THE MACHINE GAME AUTOMATIC FOR READING SKILL USING
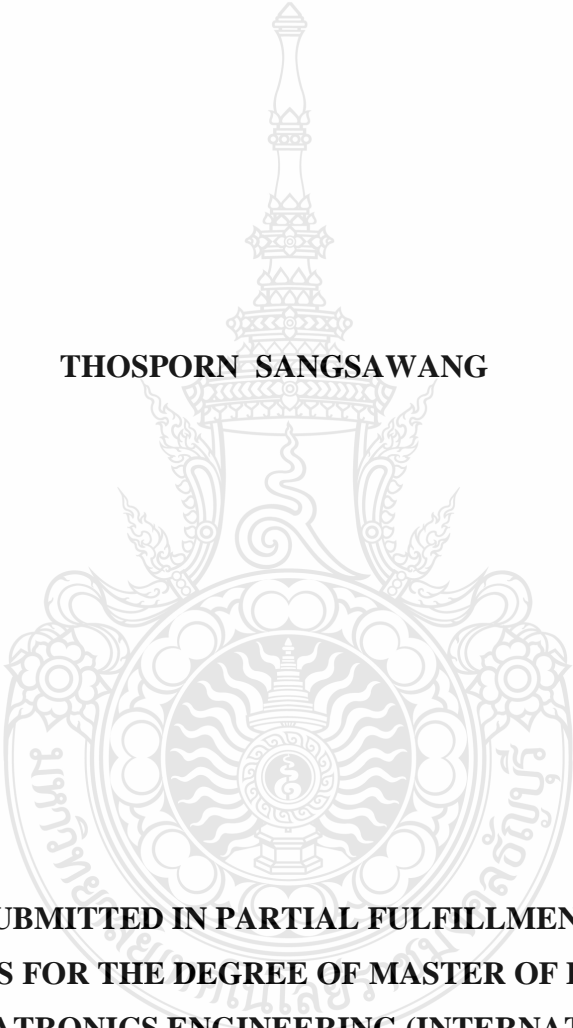# INTERNET OF THINGS

THOSPORN SANGSAWANG

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ENGINEERING
PROGRAM IN MECHATRONICS ENGINEERING (INTERNATIONAL PROGRAM)
FACULTY OF TECHNICAL EDUCATION
RAJAMANGALA UNIVERSITY OF TECHNOLOGY THANYABURI
ACADEMIC YEAR 2020**

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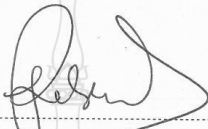PROGRAM IN MECHATRONICS ENGINEERING
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Thesis Title	The Machine Game Automatic for Reading Skill Using Internet of Things
Name - Surname	Miss Thosporn Sangsawang
Program	Mechatronics Engineering
Thesis Advisor	Associate Professor Dechrit Maneetham, D.Eng.
Academic Year	2020

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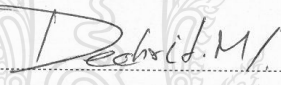|	
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ABSTRACT

The purposes of this research were to: 1) identify the efficacy of the machine game automatic for reading skill using Internet of Things, 2) compare students' achievement before and after utilizing the machine game automatic for reading skill using Internet of Things, and 3) assess the students' level of satisfaction toward the machine game automatic for reading skill using Internet of Things.

The samples of this research included 30 students with learning disabilities from 23 school networks studying in the first semester of the academic year 2019. The research instruments consisted of :1) the machine game automatic for reading skill using Internet of Things, 2) a pretest and a posttest as an achievement assessment, and 3) satisfaction questionnaires to assess the student's level of satisfaction toward the machine game automatic for reading skill using Internet of Things. The data were analyzed using mean, standard deviation, and *t-test*.

The research results showed that 1) the efficacy of the machine game automatic for reading skill using Internet of Things (E1/E2) was 82.25/81.56. 2) The students' achievement after utilizing the machine game automatic was significantly higher than before using the game t (4.07) $=17.61$, $p <.05$) as the average pretest score was 15.44 ($SD =0.89$) and the average posttest score was 17.61 ($SD =1.55$). 3) The student's level of satisfaction toward the machine game automatic for reading skill using Internet of Things was at the highest level ($M=4.80$, $SD =0.50$). It was found that the machine game automatic was beneficial. Learning the contents controlled by Arduino board with electronic devices and automatic systems using Internet of Things could improve the students' reading skill.

Keywords: automatic, internet of thing, machine game, reading skill

หัวข้อวิทยานิพนธ์	เครื่องเกมอัตโนมัติสำหรับทักษะการอ่านผ่านการใช้อินเทอร์เน็ตของสรรพสิ่ง
ชื่อ - นามสกุล	นางสาวทศพร แสงสว่าง
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ปีการศึกษา	2563

บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อ 1) หาประสิทธิภาพเครื่องเกมอัตโนมัติสำหรับทักษะการอ่านผ่านการใช้อินเทอร์เน็ตของสรรพสิ่ง 2) เปรียบเทียบคะแนนผลสัมฤทธิ์ทางการเรียนก่อนและหลังเรียนด้วยเครื่องเกมอัตโนมัติสำหรับทักษะการอ่านผ่านการใช้อินเทอร์เน็ตของสรรพสิ่ง และ 3) ประเมินความพึงพอใจของนักเรียนที่มีต่อการเรียนด้วยเครื่องเกมอัตโนมัติสำหรับทักษะการอ่านผ่านการใช้อินเทอร์เน็ตของสรรพสิ่ง

กลุ่มตัวอย่างที่ใช้ในงานวิจัยเป็นนักเรียนที่มีความบกพร่องทางการเรียนรู้ จำนวน 30 คน จากโรงเรียนเครือข่าย จำนวน 23 โรงเรียน ภาคเรียนที่ 1 ปีการศึกษา 2562 เครื่องมือในการวิจัย ได้แก่ 1) เครื่องเกมอัตโนมัติสำหรับทักษะการอ่านผ่านการใช้อินเทอร์เน็ตของสรรพสิ่ง 2) แบบทดสอบก่อนเรียนและหลังเรียน และ 3) แบบประเมินความพึงพอใจของนักเรียนที่มีต่อเครื่องเกมอัตโนมัติสำหรับทักษะการอ่านผ่านการใช้อินเทอร์เน็ตของสรรพสิ่ง สถิติที่ใช้สำหรับการวิเคราะห์ข้อมูล ได้แก่ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน และ t-test

ผลการวิจัยพบว่า 1) เครื่องเกมอัตโนมัติสำหรับทักษะการอ่านผ่านการใช้อินเทอร์เน็ตของสรรพสิ่ง มีประสิทธิภาพเป็นไปตามเกณฑ์ E1/E2 = 82.25/81.56 2) ผลสัมฤทธิ์ทางการเรียนของนักเรียนหลังเรียนสูงกว่าก่อนเรียน อย่างมีนัยสำคัญทางสถิติที่ระดับ .05 ($t(4.07)$ =17.61, $p < 0.05$) กล่าวคือ ค่าเฉลี่ยคะแนนทดสอบก่อนเรียน = 15.44 ส่วนเบี่ยงเบนมาตรฐาน = 0.89 ค่าเฉลี่ยคะแนนทดสอบหลังเรียน =17.61 ส่วนเบี่ยงเบนมาตรฐาน = 1.55 และ 3) นักเรียนผู้บกพร่องทางการเรียนรู้มีความพึงพอใจมากที่สุด = 4.80 ส่วนเบี่ยงเบนมาตรฐาน = 0.50 และพบว่า กิจกรรมการเรียนรู้ด้วยตนเองผ่านเครื่องมีประโยชน์มาก สามารถพัฒนาทักษะการอ่านที่มีการควบคุมเนื้อหาด้วยบอร์ด Arduino ที่ใช้อุปกรณ์อิเล็กทรอนิกส์และระบบอัตโนมัติผ่านอินเทอร์เน็ตของสรรพสิ่ง

คำสำคัญ: อัตโนมัติ อินเทอร์เน็ตของสรรพสิ่ง เครื่องเกม ทักษะการอ่าน
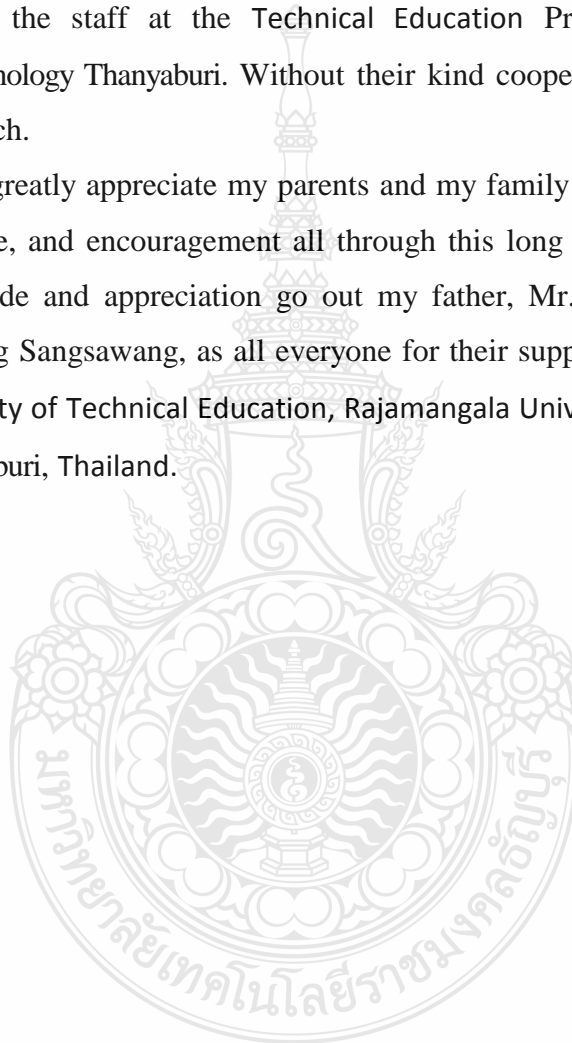
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CHAPTER 1
INTRODUCTION

1.1 Background of Statement

The machine game has any function as a pedagogical strategy tutor grounded empathic. The machine game can assist the learner based on task performance. The machine game will tutor monitoring of the learner's affective states, valence levels, and arousals that could be used to adapt to pedagogical actions. Emotionally intelligent tutoring systems, a machine tutor is an emotional practitioner because he can influence a learner's emotions to improve his learning efficiency. (Hargreaves, 2002) The machine game automatic s could help the learner in a low valence and arousal state; the machine game's behavior will entertain and engage the learner. The learner has positive valence identifying states where the learner is happy or relaxed. The machine game could be taught anywhere at any time if the learner is frustrated. More pedagogical help has been provided social skills training for children. The Autism Spectrum Disorders of students are not an easy problem that typically needs much time and repetitive effort. The machine game can be repetitive instructional; the machine game automatics can assist proposes and examines the feasibility of behavioral and could facilitate children's development with Autism Spectrum Disorders students and relieve operational burden during the training process. This machine game system incorporates mechanical stimulation design, recognition modules as human behavior activities, and reinforcement in the interaction design. Using performs once trained eye contact and reading emotions targeted at preschoolers, a comparative analysis with control group instruction by humans. The proposed system can verify to evoke a positive response in children with Autism Spectrum Disorders students. It would have paid more attention to developing educational support in the advancement of machine games' development. Robots could assist in learning the collaborative learning between educational support robots and healthy children. The number of Learning Disability children with developmental disorders in primary schools has increased annually. Developing educational support robots for learning for disabled children with developmental disorders is necessary. The research of the machine game automatics has made further innovations in children's

education, especially in the rehabilitation of those with learning difficulties and skepticism against robots in people's education and care, a study present on the acceptance of robots by experienced robot practitioners in practice. The results confirm the applicability of the model in the context of children's education and care, and the comparison highlights some skepticism among the practitioners, and a significantly higher willingness to use the robot, and experience, the hypothesis formulate robots accepted if more integrated with standard rehabilitation protocols so that benefits can outweigh the cost. (Conti1, Nuovo, Buono, and et al., 2017)

Therefore, the development of machine games teaches Learning Disabilities with developmental disorders. However, educational support robots for learning disabilities who have potential symptoms of a developmental disability. This research investigates the effects of collaborative learning between robots and children. In collaborative learning, the child and the machine game alternately read aloud one word of teaching material. These learning children have symptoms of ADHD and difficulty learning over long periods. The machine game could be designed to work by method and interact with children in real-time. Learning Disabilities of students can neither see nor touch the elements of their subject. Learning through digital games enables readers to grasp practical and technological concepts quickly, and users can easily teach. (Whitton, 2010) Teachers must consider the appropriate mix of generic academic skills, specific reading skills, and generic academic skills, such as communication, motivation, and responsibility. Learning Disabilities and performance characteristics; all students with intellectual or multiple disabilities are distinct. These characteristics were skills acquired from students with intellectual or multiple disabilities will be less than most students as they will learn them slowly. The skills learned by teachers should ensure that their skills are functional to their present and future environments.

