."

"Hayhoe (18) has described and illustrated five basic objectives : cognitive, performance, consequence, affective and exploration. Although there are variations in style, a behavioural objective usually states the condition under

which a specific behaviour is planned through instruction (terminal behaviour)."

"The teacher of reading wants his pupils to read, to use reading effectively as a learning tool, and to enjoy and appreciate reading (19)."

2.2.3 Kinds of Reading

Reading can be classified according to the rate or speed at which a person reads as well as to his purpose of reading. Most general kinds of reading which used in classes are as follows (17) :

1. Skimming Reading
2. Scanning
3. Studying Reading
4. Critical Reading
5. Recreatory Reading
6. Analytic Reading

1. Skimming Reading is reading the signs posts or clues in the selection. These signposts include chapter titles, section headings, boldfaced or italicize type, and understanding. It is fast reading in which the reader reads the headings and topic sentences and spot-reads parts of paragraphs. By dealing these, the reader skips the materials which are not of immediate interest.

2. Scanning is glancing through the page to locate a particular kind of information. For example, a students may scan through names in telephone directory, locate a friend's name, or scan a paragraph to find where an event took place. Scanning requires the reader to justify key words or phrases related to the information sought and then to focus an action on those words as he glances over a page.

3. Studying Reading – when a reader reads to understand the main ideas in what he reads and how they are related. A student must react to, challenge, and interpret the assignment he is reading. He must took an appropriate assumptions, adequate supporting evidences, and relevant information. He understands the selection he is reading and remembers it for his future use.

4. Critical Reading : this is a kind of thoughtful reading done because a more rapid reading may lead to false conclusions. The reader watches out for inconsistent logic and false analogies in what he reads. This is the kind of reading used on periodicals, books and advertising materials which are loaded with propaganda devices designed to sway opinions or sell products.

5. Recreatory Reading : One does this kind of reading when one goes over magazines, newspapers and paperbacks for one's enjoyment. The reader's eye rapidly move along the lines of print, reading for main ideas and remembering only the important words in each thought phrase.

6. Analytic Reading is the type that demands careful attention to each word and it relative important in relation to other words in the sentence or paragraph. Reading mathematical theorems and problems scientific formulae, and certain definitive statements of key ideas require a questioning mind.

2.3 Content of the Game :

As a student progresses through junior high school, senior high school, and college, English reading he is expected to do increases both in amount and in difficulty (20). A wide variety of adult basic education programs have been developed, from televised lessons through computer-assisted instruction, with varying success.

Using multimedia computer-assisted instruction game will help the students to reinforce and practice more in the motivative situation. The students can refer back to the same strategy but different content as often as needs. An instructional game has been developed to the vary range of content that make the game more motivating and challenging. However, the content is not set to produce an enjoyment game only but to meet the instructional objectives also (21).

Moreover the game content should be related and relevant to the purpose of the instruction. Because the content require a considerable amount of practice, it will seem appropriate to use multimedia computer-assisted instruction game for this differentiate content. It would not only increase the student's practice but would also treat the reading as a purposeful and livelier activity.

2.4 Related work and studies

Numerous of work and studies have been conducted on computer to determine the effect of assisted instruction on student learning, student attitude and instructional time. All of the studies were implemented in different subjects such as science, ecology, medical, nursing and language learning. There are still not many studies about computer as assisted instruction in English learning for secondary education level in Thailand, especially in the form of instructional game. Six studies will be reviewed here as they contain insights applicable to this study.

Phanit Kumseranee (22) developed computer programmed multimedia on "The separation and recycling of solid waste" for high school students and examined their effectiveness in terms of their learning enhancement and the quality of the media.. The result of this study showed the post test score of the students who learn

from computer programmed media were significantly higher than the pretest one. And the students were satisfied with the media's quality in terms of their pictures, illustrations, content, sound and language used as well.

Duangjai Srithawatchai (23) constructed and evaluated an efficiency of the CAI to assist tutorial learning in the tittle of "Natural Resource and Industry" for Upper Secondary School level by C language. Six units of the CAI program were constructed and using as a research tool. Results of the study indicated that pre-post test scores of all six units of the CAI program were significantly different at the level of 0.01, as well as the pre-post test scores between each unit. The overall data confirm that all six units of the CAI program can be used for the Upper Secondary School level.

Suchart Suwancharoen (24) constructed a computer-game to supplement the Thai word spelling skill. Authorware professional was employed as a tool to create this game. The results showed that the computer game set the efficiency at 85.48/79.78 as standard, the pretest and posttest achievement's mean score between the experimental and the control group was significantly different at .05 level. The average score of the experimental group was higher than the control group. Almost all students had a good opinion towards the computer-game to supplement the Thai word spelling skill.

Vorawan Vanicharonchai (25) studied the effectiveness of the multimedia computer-assisted instruction lesson on cardiopulmonary resuscitation to teach the fourth year nursing students. The results showed no significant difference between students' pretest and posttest scores for both sections scores and the positive opinion toward this multimedia computer-assisted instruction lessons was presented.

Friedman (26) studied about using CAI for effective learning in secondary students at New York. The result of research is at the first time the students have problem to understand the lesson. But later, they can understand the lesson and reduce time about 3-4 weeks. That can show the effective of using CAI.

Allen's attitude (16) toward CAI semantic differential instrument was modified by the investigator. Two groups of students were chosen for this investigation, including experimental group 50 and control group 47. The study data indicated that both groups displayed positive attitude towards computer assisted learning.

In contrast, some studies have indicated negative student attitudes toward CAI. Day and Paynel, cited in Allen LR. (16), found the first-year baccalaureate nursing students using CAI to learn health assessment preferred learning strategies that were traditional in nature and teacher-directed to CAI. The students indicated that CAI was less useful, less stimulation, less satisfying, more frustrating, and generally less enjoyable than other learning strategies.

CHAPTER III

METHODOLOGY

This Chapter explained the procedures used in this study. They are the following :

3.1 Steps and research methodology

3.2 The sampling of the samples

3.3 Tools

3.1 Research methodology

For developing the Treasure of Reading Game, Software Development Life Cycle (SDLC) (27) used as a base research methodology illustrates the developing steps as follows :

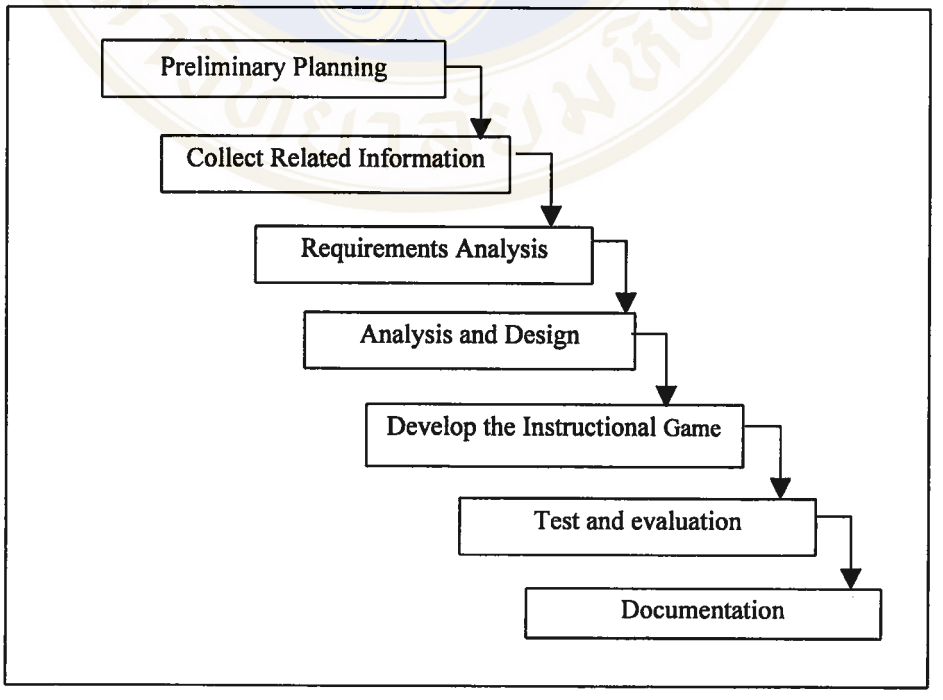

Figure 3.1 Research methodology

Step 1 : Preliminary Planning

A roughly plan in developing the Treasure of Reading Game is made in this step. This includes objectives of study, steps of study and the details of each step in a board prospect.

Step 2 : Collect related information

In this step, research documents, journals, and books are collected from secondary sources. This information is about Instructional Game theorem, the English curriculum of upper secondary schools, the behavior objectives and the content of English Critical Reading course. All of this information will be the base knowledge for developing the Treasure of Reading Game.

Step 3 : Requirements Analysis and Definition

An interview technique (28) is used for analyzing the requirement for developing the Treasure of Reading Game after creating the preliminary plan and the collecting related information. The objectives, the scope and the steps of the development are defined. The requirements for The Treasure of Reading Game is established as mentioned in chapter 1.

Step 4 : Analysis and Design

The profile of the Treasure of Reading Game, Pretest and Post-test questions, the questionnaire and the experiment are analyzed and designed in this step. Conventional methodology concept (27), Delphi method (29) and the Test Analysis Computer Program will be used for analysis and design.

1. **Analysis and design of the Treasure of Reading Game**

1.1 In the analysis phase, data model and content are defined .

1.1.1 Data modeling method makes use of the Entity-Relationship Diagram (ERD) introduced by Peter Chen in 1976, to identify data object and their relationships using a graphical notation. A data object description is used to describe the attributes of each data object in the ERD. The ERD and the data object description is shown in figure 3.2 and 3.3 respectively.

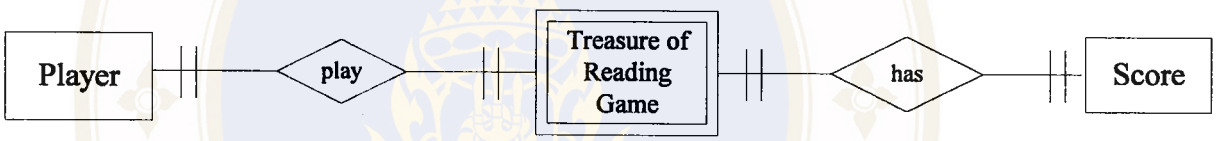

Figure 3.2 The ERD of The Treasure of Reading

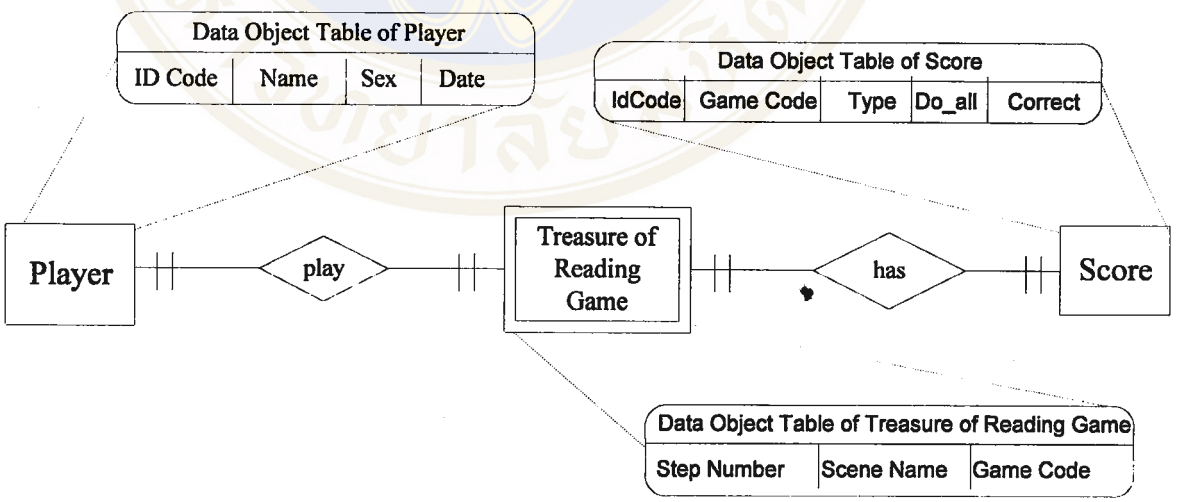

Figure 3.3 The Data Object Description of The Treasure of Reading

1.1.2 The content of the game is defined followed the course outline. The content validity and correctness of the language are considered by three expert judges in the field with Delphi method (29). One of the expert judges is an English Professor and the other two are Secondary school teachers of English. The reliability is established by using the Test Analysis Computer Program. Some samples of the content are shown in Appendix A.

1.2 In the design phase, the analyzed information is used to design clearly and concisely the storyboard, flow chart, screen display and writing content. These have to be associated with the game and the learning objectives.

i) Storyboard design

The storyboard provides the details of the game according to the learning objectives. It does this by depicting individual designs for each screen display and is used to track the preceding screens , follow or for feedback. The Treasure of Reading Game is plotted out. It is possible to edit the game and rearrange the sequence of the game or redesigne the screens before coding the game for the computer. The storyboard is shown in Appendix B.

ii) Flow Chart design

The Flow Chart defines the relationship of the major structural elements of the game frame by frame as it unfolded for the player. It is shown in Appendix C.

iii) Screen design

The screen design is presented the interface design for the arrangement of text or content graphic, color and animation of the games on the screen. The dialogue chart is used to show the structure of user interfaces in the

Treasure of Reading game as shown in Figure 3.4 and 3.5.

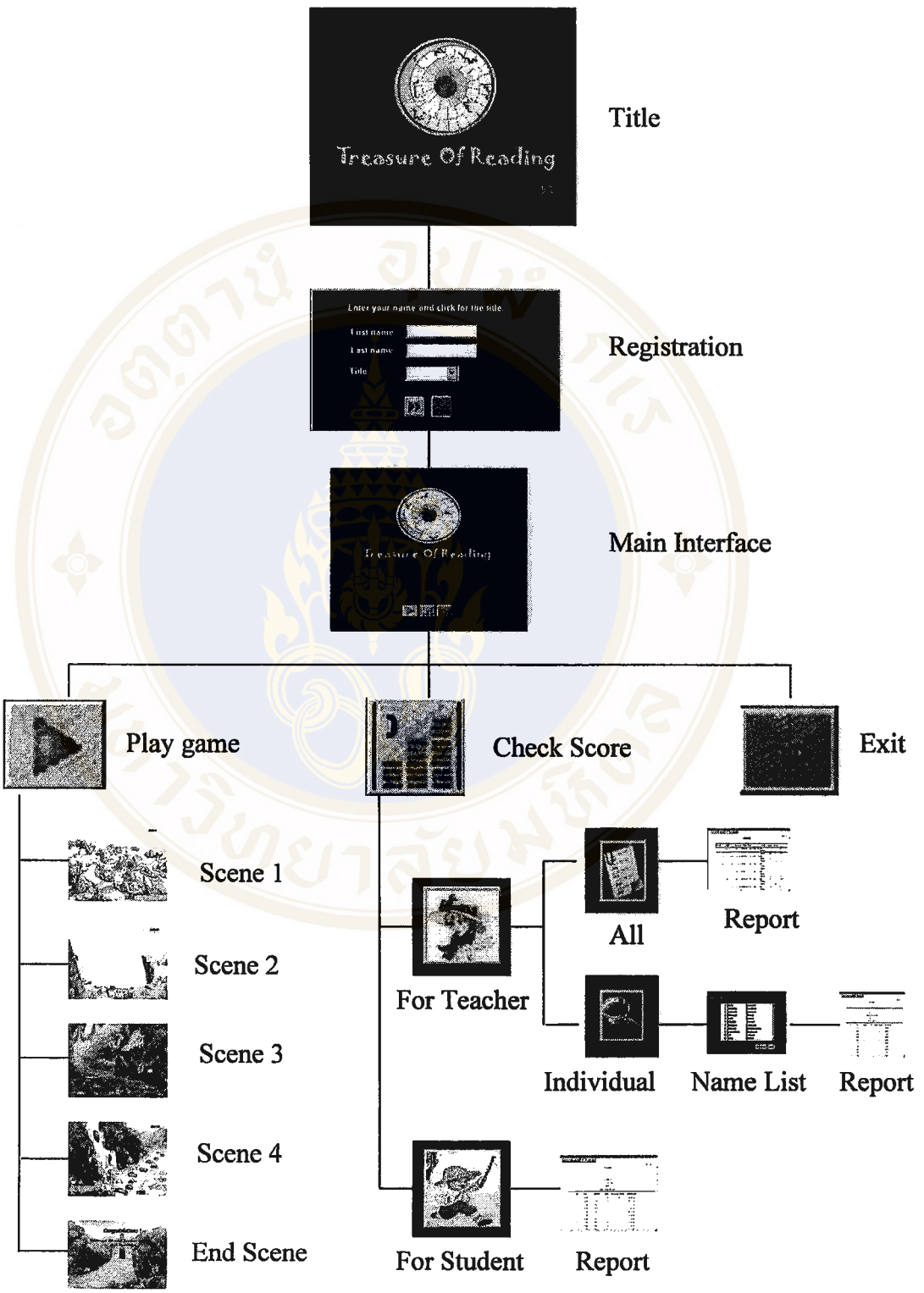

Figure 3.4 The Dialogue Chart of The Treasure of Reading Game

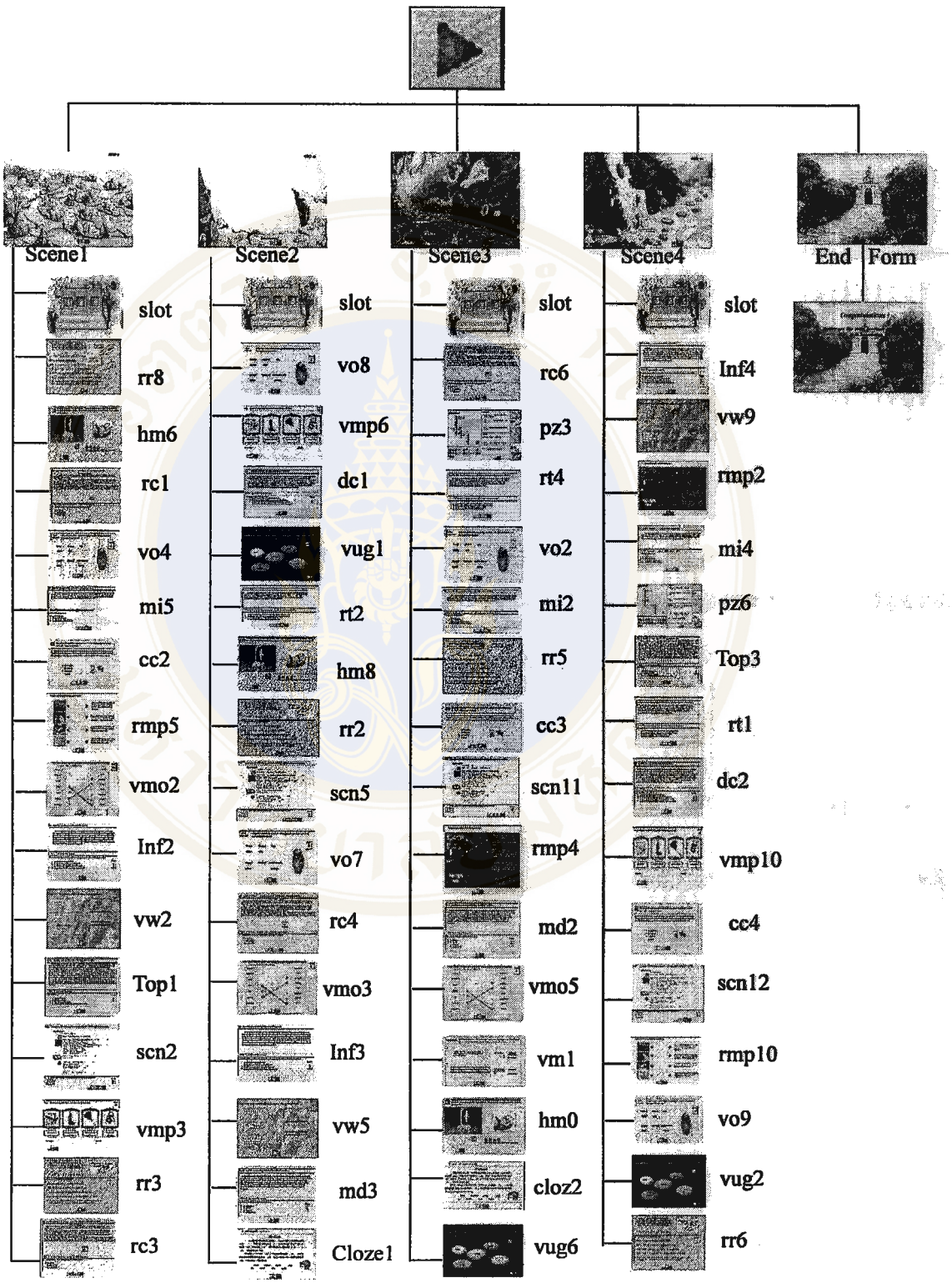

Figure 3.5 The Dialogue Chart of The Treasure of Reading Game (cont.)