There are many complex skills that a student with intellectual or multiple disabilities may not acquire because of the complexity of skills. The importance of teaching functional skills for the student is again emphasized. The number of instructional opportunities and the amount of time needed for students to acquire skills by most intellectual or multiple disabilities requires several learning opportunities before a skill is acquired. Know the requirements and play to your strengths. Each

student with multiple disabilities will have their own set of skills; learning more about each disability of the student will help address so find out more about the student's strengths and interests, enthusiasms, and preferences. This could motivate the student and is one great source of this information. The student forgetting and recoupment of many students who have acquired skills will decrease that skill if they do not use it for some time. (Whitton, 2010) It will take most students with an intellectual or multiple disability more time and instruction to return to their former performance level than it would be for a non-disabled student. Transfer and generalization cannot be assumed that a skill acquired in one environment will automatically be performed elsewhere. Learning Disabilities students have difficulty transferring or generalizing a skill from one context to another. The machine game using the cloud is synthesized skills learned in several contexts to use in a new context.

Therefore, the researcher needs to research the machine game automatic for reading skills using the Internet of Things: IoT, that development in reading skills of Learning Disabilities students, such as to be adequate in the reading skills, learning skills, critical thinking skills, and the creation of works for promoting a successful teaching experience with the machine game by Arduino board in reading skill for learning in the development of reading skills for Learning Disabilities students.

1.2 Research of Objectives

1.2.1 To find the efficacy of the machine game automatic for reading skill using IoT for Learning Disabilities.

1.2.2 To compare Learning Disabilities students' achievement between pre and post on the machine game automatic for reading skill using IoT.

1.2.3 To assess the Learning Disabilities student's satisfaction with the machine game automatic for reading skill using IoT.

1.3 Research Hypothesis

There are three research hypotheses as to the following:

1.3.1 The efficacy of the machine game automatic for reading skill using IoT according to criteria standard equal to E1/E2 =80/80.

1.3.2 Students studying with the machine game automatic for reading skill using IoT, the machine game for development in reading skill of Learning Disabilities students have higher or lower achievement than pre-learned from the machine game for development in reading skill of Learning Disabilities students with statistical significance 0.05.

1.3.3 Learning Disabilities students'satisfaction level with the machine game automatic for reading skill using IoT, there was development in reading skill of Learning Disabilities students at a higher level.

1.4 Conceptual Framework

Independent variable   Dependent variable

| The machine game automatic for reading skills using the Internet of Things for Learning Disabilities. | Learning Disabilities students using the machine game automatic for reading skill using IoT have been higher post-test achievement than pre-test from the machine game for development in reading skill of Learning Disabilities students with statistical significance 0.05. |

Figure 1.1 Conceptual framework of the machine game automatic for reading skill using the Internet of Things.

1.5 Research of Methodology

1.5.1 The population: The sample of this research included 30 students with Learning Disabilities from 23 school networks studying in the first semester of 2019.

1.5.2 The research instruments consisted of 1) the machine game automatic for reading skill using IoT, 2) a pretest and a posttest as an achievement assessment, and 3) satisfaction questionnaires to assess the student's level of satisfaction toward the machine game automatic for reading skill using IoT.

1.5.3 The data were analyzed using Mean, standard deviation, and t-test.

1.5.4 Variables: independent variables are the machine game for development in the sample of this research included 30 students with Learning Disabilities from

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23 school networks studying in the first semester of the education year 2019. The research instruments consisted of 1) the machine game automatic for reading skill using IoT, 2) a pretest and a posttest as an achievement assessment, and 3) satisfaction questionnaires to assess the student's level of satisfaction toward the machine game automatic for reading skill using IoT. The data are analyzed using Mean, standard deviation, and t-test.

      1.5.5 Dependent variable: Learning Disabilities students using the machine game automatic for reading skill using IoT have been higher posttest achievement than pretest from the machine game for development in reading skill of Learning Disabilities students with statistical significance 0.05.

      1.5.6 Content is the reading skill in the basic Thai vocabulary 64 words, the Thai Language Subject, primary school for the development of the reading skill for Learning Disabilities students.

      1.5.7 Data amassment, the researcher experimented with an experiment was one group pretest and posttest design; the population selected by purposive sampling, Learning Disabilities students. The measure and statistics and amassment are the machine game automatic for reading skill using IoT., pretest-posttest, questionnaire of satisfying data was Mean, Standard Definition, t-tests the dependent sample Statistics. Amassment statistics data after the experiment and calculate (O1) and (O2) for Mean ($\bar{\text{X}}$) and also compared, arrangement for the experimental model by the machine game automatic for reading skill using IoT in process, for students to learn by themselves.

      1.5.7.1 A request for cooperation with 23 school networks.

      1.5.7.2 Plan the Learning Disabilities subject is recording skill by analyzed the course in, course objective, determining behavioral objectives, and students' analysis.

      1.5.7.3 Process learning by using the machine game automatic for reading skill using IoT for development in reading skill of Learning Disabilities students, there are three steps goal of learning, creative thinking, construction knowledge; pretest; points; posttest; assess students satisfaction; check pretest and posttest.

1.5.6   Data analysis.

The statistics used to analyze data.

1.5.6.1   The efficacy according to criteria equal to E1/E2

1.5.6.2   Compare achievement of Learning Disabilities students between pretest and posttest.

1.5.7 To assess Learning Disabilities students' satisfaction though the machine game automatic for reading skill using IoT by *Mean*, and Standard Definition.

1.5.7.1   Research questions in this study attempted to answer the following research questions; what is the machine game automatic for reading skill using IoT efficiency for development in reading skills of Learning Disabilities students in enhancing student's spelling and reading Thai language skills?

1.5.7.2   What are the differences between the pretest and posttest scores of those ungraduated students who have learned to spell and read Thai language skills through the machine game automatic for reading skill using IoT for development in reading skills Learning Disabilities students?

1.5.7.3   What is the student satisfaction level taught through the machine game automatic for reading skill using IoT?

1.6 Definition and Scope of the Study

This study has been some limitations that can identify the potential weaknesses of the whole process for reading skills using IoT. Therefore, the development in reading skill of Learning Disabilities students in teaching Thai spelling language in reading skill of Learning Disabilities students on the machine game automatic for development in reading skill and comprises the study with participants limited to Thailand primary school students from 23 school networks for Learning Disabilities students. The study was conducted during the first semester of the academic year in 2019. The exploration of the machine game for development in reading skills of Learning Disabilities in this study was limited to Arduino board use, as there was a controlled learning management system.

The study's scope is mainly based on developing spelling and reading Thai language skills teaching programs to enhance Learning Disabilities students' language skills from 23 school networks. Participants in this study include 30 students who enroll in the Thai subject in the academic year 2019. The instructor learns the machine game automatic for reading skills using the IoT connected to the learning portal. The study used the research method by giving 8 lesson plans for 8 hours of the machine game automatic for reading skill using IoT to teach and conduct an achievement test and ratification questionnaire. The data analysis were Standard Deviation, Mean and t-test.

The scope of this study is divided into two phases:

Phase I: To synthesize learning process theories related to self-regulated for the machine game automatic for reading skill using IoT for development in reading skill of Learning Disabilities.

1) Participants chosen for this study consisted of 17 experts who were chosen through the purposive sampling method. Experts were qualified in educational psychology, educational technology. They all had a doctoral degree and had worked for over five years, and at least in Assistant Professor's position.

2) This study was to synthesize the psychological theories of Gagné, Constructivism, Constructionism.

3) The theoretical perspectives of the review of these theories focus on four terms, namely: principles for the reading skill students, teaching activities/strategies, the reading skill for students, teaching-learning environments.

4) Teaching learning models. The reading skill for students could be to synthesize in Thai language subject.

Phase II: To develop the machine game automatic for reading skills using IoT.

1) The developed the machine game automatic for reading skill using IoT.

2) The efficacy and observation were used for the machine game automatic for reading skill using the IoT.

3) The study students 'opinions for the efficacy of the machine game automatic for reading skill using the IoT.

1.7 Definition of Key Terms

1.7.1 The machine game automatic for reading skill using IoT refers to the Arduino software (IDE), and ESP2866 allows the development to improve reading skills by writing the code on Arduino programs uploading them to the board. On the Arduino software page, find the Thai keyword in spelling, make students follow the machine game, install the Arduino board to get step-by-step instructions, and select one of the following links according to teachers and students' operating systems.

1.7.2 Development in reading skill refer to the phycology education theories for Learning Disabilities students learning by themselves though in the theories, for help they will get self-regulated as following;

1.7.2.1 Theoretical Perspectives refers to Gagné's theory, constructivist and constructionist. There are analyze in principles, teaching and learning, activities and strategies, environments, and learning models.

1) Gagné's theory of 'principles' refers to creating a teaching criterion of external conditions affecting learners; creating promotion in learning events; appointing criteria according to experience step by step; using teaching procedures that have suitable systems; regulations and elasticity; creating organizational knowledge from the arrangement of experiences; effective learning obtained from implementing instructional events; having a comprehensive level of basic knowledge and the ability to solve problems; an ability in creative thinking; and intuitive thinking and initiation of thinking. Gagné's theory of 'teaching-learning activities/strategies' refers to simulating and controlling interests; informing the expected learning results to the learners; creating situations to encourage learners to be interested in creating ways of thinking; giving useful advice in learning, reverse management; assessment practice; transfer abilities arrangement; originating memory; and transfer. Gagné's theory of 'teaching-learning environments' refers to instructors, learners, and stimulus and response behaviors. Gagné's theory of 'teaching-learning models' refers to active learning.

2) Constructivism of 'principles' refers to checking previous knowledge before learning new things; encouraging learners to ask questions that require thinking to promote learners to exchange opinions by using teaching methods which are called the learning cycle; learning by creating the meaning of things and

checking understandings; emphasizing self-controlled learning in child-centered models of learning; creating an atmosphere of learning; searching for self-knowledge according to competence and previous experience; problem-solving or investigation to reduce contradiction in ideas and to be essential for assimilation; creating organizational knowledge by discovery procedures, and using knowledge which has already been learned in other contexts properly.Constructivism of 'teaching-learning environments' refers to Learning by Doing. Constructivism of 'teaching-learning activities and strategies' refers to self-discovery. Constructionism of 'principles' refers to learning for wit creation; learning by practicing or building things up; creating organizational knowledge by oneself and not from the instructors; exchanging ideas; encouraging and improving mistakes made by one another; linking ideas that will help learners to create the meanings of the things to be learned; analyzing learning procedures and letting the learners present his/her ideas to exchange them to one another; teachers' promotion in learning of new things to create concrete examples to help learners gradually develop themselves to be experts in learning and to choose the most suitable thinking models for themselves; building experiences from work and problem solving with the instructors which help learners to learn from the things that adults and instructors have done; and encouraging instructors to pay attention to the learners' problems until they understand them completely.

3) Constructionism of 'learning activities and strategies' refers to motivating learning, activating pre-knowledge, changing thinking, and transferring thinking. Constructionism of 'teaching-learning environments' refers to instructors' and learners' surroundings and knowledge resources. Constructionism of 'teaching-learning models' refers to brainstorming for learning, students' planning their learning by doing, new knowledge, presentation, learning assessment, and modifying actions.

4) Self-Regulated refers to as activities students learn through their self-understanding of the course with learning by doing work; creating thinking together with the ability to learn by themselves; sharing of knowledge and skills through various types of methods and learning environment; constructing knowledge, and activities such as simulation and games.

1.7.2.2   Thai Language refers to Thai subject in primary school.

1.7.3   Learning Disabilities refers to Learning Disabilities students and 30 students from 23 school networks during the first semester of 2019.

1.8 Significance of the Study

The research focus to the following:

1.8.1   This research provides a different understanding of education literature in the machine game automatic for development students in reading skill.Moreover, it encourages teachers to employ blended learning in the educational process, reflecting on increasing education quality effectiveness.

1.8.2   This research helps to find strategies and efficiency and provides an additional understanding to creating the machine game automatic for reading skill using IoT for development in reading skill of Learning Disabilities students. Moreover, it encourages teachers to employ blended learning in the educational process, reflecting on increasing the effectiveness of education quality-the platform for replacing traditional methods commonly used in reading skills of Thai language teaching for Learning Disabilities students.

1.8.3   This research also deals with similar problems that show the scarcity of educational research used in Learning Disabilities students to develop pedagogical programs in creating interesting methods, techniques, and strategies pursued by Thai teachers. A different understanding of education literature in Learning Disabilities students encourages teachers to employ blended learning in the educational process, reflecting on increasing the effectiveness of education quality.

1.8.4   This research helps find strategies and efficiency of Learning Disabilities students' platform to replace traditional methods commonly used in Thai language teaching. It also deals with similar problems that show the scarcity of educational research used in Learning Disabilities students, as the development of pedagogical of Arduino programs in creating interesting methods, techniques, and strategies pursued by Thai language teachers.

CHAPTER 2
REVIEW OF THE LITERATURE

This chapter focused on reviewing the previous studies related to the following area relevant to this research.

2.1 Arduino Program.

2.1.1 Meaning Arduino boards were designed refer to Arduino boards is an open-source electronics board platform. An Arduino platform has become very famous with designers or students just starting with electronics and for an excellent cause.
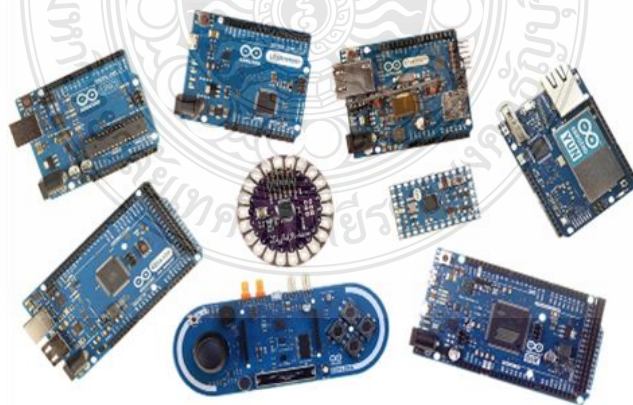
Figure 2.1 Types of Arduino boards

They are working on their composition using a USB cable a microcontroller functions in a more available package.

2.1.2 Arduino boards have been used for making different engineering projects and different applications. Arduino software does straightforward physics and chemistry principles. The microcontroller's working process is straightforward, but it gives some advantages beyond other systems for teachers, students, and beginners-inexpensive, Cross-platform, Simple, clean programming environment.

Table 2.1 Features of Arduino boards

Arduino Board	Processor	Memory	Digital I/O	Analogue I/O
Arduino Uno	16Mhz ATmega328	2KB SRAM, 32 K.B. flash	14	Six input, 0 output
Arduino Due	84MHz AT91SAM3X8E	96KB SRAM, 512KB flash	54	12 input, two output
Arduino Mega	16MHz ATmega2560	8KB SRAM, 256KB flash	54	16 inputs, 0 output
Arduino Leonardo	16MHz ATmega32u4	2.5KB SRAM, 32 K.B. flash	20	12 inputs, 0 output

2.1.3 The Arduino boards list includes the following: Uno is a massive option for your initial Arduino. Please attach it to a P.C. with a USB cable and supply it to get started with an AC-to-DC adapter or battery.

Figure 2.2 Arduino Uno (R3)

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2.1.4   Lily Pad Arduino board is using a conductive thread. This Arduino also comprises I/O, power, and sensor boards built especially for e-textiles. These are even washable.
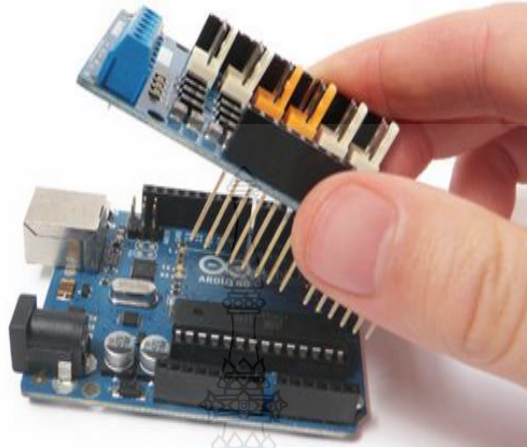
Figure 2.3 Lily Pad Arduino board

2.1.5   The Red board is straightforward to utilize in the project design.
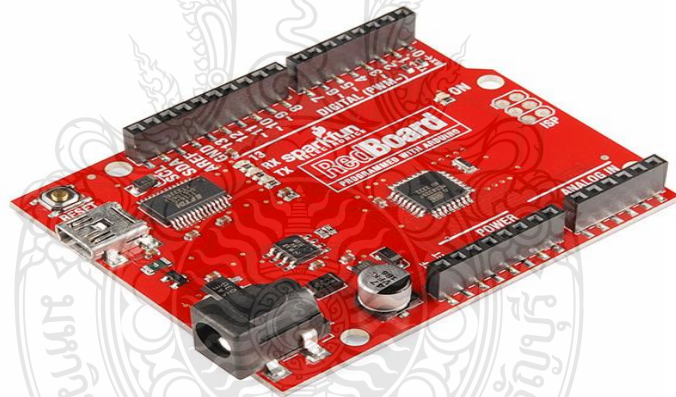
Figure 2.4 Red board

2.1.6   The Arduino Mega is similar to the UNO's. Please attach it to a P.C. with a USB cable. A massive number of pins makes this Arduino board very helpful for designing buttons.
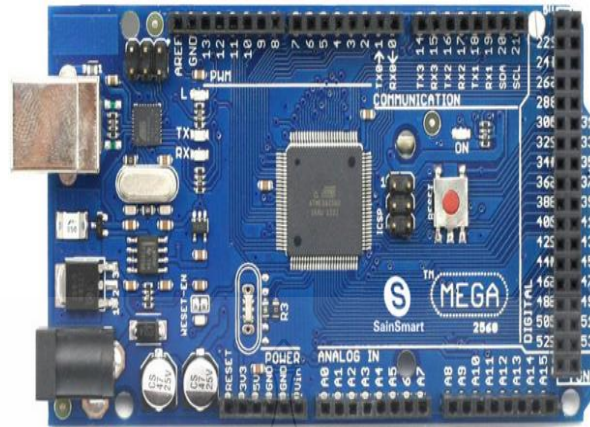
Figure 2.5 Arduino Mega (R3) board

      2.1.7 Arduino is the Leonardo board. This board uses one microcontroller along with a USB. That means it can be straightforward, letting the Arduino board follow a keyboard of the computer, mouse, etc.
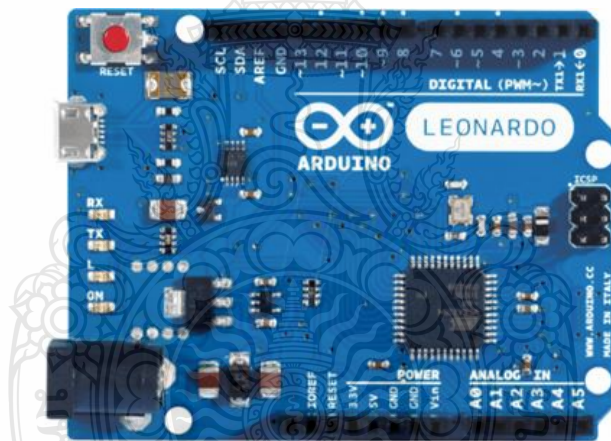
Figure 2.6 Arduino Leonardo board

      2.1.8 Arduino boards. These shields fit the Arduino compatible boards' top wireless Shields, the GSM Shield, the Ethernet shield, and the proto shields.
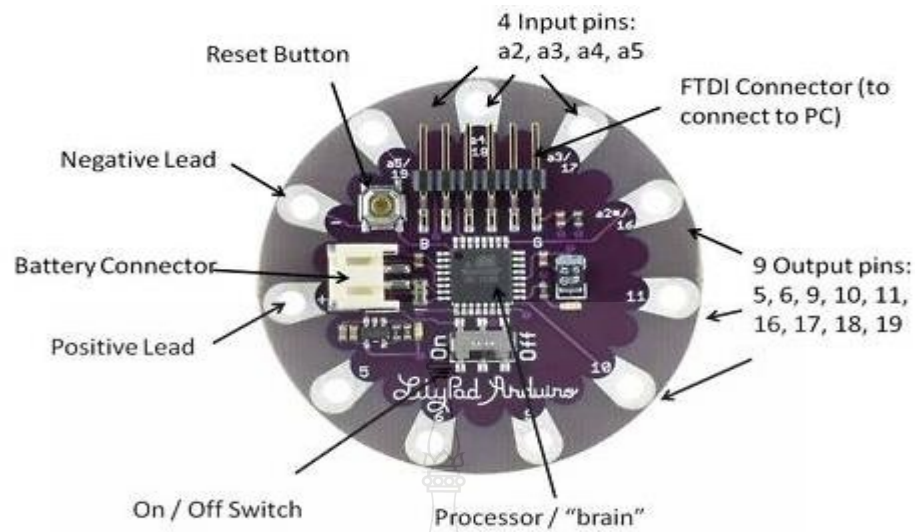
Figure 2.7 An Arduino shields

Thus, Arduino boards have got a better understanding of this concept. Furthermore, any queries regarding this concept or implementing an Arduino board-based project.

2.2 Internet of Things.

The ones that correctly vision to make machines smart enough to reduce almost human labor. The idea of interconnected devices where the devices are smart enough to share information with us, cloud-based applications, and each other device to device. These devices use this data to interact with you daily and complete tasks.

2.2.1 The IoT is a system of interrelated computing devices, mechanical and digital machines, objects, animals, or human-made objects assigned an Internet Protocol (I.P.) address and can transfer data over a network.

2.2.2 A survey conducted by KRC research in the U.K., U.S., Japan, and Germany, the early adopters of IoT, has revealed that devices the customers are more likely to use in the coming years. Smart appliances like thermostats, IoT were applications to see what our future holds. Read on and tell which intelligent devices you are eager to use.

2.2.3   Applications of IoT.

2.2.3.1   Smart home with IoT creating a buzz, 'Smart home' is the most searched IoT associated feature on Google.

2.2.3.2   Connected cars automotive digital technology has focused on optimizing vehicles' internal functions. However, this attention is now growing towards enhancing the care experience of notable brands like Tesla, BMW, Apple, and Google.

2.2.3.3   Industrial internet is electric, IoT is a "beautiful, desirable and investible" asset. The driving philosophy behind IoT is that intelligent machines are more accurate and consistent than humans in communicating through data. Moreover, accurate time information exchange about inventory among suppliers and retailers and automated delivery will increase the supply chain efficiency. According to G.E., the improvement in industry productivity will the video explains the emergence of IoT in industries very accurately.

2.2.3.4   Smart cities are another powerful IoT application, generating curiosity among the world's population. Intelligent surveillance, automated transporttation, innovative energy management systems, water distribution, urban security, and environmental monitoring are all.

2.3 Online Systems.

2.3.1   LMS was Learning Management Systems for a web-based database that a generic software that manages and tracks learners' and teachers' learning processes, uses the web as a portal to track and manage learners' learning activities. A platform provides a web server-based software application, administrative, data tracking functions, used to manage and sequence the access to the learning materials and the level and usage of the content, records all user activities, preferences generates statistical information about the level of use, including several users, the time spent on a specific course by a specific user, and assessment tracking, user activities. (Chaiprasurt, Esichaikul, 2013) User-tracking provides collaboration and communications tools, which assist with users' engagement, collaboration, and interaction outside the classroom by providing the most comprehensive communication tools for supporting their learning, such as forums, internal messages, file exchange, notes, chat, and video-

conferencing. Therefore, LMS management for learners and report learning results, collaborate, gather user profile data, create tests, content developers, instructional designers, and project managers as they organize and assemble the L.O., which will be published and delivered in courses at a later stage. LCMS collaborates, organizes reusable content, uses navigational controls to deliver content, and creates and administers tests. They can handle different learning objects, such as PowerPoint slides, video/sound clips, online modules, HTML pages, images, and illustrations.

2.4 Psychology of Learning Processes.

Although Gagné's theory, constructivism, and constructionism focus on mental process, learning by doing, and social context, they are all psychological theories aiming to help learners achieve learning objectives with effectiveness and efficiency, (Gagné, 1970), (Piaget, 1964) to help learners understand in a faster, and stable way (Piaget, 1972). Thai learners are capable of developing themselves and competing with the world's knowledge-based economy. Moreover, section 66 also reads, "learners heir capabilities for utilization of technologies for education continual lifelong basis." (Office of National Education Commission, 1999) Thai learners are capable of using technology to seek knowledge. This review focuses on the psychology of learning processes, three group of theoretical perspectives, Behaviorism's theories as namely Gagné's theory (Gagné, 1997), Creative thinking theories as constructivist theory (Vygotsky, 1978), Constructionism theory (Papert, 1991), mental processes (Gagné, 1997), self-learning (Piaget, 1972), (Sangsawang, 2021)

2.4.1 Behaviorism's Theories (a) Gagné's theory is the concept of "conditions of learning." It identifies several different types or levels of learning. There are five significant categories of learning which require different internal and external conditions necessary for each type of learning, eight hierarchical levels of intellectual skills and nine instructional events which serve as the basis for designing instruction and media selection (Open Learning Technology Corporation, 1996) Gagné focuses on cognitive constructs and the categories of learning including verbal information, intellectual skills, cognitive strategies, motor skills and attitudes, and these are embodied in his well-known "Nine Events of Instruction" (Gagné, 1985). These events

are purported to provide the necessary conditions for learning and appropriate media selection. Constructivist Theory. (b) Constructivist theory is a general theoretical framework for instruction based on the study of cognition. According to constructivism's underlying concept, the learners select and transform information from past and current knowledge into new constructs and decisions. New information is made available by the educator through dialogue to match the learners' current knowledge, encourage discovery, and enable the learners to build upon the previous achievements (Open Learning Technology Corporation, 1996) (c) Constructionism Theory is based on constructivist learning theory. Constructionists developed by Seymour Papert, Piaget's said the knowledge obtained constructing a public artifact through that construction, students will face complex issues. They are motivated by the construction confusion between constructivism and constructionism stems from (a) similar-looking words and (b) meanings, at different levels, of the word construct. Piaget talked about how mental constructions get formed; philosophical constructivists talk about how these constructions are unique noun construction, and Papert simply says that constructing is an excellent way to build mental constructions. Levels here are shifting from the physical constructionism to the mental constructivism, from theory to philosophy to method, from science to approach to practice. (Papert, 1980). The new technologies are very rich in providing new things for children to learn mathematics as part of something real. (Sangsawang, 2016).