2. **Analysis and design of Pretest and Post-test questions**

A multiple-choice English Critical reading test is constructed to be a Pretest and Post-test for both sample groups. The test consists of 40 items and is administered for 60 minutes. Its content serves the learning objectives.

3. **Analysis and design of questionnaire**

The questionnaire is designed to determine the subject group's opinions towards the developed computer program. The questionnaire contains eleven questions, ten of which measure satisfaction on Linkert - type rating scale,

5 = strongly agree

4 = agree

3 = indifferent (neither agree nor disagree)

2 = disagree

1 = strongly disagree

The final question is open-ended and asked the sample group to write any comments they wish concerning the computer instruction program. The questionnaire is divided into two sections. The first is to find out some general information concerning students. The second is to find out the students' opinions towards the application. The questionnaire is written in Thai in order to minimize the problem of word ambiguity and misinterpretation.

4. **Experimental design**

The two groups, the experimental and the control groups are both instructed by the researcher with the same teaching technique in the first semester of the 2000 academic year for 16 weeks in an English Critical Reading course. They are taught English Critical Reading for two periods a week. Both groups use the same materials

namely "Basics in Reading" and a Critical Reading", assigned for Mathayom five students by the Department of English, Mahidolwitthayanusorn School.

However, the experimental group is given additional practice by using the Instructional Game twice a week for a month. This is used as the supplementary tool in the regular English course. The game lasts for 20 - 30 minutes. It takes about three hours altogether.

At the end of the experiment, all samples take the same multiple-choice English reading comprehension test as a post-test to evaluate the effectiveness of the application and their progress overall. In addition, a questionnaire is administered to the experimental group immediately after finishing the post-test evaluation for the experimental sample to find out their opinions towards the using Instructional Game application.

Step 5 : Develop the Instructional Game

The Treasure of Reading Game, pretest, post-test and questionnaire are developed in this step.

The Game is developed by using Microsoft Visual FoxPro. This software has many features that facilitate the game. These features incorporated text, graphics, animation, pictures, sound and a database. The development is based on the storyboard design as follows :

1. Prepare computer hardware and software for developing the game. Other assistance tools, such as tool for editing images, a scanner and a sound recorder are included.

2. Design interactive presentation of The Treasure of Reading Game.

3. Input content, graphics, animation, pictures, and sound to the Game.

4. Create a database by using data design in step 3.

5. Set the content for practicing into 20 topics. The content is basic knowledge word skills, sentence reading, paragraph reading and a short passage.

6. The validity of the game in terms of content validity is considered by the experts in the field. The revision cycle is complete when all errors had been removed.

7. Test the Instructional Game using three students in obstetrics groups who resemble the samples. The students are instructed to go through the program and the researcher observes for problem areas. The researcher also tests to see if the directions are unclear, connecting points are missing, sequencing is out of order, and for a variety of other problems the students may have detected.

A Pretest and a Post-test are developed to evaluate the knowledge that the students have acquired. In developing the pretest and post-test steps, 60 items of the test are established beforehand. A pilot study is administered to a similar group of 20 students from Mahidolwitthayanusorn school. They take a 90 minute test. The data obtained from the pilot study is analyzed by using a computer program namely "Total Item Analysis Difficulty Discrimination and Reliability" to examine the level of difficulty and the discrimination value of the test by means of item analysis. The items which come under the criteria of item analysis are deleted from the 60 items and only 40 items are selected for the pretest and post-test.

A questionnaire is developed to evaluate the students opinions towards the Instructional Game. This instrument consistes of eleven questions, of which ten

questions are constructed using Linkert – type rating scale. The answer for each question ranges from 5, indicating they strongly agreed to 1, indicating they strongly disagreed with the question. Since there are 10 questions in this questionnaire, each with a score ranging from 5 to 1, the total scores can range from 50 to 10. The last question is open-ended and asked the students to write the comments about the game.

Subsequently, the content in the questionnaire is checked for appropriateness and word ambiguity by instructors in the school. This instrument is revised according to the suggestions of the instructors. The revision cycle is complete when all errors had been removed.

Step 6 : Test and evaluation

The program is tested to check its validity and then the entire application is evaluated.

1. Program validation testing

Bottom-up testing is used to test if all of the components of the program worked. When an error occurs, it is corrected before going to the next step.

2. Application evaluation

The ideas collects during the formative evaluation are the validity of the construction of the application, the achievement of the students' learning after using the program, and the opinions towards using the Instructional Game application.

2.1 The validity of the construction of the application is evaluated by using a t-test to compare the difference in mean scores, significant at $p < 0.05$. It tested for significant differences between the difference in mean scores of the Pretest

and Post-test scores of the sample groups in the experiment. SPSS 6.0 for Windows is used for the analysis.

2.2 A questionnaire is administered to the experimental group to find out the opinions of the students towards the Instructional Game application. This instrument is employed immediately after finishing the Posttest. The opinions are evaluated by using SPSS 6.0 for Windows.

Step 7 : Documentation

The last step of research methodology is to generate a complete research document and user manual document. Research is concluded and recommended based on inferential statistics and observations made through the study.

3.2 The sampling of the samples

The samples in this study are sixty volunteer science students. They are studying in Mathayom 5 at Mahidolwitthayanusorn School, Salaya Nakornpathom in the 2000 academic year . They have fairly strong ability to use the computer and have a Grade Point Average (GPA) of at least 2.0. Thirty students are selected from a total of sixty, forming the experimental group, the rest are members of the control group.

The sampling procedure

Prior to the experiment, these students take the pretest, a multiple-choice English reading comprehension test. Then, according to the pretest scores, the students are put in pairs with equivalent marks. One from each pair is randomly selected and placed in the experimental group and the other one is placed in the control group. Grouping the samples is shown in the Table 3.1.

Table 3.1 : Grouping the samples

Number of Samples	Experimental Group	Control Group
	Pretest Score (40)	Pretest Score (40)
Pair 1	31	32
Pair 2	28	29
Pair 3	28	29
Pair 4	27	28
Pair 5	27	27
Pair 6	26	26
Pair 7	26	26
Pair 8	26	25
Pair 9	25	25
Pair 10	25	23
Pair 11	24	23
Pair 12	24	22
Pair 13	23	22
Pair 14	22	21
Pair 15	22	21
Pair 16	22	21
Pair 17	22	21
Pair 18	21	21
Pair 19	21	20
Pair 20	19	20
Pair 21	18	20
Pair 22	18	19
Pair 23	18	18
Pair 24	18	18
Pair 25	18	17
Pair 26	17	17
Pair 27	15	17
Pair 28	15	16
Pair 29	14	16
Pair 30	14	14
Mean	21.7667	21.8000
SD.	4.5915	4.4675

3.3 Research Tools

3.3.1 Hardware

For developing the Treasure of Reading, an Instructional Game, using a personal computer with a specification given below is used.

CPU	:	Intel Pentium compatible
RAM	:	At least 32 MB
Hard disk	:	At least 3 GB
Monitor	:	15" Super VGA Monitor
Peripherals	:	Keyboard, Mouse, Sound Card, Speaker, Scanner and Laser Printer

3.3.2 Software

The software used to develop the Treasure of Reading is

Operating System	:	Microsoft Windows 98
Application Tool and DBMS	:	Microsoft Visual FoxPro
Photo Editor	:	Adobe Photoshop
		Illastrator
Animation Editor	:	Adobe Image Ready
		Microsoft GIF Animation
		GIF Movie Gear
Sound Editor	:	Sound Forge
		Winamp
Statistic Tools	:	SPSS 6.0 for Windows
Document Generation Tools	:	Microsoft Word for Windows
		Microsoft PowerPoint for Windows

CHAPTER IV

RESULTS

The purpose of this study are to develop an Instructional Game and to investigate its potential as a supplementary practice for an English Critical Reading Course, an elective course for high school students. The results are shown in two parts the Treasure of Reading Game and the evaluation of the potential of the Game

4.1 The Treasure of Reading Game

The Treasure of Reading Game is divided into four parts :

- Registration
- Slotting
- Play
- Score

4.1.1 Registration

Before playing the Treasure of Reading Game, all players have to register by entering their name and title as illustrated in the figure 4.1.

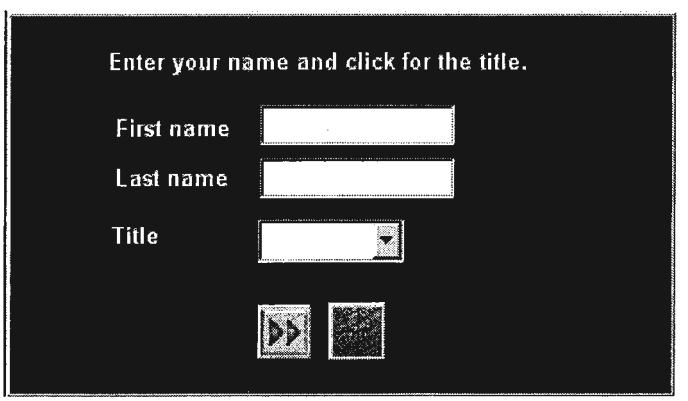

Figure 4.1 The Treasure of Reading Registration

The information of the player is collected in the database. Then the main screen and the characters is generated as illustrated in the figure 4.2.

Figure 4.2 The Treasure of Reading Game main screen and the character of the player

4.1.2 Slotting

At the starting point of each scene, the slot machine is revealed for the player to slot after clicking forward button, . Then the player walks in accordance with the points step by step by clicking forward button. And the slot machine also displays at the time the player gets the marks of the practice more than 80 percentage. The screen of slot machine and the points is illustrated in the figure 4.3 .

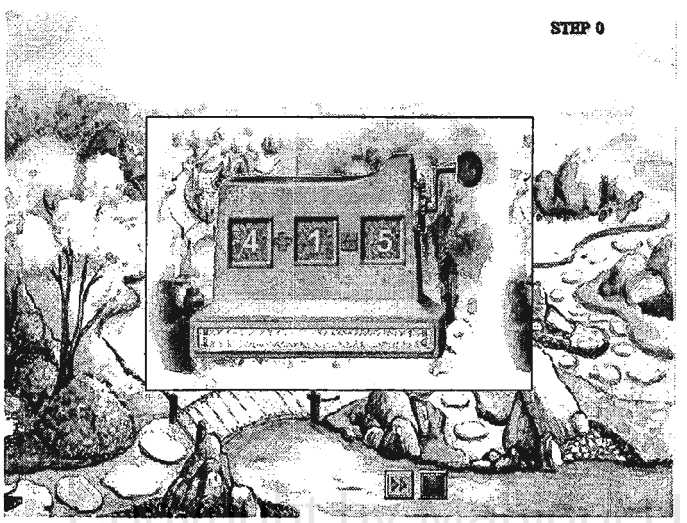

Figure 4.3 Slotting

4.1.3 Play

This part is English vocabulary and reading comprehension practice fixed in each step. There are 4 language skills of English reading comprehension in this game which are word skills, sentence reading, scanning, paragraph Reading and short passages illustrated in the figure 4.4 – 4.23.