2.4.2 Mental processes: many experts focus on mental processes and how thoughts occur to how behaviorism arose from mental processes. This system examines the outcomes or behaviors of learning (Sirigusa, 2005). The mental processes in this instructional design framework apply to cognitive, behavioral, and attitudinal learning. Therefore, that is tied to cognitive strategy learning theory. The first event in informing of the objectives," further activates the process of getting the trainees' "attention" focused by stimulating recall of requisite learning ties into In so doing, the relevant sections of social learning theory will be referred to for additional information (Blanchard, Thacker, 2007), (Sangsawang, 2021)

2.4.3 Learning by Doing approach: The most popular and effective learning process ever adopted by psychology and the teaching-learning process is through

learning by doing. In these learning processes, the activity is based on practical activities for creating skills for occupations or vocation. There is a reference to experience in group participants of techniques or technology. (Sangsawang, 2021)

        2.4.4 Social context is social work and teaching or experiential learning (Kolb, 2008). This focus incorporates how thoughts occur in developing a theory of learning and a system for educational development. An individual is engaged in constructing "personally meaningful products" (Resnick, 1996). In constructionism, the effect of this is as significant as gaining knowledge. Courses in vocational education provide learners with opportunities and experience in hands-on learning (Walker, 2000), (Velde, and Cooper, 2000). When electronic learning (Online) is introduced to primary education, practical or hands-on elements are transformed into conceptual understanding. (Attwell, 1997), (Marr, Thomas, Benne, Thomas, and Hume, 1999). This study's result were learning theories in behaviorisms, and organizational study. Procedures that could be a nine-step procedure, how an online course can keep the learners' attention is described in instruction procedure (Muzio, and Mundell, 2002).

Table 2.2 Nine step's events of instruction (Kruse, 2002).

Instructional step	Mental Process
1. Gaining attention.	Stimulates and activates receptors.
2. Informing learners of objectives.	I am creating a level of learning expectation.
3. Stimulation of the recall of prior Learning.	Retrieves and activates short-term memory.
4. Presenting the content.	Selective perception of content is formed.
5. Providing learning guidance".	Leads to semantic encoding of long-term memory. Eliciting performance Performance. Responding to questions that elearning.

Table 2.2 Nine step's events of instruction (Kruse, 2002) (cont.).

Instructional step	Mental Process
7. Provide feedback.	Reinforcement and assessment.
8. Assessment of Performance.	Retrieval and reinforcement.
9. Enhancing retention and transferring to the job.	Retrieval and use of learned skills in a new situation.

       2.4.5 Creative thinking online knowledge: the student's mind honeybees proposed a target to aid the knowledge construction process. (Sangsawang, 2021)

       2.4.6 Organization is learning theories that online training should make the trainees interested in building their work.

2.5 Application Control via IoT.

       This machine game automation through IoT system is advantageous mainly in reading skills, word category, reading practices. Self-learning can change memory cards and more word categories. It integrated into learning within the English word level and counted numbers in Mathematics. Application controlled machine games and communication via IoT. The internet-enabled microprocessor obtains data from the cloud, and the data is transferred from the android game. The automatic system via IoT uses the ESP8266 board to write the code to control the machine game's intuitive reading skills. The Arduino board controls all contents, and the respective data will be obtained and collected. (Sangsawang, 2020) In 1999, the IoT was introduced by Kelvin Ashton, referred to as the recognized connected objects with radio frequency identification (RFID). IoT is a new technology in the area of wireless communication and networking. For the short-range interconnection of devices, the networks include various technologies, wireless sensor networks (WSNs) then used Bluetooth, frequently used wireless fidelity (Wi-Fi), and RFID networks, and now Zigbee is also popular. Machine to machine (M2M) or device to device (D2D) technologies provides communications between computers, intelligent gadgets, embedded systems, sensors, actuators with or without user interruption and can analyze differences and correlation among M2M, CPS, and IoT gives the capability to physical objects so that devices can

see, think, speak, hear, and complete the required instructions by 'talk 'together, transfer data or information, and helps to drive decisions; IoT performs these things traditionally brilliantly by using their built-in technologies. Pretz informed that IoT is a thing with a connected network; these things are connected through sensors wirelessly and communicate without human interference. (Yadav, and Prasad, 2019).

IoT devices, anything with a sensor or transmitter, including a receiver connected to it, can transfer information between objects or between users and devices using the Internet known as the IoT devices contain various components such as wireless sensors, software or apps, actuators, and computer devices connected with any object and the Internet. Finally, these devices can transfer information between users and devices without user interruption. IoT devices include four components that are circuit board, microchip, transmitter, and receiver.

2.6 The Efficiency of Application Control via IoT.

Node MCU 2866 can be enhanced by practicing reading skills and developing reading skills for students with learning disabilities. (Sangsawang, 2020) This joint machine learning and game theory modeling (MLGT) based rate control optimization framework has been proposed for HEVC. Three main contributions have been presented. First, a machine learning-based R-D model prediction method has been proposed to enhance the CTU-level R-D modeling accuracy. We also utilize the scene change detection for R-D model prediction, and its coding performances are compared with the machine learning-based method. Second, a hybrid R-D model-based game theory approach has been proposed for a bit allocation optimization, where the minimum utility definition is refined. After proving the convexity for mixed R-D model-based mapping functions, the NBS solution is achieved by the proposed iterative solution search method. A two-stage remaining bit refinement method is used for bit allocation and Q.P. determination. Finally, the intrafirm Q.P. and adaptive bit ratios among frames are effectively refined to better exploit the potentials of the proposed MLGT method. Experimental results demonstrate that the proposed MLGT RC method can achieve much better results on R-D Performance, bit rate accuracy, quality smoothness, buffer occupancy control, and subjective visual experience than all other

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state-of-the-art one-pass R.C. methods the achieved results on R-D performances and quality. (Gao, Kwong, and Jia, 2017)

IoT projects using the ESP8266 Wi-Fi chip the robust and low-cost ESP8266 and build exciting projects in the field of IoT. Configure ESP8266 board to the cloud and explore the networkable modules that will be utilized in the IoT projects. This step-by-step guide teaches you the basics of IoT with ESP8266 board and makes life easier who want to build robust and inexpensive IoT projects using the ESP8266 board Wi-Fi chip. IoT have experience with other platforms such as Arduino. Control various devices from the cloud. Interact with web services, such as Twitter or Facebook. Make two ESP8266 boards communicate with each other via the cloud. Send notifications to users of the ESP8266 boards, via email, text message, or push notifications. Build a physical device that indicates the current price of Bitcoin. Build a simple home automation system that can be controlled from the cloud. Create your cloud platform to control ESP8266 board devices in detail. The IoT is the network of objects such as physical things embedded with electronics, software, sensors, and connectivity, enabling data exchange. ESP8266 boards is a low-cost Wi-Fi microcontroller chip that can empower IoT and helps the exchange of information among various connected objects. ESP8266 boards consists of networkable microcontroller modules, and with this low-cost chip, IoT is booming. The ESP8266 boards Wi-Fi chip platform and get you to build exciting projects. Kick-starting with an introduction to the ESP8266 boards chip will demonstrate how to build a simple LED using the ESP8266 boards. That have activities for read, send, and monitor data from the cloud. Furthermore, the ESP8266 boards to interact with web services such as Twitter and Facebook. In order to make several ESP8266s boards interact and exchange data without the need for human intervention, the concept of machine-to-machine communication. The latter part of the book focuses more on projects, including a door lock controlled from the cloud, building a physical Bitcoin ticker, and doing wireless gardening. A cloud-based ESP8266 boards home automation system and a cloud-controlled ESP8266 board's robot. Finally, you will discover how to build your cloud platform to control ESP8266 board devices. With this book, you will create and program IoT projects using the ESP8266 board's Wi-Fi chip. Style and approach this is a step-by-step guide that

provides excellent IOT projects with ESP8266 boards. All the fundamental concepts are explained in detail with the help of examples and demonstrations of the projects.

2.7 The PID Control.

The PID algorithm controls sensors and controls the sign of the word and sound. Node MCU controls via Wi-Fi. The machine's set point is to stop when the sensor touches the stop button, and students can control themselves. Students were in secondary education. PID parameter was control the D.C. motor position though an encoder. The PID control achieved with gain and respectively. The PID control are achieved respectively. The equation that forms this circuit explains *Kp*, changing the proportion of the error value. This proportional response can be achieved by multiplying the error value by a constant. *Ki* is an integral extension. It is proportional to the error's size and the duration of the error. *Kd* is the rate of change of the process error and is calculated from the slope of the error. (Nise, 2011)

A proportional integral derivative controller (PID controller or three-term controller) is a control loop mechanism employing feedback widely used in industrial control systems and various other applications requiring continuously modulated control. The PID controller continuously calculates an error value {\display style e(t)}e(t) as the difference between the desired set point (S.P.) and a measured process variable (P.V.) and applies a correction based on proportional, integral, and derivative terms denoted P, I, and D respectively, hence the name.

In practical terms, it automatically applies an accurate and responsive correction to a control function. An everyday example is the cruise control on a car, where ascending a hill would lower speed if only constant engine power were applied. The controller's PID algorithm restores the measured speed to the desired speed with minimal delay and overshoot by increasing the engine's power output. The first theoretical analysis and practical application were automatic steering systems for ships, developed from the early 1920s onwards. It was then used for automatic process control in the manufacturing industry, where it was widely implemented in the first pneumatic and then electronic controllers. Today the PID concept is used universally in applications requiring accurate and optimized automatic control.

2.8 The Delphi Technique.

The Delphi Technique refers to the systematic forecasting method used to gather opinions of the panel of experts on the problem being encountered, through the questionnaires, often sent through the mail. In other words, a set of opinions about a specific problem, obtained in writing, usually through questionnaires from several experts in the specific field, is called a Delphi Technique, the group facilitator or the change agent aggregates all the anonymous opinions received through the questionnaires, sent two or three times to the same set of experts. The experts are required to justify the answers given in the first questionnaire and based on it, the revised questionnaire is prepared and is again sent to the same group of experts. The experts can modify their answers by the replies given by other panel members. The objective of a Delphi Technique is to reach the most accurate answer by decreasing the number of solutions each time the questionnaire is sent to the group of experts. The experts are required to give their opinion every time the questionnaire is received, and this process continues until the issues are narrowed, responses are focused, and the consensus is reached. In a Delphi Technique, the identity of the group members is not revealed, and they are not even required to gather for a physical meeting. Each member is free to give his opinion concerning the problem, thereby avoiding the significant effect of an assertive or authoritative member on the other group members. This technique is quite advantageous as diverse opinions can be gathered from a large pool of experts who might be geographically separated. Quality gets improved as the expertise of each group member is capitalized on to reach a final solution.

The research used four rounds following:

1) Brainstorming, the first round was brainstorming. As identified in synthesize learning process related to self-regulate learning based on three psychology theories.

2) Evaluation of the expert's ideas, the second round evaluated learning in vocational education.

3) Re-evaluation, the third round involved a re-evaluation of synthesize learning process theories related to self-regulated online learning in educational media and to study students' opinions who have been taught through an instructional design framework for educational media.

4) Resolved and reported, the fourth round had been identified, resolved, reported, and provided. (Sangsawang, 2015)

2.9 Literature Review of the Relevance of Research.

Gao, Kwong, and Jia (2017). In this paper, a joint machine learning and game theory modeling (MLGT) framework is proposed for inter-frame coding tree unit (CTU) level bit allocation and rate control (R.C.) optimization in high-efficiency video coding (HEVC). First, a support vector machine-based multi-classification scheme is proposed to improve the prediction accuracy of the CTU-level rate-distortion (R-D) model. The legacy "chicken-and-egg" dilemma in video coding is proposed to be overcome by the learning-based R-D model. Second, a mixed R-D model-based cooperative bargaining game theory is proposed for bit allocation optimization. The convexity of the mixed R-D model-based utility function is shown, and the Nash bargaining solution is achieved by the proposed iterative solution search method. The minimum utility is adjusted by the reference coding distortion and frame-level quantization parameter (Q.P.) change. Finally, intrafirm Q.P. and inter-frame adaptive bit ratios are adjusted to make inter frames have more bit resources to maintain smooth quality and bit consumption in the bargaining game optimization. The proposed MLGT-based RC method can achieve much better R-D performance, quality smoothness, bit rate accuracy, buffer control results, subjective visual quality than the other state-of-the-art one-pass R.C. methods, and achieved R-D performances are very close to the performance limits from the Fixed method.

Nguyen, Ho, and Le (2021). Wireless Sensor Networks: WSN are a part of the IoT. The sensors connect to an IoT platform via wireless or fixed-line networks for specific applications such as e-health environmental monitoring applications or underwater applications. Sensor nodes can perform different tasks such as environmental monitoring and control the WSN configuration, one of many WSN based-IoT applications. The sensor nodes connect to the gateway, which transmits data to the Internet. It is necessary to maintain the network topology, which requires low energy consumption at the sink node and long network lifetime. In order to satisfy the quality of services of WSN based IoT, the topology control algorithm allows the sensors

to be configured to maintain the communication links as well as reduce interference and packet loss. To this end, we introduce the modified LEACH to discover neighbors and, then, to form into the cluster. The maximum number of cluster members is set to the desired value equal to the node degree of the cluster head. The modified LEACH algorithm can adapt to the changing of the dynamic network; therefore, the Node can adaptively change its transmission range to ensure network connectivity.

Jain, Saikia, Rai, and Ray. (2020) In order to operate by the mobile robot, the autonomous and computer-controlled system provides the best solution for different applications. To cater to such needs, the web-based application and mobile app provide a vital role in operating robots and bring a new way of performing the machine game automatic tasks autonomously. The web-based application controlled robots can be used in different fields such as industrial, mining, medical, military operations, and agriculture. In this paper, a web application for a mobile robot is designed to understand every aspect of the robot's functionality and all the necessary controls and visuals of sensor and actuator data by the user. A user interface and web application are being developed for managing obstacles along the pathway of the robot that can control internet-of-thing (IOT) enabled web applications and to stop and movement of the machine game automatic vehicle. Web application-based processed commands are to be transmitted to the robot's control unit through Wi-Fi, and this robot can be controlled through a web application via a mobile phone. The visualization of air quantity in the environment is also done using the IOT cloud that also facilitates storing data for analysis in the future.

Bouteraa, and Abdallah (2020). The machine game automatic solution based on the IoT for home wrist rehabilitation is developed. The proposed architecture allows remote control by the gesture. A Kinect camera detects the wrist movement performed by the physiotherapist before being communicated to the developed human-machine interface (HMI). The Kinect image is processed, and the calculated angle is used as a desired angle for the implemented controller. The computed torque is sent to the robot via an MQTT protocol. The range of motion (ROM) performed is measured and sent via the network to the HMI. The results obtained are recorded in real-time in a database,

ensuring traceability and a digital medical record. The experimental results obtained show the efficiency of the developed system.

Chaudhary, and Kumar (2019). The control design of a TRMS system resembling a helicopter is a highly complex task. Since it is a highly nonlinear system, the controller design for the TRMS system is a very complex problem. TRMS system is connected with two rotors, in which the first one is the main rotor, and the other is the tail rotor. A beam, supported by a counterbalance. Two degrees of freedom (2DOF) PID controller and FOPID controller model of TRMS involving horizontal and vertical plane have been obtained for controller design. 2-DOF PID and FOPID controllers have both been discussed in this paper. The factional order PID controller has survived better than the 2-DOF controller with the simulation results obtained for the vertical and flat plane. The results of all the simulation work have been performed on the MATLAB/Simulink environment.

CHAPTER 3
RESEARCH METHODOLOGY

The research used quantitative and qualitative methods to answer the research questions and guided the researcher to collect and analyze the data. This chapter was conducted according to the following structure:

3.1 Research Design

3.2 Data Assessment

3.3 Data Analysis

3.4 Data and Statistical Analysis

3.1 Research Design

The research design was conducted according to the following structure in the objective of the research; it has been moving with steps as flowing:

3.1.1 Design the machine game automatic for reading ability using IoT, the machine game by Arduino board and ESP8266 for Wi-Fi on reading skill for learning in developing the reading skill for Learning Disabilities students. Synthesize the psychology education theories that have been from the three instructional design theories. The data designed the machine game automatic for reading skill using IoT, the machine game by Arduino board and ESP8266 for Wi-Fi. There was the data collection was as follows:

3.1.2 Connected with 17 qualified experts by phone to request their agreement to participate in the study using the questionnaires interview.

3.1.3 The data from the interviews of the questionnaire and observation concerning teaching and learning design. The machine game designed for reading skills using the IoT by Arduino board and ESP8266 board for Wi-Fi. Data analysis using frequency and percentage, and the research prepared questionnaire followed Likert's five rating scale. The part with five scales was analyzed using *Mean* (*M*), standard deviation (*SD*), and correlation. The levels of agreement from respondents were an average score of 1.00-1.49 means strongly disagree, an average score of 4.50-5.00 means agrees.

3.1.4 The researcher studies the sample group by giving the pretest and posttest as shown in the following diagram.

$$O_1 \quad X \quad O_2$$

O_1 = Measurement of the pretest score

X = Instructional activities

O_2 = Measurement of the achievement of the posttest score

3.1.5 Students' opinions that have been taught through the machine game automatic for reading skill using IoT.

3.1.6 Students were learned with the machine game automatic for reading skills using the IoT, and comparing the achievement test, the researcher conducts a questionnaire form to the student to understand how they react to the research tools.

3.1.7 Students' assessments of the services provided by Learning Disabilities students. In a more detailed analysis, Thomas and Galambos (2004) described student satisfaction as a complex construct influenced by various characteristics of students and institutions. The students' satisfaction questionnaire is critical in understanding the idea and opinions of the students. Therefore, the researcher develops a questionnaire to get the student's feedback on the process.

3.1.8 Population was Learning Disabilities students the number of 30 students from 23 school network, in the first semester of 2019.

3.2 Data Assessment

The machine game automatic of data amassment were 1) an experiment was one group pretest-posttest design. 2)The measure and statistics and amassment are, pretest, and posttest, questionnaire of satisfying data was Mean, Standard Definition, t-tests the dependent sample. 3) Statistics and amassment data after the experiment and calculate (O_1) and (O_2) for Mean (x) and also compared, arrangement for the experimental model by offline in process, for students to learn by themselves, the researcher puts some data amassment as follow. 4) Request for cooperation with 23 school networks. Plan the reading skill for Learning Disabilities subject by analyzed the

course in, course objective; determine behavioral objectives, students' analysis. 5) Process learning by used the machine game automatic for reading skill using IoT are three steps as follows goal of learning, creative thinking, construction knowledge; pretest; points; posttest; assess students satisfaction; check pretest and posttest.

3.3 Data Analysis

3.3.1 The efficacy was criteria equal to E1/E2

3.3.2 Compare achievement of students between pretest and posttest on the machine game automatic for reading skill using IoT.

3.3.3 Students' satisfaction learned though the machine game automatic for reading skill using IoT, using *Mean*, Standard Definition.

3.3.4 Duration of the study covered with 23 schools network, Thailand. It took around three months in the first semester in 2019, starting from January to April 2019.

3.3.5 The machine game automatic for reading skill using the IoT has been showing in blended-learning teaching and learning instructional packages. The machine game automatic for reading skill using IoT, the machine game by Arduino board and ESP8266 board for Wi-Fi refers content learning material that supports students and teacher in learning and teaching. The machine game automatic for reading skill using IoT for Learning Disabilities students. It is designed specifically for teaching and learning and is considered a support, mediation, and reference tool, including a printed textbook for students and a printed or electronic teacher's guide. The students, there are Thai language skill-Listening, speaking, reading, and writing.

3.3.6 Development and evaluation of educational instruments.

3.3.6.1 The machine game automatic for reading skill using IoT. The machine game by Arduino board and ESP8266 board for Wi-Fi, for developing the reading skill for Learning Disabilities students, has been shown in blended learning teaching and learning.

3.3.6.2 Step in finding the effectiveness of the instruction with the machine game automatic for reading skill using IoT by Arduino board and ESP8266 board for Wi-Fi. In the previous two stages, the researcher introduced the steps in

finding the effectiveness of the instructional package as the following experiment: one-to-one try out. This experiment was introduced by making a tryout on Learning Disabilities students. This tryout went for 30 students studying in the first semester of the academic year 2019. Those 30 students were selected by choosing one student with the highest score in the class, one from the middle score in the class, and one from the lowest score in the class. The researcher did this experiment to check and find out incomplete items in the content and verify the usefulness of the activities and educational media using on the instruction. Then, the researcher conducted the instructional activates asset in the lesson plans. At this stage, the efficiency of the recruiting skill was set as E1/E2 = 80/80.

   3.3.6.3 Achievement tests with pretest and posttest. An achievement test is an essential tool in evaluating school performance and has great significance in measuring the student's instructional progress and learning progress in a particular subject. Achievement test commonly refers to a standardized test developed to measure skills and knowledge learned in a given grade level, usually through the machine game by Arduino board and ESP8266 board for Wi-Fi, such as in classroom. (University of Wisconsin–Stout, 2007). There are three reasons why the researcher used the achievement test. Firstly, in planning a good curriculum or instruction, researchers must ensure the accurate achievement test score to show a clear picture of students' knowledge and skills in the subject area. Secondly, achievement test provides researchers understand the effectiveness of the student in performing the theory and the learning areas (Amanda, 2014). Thirdly, the test also allows the researchers to evaluate the adequate validity and reliability of the test score. In this study, Achievement tests (pretest and posttest) about Thai language skills for the high school students a questionnaire on the achievement tests with pretest and posttest about Thai language skills for the high school students includes 60 multiple-choice questions. Designing achievement tests with pretest and posttest, the researcher made pretest and posttest by putting the same number of 30 items. All items in the test were multiple-choice questions. The answer to each item covered four choices (A, B, C, and D) which were defined according to the content and behavior of the measurement test on knowledge, understanding, application, analysis, synthesis, and assessment.

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3.3.6.4 Then, select the test with a consistency index of 0.5 or higher.

3.3.6.5 Take the achievement tests with the content of consistency of 0.5 up with were verified by IOC to experiment with the students in ungraduated students who studied in the first semester of the academic year 2019.

3.3.6.6 The scores were analyzed by using the Item Difficulty Index (p) and the Item Discrimination Index (r). The 30 items were selected with difficulty from 0.02 to 0.80 and with the discrimination of 0.20 and above.

3.3.6.7 Bring the test scores from the students in order to find the confidence interval by using the *KR-20* formula of Kuder-Richardson.

3.3.7 Questionnaire's student opinion, after students, were learned with the machine game automatic for reading skill using IoT for Learning Disabilities students. The students' satisfaction questionnaire is critical in understanding the idea and opinions of the students. Therefore, the researcher develops a questionnaire to get the student's feedback on the process. Study students' opinions for education media. They designed questionnaires for students' satisfaction as flowing study researcher articles regarding creating an effective questionnaire form for asking students' satisfaction. Analyze learning objectives and content to create a questionnaire for students. The rating scale is set based on Likert's five-level rates take the questionnaires to 17 experts to check the consistency and suitability of the questions. Apply the questionnaires that were edited and suggested by the experts to give their idea and view on their satisfaction.

3.4 Data and Statistical Analysis

3.4.1 Data collection was carried out and thought questionnaires were analyzed to determine the results as follows:

3.4.1.1 The value of the median should not be below 3.50.

3.4.1.2 The absolute value of the difference between median and mode should not be above 1.00.

3.4.1.3 The value of the interquartile range (IQ3 - IQ1) should not be above 1.5.

3.4.1.4 The IQR=Interquartile Range (IQR< 0.50 ≥ 1.00=Congruent; IQR>1.00=Incongruent). The meaning and level of experts' opinions of selected

psychology theories. The meaning is shown in table 3.1 and was used to analyze the significant difference between respondent's opinions of selected psychology theories.

Table 3.1 Mean and level of expert opinions on selected psychology theories.

No.	M	Level of opinion
1.	1.00 – 1.49	Strongly disagree
2.	1.50 – 2.49	Disagree
3.	2.50 – 3.49	Neutral
4.	3.50 – 4.49	Moderately agree
5.	4.50 – 5.00	Strongly agree

Note: M = mean.

The level of the standard deviation. Measures of the dispersion of a collection of data from its *Mean* (Wongrattana, 2003) were as follows:

0.000-0.999　　　means　　less spread apart data.

More than 1.000　　means　　more spread apart data.

The interviews and judgments were experts' opinions of selected psychology theories, qualification requirements, training approaches, and assessment. Some data were overcome in cases where there were similarities keyword analysis. (Miles and Huberman, 1994).

3.4.2 Data analysis, the researcher conducted the data analysis in the following steps:

3.4.2.1 Find the effectiveness of the machine game automatics for students following the criteria standard equal E1/E2 = 80/80.

3.4.2.2 The first 80 is the mean score obtained from the machine game automatics activities during the learning period of the students. The value of the test score after the instruction is no less than 80 percent.

3.4.2.3 he second 80 refers to the mean score in the percentage of the answer that the students were right. The value of the test score is no less than 80 percentage points.

3.4.3 Compare learning achievement between pretest and posttest scores with the machine game automatics in Thai Langue. The sample students used a *t-test* model-

dependent sample. Analysis of students' feedback toward the machine game automatics in Thai Langue of the five-level Likert rating scale in the questionnaire. The analysis score was conducted as follows:

5 points mean Strongly Agree.