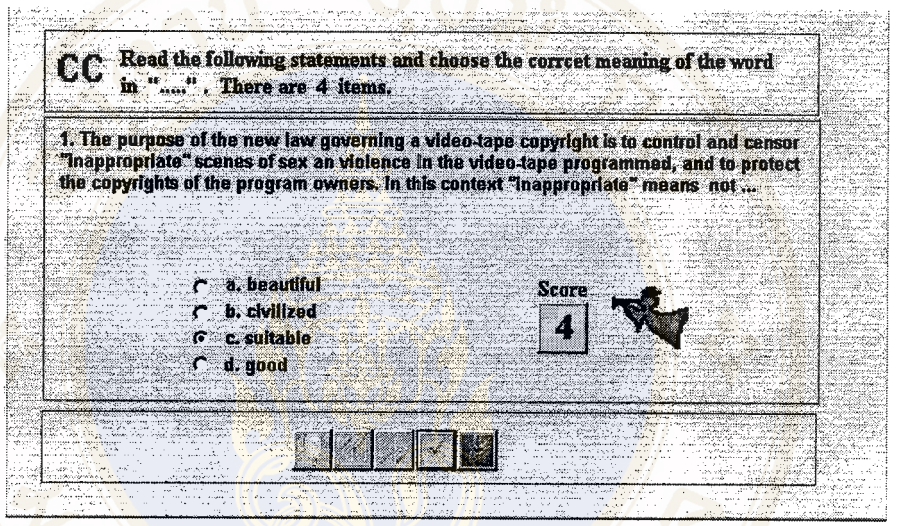

Figure 4.4 Word Skill: Context Clue

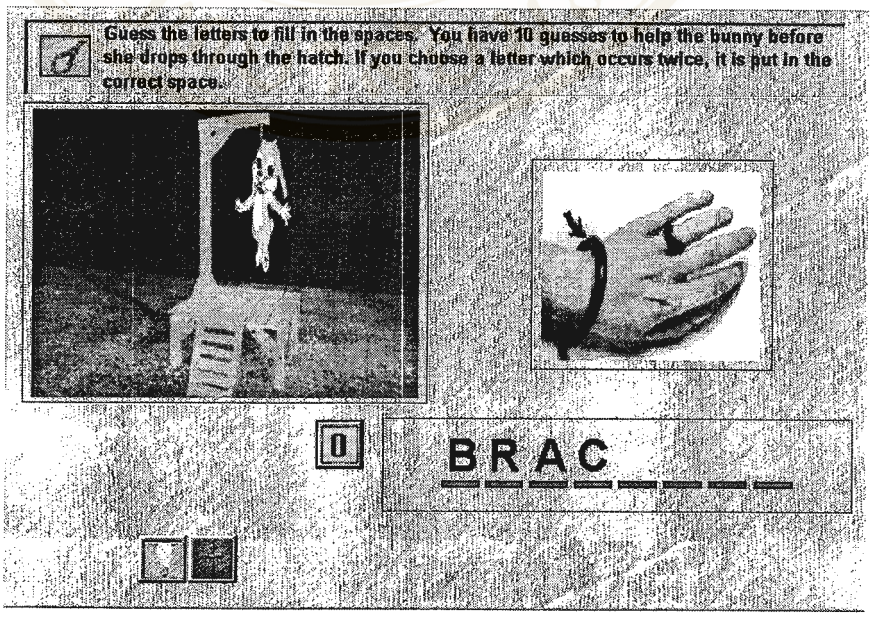

Figure 4.5 Word Skill: Hang Man

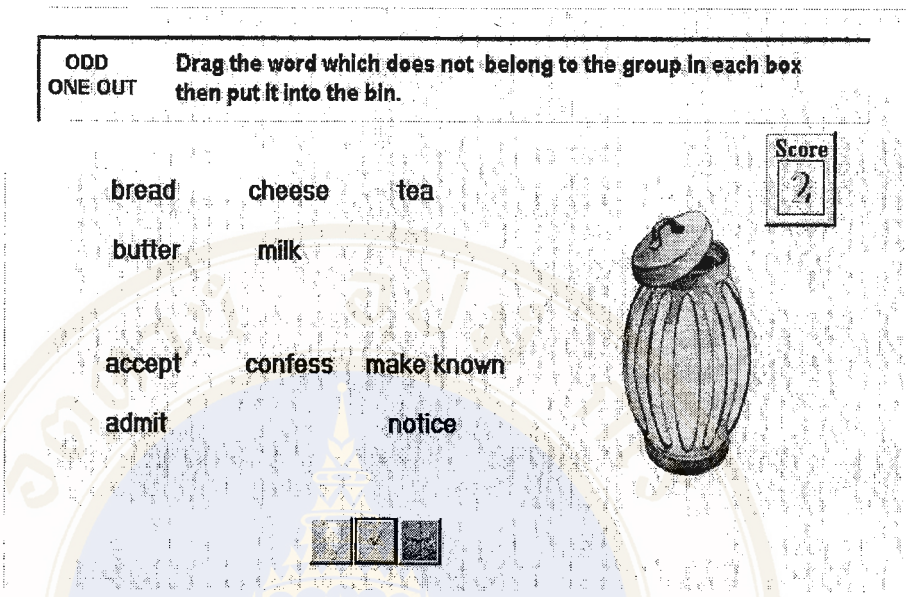

Figure 4.6 Word Skill: Odd One Out

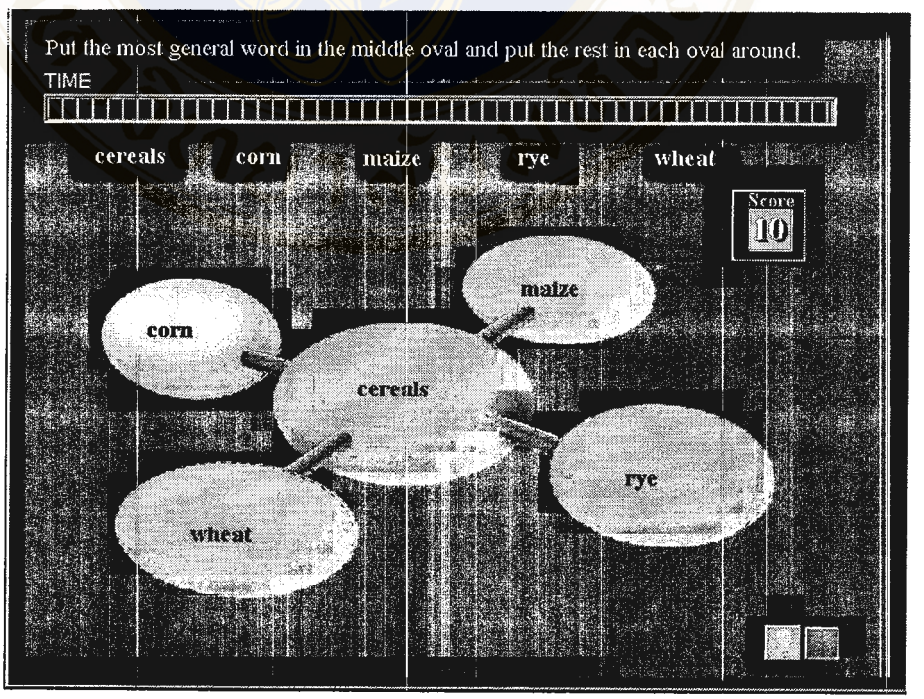

Figure 4.7 Word Skill: General word

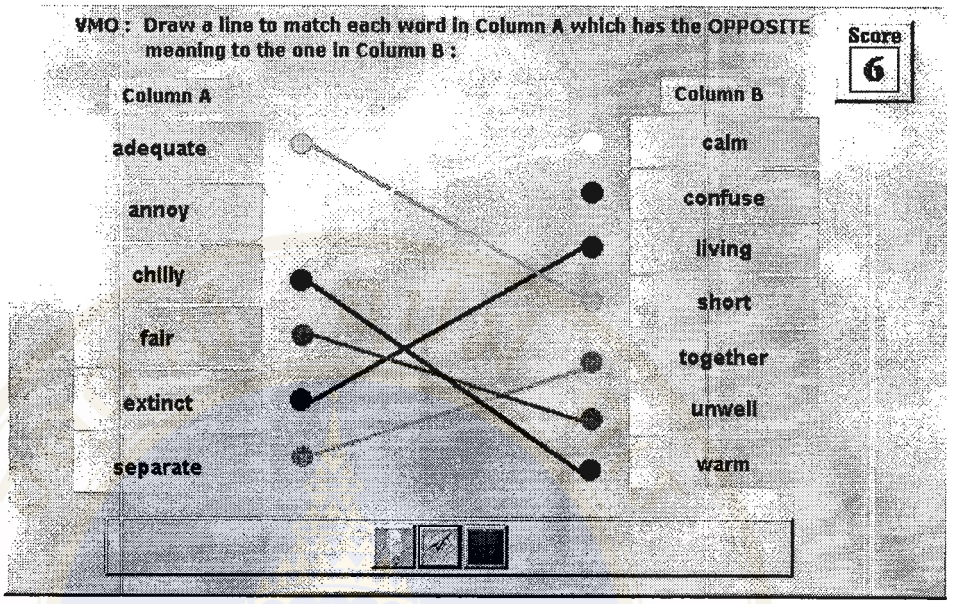

Figure 4.8 Word Skill: Antonym

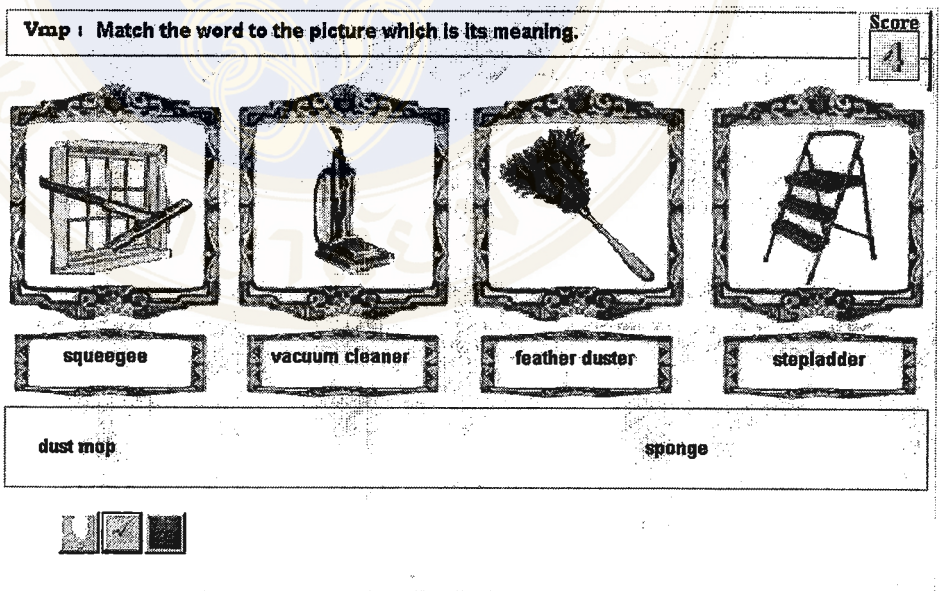

Figure 4.9 Word Skill: Synonym

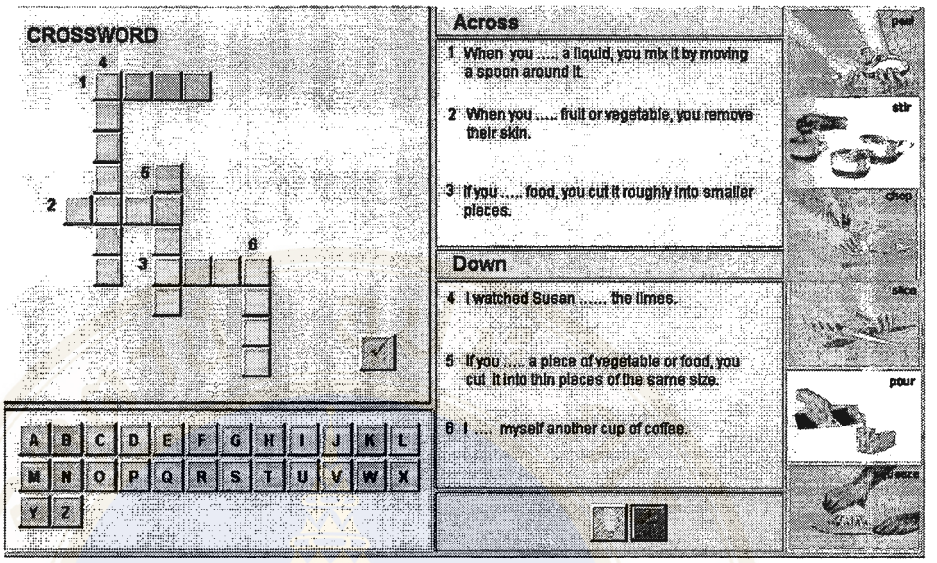

Figure 4.10 Sentence Reading : Puzzle

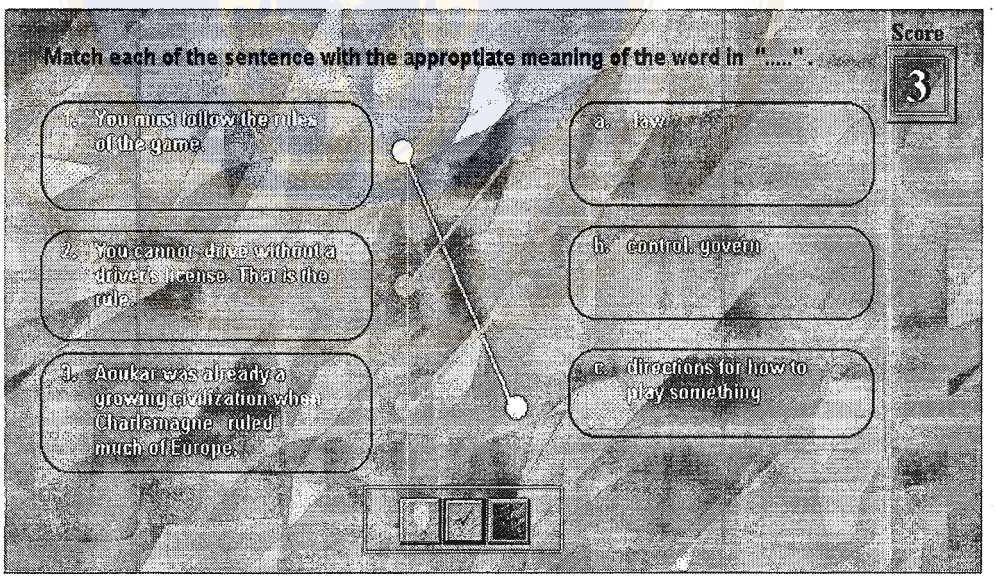

Figure 4.11 Sentence Reading : Word more than one meaning

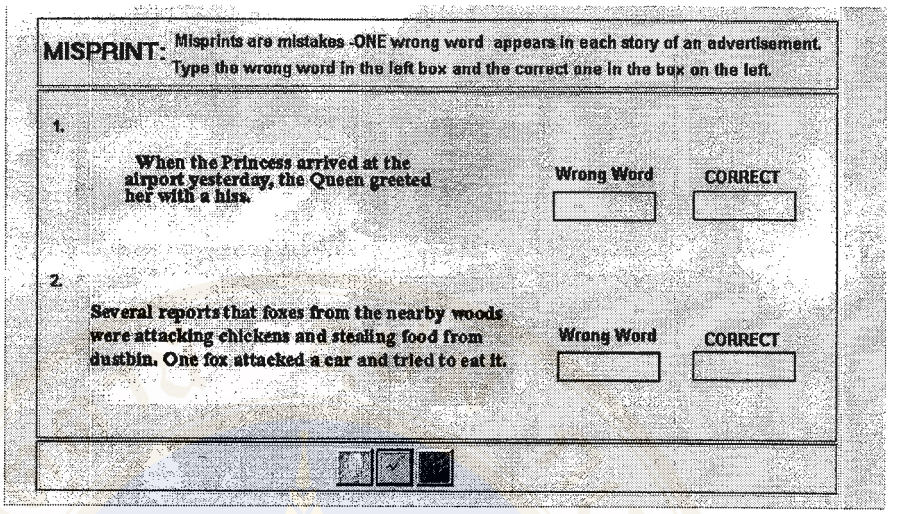

Figure 4.12 Sentence Reading : Misprint

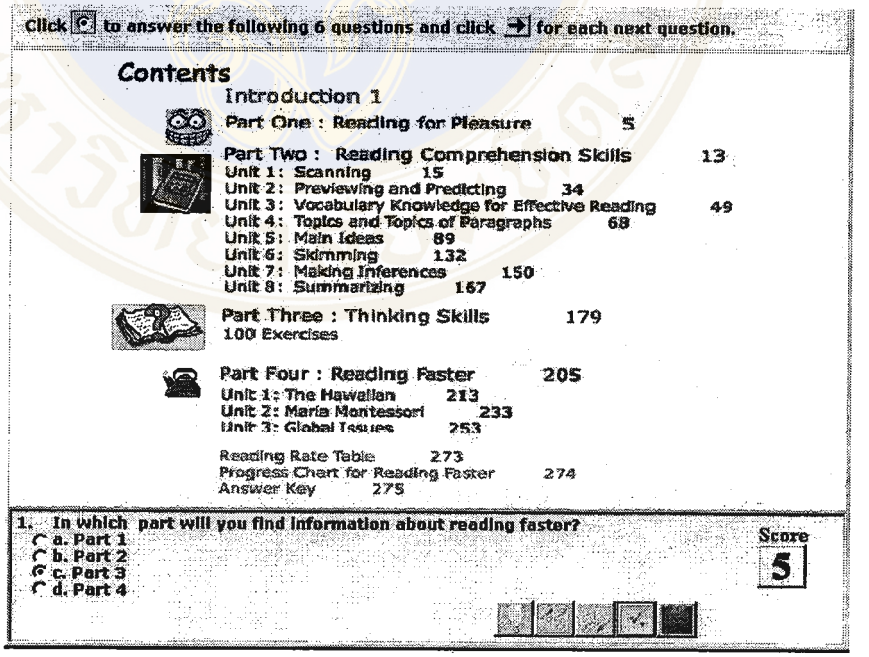

Figure 4.13 Scanning

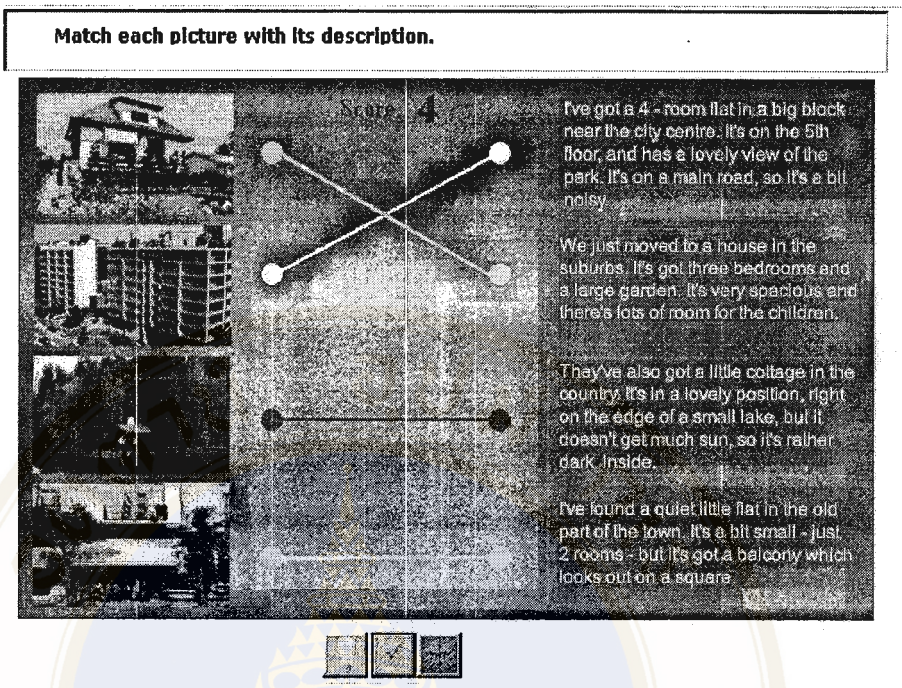

Figure 4.14 Paragraph Reading : Description

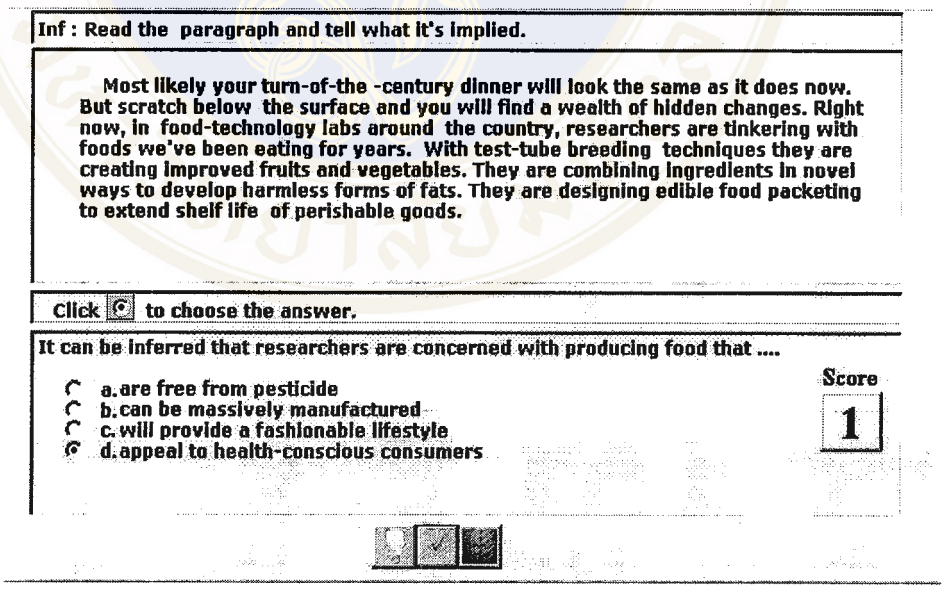

Figure 4.15 Paragraph Reading : Inferences

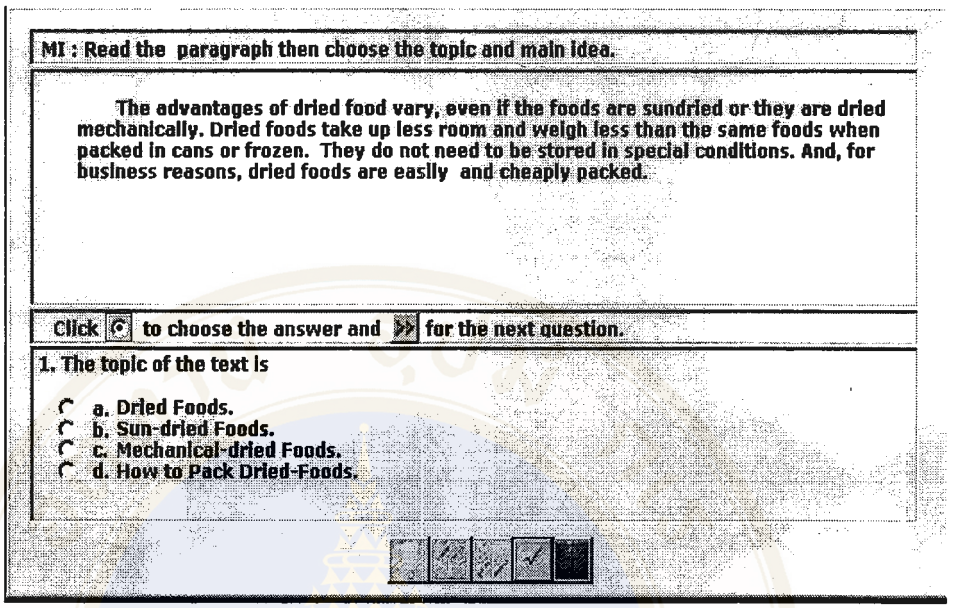

Figure 4.16 Paragraph Reading : Main Ideas

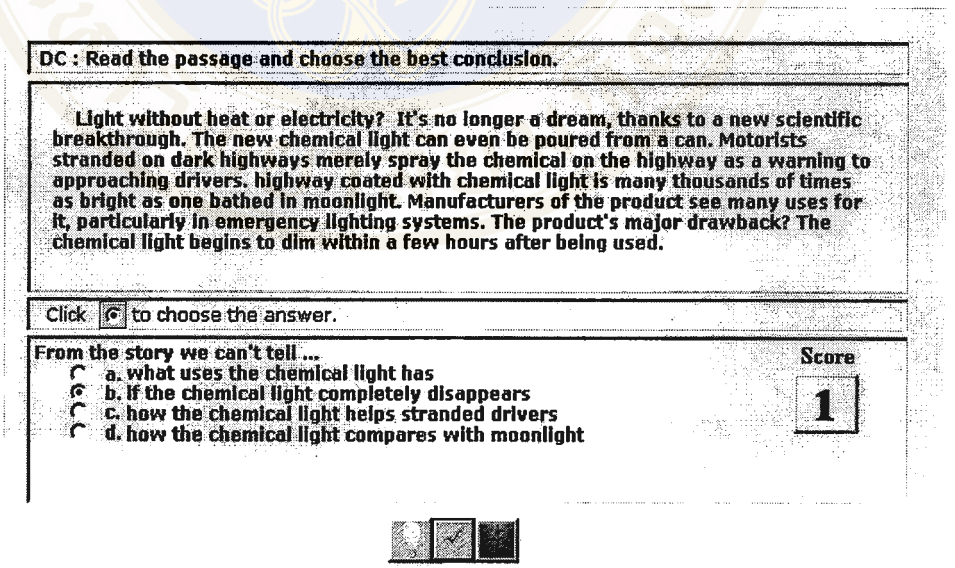

Figure 4.17 Paragraph Reading : Draw Conclusions

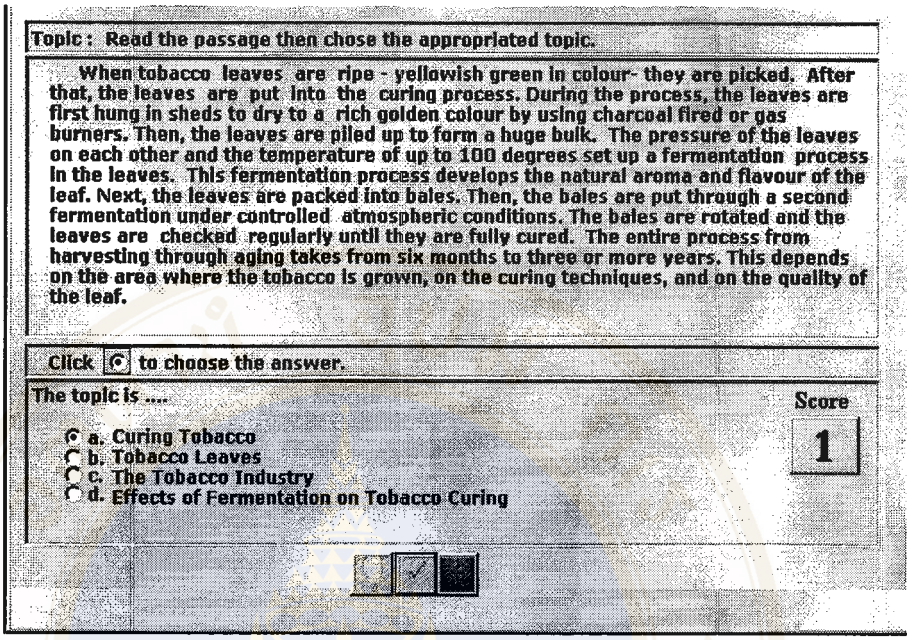

Figure 4.18 Paragraph Reading : Topics

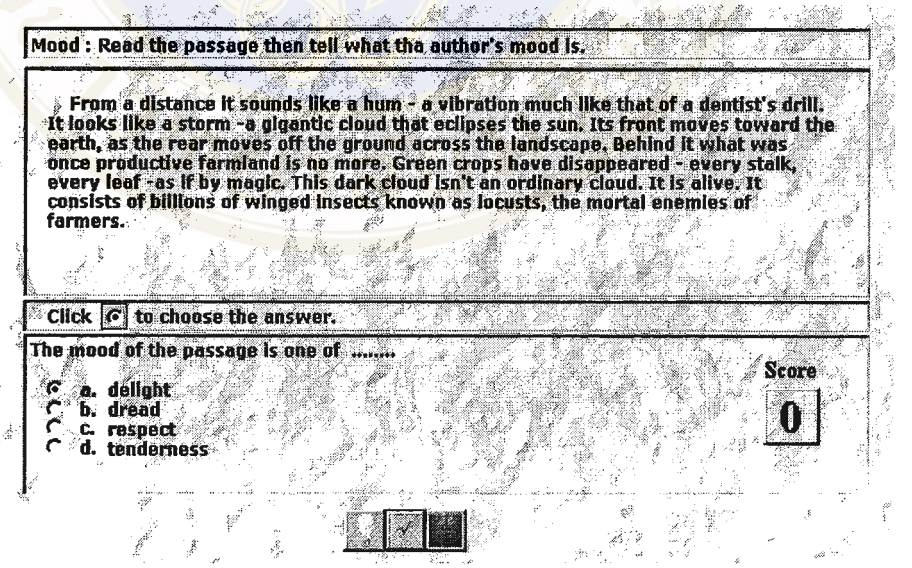

Figure 4.19 Paragraph Reading : Mood and Tone

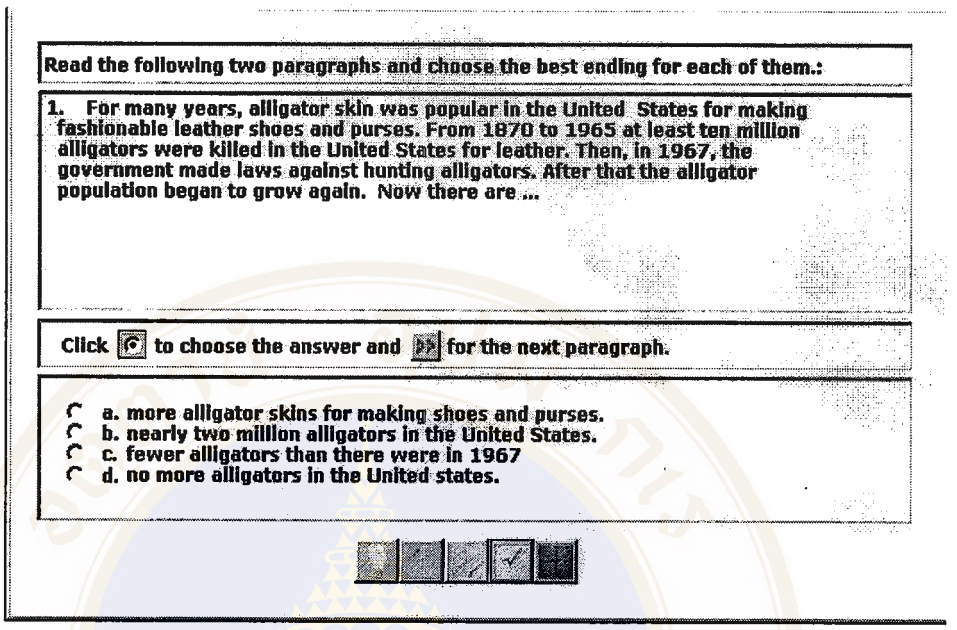

Figure 4.20 Paragraph Reading : Ending Prediction

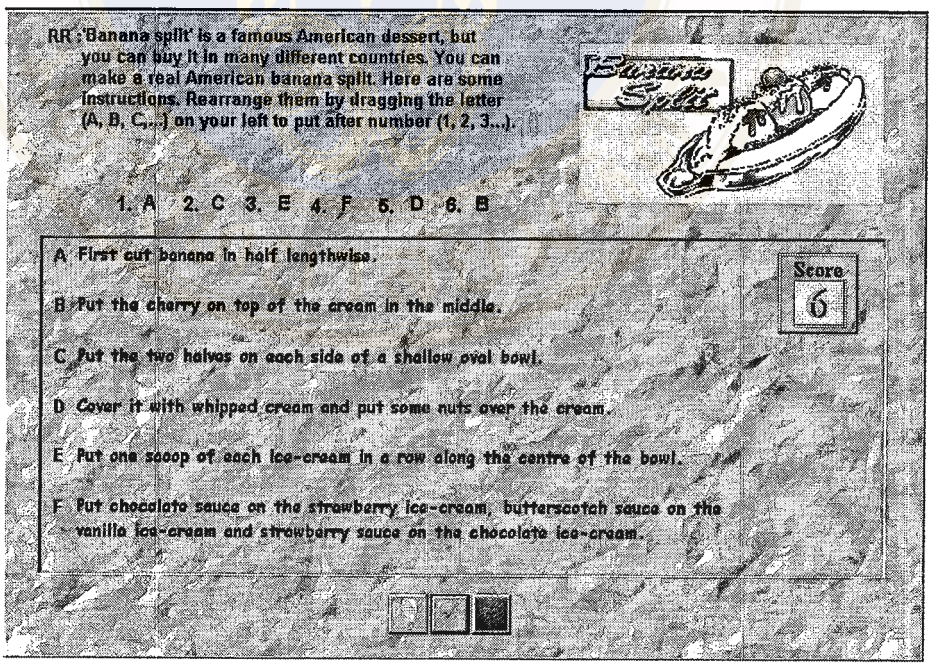

Figure 4.21 Paragraph Reading : Re-arrange

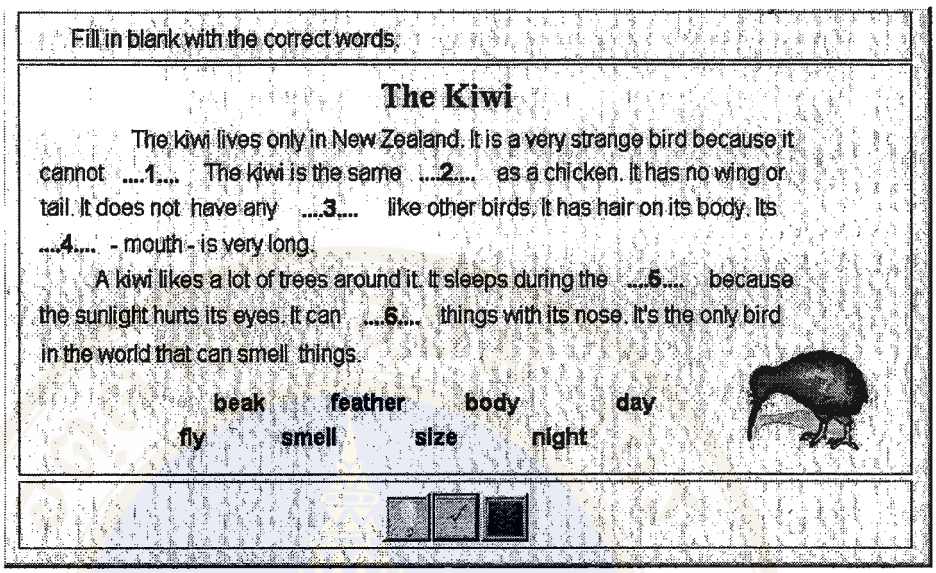

Figure 4.22 Paragraph Reading : Cloze

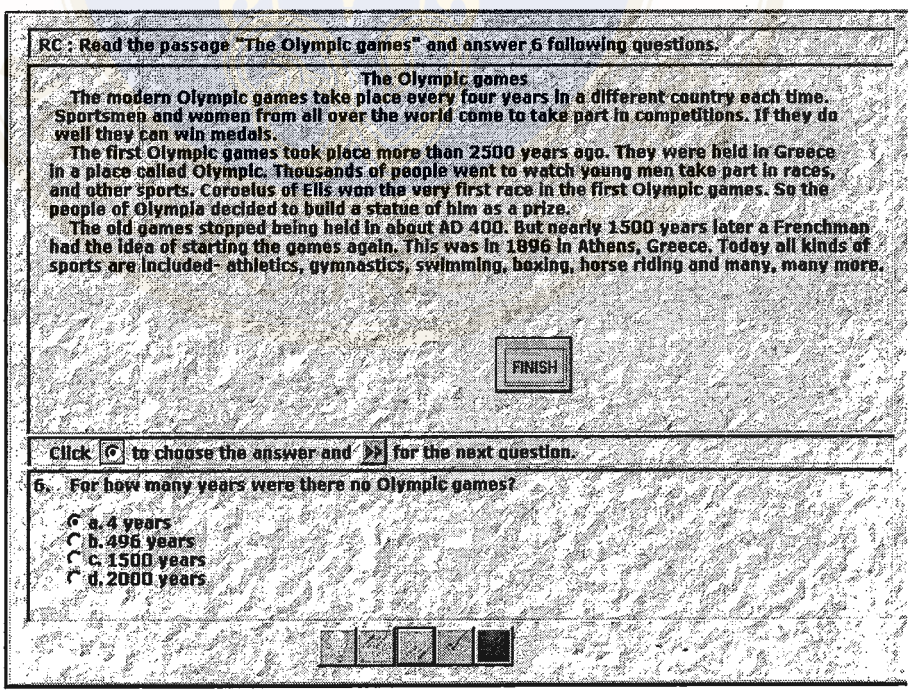

Figure 4.23 Short Passage

4.1.4 Score

The player can check his/her score after finishing playing by clicking score button. In the interval of playing, she/he can do by clicking exit button to the main screen and select score button. In the case of the existing player, she/he can check the current score as a whole by clicking student button. She/He can checked his/her score after registration as well. Only authorized user can view all of the players' scores. The authorized user can change the password any time she/he wants. The score report can be printed as needed. The screens of score are illustrated in the figure 4.24 – 4.27 .

Figure 4.24 The screen of score

Figure 4.25 The screen for authorized user

00.10.05

SCORE

Id Code	Name	Gender	Date-Time	Part	Total	Correct	%
1	mana peemanee	Male	00.08.26 10:45:59 PM	Vocabulary	143	21	14.68
				Reading	23	1	4.34
				Total	166	22	13.25
2	supannika komolboon	Female	00.08.26 10:56:13 PM	Vocabulary	2	2	100.00
				Reading	4	2	50.00
				Total	6	4	66.66
3	supannika komolboon	Female	00.09.03 01:49:51 PM	Vocabulary	39	16	41.02
				Reading	10	5	50.00
				Total	49	21	42.85
4	Theerasak Akomol	Male	00.09.03 01:41:14 PM	Vocabulary	26	19	73.07
				Reading	8	5	62.50
				Total	34	27	79.41
5	sarun Itthiwan	Male	00.09.10 01:59:14 PM	Vocabulary	37	35	94.59
				Reading	8	8	100.00
				Total	45	43	95.55
6	panwipha daramad	Female	00.09.10 02:19:31 PM	Vocabulary	4	4	100.00
				Reading	3	2	66.66

Figure 4.26 Score Report of all players

Id code 7
Daungporn leelanuwat
Female
00.09.10 02:43:30

Item	Part	Content	Total	Correct Numbers	Percentage
1	Vocab	vo	2	2	100.00 %
2	Vocab	vo	2	2	100.00 %
3	Vocab	vw	3	1	33.33 %
4	Vocab	vw	3	3	100.00 %
5	Vocab	vmp	4	3	75.00 %
6	Vocab	vo	2	2	100.00 %
7	Reading	mi	2	0	0.00 %
8	Reading	md	1	1	100.00 %
9	Reading	top	1	0	0.00 %
10	Reading	md	1	0	0.00 %
11	Reading	mi	2	2	100.00 %
12	Reading	scn	4	2	50.00 %
13	Reading	md	1	1	100.00 %
		Total	28	19	67.85 %

Figure 4.27 Score Report of a player

The Instructional Game include interaction and feature of a multimedia computer is shown in Table 4.1.

Table 4.1 The feature of each section in the multimedia computer Instructional Game

Content	Game Styles	Interactions	Feature			
			Motion	Image	Color	Sound
1. Introduction	- Board Game		✓	✓	✓	✓
	- Slot Machine		✓	✓	✓	✓
2. Word Skills						
2.1 Using Context Clues	- Hangman	Mouse Click	✓	✓	✓	✓
	- Multiple Choices	Mouse Click		✓	✓	✓
	- Puzzle	Drag Drop	✓	✓	✓	✓
2.2 Analysis Word Parts : Using Affix	- Multiple Choices	Mouse Click	✓	✓	✓	✓
2.3 Analysis Word meanings						
2.3.1 Antonym	- Matching	Draw a line		✓	✓	✓
2.3.2 Synonym	- Matching	Draw a line		✓	✓	✓
2.3.3 Grouping	- Odd One Out	Drag Drop	✓	✓	✓	✓
	- General word	Drag Drop	✓	✓	✓	✓
3. Sentence Reading	- Multiple Choices	Mouse Click	✓			
3.1 Sentence Interpretation				✓	✓	✓
3.2 Sentence Comprehension				✓	✓	✓
4. Paragraph Reading	- Multiple Choices	Mouse Click	✓			
4.1 Inferences				✓	✓	✓
4.2 Main Ideas				✓	✓	✓
4.3 Topics / Title				✓	✓	✓
4.4 Conclusion				✓	✓	✓
4.5 Details				✓	✓	✓
4.6 Predicting				✓	✓	✓
5. Short Passages	- Multiple Choices	Mouse Click	✓	✓	✓	✓
6. End Form			✓	✓	✓	✓

4.2 The evaluation of the potential of an Instructional Game

The results of this research are divided into three parts as follows :

2.1 The results of the development of an Instructional Game are measured by comparing the difference in mean scores between the Pretest and Post-test scores in the experimental and the control groups. The results are shown in table 4.2.

Table 4.2 The difference in mean scores between the Pretest and Post-test of the samples

Samples	Number of Students	Mean	SD	t	p
Experimental Group	30	5.5333	3.3604	4.711	<.05
Control Group	30	2.0000	3.2905		

The results in Table 4.2 show the difference in mean scores of the experimental and the control groups that is 5.53333 and 2.0000 respectively. The data is analysed by using a t-test in SPSS 6.0 for Windows. This indicates that there is a significant difference between the mean score of the Posttest of the experimental and the control groups at the .05 level.

2.2 The achievement of the students' learning by using the Instructional Game is measured by comparing the difference between the Pretest and Posttest scores in each group. The results of the experimental and the control groups are shown in table 4.3 and 4.4 respectively.

Table 4.3 The Pretest and Post-test scores of the experimental group

Test	Number of Students	Mean	SD	t	p
Pretest	30	21.7667	4.5915		
				9.019	<.05
Posttest	30	27.3000	4.0356		