4 points mean Agree.

3 points mean Undecided.

2 points mean Disagree.

1 point means Strongly Disagree.

3.4.4 The result of the score was interpreted by collecting all the questionnaire answers and calculating them into Mean (M) and Standard Derivation (SD). The resulting score will be between 1.00 and 5.00. The meanings of the score were translated as the following:

4.51 to 5.00   means   indicates the highest level of opinion.

3.51 to 4.50   means   indicates the opinions are high.

2.51 to 3.50   means   indicates a moderate level of opinion.

1.51 - 2.50   means   indicates the opinions are low.

1.50 - 1.00   means   the comments are minimal.

The bare statistics in data analysis include:

3.4.4.1   The arithmetic mean formula Mean (M) in this study was:

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

$\overline{X}$ represent   Arithmetic Mean.

$\sum X$ represent   Sum of all score results.

N represent   Number of students.

3.4.4.2   The formula of Standard Derivation (SD.) in the study was:

$$SD = \sqrt{\frac{\sum (x - \overline{x})^2}{N}}$$

SD	represents	Standard Derivation.
x	represent	Student Score.
$\overline{X}$	represent	Mean Score.
N	represent	Number of students.

3.4.4.3   The formula used for the percentage was:

$$P \quad = \quad \frac{f}{N} \times 100$$

P	represent	Percentage.
f	represent	Frequency.
N	represent	Total frequency.

3.4.4.4   The statistics used to determine the quality of the instruments were: In finding content validity of the achievement test, we conducted the IOC formula (Item Objectives Congruence) by following the formula below:

$$IOC = \frac{\sum R}{N}$$

IOC	represent	Index of correspondence between the test and the objective.
R	represent	Expert Rating.
$\sum R$	represent	Sum of individual expert scores.
N	represent	Number of experts.

Configuration expert scores were:

+1 means   The test measures are precisely the learning objective.

 0 means   The Uncertainty the test measures are precisely what the learning objective.

-1 means   The test does not measure are precisely the learning objective.

3.4.4.5 The formula used in finding the difficulty index of the achievement test were:

$$P = \frac{R_{H+}R_L}{N_H + N_L}$$

p	represent	Difficulty level.
R_H	represent	The number of people who chose the highest option rate.
R_L	represent	The number of people who chose the lowest option rate.
N_H	represent	The Total number of people in the high group.
N_L	represent	The Total number of people in the low group.

3.4.4.6 The formula used in finding the item discrimination of the achievement test were:

$$r = \frac{R_H - R_L}{N_H or N_L}$$

r	represent	Discriminative score.
R_H	represent	The number of people who chose the highest option rate.
R_L	represent	The number of people who chose the lowest option rate.
N_H	represent	A Total number of people in the high group.
N_L	represent	The Total number of people in the low group.

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3.4.4.7 The formula used in finding the reliability of the achievement test was:

$$r_{tt} = \frac{k}{k-1}\left[1 - \frac{\sum pq}{S^2}\right]$$

r_{tt} represent   Reliability score.

k represent   Number of items in the quiz.

p represent   The proportion of the right answer.

q represent   The proportion of the wrong answer.

S^2 represent   Variability of scores from the quiz.

3.4.4.8 The formula used in finding the variability of the achievement test was:

$$s\text{Two} = \frac{n\sum fx^2 - \left(\sum fx\right)^2}{n(n-1)}$$

S^2 represent   Variability of scores.

n represent   Number of students.

x represent   Achievement test score.

f represent   Frequency data.

3.4.4.9 The statistics used to verify the hypothesis were: The formula used in analyzing the differences in achievement scores using the dependent t-test was:

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

$\sum D$	represent	The sum of the variances score of
		achievement test.
$\sum D^2$	represent	The sum of squares of the Difference of
		achievement test score.
$\left(\sum D\right)^2$	represent	The sum of the variances score of the
		square test.
n	represent	The Total number of students.
D	represent	The Difference between the pretest and
		posttest score of each student.

3.4.4.10   The formula used in calculating performance analysis of the E1/E2 based on standard 80/80 was:

$$E1 = \frac{X_1}{A_1} \times 100$$

E1	represents	The Efficiency of the teaching process.
X_1	represent	The mean score of the students in the class.
A_1	represent	Full score of the exercise

$$E2 = \frac{X_2}{A_2} \times 100$$

E2	represents	The Efficiency of the teaching process.
X_2	represent	The mean score of the students in the class.
A_2	represent	Full score of the exercise.

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CHAPTER 4
RESEARCH RESULT

This chapter provides a descriptive analysis and meaningful analysis of the machine game automatic for reading skill using Internet of Things: IoT. The system is controlled by Arduino board and ESP8266 board for Wi-Fi. Moreover, to study students' opinions taught through the machine game automatic for reading skills using IoT. The population of this research was Learning Disabilities students, 30 students from a 23 schools network, during the first semester of 2019. Therefore, the analysis results of this study present in the following step. The categories summarize the results of the Analysis of the interview and survey data. The tables summarize the results of the analysis of the Delphi technique. The Delphi technique used in this research by experts is 17 teachers from 23 schools network is outlined below.

4.1 Descriptive Data Statistics

4.2 Analysis Results

4.3 Summary

4.1 Descriptive Data Statistics

4.1.1 The result of the efficacy of the machine game automatic for reading skill using IoT. The researcher was analysis data as following 1) analysis were the three instructional design theories from 23 experts from 23 school network., 2) create is the machine game automatic for reading skill using the IoT. There are controlled by Arduino board and ESP8266 board for Wi-Fi.

Analysis were the three instructional design theories from 23 experts from 23 school networks. This research was analysis data step by step as following:

The first round was brainstorming, as identified in synthesize learning process theories related to self-regulate for the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language based on open end in three psychology theories, namely Gagné's theory, constructivism, and constructionism. The results of the interviews or the first round of brainstorming were

provided in the framework based on the theories, and these also included aspects of the learning process as identified in activities from three theories.

The second round evaluated to synthesize learning process theories related to self-regulate the machine game automatic help Learning Disabilities students learned in Thai language based on the evaluation focused on the three psychology theories, Gagné's theory, constructivism, and constructionism, and there was also a Likert five-rating scale questionnaire. (Strawbridge, 2007)

Third round: re-evaluation, involved a re-evaluation of synthesize learning process theories related to self-regulated machine game automatic for reading skill using the IoT. Learning Disabilities students learned in Thai language and to study students' opinions who have been taught through the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai langue.

The fourth round, the feasible ideas had been identified, resolved, and reported. These are provided in Questionnaire. Learning Disabilities students learned in Thai language as an instructional design framework for educational media, and to study students' opinions who have been taught through the machine game automatic for Learning Disabilities students learned in Thai language platform.

In order to synthesize the psychology theories focused on Gagné's theory, constructivism, and constructionism from the results of this first round into the machine game automatic for reading skill using IoT for Learning Disabilities students learned in the Thai language; there was a need for the experts to identify the interview for creating a questionnaire. The conceptual framework of Gagné's theory, constructivism, and constructionism had four parts. They are discussed below and shown in tables 4.1 - 4.5.

Table 4.1 The result of experts' opinions of the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language. to create activity for teaching.

Activity for teacher design	*M*	Opinion of experts	*SD*	IQR	Consensus
1. Create teaching to suit the learner's conditions for the machine game automatic for reading skills using the IoT for Learning Disabilities students.	4.53	Strongly agree	0.44	1	Congruence
2. Promote learning events for the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language.	4.12	Moderately agree	0.49	1	Congruence
3. Develop criteria according to step by step experience for the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language.	4.06	Moderately agree	0.50	1	Congruence
4. Use teaching procedures with suitable systems, regulations, and elasticity for the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language.	4.82	Strongly agree	0.39	1	Congruence

Table 4.1 The result of experts' opinions of the machine game automatic for reading
skill using IoT for Learning Disabilities students learned in Thai language.
To create activity for teaching. (Cont.)

Activity for teacher design	*M*	Opinion of experts	*SD*	IQR	Consensus
5. Create organizational knowledge from experience for the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language.	4.59	Strongly agree	0.42	1	Congruence
6. Use a teaching method called the learning cycle to encourage learners to ask questions that require thinking and stimulate learners to exchange opinions for Learning Disabilities students learned in the Thai language via the machine game automatic for reading skills using the IoT.	4.35	Moderately agree	0.45	1	Congruence
7. Create a Learning atmosphere for Learning Disabilities students learned in the Thai language via the machine game automatic for understanding skill using the IoT.	4.35	Moderately agree	0.45	1	Congruence

From table 4.1 The results from experts' opinions of the research to create to activity for teaching. Experts' opinions of the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language, to create to activity for teaching for the teacher should be prepared for the teaching as follows:

1) Create teaching to suit the learner's conditions.

2) Promote learning events.

3) Develop criteria according to step-by-step experience.

4) Use teaching procedures that have suitable systems, regulations, and elasticity.

5) Create organizational knowledge from experience.

6) Use a teaching method called the learning cycle to encourage the student to ask questions that require thinking and stimulate students to exchange opinions.

7) Create the Learning atmosphere.

Table 4.2 The result of students' opinions of the machine game automatic for reading skill using IoT in Thai language, to create to activity for learning.

Activity for learner design	*M*	Opinion of experts	*SD*	IQR	Consensus
1. Students can learn effectively if instructional situations are formulated for the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language.	4.29	Moderately agree	0.48	1	Congruence

Table 4.2 The result of students' opinions of the machine game automatic for reading skill using IoT in Thai language, to create to activity for learning. (Cont.)

Activity for learner design	*M*	Opinion of experts	*SD*	IQR	Consensus
2. Students should have basic knowledge at a comprehensive level and solve problems for the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language.	4.29	Moderately agree	0.48	1	Congruence
3. Students' abilities consist of creative thinking, reflexive thinking, and thinking initiative for the machine game automatic for Learning Disabilities students learned in Thai language.	4.06	Moderately agree	0.50	1	Congruence
4. Students check previous knowledge before learning new things. For Learning Disabilities, students learned in the Thai language via the machine game automatic for reading skill using the IoT.	4.29	Moderately agree	0.48	1	Congruence
5. Students learn by creating the meaning of things and checking their understanding for Learning Disabilities students learned in Thai language via the machine game automatic for reading skills using the IoT.	4.47	Moderately agree	0.44	1	Congruence

Table 4.2 The result of students' opinions of the machine game automatic for reading skill using IoT in Thai language, to create to activity for learning. (Cont.)

Activity for learner design	*M*	Opinion of experts	*SD*	IQR	Consensus
6. Students emphasize a child-centered model of self-controlled learning for Learning Disabilities students learned in Thai language via the machine game automatic for reading skills.	4.35	Moderately agree	0.48	1	Congruence
7. Students' 'self-knowledge' should be developed according to their competence and previous experience for Learning Disabilities students learned in the Thai language via the machine game automatic for reading skills using the IoT.	4.59	Strongly agree	0.42	1	Congruence
8. Students should solve problems or investigate them in order to reduce contradictions in ideas which are essential for learners to assimilate for Learning Disabilities students learned in the Thai language via the machine game automatic for reading skill using IoT.	4.35	Moderately agree	0.45	1	Congruence

Table 4.2 The result of students' opinions of the machine game automatic for reading skill using IoT in Thai language, to create to activity for learning. (Cont.)

Activity for learner design	*M*	Opinion of experts	*SD*	IQR	Consensus
9. Students create a body of discovery knowledge Through the Learning Disabilities, students learned in the Thai language via the machine game automatic for reading skill using IoT.	4.59	Strongly agree	0.42	1	Congruence
10. Students use the knowledge that has already been learned for Learning Disabilities students learned in Thai language via the machine game automatic for reading skills using the IoT.	4.35	Moderately agree	0.45	1	Congruence
11. Students create learning using their wit for Learning Disabilities students learned in the Thai language via the machine game automatic for reading skill.	4.35	Moderately agree	0.45	1	Congruence
12. Students learn by practicing or building Up skills for Learning Disabilities students learned in Thai language via the machine game automatic for reading skill using IoT.	4.24	Moderately agree	0.49	1	Congruence

Table 4.2 The result of students' opinions of the machine game automatic for reading skill using IoT in Thai language, to create to activity for learning. (Con.)

Activity for learner design	*M*	Opinion of experts	*SD*	IQR	Consensus
13. Learners create organizational knowledge on their own and not from instructors for Learning Disabilities students learned in Thai language via the machine game automatic for reading skill using IoT.	4.35	Moderately agree	0.45	1	Congruence
14. Students exchange ideas, encourage one another, and correct the mistakes of one another for Learning Disabilities students learned in Thai language via the machine game automatic for reading skill using IoT.	4.24	Moderately agree	0.49	1	Congruence
15. Students link ideas to help create the meanings of the things to be learned for Learning Disabilities students learned in Thai language via the machine game automatic for reading skill using IoT.	4.35	Moderately agree	0.45	1	Congruence

From table 4.2 The results from experts' opinions of the research to create to activity for teaching. Experts' opinions of the machine game automatic for reading skill using IoT for Learning Disabilities students learned in Thai language, to create to activity for students should create activity as follows:

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1) Students can learn effectively if instructional situations are formulated.