The results in Table 4.3 show the mean score of the Pretest and the Posttest that is 21.7667 and 27.3000 respectively. The data is analysed by using a Paired t-test in SPSS 6.0 for Windows. It indicates that there is a significant difference between the mean scores of the Pretest and Posttest of the experimental group at the .05 level. ($t = 9.019, p < .05$)

Table 4.4 The Pretest and Post-test scores of the control group

Test	Number of Students	Mean	SD	t	p
Pretest	30	21.8000	4.4675		
				3.329	<.05
Posttest	30	23.8000	4.9299		

The results in Table 4.4 show the mean score of the Pretest and the Posttest that is equal to 21.8000 and 23.8000 consequently. The data is analysed by using a Paired t-test in SPSS 6.0 for Windows. It indicates that there is a significant difference between the mean scores of the Pretest and Posttest of the control group at the .05 level. ($t = 3.33, p < .05$)

2.3 The results of the evaluation of opinions towards the Instructional Game through the questionnaire is calculated using percentages and analyzed using SPSS.

The questionnaire is distributed to the thirty students in the experimental group at the end of the experiment. There are ten questions and one open-ended question. The original questionnaire is in Thai (see Appendix E). The questionnaire consisted of two main parts.

The first part of questionnaire is the questions about the general information of the students and their game playing experience. The second part is about the students' opinions towards the benefit of the Instructional Game and the format of the Game. The data obtained from both parts are corrected and presented in the tables 4.5 and 4.6 respectively.

Table 4.5 : General Information of the experimental group

Demographic Data	Number	%
1. Gender		
1.1 Male	9	30
1.2 Female	21	70
2. Age		
2.1 16 years	6	20
2.2 17 years	21	70
2.3 18 years	3	10
3. Studied Mattayom 3 at school		
3.1 in Bangkok.	9	30.0
3.2 outside Bangkok.	21	70.0
4. Started study English in		
4.1 kindergarten.	8	26.7
4.2 Pratom 1	1	3.33
4.3 Pratom 5	21	70.0
5. Average grade of English course in Mattayom 3		
5.1 Grade 4	5	16.7
5.2 Grade 3	11	36.7
5.3 Grade 2	8	26.6
5.4 Grade 1	6	20.0

Demographic Data	Number	%
6. Average grade of English course in the Mattayom 4		
6.1 Grade 4	3	10.0
6.2 Grade 3	5	16.7
6.3 Grade 2	12	40.0
6.4 Grade 1	10	33.3
7. Experience playing computer games		
7.1 Yes	13	43.3
7.2 No	17	56.7
8. Experience playing English Instructional Games		
8.1 Yes	4	13.3
8.2 No	26	86.7

The data in Table 4.5 shows that the samples are between 16–18 years of age. It is found 21 students out of 30, representing 70%, are female, graduated from schools outside Bangkok and started studying English in Prathom 5. The results indicate that 53.3 % of them like studying English, but 16.7 % dislike it. Concerning computer games, it is found that 43.3 % of the respondents had tried them, but these are not English Instructional Games.

The second part of the questionnaires is rating scale questionnaires which Investigated the samples' opinions towards the Instructional Game. There are ten questions and one-ended question. The data obtained from this part is gathered and analyzed by using SPSS 6.0 for Windows to find out their mean scores and Standard Deviation (SD). The criteria used for interpretation of mean scores to opinion levels uses the rating scales below:

mean	level
1.00 – 1.80	Strongly Disagree
1.81 – 2.60	Disagree
2.61 – 3.40	Indifferent
3.41 – 4.20	Agree
4.21 – 5.00	Strongly Disagree

The results of the second part of questionnaires are presented in the Table 4.6

Table 4.6 : Students' opinions towards the Instructional Game

Opinions	Mean	SD	Level
1. Enjoy playing this game.	4.33	.47	Strongly agree
2. Play this game as a supplementary practice according to one own capability.	4.46	.49	Strongly agree
3. Feel free while playing this game.	4.36	.4.	Strongly agree
4. The appropriate content with the game.	4.13	.32	Agree
5. Inadequate content for the game.	2.23	.84	Disagree
6. Need more English Instructional game to play.	4.16	.57	Agree
7. The attractive of Animations, images and sound in this game.	4.33	.69	Strongly agree
8. User friendly in steps and ways to play the game.	4.53	.62	Strongly agree
9. The appropriate characters in this game.	4.83	.36	Strongly agree
10. The stimulates of score report for the player.	4.66	1.03	Strongly agree

According to the data in Table 4.6, for seven items out of ten strongly agree with positive quality towards the game. There are only three mixed opinions.

In terms of attitudes towards the game, it is reported that the mean scores of items 1 – 3 are between 4.33 – 4.46. This means the samples strongly agreed that the game is enjoyable. They accepted that the game could help them to practise English reading on their own capability and time restraints without pressure.

In terms of the content and implementation of the Instructional Game, the mean scores of items 4 and 6 are 4.13 and 4.16 respectively. This indicates the samples agreed that the content is appropriate and adequate. In addition, they agreed that there should be more Instructional Game for English reading comprehension practice. The samples responded with negative attitude to the negative question item 5. This data, therefore supports their positive attitudes towards the content of the game.

The data in items 7 – 10 showed the mean scores between 4.33 – 4.83 which is the strong agreement with the features and the style of the game of the samples. They liked the animation, images and the sounds of the game. They accepted that the format and the styles of the game are appropriate to the content. The steps of the game are easy to play and the score report in each step encouraged them to continue playing.

CHAPTER V

DISCUSSION

This chapter presents a summary of the study and a discussion of its results.

A summary of the study

This study is performed to develop the instructional game for English Critical Reading as a supplementary practice. The development of the instructional game serves as an exciting tool to encourage students to practice English more. The development coincided with the one of the English elective courses for high school students. The content is broken down into small topics. Each topic of the game reinforces one concept of strategies for reading and students received immediate feedback as to whether the answers are right or wrong.

Discussion of the results

There are two results obtained by data analysis.

Result 1: The results of the multiple-choice English reading comprehension test taken by both the experimental and the control groups

The results of data analysis in Table 4.1 indicate that there is a significant difference between the mean score of the posttest of the experimental and the control groups at the .05 level. This analysis shows that the samples in the experimental group achieved higher scores than those in the control group. It can be concluded that the practice of the instructional game as a supplementary addition to the English Critical Reading course could help students improve their test scores.

The data in Table 4.2 also indicates that there is a significant difference between the mean score of the pretest and the post-test of the experimental group at the .05 level. This implies that the students in the experimental group improved their reading comprehension significantly after they were both taught with regular lessons and practice with the instructional game.

The data in Table 4.3 indicates that there is a significant difference between mean score of the pretest and the post-test of the control group at the .05 level. This implies that the students in the control group improved their reading comprehension significantly after they were taught with regular lessons.

With regards to Result 1, the results of the multiple-choice English reading comprehension test taken by both the experimental and the control groups showed that students in both groups improved their English Reading scores significantly. After being instructed with the regular teaching alone, all students improved their English reading scores. Nonetheless, the additional practice with the Instructional Game resulted in an additional improvement by that group. A significant difference between the posttest mean scores of the two groups was found. The experimental group got higher scores in the posttest than those in the control group. This seems to indicate that the extra practice with the Instructional Game helped the students in the experimental group achieve higher scores than those in the control group. This supports the studies about using Computer Games to supplement The Thai Word Spelled Writing Skill for Marthayomsuksa Two Students by Suchart Suwancharoen 1994 and a development of multimedia computer assisted instruction by Phanit Kumseranee 1997 ; and Vorawan Vanicharoenchai 1998.

Result 2: The results of the questionnaire investigating the samples' opinion about using the instructional game

Gathered opinions of the students towards the game were analyzed using mean ($\bar{X}$) and standard deviation (SD). Almost all of the opinions were of a high level towards the game, i.e. user friendly, sufficient content, suitable color and format. In general, the students said that they liked to play the game and thought that the content was suitable and encouraged them to continue practicing. However, there were some points that might be improved. In addition to the mentioned opinions, the students provided these overall remarks for the game as follows :

1. The font and size of the text on the practice screen should be more attractive .
2. There should be correct answers as a key for each practice.
3. There should be explanations and translations into Thai after doing each practice.
4. Time given during doing each practice should be a little bit longer.
5. Attractive components such as music or animation should be added to the game.
6. A User manual should be available

From the Result 2, all of the samples' opinions about the game were positive. The cooperative attitude of the students is an important factor which affected the students' performance. This can be explained that the use of the Instructional Game had the advantages of color, pictures, feedback and chance the students to incorporate the program into the learning. The Instructional Game had the potential to enhance each individualize practice. It encouraged active self-studying and allowed the students to see their progress. In terms of procedural content, the teachers were able to decide what

they wanted to be a part of the multimedia computer assisted instruction lessons. Trying new concepts with multimedia computer assisted instruction enhanced creativity in students and enabled the teachers to teach creativity.

CHAPTER VI

CONCLUSION

Due to the wide need for English reading comprehension, students require practice to achieve a high score on English test. Supplementary practice by using an Instructional Game is one of the tools that can help students to achieve these scores. Therefore, Instructional Games can be effective as they play an increasingly important role in assessing language competency.

This study has been conducted in order to research the Development of Instructional Games, to find out the effectiveness of using the game as a supplementary practice, and to evaluate the opinions towards Instruction games.

Materials in this study

The materials used in this study are

1. An Instructional Game for English Critical Reading designed as a supplementary practice.
2. Pretest and posttest questions about English Critical Reading.
3. Questionnaires about the opinions towards the Instructional Game.

Process of a development of Instructional Game

There have been three important processes in the development which are as follows :

1. The creation of an Instructional Game
2. The construction of a pretest, post-test and questionnaire
3. Sampling and experiment

1. The creation of an Instructional Game began with collecting information, designing content, creating a flowchart, creating a storyboard, and designing the test. The experts who are specialists in English validated the content of the game. Then all the accepted content was inputted into the game's database. The content and program were designed and created to the Database Format files .dbf and .dbc respectively. The flowchart was created to present the models' design.

2. The construction of pretest-posttest and questionnaires was done. Pretest-posttest questions were established according to the curriculum and course outline of an English Critical Reading course. The draft of the test was modified and revised based on the suggestions of specialists. Then the test was tested in a pilot study. The results of the pilot study were analyzed by using a computer program named "Total Item Analysis Difficulty Discrimination and Reliability".

3. The sampling and experimentation was carried out. The samples in this study consisted of sixty students at Mahidolwitthayanusorn School. Thirty students were in the experimental group while the other thirty were in the control group. Samples in both groups were selected from volunteers studying in Mathayom 5. They all had the same level of English proficiency, which was assessed based on the pretest score, as shown in Table 3.3 Grouping the samples.

Prior to the experimental phase, a reading comprehension test was given to both the experimental and the control groups in order to assess their English reading ability. Then, both the experimental and the control groups were instructed with an English Critical Reading course by the researcher using the same teaching techniques. However, in additional, the experimental group also practised with the Instructional Game for English Critical Reading whereas the control did not.

Each experimental sample used a computer PC with a multimedia set prepared by the researcher. These samples tried out the game twice a week for a month. Some spent 25 minutes while others spent 30 – 40 minutes practising each session.

At the end of the experiment, a post-test was given to both groups to investigate the extent to which the Instructional Game had affected the test scores. In addition, a questionnaire was also filled out by the samples in the experimental group in order to examine their attitudes towards the game.

Data obtained from the pretest, post-test and the questionnaire was analyzed by using The Statistical Package for Social Science (SPSS). The results of the analysis were used for application improvement.

The results of developing the Instructional Game for English Critical Reading can be summarized as follows :

1. An application program for the game which is successive useful, practice and stepping automatically through slotting has been achieved. Moreover, the application has a score record of players' practice in each step and as a whole.

2. The development of the Instructional game was effective at enhancing the English education of the students. This game was appropriate for the students to increase the efficiency of English reading comprehension. Furthermore, the samples had positive opinions towards the Instructional Game. That is, the game would improve the students' knowledge and helped them to review their reading comprehension skills easily.

Recommendations for further development and research

The main aim of this study was to develop an application, Instructional Game, which is suitable to practice the users' English skills. This should include the aims of

the game which suited the subject , an attractive user interface and a measurement of effectiveness of the user English competence .

The recommendations for further development are as follows:

1. The content should be concise. Animation and sound should be added to stimulate the students' interest.

2. The interface of the program should be improved, mainly in terms of color of the screen, format and color of text, and ease of use.

3. The program should show the correct answer of each step with explanations after the user finishes them.

4. The Instructional Game can be applied to any subject to review or practise, mathematics, science, or other subjects. This game can be used in primary and secondary school, as well as at the undergraduate level.

5. In selecting the interface development software, the developer should not only consider the software's ability to communicate to create databases but also whether the tools of the software are sufficient at supporting the program development. Moreover, the chosen software should include a visual component, re-use, and inheritance properties which will reduce the development time.

The recommendations for further research are as follows:

1. Further research could be done in the area multiple players of the game and the use of competition.
2. Further research could be undertaken according to various levels of content in the same Instructional Game including different levels of knowledge for students to choose, like pre-intermediate, intermediate and advanced levels.

3. Further research should add more content in the database for randomizing in each step of the game.
4. Further research could be done on Web Page as well.

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APPENDIX A

EXAMPLES OF THE CONTENT

Hangman

C R Y S T A L

HM1

C H I M N E Y

HM2

F O O T P R I N T S

HM3

CC : Read the sentences and choose the correct meaning for each underlined word by checking in the box you choose.

1. Alcohol, nicotine and drugs are all dangerous. If they are misused, they may bring death to people who use them. In this context 'misused' means
   a. means used correctly
   b. used wrongly
   c. used continuously
   d. used heavily

2. Jane typed a letter for her boss. After boss read it, he asked her to retype it because he found several mistakes in it. In this context 'retype' means
   a. type again
   b. stop to type
   c. begin to type
   d. continue to type

3. Most post-war films are about the war in Vietnam. They present the things which happened during the Vietnam war. In this context 'post-war' means
   a. during the war
   b. before the war
   c. after the war
   d. beginning of the war

4. He got F in statistics because his score is in a substandard band.
   In this context 'substandard' means
   a. out of standard
   b. between standard
   c. below standard
   d. over standard

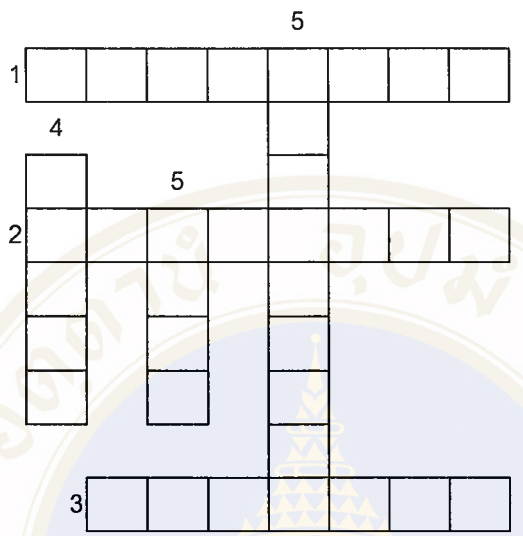
5. When maize is harvested, it is cut and dried for several weeks. After that , the cobs are removed by hand and the grains are then detached from the cobs by shelling.
   In this context 'detached' means
   a. formed b. circulated c. put together d. separate

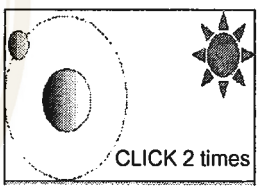
6. The purpose of the new law governing a video-tape copyright is to control and censor inappropriate scenes of sex an violence in the video-tape programmed, and to protect the copyrights of the program owners.
   In this context 'inappropriate' means
   a. not beautiful b. not civilized c. not suitable d. not good

7. Tree plants can be divided into five main types according to the reasons for planting them. Each type can be subdivided into different groups according to their characteristics. In this context 'subdivided' means
   a. divided into complex parts
   b. divided into bigger parts
   c. divided into different parts
   d. divided into smaller parts

8. Viruses are the smallest and simplest of all micro-organisms. They can infect animals, plants and insects. In this context 'micro-organism' means
   a. very small living things
   b. big living things
   c. living organisms
   d. living substances

PUZZLE 1





ACROSS

1. A … is a large reptile which lived in prehistoric times and which is now extinct.
2. The moon …. the sun's ray.
3. One of the very light, soft and smooth hairs that form the covering on a bird's body is a …..

DOWN

4. To travel in a circle around a larger object such as the Earth, the sun etc. is to …
5. A … is a type of plant which has no flower.
6. A … is an expert in one of the sciences who does work, especially research work.

Misprints are mistakes – the wrong word appears in a story of an advertisement. Find a wrong word in each piece of news , then write it in the box .

1.

When the Princess arrived at the airport yesterday, the Queen greeted her with a hiss.

The wrong word is .....

2.

Several reports that foxes from the nearby woods Were attacking chickens and stealing food from dustbins. One fox attacked a car and tried to eat it,

The wrong word is .....

3.

The US Ambassador, Mr. Carver J. Thurup, had to leave the party early, because of an urgent telephone call from The White Mouse. Other guests were

The wrong word is .....

4.

A Bristol man was sentenced to three years in prison for theft at Bristol Crown Court yesterday. Michael White, 44, of Hamble Street, stole a nurse from a public house in Keynsham

The wrong word is .....

VMO Draw a line to match each word in Column A which has the opposite meaning to the one in Column B

Column A	Column B
adequate	calm
annoy	confuse
chilly	living
fair	short
extinct	together
separate	unwell
	warm

Scan03 : Scan the population statistics then answer the questions.

Hawaii's population

Here are the latest population statistics by ethic group for Hawaii. Total population in 1988 was 942,564 excluding military and dependents.

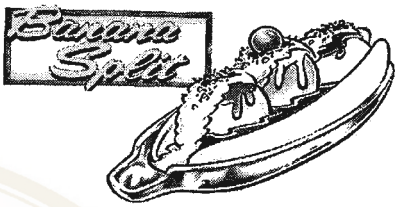
	Population	Percent
Japanese	222,697	23.9%
Mixed (Part Hawaiian)	202,134	21.4%
Caucasian	191,553	20.3%
Filipino	118,694	12.6%
Mixed (Non-Hawaiian)	112,411	11.9%
Chinese	47,787	5.1%
Other unmixed	12,579	1.3%
Korean	10,720	1.1%
Pure Hawaiian	9,344	1%
Samoan	5,106	.5%
PuertoRican	3,336	.3%
Black	3,203	.3%

Source : State Department of Health Hawaii Health Surveillance Program for 1988. Because of rounding percentages may not total 100.

1. In what year were the population statistics calculated?
   a. 1986 b. 1988 c. 1990 d.1998
2. Which group in Hawaiian is the largest?
   a. Caucasian b. Chinese c. Filipino d. Japanese
3. What is the combined total of mixed and pure Hawaiians?
   a. 112,411 b. 121,755 c. 202,134 d. 211,478
4. How many Chinese residents are listed?
   a. 118,694 b. 191,553 c. 202,134 d. 222,697
5. What is the percentage of Samoans?
   a. .5% b. .3% c. 1.5% d. 5.1%
6. How many Caucasians live in Hawaii?
   a. 118,694 b. 191,553 c. 202,134 d. 222,697

Re-arrange : 'Banana split' is a famous American dessert, but you can buy it in many different countries. You can make a real American banana split. Here are some instructions. Put them in the correct order and write the letters in the boxes.

1	2	3	4	5	6	7



a. Put one scoop of each ice-cream in a row along the centre of the bowl.
b. Put the two halves on each side of a shallow oval bowl.
c. Put the cherry on top of the cream in the middle.
d. Cover it with whipped cream.
e. First cut banana in half lengthwise.
f. Put chocolate sauce on the strawberry ice-cream, butterscotch sauce on the vanilla ice-cream and strawberry sauce on the chocolate ice-cream.
g. Put some nuts over the cream.

Topic 1 Chicks are hatched from eggs. Eggs for hatching should be selected from healthy birds in their first year of laying. Eggs should be fertile, clean, recently collected, and of good size and shape. The shell should be firm and free from cracks.

Eggs take three weeks (21 days) to incubate or develop into chicks. This is done naturally by placing the eggs under a brooding mother hen or artificially in an incubator. The incubator must provide a few essential conditions for successful incubation such as a free circulation of fresh air, a temperature range of 102°F - 105°F during the incubation period, enough moisture to prevent the eggs from drying up, a regular or automatic turning device in order to prevent the embryo from sticking to any part of the inside of the egg.

The topic is .....

a. Eggs for Hatching
b. The Selection of Eggs
c. The Incubation of eggs
d. The Selection and Incubation of eggs

Cotton originated in South America and was introduced into East Africa. It is the most important source of fibre in the world. Its many uses in East, Africa are as follows:

1) Uses by the textile industry for making cloth from the fibre.
2) As cotton seed oil, which is pressed from the seed. The Oil can be used for cooking, manufacture of margarine, soap, paints, and lubricants.
3) The seed cake which is left behind after the oil has been removed is rich in protein. It is very good cattle food.
4) Some by-products of cotton growing, for example, linters, are used for making mattresses.

The topic is .....

a. Uses of Cotton
b. Cotton in East Africa
c. Cotton in South Africa
d. Origin and Uses of Cotton

Ending Prediction: Choose the best ending for each paragraph :

1. The idea of a car that knows where to go may seem impossible. However, new technology may soon make this possible. Cars will have computers to tell drivers which roads have the least traffic. That way the drivers will not waste time in traffic jams. There will also be less pollution because the car engines will be running less. These new car will be known as …. cars.
   a. expensive b. fast c. traffic d. smart

2. Robots are entering into all kinds of activities. They've even taken up hunting in some places. Most states of the United states have very strict laws to limit the hunting of deer (a large mammal). Some hunters, however, do not obey the laws and try to kill too many deer. So, the forest services have developed a robot that looks and acts just like a deer. This robot-deer is left in the woods near a road where people will see it. It looks and acts just like a real deer. But if a hunter tries to shoot it, the police come out from the woods and check his hunting license. The hunter may have wanted to get a deer, but , instead the …
   a. police have gotten the deer. b. deer has gotten the hunter.
   c. hunter has gotten a large mammal d. deer has gotten the police

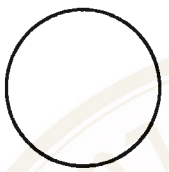
3. For many years, alligator skin was popular in the United States for making fashionable leather shoes and purses. From 1870 to 1965 at least ten million alligators were killed in the United States for leather. Then, in 1967, the government made laws against hunting alligators. After that the alligator population began to grow again. Now there are …
   a. no more alligators in the United states.
   b. fewer alligators than there were in 1967
   c. more alligator skins for making shoes and purses.
   d. nearly two million alligators in the United States.

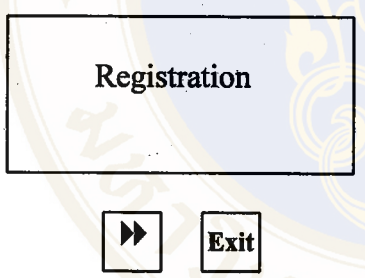
4. After the "desktop", the "laptop," and the "notebook' computers, what will come next? The answer, according to the experts, is the "personal communicator." This is a little machine that severs many purposes. It can make "cellular" (wireless) telephone calls and send messages by fax or modem. It can also work with data, do word processing or play games, like other computers. For the traveling businessman, the personal communicator could replace …
   a. the office secretary b. most of his work
   c. the typewriter and the car. d. both the telephone and the computer.