2) Students should have basic knowledge at a comprehensive level and solve problems.

3) Students' abilities consist of creative thinking, reflexive thinking, and thinking initiative.

4) Students check previous knowledge before learning new things.

5) Students learn by creating the meaning of things and checking their understanding.

6) Students emphasize a child-centered model of self-controlled learning.

7) Students 'self-knowledge' should be developed according to their competence and previous experience.

8) Students should solve problems or investigate them in order to reduce contradictions in ideas that are important.

9) Students create a body of discovery knowledge through procedures.

10) Students use the knowledge which has already been learned.

11) Students create learning using their wit.

12) Students learn by practicing or building up skills.

13) Students create organizational knowledge on their own and not from instructors.

14) Students exchange ideas, encourage one another, and correct the mistakes of one another.

15) Students link ideas to help create the meanings.

4.2 Analysis Results
    4.2.1   Descriptive of the efficacy on the research.

Table 4.3   Descriptive of the efficacy on the research. The population of this research
             was Learning Disabilities students, 30 students from 23 school network.
             A descriptive analysis and meaning analysis of the machine game automatic
             for reading skill using IoT. There are controlled by Arduino board and
             ESP8266 board for Wi-Fi.

Machine game automatic for reading skills	(E1)	(E2)	E1/E2
1. Read in Thai word red color group 1-16 word.	81.59	81.62	
2. Read Thai the word green color group 17-33 word.	81.58	81.52	
3. Reading in Thai word yellow color group 34-50 word.	82.88	81.55	82.25/81.56
4. Reading in Thai word blue color group 51-67 word.	82.95	81.56	
Average total	82.25	81.56	

        Form table 1 shows the efficacy of the machine game automatic for
reading skills. The efficacy was criteria equal to E1/E2 = 82.25/81.56 as the hypothesis,
the average (E1) = 82.25, and the average (E2) = 81.56.
    4.2.2   Compare students' enhanced achievement between pretest and posttest
on the machine game automatic for reading skill using IoT, the results can be seen in the
following table 4.4.

Table 4.4   The report of students to improve achievement between pretest and posttest
             on the machine game automatic for reading skills in Thai language using
             IoT for Learning Disabilities students.

Experiment	Score	M	SD	percent	E1/ E2	t	Sig.(2-tailed)
Pre-test	20	15.44	0.89	81.25	82.25	4.07	0.0025
Post-test	20	17.61	1.55	80.56	81.56		

P-value<0.05

From table 4.4 the results of the machine game automatic for reading skills using the IoT. The research were (1) the efficiency of the machine game automation development of the reading skill in Thai language the average criteria equal to 82.25/81.56, the efficiency of the student after the study is higher than before the study, with the average equal to 15.44 and standing vision equal to 0.89. The average equals 17.61, withstanding vision equal to 1.55, *t-test* value here and after the study equal to 4.07, which significantly affects statistics at the level 0.05 and Sig. (2-tailed=0.0025).

4.2.3 Students' satisfaction with the machine game automatic for reading skill using IoT. Shows in table 4.5 as follows:

Table 4.5 shows the mean and standard deviation for students' satisfaction with the research.

Item	$\bar{x}$	SD	Results (Satisfaction levels)
1. Teachers have to teach preparation.	5.00	0.30	The most
2. The content in Thai language is appropriate for the learners.	5.00	0.30	The most
3. The content in Thai language helps to increase knowledge and understanding of the reading skill more.	5.00	0.30	The most
4. The study duration is appropriate.	4.89	0.30	The most
5. Teachers use the machine game automatically for reading skills using the Internet of Things.	5.00	0.30	The most
6. The equipment was suitable.	5.00	0.25	The most
7. Teachers intend to teach and give advice to students in activities.	4.89	0.66	The most
8. The teacher encourages the Learning Disabilities to take the initiative and to criticize.	4.67	0.50	The most

Table 4.5 shows the mean and standard deviation for students' satisfaction with the research. (Cont.)

Item	$\bar{x}$	SD	Results (Satisfaction levels)
9. Learning Disabilities are involved in learning activities.	4.78	0.33	The most
10. The vocabulary is appropriate for Learning Disability students.	4.70	0.35	The most
11. Tests and exercises are appropriate.	5.00	0.25	The most
12. Learning Disabilities were satisfied with the learning set and reading skills learning.	4.40	0.89	The most
13. Learning Disabilities students can apply knowledge gained to practice as writing.	4.00	1.56	The most
Total Average	4.80	0.50	The most

From table 4.5 the satisfaction of Learning Disabilities students are classified at the most -level all every item-total *x* equal to 4.80 with a *SD* equal to 0.50.

4.2.4 Arduino code for create the machine game automatic for reading skill using IoT.

4.2.5 Flow chart of the machine game automatic for reading skill using IoT, the machine game for Learning Disabilities students, control, hardware work with Arduino board.
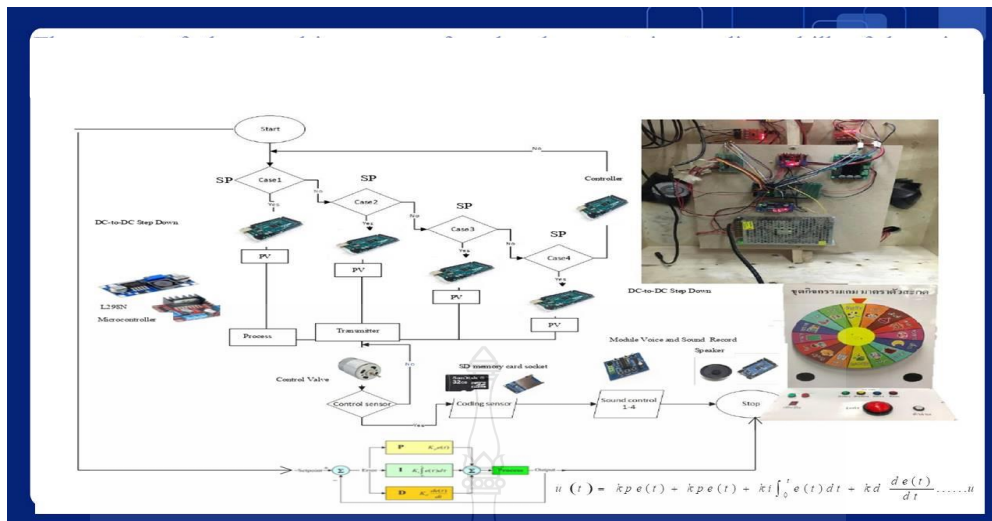
Figure 4.1 Flow chart of the machine game automatic.
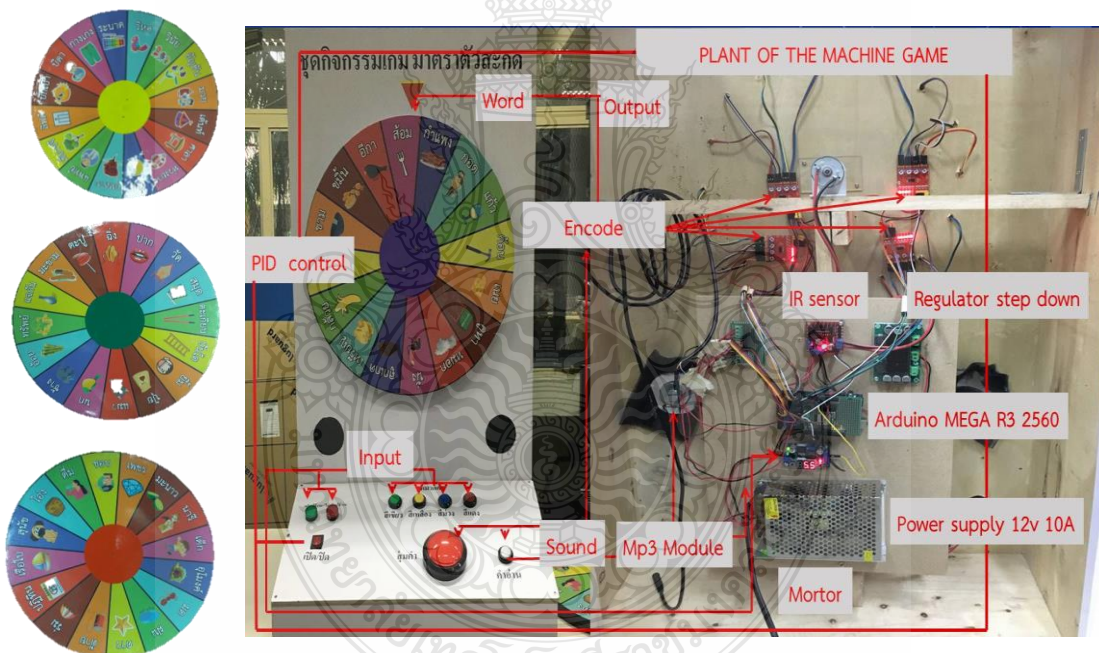
Figure 4.2 The machine game automatic for reading skill.
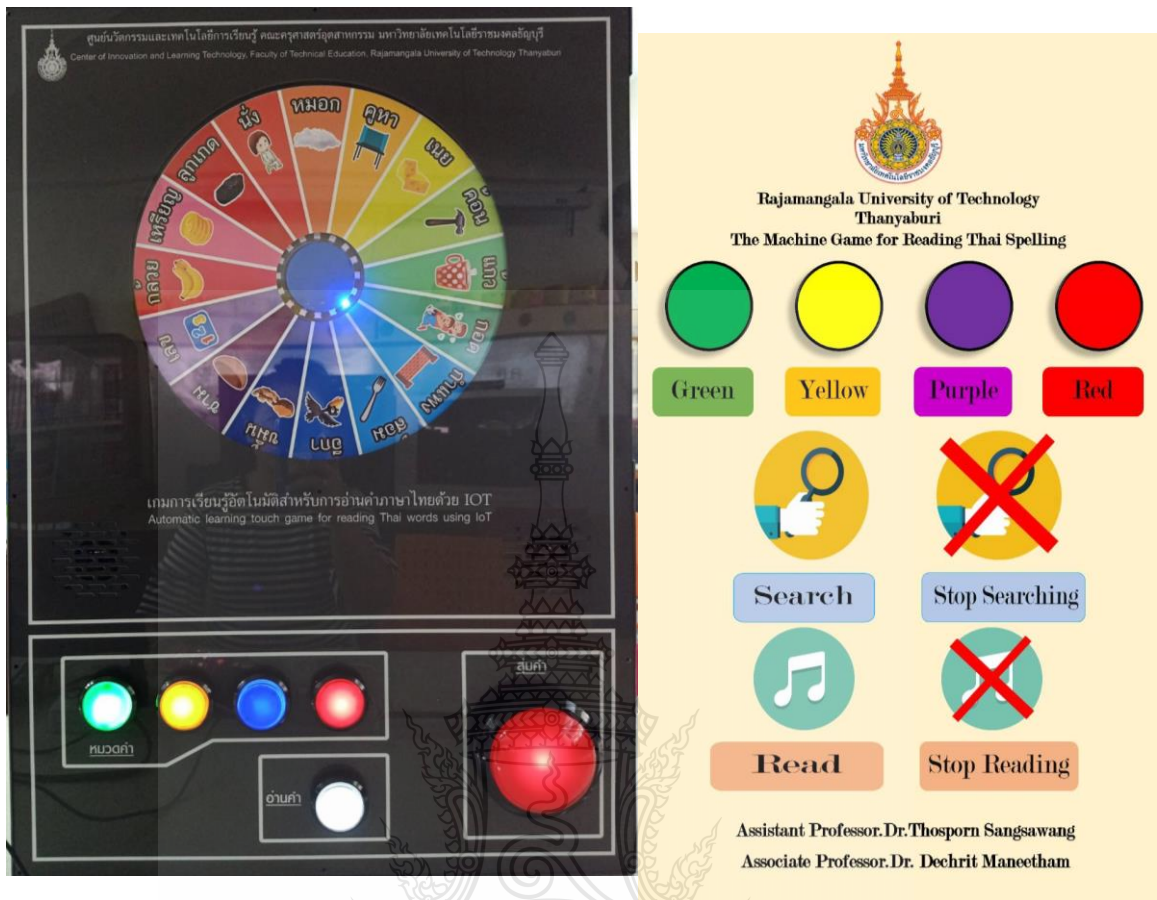
Figure 4.3 The machine game automatic for reading skill using Internet of Things.

Figure 4.4 Test of the machine game automatic for reading skill using IoT.