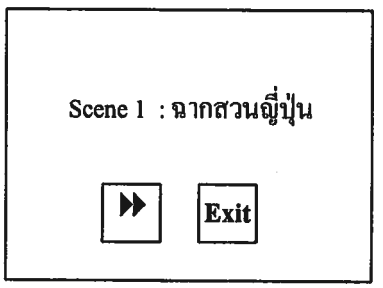
5. Most flowering plants bloom in the spring or summer. But there are some plants that also have flowers in the winter. One of these is the peony. Certain kinds of peonies can produce beautiful red and pink flowers even …
   a. when it has no leaves b. on the warmest days of the year
   c. on the coldest days of the year d. when other flowers are blooming

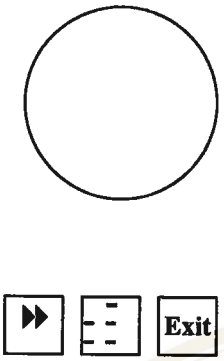
APPENDIX B

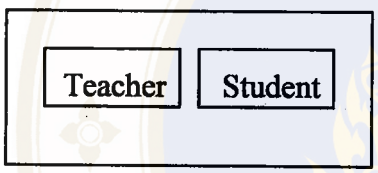
STORYBOARD DESIGN

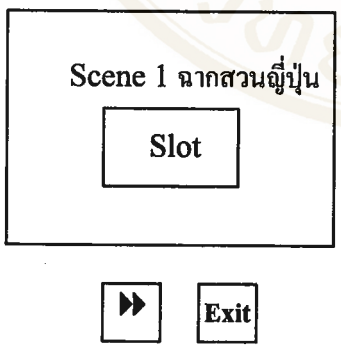
1. Title	Explanation
 Treasure of Reading JG	1. ไฟล์ title.avi แสดงไตเติ้ล เป็นรูป Board Game ที่ค่อย ๆ เปลี่ยนจากภาพเล็กเป็นใหญ่ขึ้น มีข้อความ Treasure of Reading และ JG ปรากฏใต้ภาพตามลำดับ 2. สิ้นสุดไตเติ้ล ปรากฏหน้าจอลงทะเบียน 3. Sound : sound 034.avi

2. Registratuion	Explanation
	1. แสดงหน้าจอลงทะเบียน ผู้เล่นพิมพ์ ชื่อ นามสกุล และคลิกเลือกคำนำหน้าชื่อ 2. มีเมนูการทำงาน ใช้เม้าส์ชี้ที่ปุ่ม จะมี tool tip บอกหน้าที่ เมื่อคลิกจะเรืองแสงและทำหน้าที่ ดังนี้ เข้าสู่หน้าจอ Scene 1 / Sound . wav Exit ออกจากโปรแกรม / Sound . wav

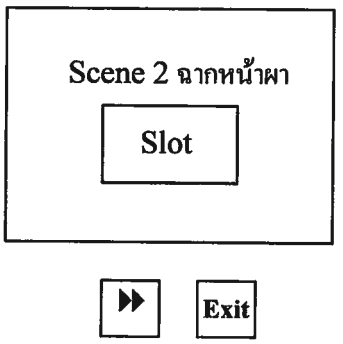
3. Play	Explanation
	1. แสดง Scene 1 ฉากสวนญี่ปุ่น 2. มีเมนูการทำงาน ใช้เม้าส์ชี้ที่ปุ่ม จะมี tool tip บอกหน้าที่ เมื่อคลิกจะเรืองแสงและทำหน้าที่ ดังนี้ ปรากฏ Slot เริ่มเล่นเกม / Sound . wav Exit ออกสู่หน้าจอ Main / Sound . wav

4. Main	Explanation
	1. แสดงภาพ Board Game 2. มีเมนูการทำงาน ใช้เม้าส์ชี้ที่ปุ่ม จะมี tool tip บอกหน้าที่ เมื่อคลิกจะเรืองแสงและทำหน้าที่ ดังนี้ กลับไปยังหน้าจอ Play / Sound .wave เข้าสู่หน้าจอ Score / Sound .wave Exit ออกจากโปรแกรม / Sound .wave

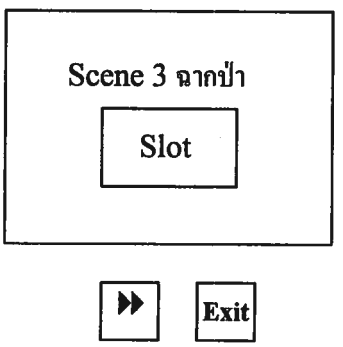
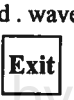
5. Score	Explanation
	1. แสดงภาพ ให้คลิกเพื่อระบุสถานภาพของผู้ต้องการดูคะแนน

3.1 Play : Scene 1	Explanation
	1. หน้าจอสวนญี่ปุ่น เมื่อคลิก จะปรากฏ Slot ใช้เม้าส์ชี้ที่คันโยก จะเป็นรูปมือ คลิก 1 ครั้ง คันโยกเคลื่อนที่ ปรากฏคะแนนที่หน้าจอ Sound : Sound . wave 2. คลิก เดินตามจำนวนก้าวที่ได้ Sound . wave 3. สิ้นสุดการเดิน คลิก เพื่อเข้าสู่หน้าจอแบบฝึก Sound . wave 4. คลิก Exit ออกสู่หน้าจอ main

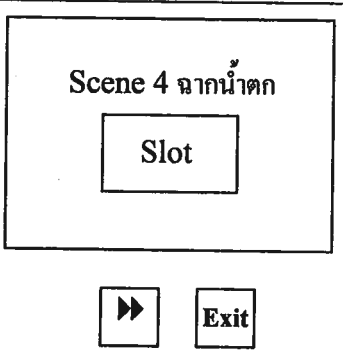
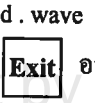
3.1.1 Practice 1 - 15	Explanation
1. Re-arrange 8 2. Hangman 6 3. Read & Choice 1 4. Odd One Out 4 5. Main Idea 5 6. Context Clues 2 7. Match picture with sentences 5 8. Match Antonym 2 9. Inference 2 10. Word more than one meaning 2 11. Topic 1 12. Scanning 2 13. Match picture with word 3 14. Re-arrange 3 15. Read & choice 3 	1. หน้าจอเกม ปรากฏแบบฝึกภาษาอังกฤษตามลำดับก้าว (Step) ที่กำหนดไว้ แต่ละแบบฝึกมีคำอธิบายวิธีการเล่นระบุไว้ 2. เงื่อนไขการเล่น - ถ้าตอบถูกมากกว่า 80 % ให้เดินฟรี 1 ครั้ง โยก Slot เดินต่อตามจำนวนก้าวที่โยก Slot ได้ แล้วทำแบบฝึก - ถ้าตอบถูกมากกว่า 50 % ให้เดินฟรี 1 ครั้ง แล้วทำแบบฝึก - ถ้าตอบถูกน้อยกว่า 50 % เดินถอยหลัง 1 ครั้ง แล้วทำแบบฝึก 3. มีเมนูการทำงาน ใช้เม้าส์ชี้ที่ปุ่ม จะมี tool tip บอกหน้าที่ เมื่อคลิกจะเรืองแสงและทำหน้าที่ ดังนี้  อธิบายวิธีทำแบบฝึกเป็นภาษาไทย Sound : sound .wave  ตรวจคะแนน Sound .wave  ย้อนกลับไปข้อเดิม ในกรณีที่มีมากกว่า 1 ข้อ Sound .wave  ไปข้อต่อไปในกรณีที่มีมากกว่า 1 ข้อ Sound .wave  ออกสู่หน้าจอ main Sound .wave 4. หลังจาก ก้าวที่ 15 หน้าจอจะเปลี่ยนเป็น ฉาก 2

3.2 Play : Scene 2	Explanation
	1. หน้าจอฉากหน้าผา เมื่อคลิก  จะปรากฏ Slot ใช้เม้าส์ชี้ที่คันโยก จะเป็นรูปมือ คลิก 1 ครั้ง คันโยกเคลื่อนที่ ปรากฏคะแนนที่หน้าจอ Sound : Sound . wave 2. คลิก  เดินตามจำนวนก้าวที่ได้ Sound . wave 3. สิ้นสุดการเดิน คลิก  เพื่อเข้าสู่หน้าจอแบบฝึก Sound . wave 4. คลิก  ออกสู่หน้าจอ main

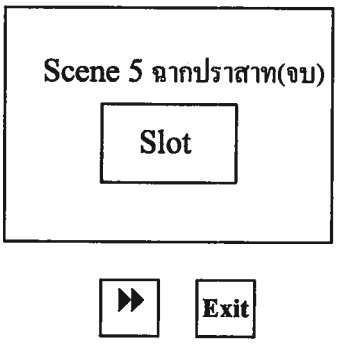
3.2.1 Practice 16 - 30	Explanation
16. Odd One Out 8 17. Match picture with word 6 18. Draw Conclusion 1 19. Wore in General 1 20. Prediction Ending 2 21. Hangman 8 22. Re-arrange 2 23. Scanning 5 24. Odd One Out 7 25. Read & choice 4 26. Match Antonym 3 27. Inference 3 28. Word more than one meaning 5 29. mood and Tone 3 30. Cloze 1 	2. หน้าจอเกม ปรากฏแบบฝึกภาษาอังกฤษตามลำดับก้าว (Step) ที่กำหนดไว้ แต่ละแบบฝึกมีคำอธิบายวิธีการเล่นระบุไว้ 2. เงื่อนไขการเล่น - ถ้าตอบถูกมากกว่า 80 % ให้เดินฟรี 1 ครั้ง โยก Slot เดินต่อตามจำนวนก้าวที่โยก Slot ได้ แล้วทำแบบฝึก - ถ้าตอบถูกมากกว่า 50 % ให้เดินฟรี 1 ครั้ง แล้วทำแบบฝึก - ถ้าตอบถูกน้อยกว่า 50 % เดินถอยหลัง 1 ครั้ง แล้วทำแบบฝึก 4. มีเมนูการทำงาน ใช้เม้าส์ชี้ที่ปุ่ม จะมี tool tip บอกหน้าที่ เมื่อคลิกจะเรืองแสงและทำหน้าที่ ดังนี้  อธิบายวิธีทำแบบฝึกเป็นภาษาไทย Sound .wave  ตรวจคะแนน Sound .wave  ย้อนกลับไปข้อเดิม ในกรณีที่มีมากกว่า 1 ข้อ Sound .wave  ไปข้อต่อไปในกรณีที่มีมากกว่า 1 ข้อ Sound .wave  ออกสู่หน้าจอ main Sound .wave 4. หลังจาก ก้าวที่ 30 หน้าจอจะเปลี่ยนเป็น ฉาก

3.3 Play : Scene 3	Explanation
	1. หน้าจอฉากป่า เมื่อคลิก  จะปรากฏ Slot ใช้เม้าส์ชี้ที่คันโยก จะเป็นรูปมือ คลิก 1 ครั้ง คันโยกเคลื่อนที่ ปรากฏคะแนนที่หน้าจอ Sound : Sound . wave 2. คลิก  เดินตามจำนวนก้าวที่ได้ Sound . wave 3. สิ้นสุดการเดิน คลิก  เพื่อเข้าสู่หน้าจอแบบฝึก Sound . wave 4. คลิก  ออกสู่หน้าจอ main

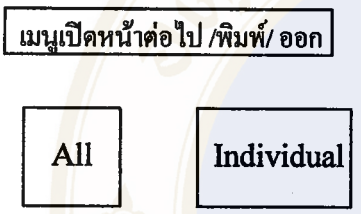
3.3.1 Practice 31 - 45	Explanation
31. Read & choice 6 32. Puzzle 3 33. Prediction Ending 4 34. Odd One Out 2 35. Main Idea 2 36. Re-arrange 5 37. Context Clues 3 38. Scanning 11 39. Match picture with sentence 4 40. Mood & Tone 2 41. Match Antonym 5 42. Misprint 1 43. Hangman 0 44. Cloze 2 45. Word in General 6 	3. หน้าจอเกม ปรากฏแบบฝึกภาษาอังกฤษตามลำดับก้าว (Step) ที่กำหนดไว้ แต่ละแบบฝึกมีคำอธิบายวิธีการเล่นระบุไว้ 2. เงื่อนไขการเล่น - ถ้าตอบถูกมากกว่า 80 % ให้เดินฟรี 1 ครั้ง โยก Slot เดินต่อตามจำนวนก้าวที่โยก Slot ได้ แล้วทำแบบฝึก - ถ้าตอบถูกมากกว่า 50 % ให้เดินฟรี 1 ครั้ง แล้วทำแบบฝึก - ถ้าตอบถูกน้อยกว่า 50 % เดินถอยหลัง 1 ครั้ง แล้วทำแบบฝึก 5. มีเมนูการทำงาน ใช้เม้าส์ชี้ที่ปุ่ม จะมี tool tip บอกหน้าที่ เมื่อคลิกจะเรืองแสงและทำหน้าที่ ดังนี้  อธิบายวิธีทำแบบฝึกเป็นภาษาไทย Sound .wave  ตรวจคะแนน Sound .wave  ย้อนกลับไปข้อเดิม ในกรณีที่มีมากกว่า 1 ข้อ Sound .wave  ไปข้อต่อไปในกรณีที่มีมากกว่า 1 ข้อ Sound .wave  ออกสู่หน้าจอ main Sound .wave 4. หลังจาก ก้าวที่ 45 หน้าจอจะเปลี่ยนเป็น ฉาก 4

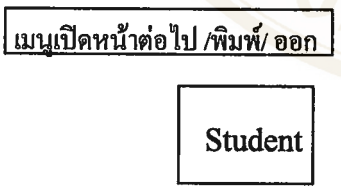
3.4 Play : Scene 4	Explanation
 	1. หน้าจอฉากน้ำตก เมื่อคลิก  จะปรากฏ Slot ใช้เม้าส์ชี้ที่คันโยก จะเป็นรูปมือ คลิก 1 ครั้ง คันโยกเคลื่อนที่ ปรากฏคะแนนที่หน้าจอ Sound . wave 2. คลิก  เดินตามจำนวนก้าวที่ได้ Sound . wave 3. สิ้นสุดการเดิน คลิก  เพื่อเข้าสู่หน้าจอแบบฝึก Sound . wave 4. คลิก  ออกสู่หน้าจอ main

3.4.1 Practice 46 - 60	Explanation
46. Inference 4 47. Match Antonym 9 48. Match picture with sentence 2 49. Main Idea 4 50. Puzzle 6 51. Topic 3 52. Prediction Ending 1 53. Draw Conclusion 2 54. Match picture with Word 10 55. Context Clues 4 56. Scanning 12 57. Match picture with sentence 10 58. Odd One Out 9 59. General Word 2 60. Re-arrange 6 	1. หน้าจอเกม ปรากฏแบบฝึกภาษาอังกฤษตามลำดับก้าว (Step) ที่กำหนดไว้ แต่ละแบบฝึกมีคำอธิบายวิธีการเล่นระบุไว้ 2. เงื่อนไขการเล่น - ถ้าตอบถูกมากกว่า 80 % ให้เดินฟรี 1 ครั้ง โยก Slot เดินต่อตามจำนวนก้าวที่โยก Slot ได้ แล้วทำแบบฝึก - ถ้าตอบถูกมากกว่า 50 % ให้เดินฟรี 1 ครั้ง แล้วทำแบบฝึก - ถ้าตอบถูกน้อยกว่า 50 % เดินถอยหลัง 1 ครั้ง แล้วทำแบบฝึก 6. มีเมนูการทำงาน ใช้เม้าส์ชี้ที่ปุ่ม จะมี tool tip บอกหน้าที่ เมื่อคลิกจะเรืองแสงและทำหน้าที่ ดังนี้  อธิบายวิธีทำแบบฝึกเป็นภาษาไทย Sound .wave  ตรวจคะแนน Sound .wave  ย้อนกลับไปข้อเดิม ในกรณีที่มีมากกว่า 1 ข้อ Sound .wave  ไปข้อต่อไปในกรณีที่มีมากกว่า 1 ข้อ Sound .wave  ออกสู่หน้าจอ main Sound .wave 4. หลังจาก ก้าวที่ 60 หน้าจอจะเปลี่ยนเป็น ฉาก 5

3.5 Play : Scene 5	Explanation
	1. หน้าจอฉากปราสาท เมื่อคลิก  จะปรากฏ Slot ใช้เม้าส์ชี้ที่คันโยก จะเป็นรูปมือ คลิก 1 ครั้ง คันโยกเคลื่อนที่ ปรากฏคะแนนที่หน้าจอ Sound . wave 2. คลิก  เดินตามจำนวนก้าวที่ได้ Sound . wave 3. สิ้นสุดการเดิน คลิก  เพื่อเข้าสู่หน้าจอแบบฝึก Sound . wave 4. คลิก  ออกสู่หน้าจอ main

5.1 Score : Teacher : password	Explanation
	1. ใช้เม้าส์ชี้ไอคอนภาพครู ปรากฏ tool tip ว่า teacher คลิก ที่ไอคอน ปรากฏหน้าจอ Password 2. ใส่ Password ถูก จะเข้าสู่หน้าจอ All Individual ใส่ Password ผิด หน้าจอจะถามให้ยืนยันการใส่ Password ถ้าไม่ต้องการใส่ Password จะกลับไปหน้าจอ main

5.2 Score : Teacher : All-individual	Explanation
	1. ใช้เม้าส์คลิกไอคอน All จะเรืองแสง และปรากฏคะแนนของผู้เล่นทุกคน 2. สั่งพิมพ์รายงานคะแนนรวมได้เมื่อคลิกเมนูพิมพ์ 3. ใช้เม้าส์คลิกไอคอน Individual จะเรืองแสง และปรากฏรายชื่อผู้เล่นพร้อมทั้ง Code คลิกชื่อที่ต้องการดูคะแนนหน้าจอปรากฏ คะแนนทุก Part ของผู้เล่นตามชื่อที่เลือก 4. สั่งพิมพ์รายงานคะแนนของผู้เล่นแต่ละคนมีรายละเอียดการเล่นทุก Part ได้เมื่อคลิกเมนูพิมพ์

5.2 Score : Student	Explanation
	1. ใช้เม้าส์คลิกไอคอน student จะเรืองแสง และปรากฏคะแนนของผู้เล่นที่กำลังเล่น หรือ ของเจ้าของชื่อที่พิมพ์ ใน Registration ทุก Part ที่เล่น 2. ถ้าเป็นผู้ที่ไม่เคยเล่น จะกลับสู่หน้าจอ Main 3. สั่งพิมพ์รายงานคะแนนของผู้เล่นแต่ละคนมีรายละเอียดการเล่นทุก Part ได้เมื่อคลิกเมนูพิมพ์

APPENDIX C

FLOWCHART

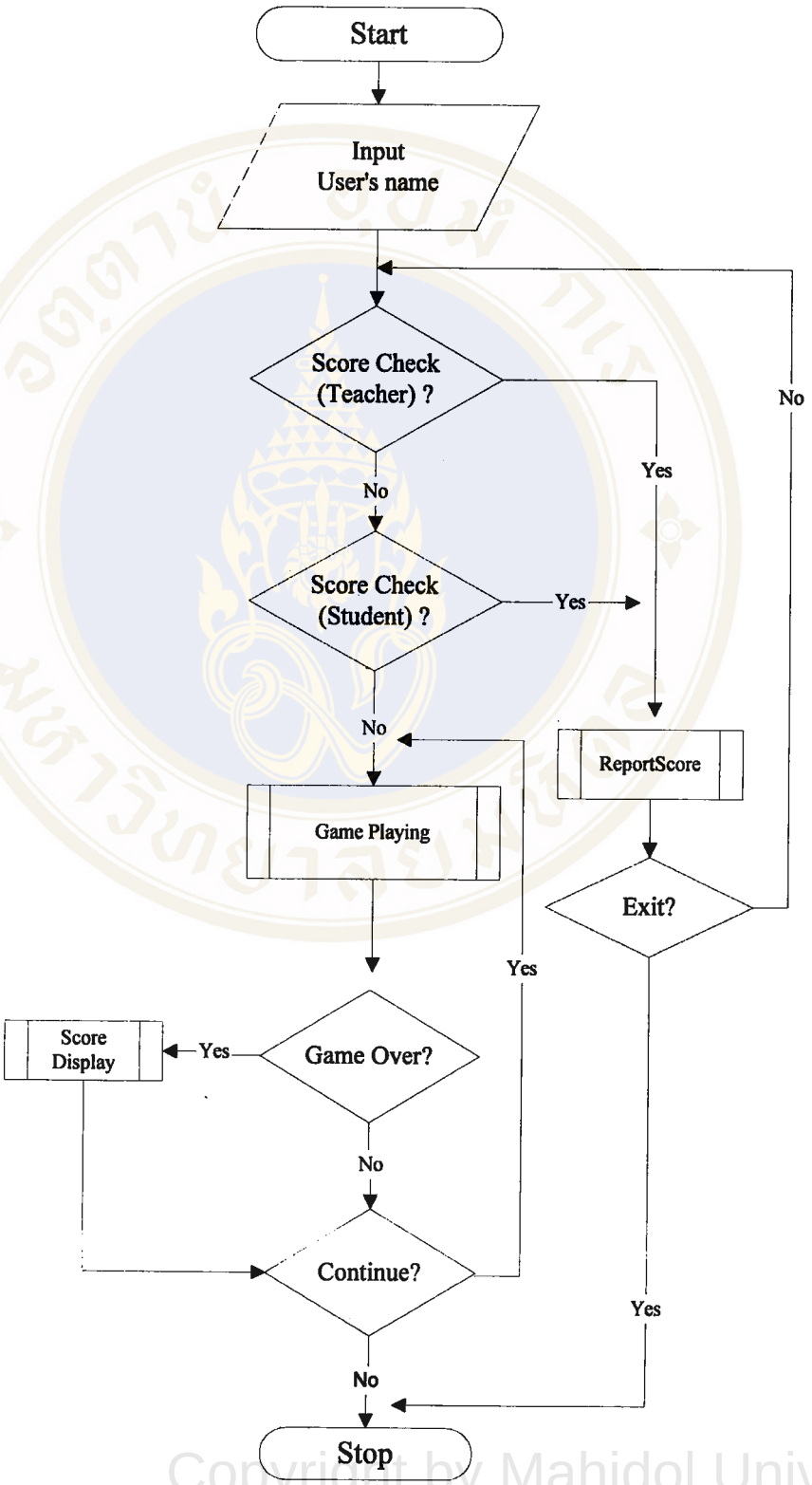


Figure C.1 Flowchart of Specification of the Treasure of Reading Game

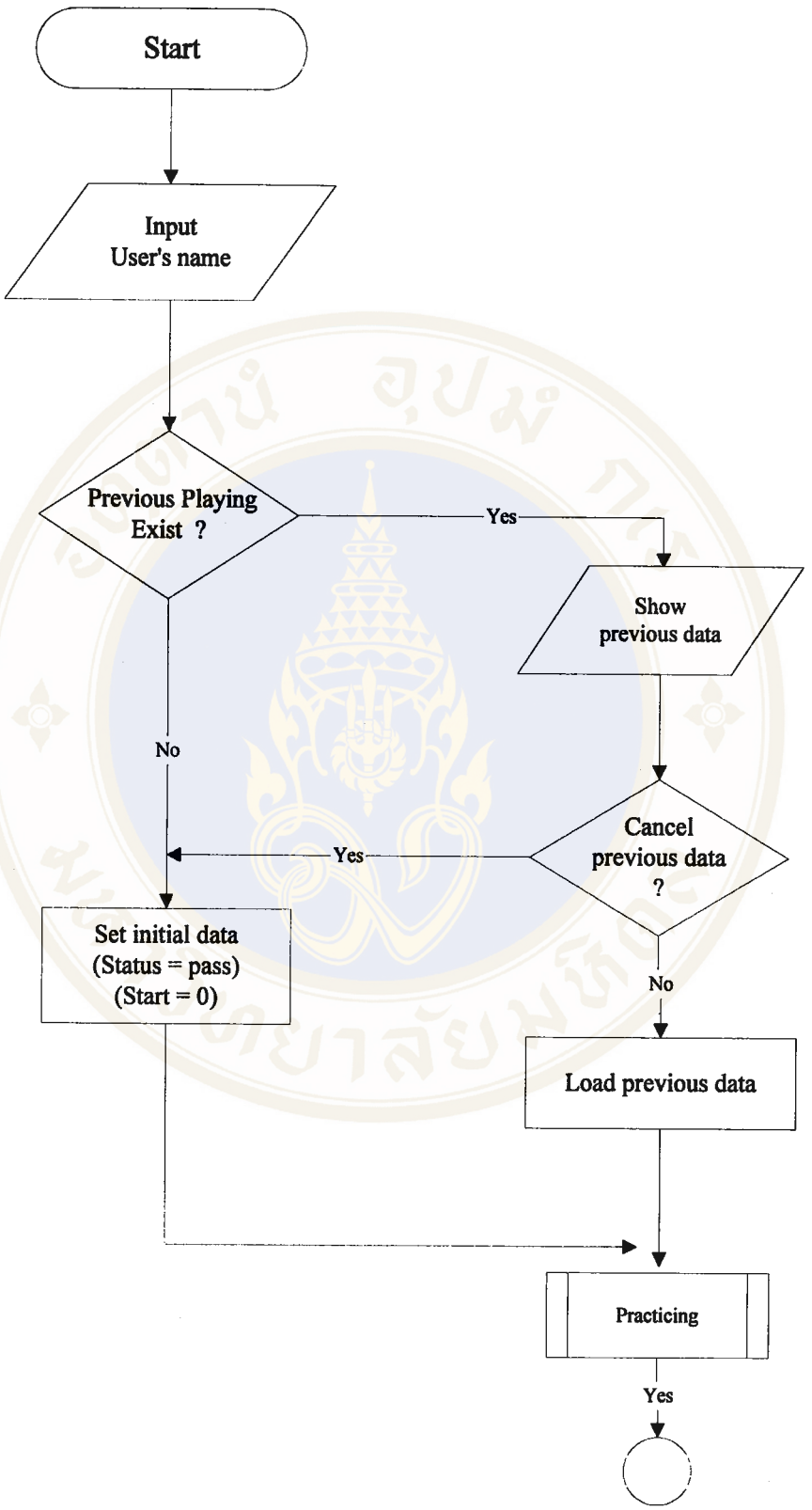


Figure C.2 Flowchart of Game playing

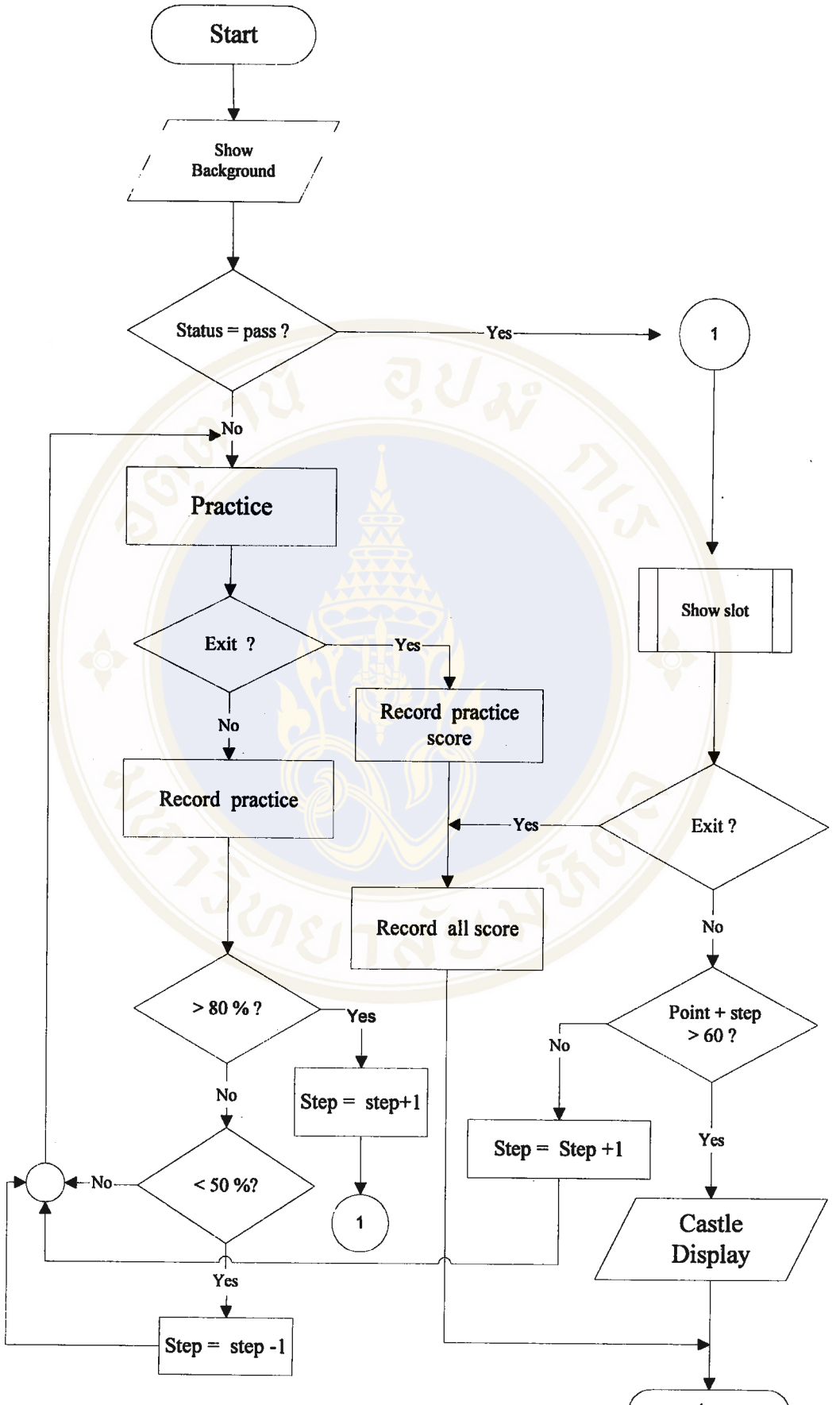


Figure C.3 Flowchart of Practicing

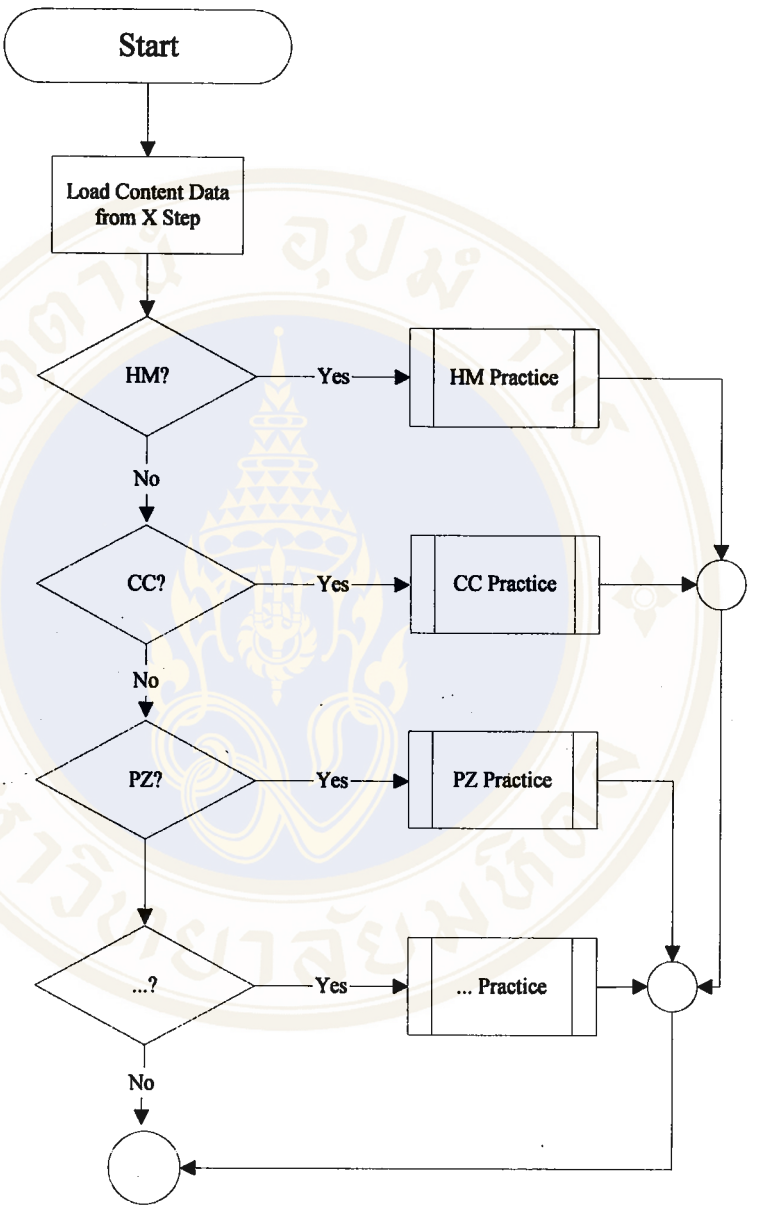


Figure C.4 Flowchart of Practice

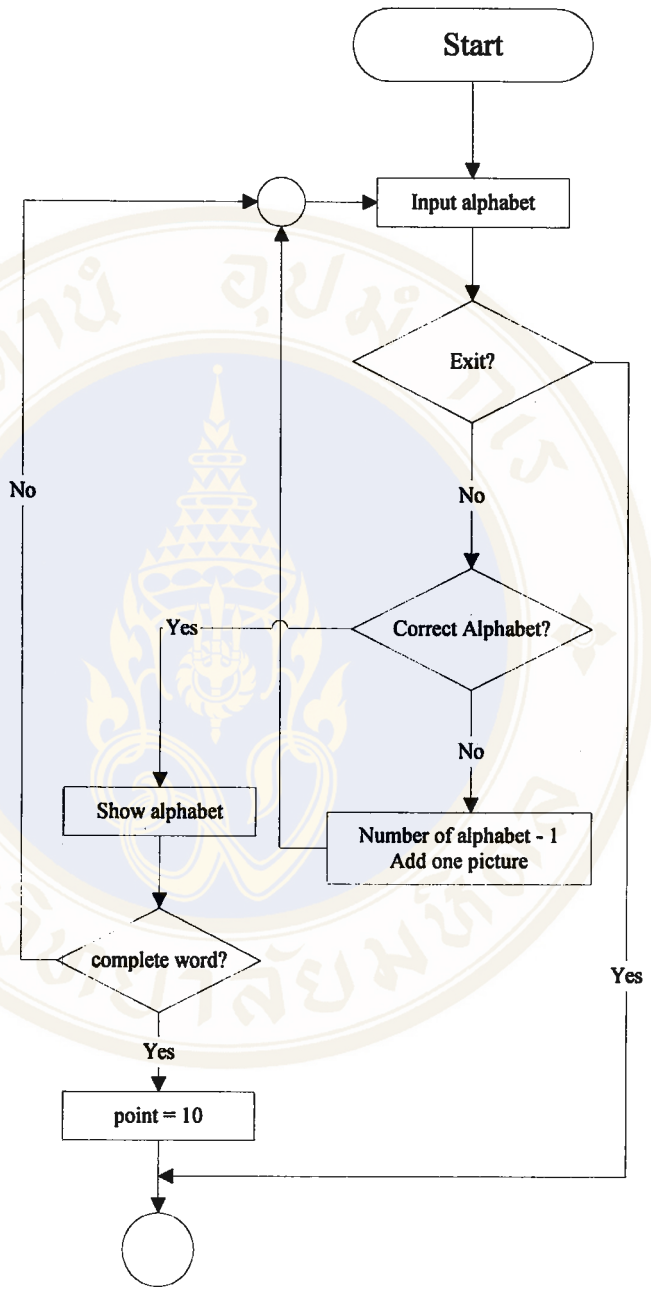


Figure C.5 Flowchart of Hangman

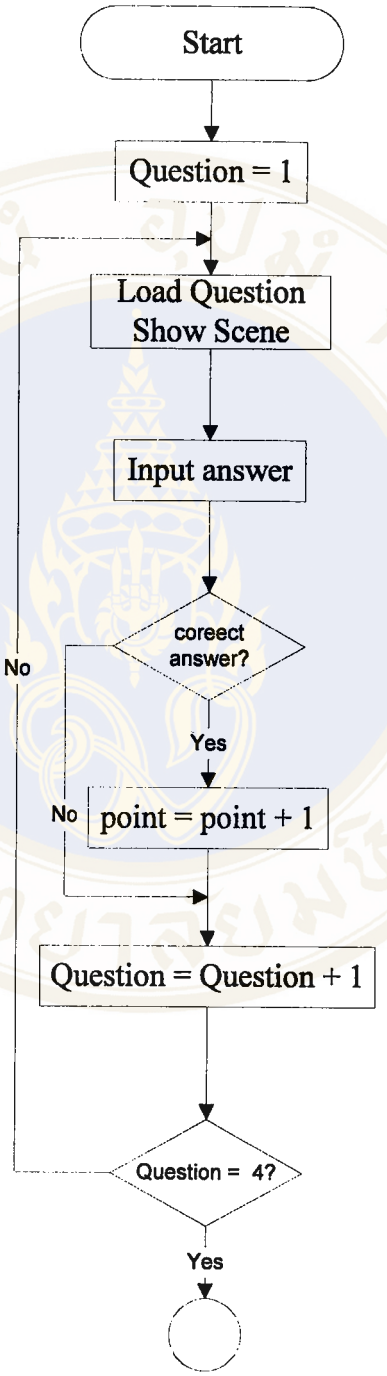


Figure C.6 Flowchart of Context Clues

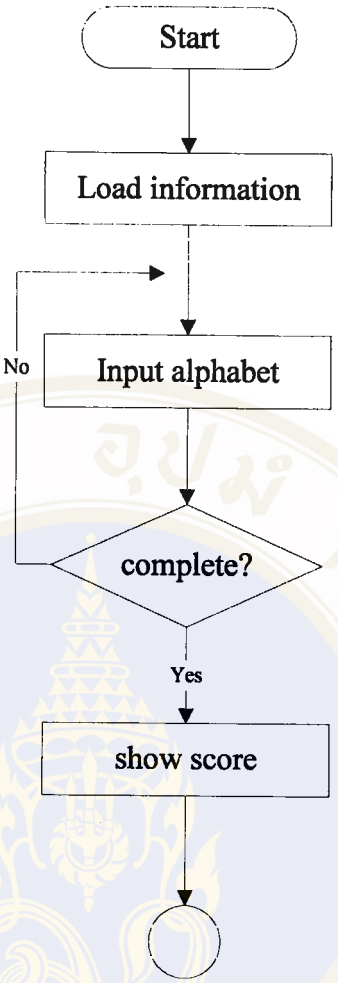


Figure C.7 Flowchart of Puzzle

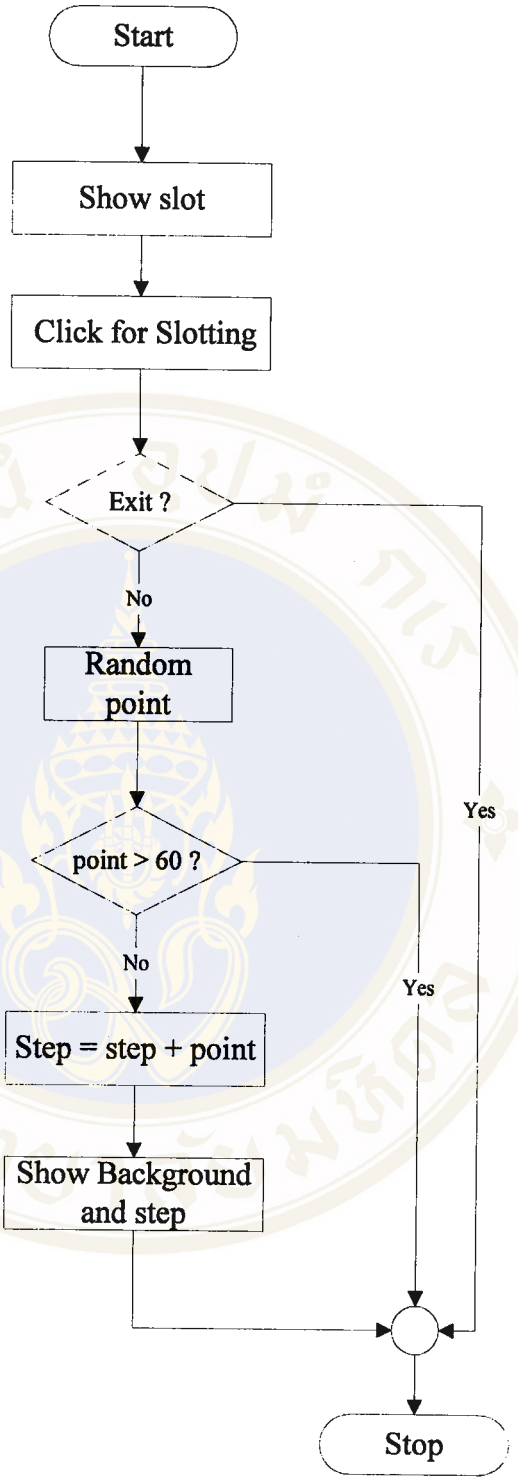


Figure C.8 Flowchart of Show Slot

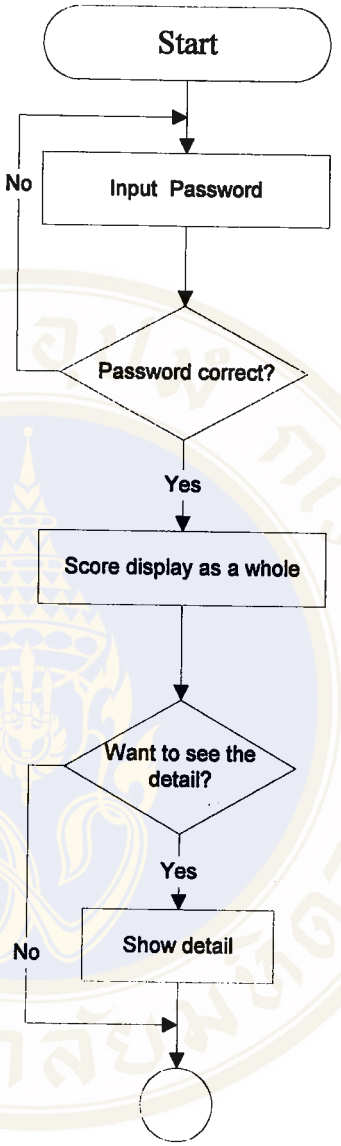


Figure C.9 Flowchart of Score Ckeck (Teacher)

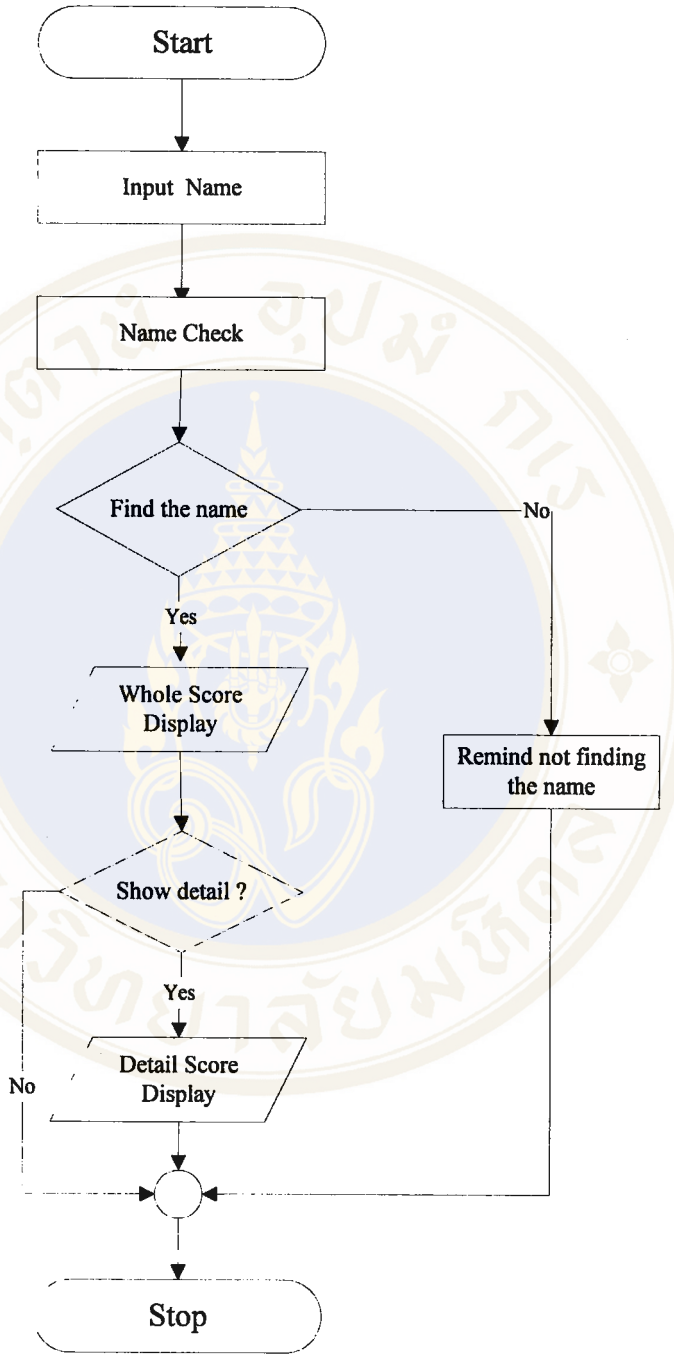


Figure C.10 Flowchart of Show Score (Student)

APPENDIX D

TEST

Mahidowitthayanusorn School — Pretest – Post-Test — English Critical Reading

40 items — 60 minutes

Read the following poem and choose the most appropriate answer .

FISH !

The little fish eats the **tiny** fish,
The big fish eats the little fish.
So only the biggest fish get fat.
Do you know any folks like that?

1. The little fish eats the **tiny** fish,. The word "**tiny**" means ..
   1. huge
   2. little
   3. large
   4. very little
2. We can compare this poem with ....
   1. the fair people who are weak
   2. the big fish that can live safely in the world
   3. strong people who are always treated like that
   4. the powerful people who usually treat the weak ones like that

Read each of the following encyclopaedia articles and answer the questions that follow :

Cabbage tree is a name given to various tree in many parts of the world. In Africa, a tree of the ivy family is called cabbage tree. It resembles a large palm tree, and men use the leaves to feed animals. The name *cabbage tree* is also given to a tree of the strychnos family that has leaves that look like cabbages. In New Zealand, the *palm lily* is also called cabbage tree. Wood from this plant stays alive for a long time. Stems will sprout when planted after being left to dry in the sun for many months. Various palms are called cabbage trees in other parts of the world, including Australia, the Bahamas, the United States, and the West Indies. See also PALM; PALMETTO.

3. What does this passage tell you about?
   1. A book
   2. A kind of tree
   3. A place
   4. A kind of vegetable
4. Which statement is true?
   1. The palm lily can also be found in Africa.
   2. All kinds of palm trees are called cabbage tree.
   3. A tree of the strychnos family is called palm lily.
   4. A kind of cabbage tree grows in the West Indies.

Read the following passages and then choose the best alternative for each item

Passage A

My name is Reungsak. I was born 27 years ago in Ayuthaya. I lived there until I graduated from a secondary school when I was 18 years old. Then my family decided to move to Bangkok. I spent four years studying Economics in the university there, and I got my bachelor degree.

5. How old was Reungsak when he graduated from the university ?
   1. 27 years 2. 24 years 3. 22 years 4. 20 years

Passage B

Some people don't like New York City. They find all the stores and streets are too crowded. They think that the city is too noisy and the buildings are confusing. However, it is these things that make New York such an exciting and interesting city.

6. What is the main idea of this passage ?
   1. New York is too crowded
   2. New York is very noisy city
   3. New York is a very confusing city
   4. New York is an exciting and interesting city.

Passage C

You may have notice that when you see a rainbow, you always have your back to the sun. In the morning, when the sun is in the eastern sky, rainbows always appear in the west. In the afternoon they always appear in the east. Rainbows are always in the opposite direction from the sun.

7. What is the main idea of this passage ?
   1. Rainbows always appear in the eastern sky
   2. In the morning rainbows always appear in the western sky.
   3. A rainbow's location has no particular relationship to the sun
   4. Rainbows always appear in the sky in the opposite direction from the sun

Passage D

My favorite season of the year is spring. The weather turns warmer, flowers push their ways up through the wet earth, and the branches of the trees fill with colors. But even more than all of this, I like spring best because in the spring the baseball season begins.

8. What is the topic of this passage ?
   1. Spring
   2. Flowering Time
   3. Baseball Season.
   4. The Writer's Favorite Season.

Passage E

Besides feeling the soil and sniffing the air, farmers can now point gun-shaped infrared meters at their crops to find out when the plants need watering. These portable meters give digital readouts that indicate the difference between a plant's temperature and that of the surrounding air. When it is shot of water, a plant, which normally uses evaporation as means of cooling, cannot rid itself of the own metabolism. Therefore, if the meter indicates that a plant is warmer than the air, it may mean that it is time to irrigate.

9. Which of the following would be the most appropriate tittle for the passage?
   1. A New Aid for Farmers
   2. Checking Crop Yields
   3. Plant Temperatures and Evaporation
   4. The Metabolism of Plants
10. According to the passage, what do the meter measure?
   1. The quantity of crops being grown
   2. The water content of plants
   3. The temperatures of plants and air
   4. The rate of evaporation
11. Which of the following plays the most important role in a plant's cooling?
   1. evaporation
   2. sunlight
   3. absorption of water
   4. infrared rays
12. According to the passage , a plant can no longer cool itself if …
   1. it needs water
   2. the soil becomes to warm
   3. it absorbs infrared rays
   4. outside temperatures are high

Passage F

Freshwater fish farming is becoming more and more popular. It is quite a profitable business for farmers. That is to say; farm fish make more efficient use of an area and provide an additional source of income. Farmers can convert unused land into ponds where fish can be raised. In this way the land can be more fully **utilized**. Farmers may feed fish with vegetables from the farm that are not good enough to sell. Framers can sell the fish. They can eat them fresh. Moreover, they can preserve **them** with salt for a future food supply for their family.

13. What may be the topic of the text?
   1. An additional source of income
   2. Freshwater fish farming
   3. A popular business.
   4. Farmers and fish.
14. What is the main idea of the text?
   1. Freshwater fish farming is beneficial to farmers.
   2. Freshwater fish farming produces more fresh fish.
   3. Freshwater fish farming is done on unused land.
   4. Freshwater fish farming becomes very popular.
15. '**utilized**' means
   1. supplied
   2. made use of
   3. worked
   4. developed
16. '**them**' refers to … .
   1. the vegetables
   2. the freshwater
   3. the farmers
   4. the fish

Passage G

If we look around us, we can see a lot of people who are in need of help of some sort - people who are poor, old, alone, or ill, for example. Some people ask for help and get **it** - either from **individuals** or from large organizations. Others are too shy or too ashamed to ask for help. They may not get any. It is sometimes difficult to decide who is the most in need of help and also how to help. Some people are possibly in need of help, but what sort of help do they need? How do we know?

17. The topic of the text should be ….
   1. people who need help.
   2. helping other people.
   3. some sort of people.
   4. how people get help.
18. The text describes that a lot of people need help ….
   1. and they never get it .
   2. and they ask for it .
   3. but they may or may not get it..
   4. and they always get it .

19. '**individuals**' means
    1. everyone
    2. any one human beings
    3. many people
    4. every people
20. '**it**' refers to … .
    1. money
    2. medicine
    3. friend
    4. help

Passage H

In the upper part of Earth's atmosphere there is a gas which is essential to all forms of life. It is called ozone. It is necessary because it protects plants and animals from the harmful ultraviolet rays of the sun. In the stratosphere, the ultraviolet rays from the sun are reflected by the ozone. In this way, ozone prevents a large amount of ultraviolet radiation from reaching Earth. This is important for plants because crops such as rice and wheat yield smaller harvests if too much ultraviolet radiation reaches them. It is also vital for human being , since excessive ultraviolet radiation can cause skin cancer.

However, ozone at ground level is a problem. It can damage plants and cause headaches and breathing difficulties in humans. Large amounts can cause more serious problems. At ground level, ozone is produced by a chemical reaction between oxygen and the gases and smoke from cars and factories. The reaction is speeded up by strong sunlight. The result is "photochemical smog", which is becoming more ad more common in the large, polluted cities of the world. This kind of smog can only controlled by reducing pollution from cars and factories.

21. A suitable tittle for the test is … .
    1. Greenhouse Gas
    2. How ozone affects us
    3. The cause of photochemical smog
    4. The benefits of ozone
22. Ozone is … for life on earth.
    1. necessary
    2. harmful
    3. unnecessary
    4. both good and bad
23. Ozone in the upper atmosphere protects plants and animals … .
    1. because it reflects the ultraviolet rays of the sun
    2. by breaking down the ultraviolet rays of the sun
    3. by reducing crop production and cause skin cancer
    4. by allowing the ultraviolet rays of the sun to reach Earth
24. Excessive ultraviolet radiation causes … in crop production.
    1. no change
    2. a decrease
    3. an increase
    4. Speed up
25. Ozone at ground level … .
    1. causes to react faster
    2. is destroyed by strong sunlight
    3. forms part of photochemical smog
    4. is produced by cars and factories

Read the following boxes of sentences and then choose the best alternative for each item.

A. He was feeling rather hungry so he ate a piece. He was looking round the rest of the house, stealing jewelry and paintings, when he began to feel rather thirsty

B. He was still feeling thirsty so he drank a second bottle. And a third.

C. Next morning when the owners got home, he was still lying on the bed, fast asleep. He only woke up when the police arrived and arrested him.

D. A Parisian burglar broke into a house while the owners were away for the weekend. While he was looking for things to steal, he found some of his favorite cheese in the kitchen.

E. He went back to the kitchen where he found some champagne. He drank the whole bottle.

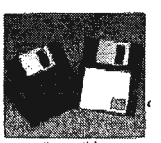
F. A little later, while he was taking things from the bedroom, he began to feel tired. So he lay on the bed, just for a few minutes.

26. Which alternative puts the sections of the story in the correct order ?
1. D, A, E, B, C, F
2. A, D, E, B, F, C
3. D, A, B, E, F, C
4. D, A, E, B, F, C

27. "He was feeling rather hungry so he ate **a piece**". The words "**a piece**" refers to
1. wine
2. bread
3. butter
4. Cheese

28. Why was a Parisian burglar arrested ?
1. He was tired.
2. He had fallen into a deep sleep.
3. He was hungry.
4. He was knocked out.

Read the following articles and complete each blank with the right word(s):


floppy disks

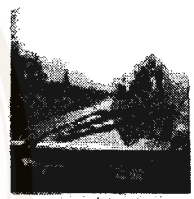
Dr.Yoshiro Nakamats patented the first floppy disk in 1950. Nakamats, an … 29… at Tokyo University in Japan, holds 2,300 other patents, including one for golf club designs. IBM, a computer company, bought the sales …30… for the disks. They improved Nakamats' design and started …31… floppy disks in 1970.

29. 1. bachelor 2. explorer 3. inventor 4. surveyor
30. 1. license 2. patent 3. shop 4. company
31. 1. to buy 2. to sell 3. buying 4. selling

One day in the 1950s Georges de Mestral was walking in his native Switzerland, when he ...32... some plant seeds sticking to his jacket. He looked at the under a microscope and saw that the seeds were covered with tiny hooks, which attached themselves to the fabric of ...33...This gave him the idea of Velcro™. The first Velcro™ was made ...34... in France and took along time to make. Today ...35... use Velcro™ to prevent objects from moving around when they are traveling in space.

32. 1. noticed 2. ran for 3. lay out 4. compared
33. 1. its plant 2. his clothing 3. their seeds 4. their jackets
34. 1. by hand 2. automatically 3. already 4. accidentally
35. 1. astronauts 2. astronomers 3. astrologers 4. manufacturers

The windshield wiper was invented in 1903 by Mary Anderson, a woman from Alabama, U.S.A. ...36... Anderson was riding a streetcar during a trip to New York City, she noticed that the driver often had to get out to wipe snow from the ...37... She quickly drew an idea for a mechanical windshield wiper in her ...38... Later she tried to sell her idea to a Canadian company, but ...39... decided that the invention wouldn't be ...40... Anderson gave up on trying to sell her invention and never made any money from it.



36. 1. If 2. When 3. After 4. While
37. 1. trip 2. collar 3. windshield 4. streetcar
38. 1. mind 2. memory 3. imagination 4. sketchbook
39. 1. a Canadian 2. some Canadians 3. the company 4. a company
40. 1. succeed 2. success 3. successful 4. successfully

End of Paper

APPENDIX E

QUESTIONNAIRE

แบบสอบถามความคิดเห็นที่มีต่อการเล่นเกมเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์

คำชี้แจง : แบบสอบถามนี้เป็นแบบสอบถามความคิดเห็นของนักเรียน โรงเรียนมหิดลวิทยานุสรณ์ ที่มีต่อการใช้เกมการเรียนการสอนเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์ (An Instructional Game as a supplement practice for English Critical Reading Course) การทำแบบสอบถามฉบับนี้ ไม่มีผลเกี่ยวข้องกับคะแนนการเรียน ขอให้นักเรียนตอบแบบสอบถามตามความเป็นจริง ข้อมูลที่ได้จะนำไปใช้ประโยชน์ในการพัฒนาสื่อการเรียนการสอน อื่น ๆ ต่อไป แบบสอบถามแบ่งเป็น 2 ตอน ตอนแรก เกี่ยวกับข้อมูลของผู้ตอบแบบสอบถาม ตอนที่สอง เกี่ยวกับความคิดเห็นของนักเรียนต่อการใช้เกมการเรียนการสอนเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์

ตอนที่ 1 ข้อมูลทั่วไป

วิธีการตอบ ให้นักเรียนเติมข้อความ หรือ ทำเครื่องหมาย ✓ ลงในช่องว่าง ที่ตรงกับข้อมูลของนักเรียน

1. เพศ ( ) ชาย ( ) หญิง
2. อายุ ..... ปี
3. จบชั้นมัธยมศึกษาตอนต้นจากโรงเรียน ..... จังหวัด .....
4. เริ่มเรียนภาษาอังกฤษครั้งแรกชั้น ( ) อนุบาล ( ) ประถมปีที่ 1
   ( ) ประถมปีที่ 3 ( ) ประถมปีที่ 5
   ( ) มัธยมปีที่ 1 ( ) มัธยมปีที่ 3
   ( ) อื่น ๆ (โปรดระบุ .....)
5. คะแนนเฉลี่ยวิชาภาษาอังกฤษระดับมัธยมปีที่ 3 .....
6. คะแนนเฉลี่ยวิชาภาษาอังกฤษระดับมัธยมปีที่ 4 ที่โรงเรียนมหิดลวิทยานุสรณ์ .....
7. นักเรียนชอบเรียนวิชาภาษาอังกฤษหรือไม่ ( ) ชอบมากที่สุด
   ( ) ชอบมาก
   ( ) ชอบ
   ( ) ชอบค่อนข้างน้อย
   ( ) ไม่ชอบ
   ( ) ไม่ชอบมากที่สุด
8. นักเรียนเคยเล่นเกมคอมพิวเตอร์ มาก่อนหรือไม่ ( ) เคย ( ) ไม่เคย
9. นักเรียนเคยเล่นเกมการเรียนการสอนภาษาอังกฤษ มาก่อนหรือไม่ ( ) เคย ( ) ไม่เคย

ตอนที่ 2 ความคิดเห็นและทัศนคติต่อการเล่นเกมเสริมทักษะการอ่านภาษอังกฤษเชิงวิเคราะห์

วิธีการตอบ ให้นักเรียนทำเครื่องหมาย ✔ ลงในช่องที่ตรงกับความเห็นของนักเรียนที่สุด โดยแต่ละข้อ มีคะแนน ดังนี้

5 หมายถึง เห็นด้วยอย่างยิ่ง

4 หมายถึง เห็นด้วย

3 หมายถึง ไม่แน่ใจ / เฉย ๆ

2 หมายถึง ไม่เห็นด้วย

1 หมายถึง ไม่เห็นด้วยอย่างยิ่ง

ความคิดเห็นของนักเรียน	5	4	3	2	1
1. นักเรียนรู้สึกสนุกสนานในการเล่นเกมเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์					
2. นักเรียนสามารเล่นเกมเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์ ได้อย่างเต็มที่ ตามความสามารถของตนเอง					
3. นักเรียนรูสึกเป็นอิสระในการเล่นเกมเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์					
4. เนื้อหาที่ใช้ในเกมเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์ เหมาะสมดีแล้ว					
5. เนื้อหาที่ใช้ในเกมเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์ น้อยเกินไป					
6. นักเรียนต้องการให้มีเกมการเรียนการสอนแบบนี้ในเรื่องอื่น ๆ ด้วย					
7. การใช้ภาพเคลื่อนไหว, รูปภาพ และเสียง ในเกมนี้ ช่วยดึงดูดให้เกิดความน่าสนใจมากขึ้น					
8. วิธีการและขั้นตอนในการเล่นเกมเสริมทักษะการอ่านอังกฤษเชิงวิเคราะห์ ง่ายและสะดวก					
9. การใช้ตัวอักษรในเกมนี้ เหมาะสม รวมทั้งสอดคล้องกับภาพ และเนื้อหา					
10. การรายงานผลคะแนนในแต่ละชุดแบบฝึก ช่วยกระตุ้นให้นักเรียนต้องการทำแบบฝึกต่อไป					

ข้อเสนอแนะอื่น ๆ (ถ้ามี) .....

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BIOGRAPHY

NAME	Mrs. Jiraporn Gotam
DATE OF BIRTH	11 September 1952
PLACE OF BIRTH	Bangkok, Thailand
INSTITUTIONS ATTENDED	Srinakarinwirot University, 1969 – 1973: Bachelor of Education (English)
	Srinakarinwirot University, 1990 – 1991: Dip. in TEFL. (Teaching English as a Foreign Language)
	Mahidol University, 1997 – 2000: Master of Science (Technology of Information System Management)