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4.3 Summary

The board is on the border on machine operation in reading skills to develop the reading skill for Learning Disabilities for students. The control theory was related to the synergistic combination of mechanical control, electronics control, and computer engineering control, the critical factor being the integration of these areas during the design process. The mechatronics engineering control specialization covers the fundamental scientific principles and technologies used in the design of modern computer-controlled machines and processes and focuses on the synergies in the design process. Mechatronics created the machine game automatic for reading skills using the IoT. The Arduino code controls all mechanical of the machine game automatic. There is control bottom and switch on/off, sound, feedback, and stop that make the motivation for students. The PID algorithm are use guarantees control sensors and controls the sign of the word, there are random and sound bottom. The process was set to where the machine knows which word to stop when seeing the sensor and takes timing when student push stops bottom, the machine would be stop, and students can control by themselves. Students were know their words in the Thai language, and they can read simple words.
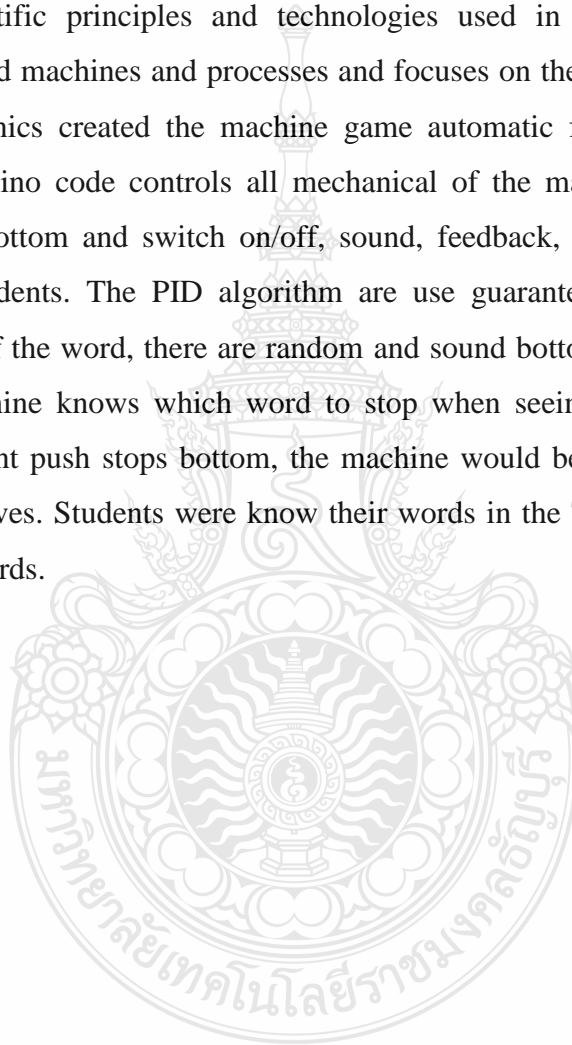
CHAPTER 5

DISCUSSION AND RECOMMENDATION

This research have summary as following:

5.1 Discussion and Recommendation

5.2 Implication for Practice and Future Research

5.1 Discussion and Recommendation

5.1.1 The machine game automatic for reading skills using the IoT. It will help develop reading skills for Learning Disabilities students and general students, this research were 1) the efficacy of the machine game automatic for reading skill using IoT. This research finds machine effectiveness and students via IoT overall satisfaction. Thirty students were randomly selected from 23 school networks. The pre-test was their reading skill before introducing the machine games, followed by a post-test and a satisfaction questionnaire. Statistics are t-tests were used to analyze the data. E1/E2=82.25/81.56 as (E1)=82.25 and (E2)=81.56. 2) compere students' achievement between pretest and posttest on the machine game automatic for reading skill using IoT, compare students' improved achievement between pretest and posttest, create this machine game via the Arduino code and Node MCU 8266 control reading skill. Students are developing reading skills. Analysis results can show in the posttest (M=17.61, SD=1.55) showed that the reading skills of the students improved from the pre-test (M=15.44, SD=0.89) significantly, $t(4.07)$=17.61, $p<0.05$., and Sig.(2-tailed= 0.0025). 3) the student's satisfaction with the machine game automatic for reading skill using IoT. The machine game automatic for reading skill via IoT, a self-learning activity, has been to help students read and improve their reading skills. The satisfaction of Learning Disabilities is classified at the most level all every item-total average equal to 4.80 with a standard deviation equal to 0.50. They were satisfied and found the self-learning activity via a helpful machine.

5.1.2 The control theory for mechatronics engineering was related to the synergistic combination of mechanical, electronics, control, and computer engineering, the critical factor being integrating these areas during the design process. The machine

game as tutor's behavior was grounded in empathic and pedagogical strategies, building on previous work. The student uses pedagogical actions in reading skills and writing skills to practice efficacy skills. The machine game as a tutor monitors learners' affective states, valence, and arousal groups to adapt pedagogical actions. Students are in a low valence and arousal state, which indicates a state of tiredness or boredom, the machine game's behavior will be to entertain and engage with students. When students have positive valence identifying countries where students are happy or relaxed, then the number of pedagogical actions is reduced. When students are frustrated, more pedagogical help is provided. The social skills training for children with autism spectrum disorders is a problem, so the machine game could be help students to typically spend much time and repetitive efforts. Assistance proposes and examines the feasibility of a the machine game automatic behavioral intervention system to facilitate the social development of children with autism spectrum disorders and relieve the operational burden during the training process; based on well-known behavioral treatment protocols; the machine game system incorporates mechanical stimulation design, recognition modules for human activities, and reinforcement procedure in the interaction scheme design. Using performs reading targeted at schoolers with a high functioning level in the planned process. An advantage in a comparative analysis with a control group taught by humans, the proposed system could evoke a positive response of children with autism spectrum disorders and provide a labor-saving effect on the clinical environment. The advancement in the machine game automatic s, more attention to educational-support robots that assist in learning. Although most existing studies report the impact of collaborative learning between educational-support robots and healthy children, since the number of children with developmental disorders in primary schools has increased annually, developing educational-support robots for children with developmental disorders is necessary. Therefore, a recent study developed a robot that teaches children with developmental disorders. However, existing studies do not report educational support for children with potential symptoms of a developmental disability, this study investigates the effects of collaborative learning between robots and children. The cooperative learning, the child, and the machine game alternately read aloud one page of teaching material. The children have symptoms

similar to Attention Deficit Hyperactivity Disorder and difficulty learning over long periods. The machine game is designed to work with the IoT and interacts with children in real-time. Learning Disabilities can neither see nor touch the elements of their subject. When teachers introduce abstract concepts into learning, there can be erroneous notions about the concepts taught in class when only. In durations, one must consider the appropriate mix of generic academic skills, specific reading skills, such as communication, motivation, and responsibility. The classification is similar, distinguishing between cognitive, technical, and behavioral skills. Some of all three skills are required for nearly all jobs the different skills vary across readings. (Sangsawang, 2017) Learning Disabilities identify learning and performance characteristics all students with intellectual or multiple disabilities are distinct, several informal learning and performance characteristics are identified. The student's characteristics should be addressed when planning individual programmers and instructions. The number of skills acquired from students with intellectual or multiple disabilities will be less than most students as they will learn them slowly. This characteristic results in fewer skills' acquisition. Due to the fewer skills learned, teachers should ensure that their abilities are functional to the student's present and future environments. (Sangsawang, 2015) It will take most students with intellectual or multiple disabilities more time and instruction to return to their former performance level than it would be for a non-disabled student; transfer and generalization assume that acquisition in one environment will automatically have been performed elsewhere. Reading and writing skills are many complex skills that a student with intellectual or multiple disabilities may not acquire because of the complexity of that skills. Students to acquire skills by most intellectual or multiple disabilities requires several learning opportunities before a skill is acquired. Forgetting and recoupment of many students who have received talents will decrease that skill's performance if they do not use it for some time. (Sangsawang, & Maneetham, 2020) Most students with intellectual or multiple disabilities more time and instruction to return to their former performance level than it would be for a non-disabled student; transfer and generalization assume that acquisition in one environment will automatically have been performed elsewhere. Most intellectual or multiple disabilities have difficulty transferring or generalizing a

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skill from one context to another. (Sangsawang, 2018) Instructions in each of the environments will be challenging to put together or synthesizing skills learned in several contexts to use in a new context. (Maneetham, 2018)

5.1.3 The machine game automatic for reading skills via IoT, for Learning Disabilities students. Learning in developing reading skills for reading skills, learning skills, critical thinking skills, and creating works promoted a successful teaching experience. An Arduino board and Node MCU 8266 for control in reading aptitude to develop reading skills for Learning Disabilities students. It will commonly identify the learning and performance characteristics; although all students with intellectual or multiple disabilities are distinct, several everyday learning and performance characteristics have been identified. The characteristics should be addressed when planning individual programmers and instructions.

5.1.4 Prediction of the Arduino code and Node MCU 8266 control, all mechanical of the machine game automatic for reading skill via IoT. Its control bottom and sound, feedback, and stop that motivates students. The board is on the border of machine operation in reading skills to develop students' reading skills.
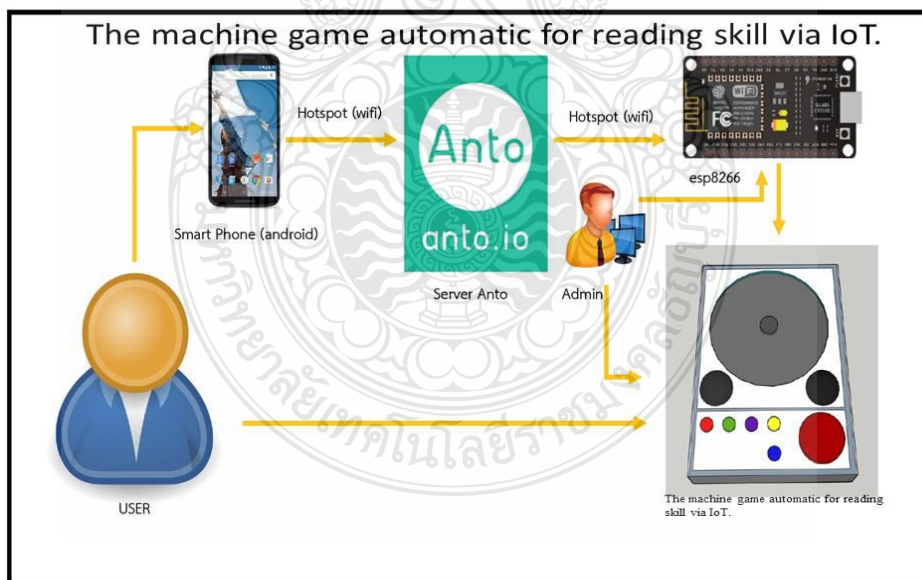
Figure 5.1 The conceptual design of the machine game for reading skills using IoT.

5.1.5 The research process were 1) the population was the research sample involved Learning Disabilities students, and 30 students were purposive selected from the 23 school networks, the first semester of 2020. 2) the variables independent are a machine game for development in the reading skills of Learning Disabilities students. Dependent variables were the efficacy of the machine game for growth in the reading skill of Learning Disabilities students, the student's achievement, students are satisfaction with the machine game for development in teaching disabled students. 3) content scope, this research was used in the first semester at 23. The school network for Learning Disabilities students includes reading skills in the Thai language. 4) data amassment in experimented the researcher; a specific selection selected the sample one group pretest-posttest design learning. A specific selection selected the sample. The experiment was one group pretest and posttest design the measures and statistics and amassment are the self-learning activity-packed pre-test and post-test, questionnaire of satisfying data was mean, standard definition, t-tests the dependent sample. Statistics and amassment data after the experiment and calculation E1/E2 for the mean (x) and compared, arrangement for the experimental model by offline and online in the process, for students to learn by themselves, the researcher puts some data amassment. Based on cooperation with 23 the school network, plan the reading skills for Learning Disabilities by analyzing the course in, course objective, determining behavioral purposes, and students' analysis. Learning, creative thinking, construction knowledge; pretest; points; posttest; assess student satisfaction; check pre-test and posttest.

5.1.6 Data analysis. The statistics used to analyze data were to 1) to find the efficacy is of the machine game for development in reading skills of students' subjects by E1/E2., 2) to compare the achievement of Learning Disabilities to students improving between pre and post on the machine game Arduino board via Node MCU 2866 in reading skill for learning in the development of the reading skill by pre-test and post-test as a research instrument., 3) to assess Learning Disabilities students' satisfaction in the machine game for development in reading skill in developing the reading skill by mean, Standard Definition.

5.1.7 Results and Discussion. The efficiency of the machine game in reading skills by Arduino board via Node MCU 2866 can be enhanced by practicing developing

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the reading skill for Learning Disabilities students using statistics are mean, Standard Definition, t-tests. The analysis results of the development of the reading skill for Learning Disabilities students through pre-test and post-test. The research found that the efficiency of the machine game in reading skill was the average criteria equal to 82.25/81.56, the efficiency of the student posttest is higher than pre-test, the average equal to 15.44, and criteria equal to 0.89. The posttest equals 17.61 with different equal to 1.55, *t-test* equal to 4.07, which significantly affects statistics at the level of 0.05 and Sig. (2-tailed=0.0025). Students are satisfaction on the machine game in reading skill follows as average equal to 4.80, *SD* equal to 0.50.

   5.1.8 The PID algorithm guarantees all control sensors and controls the sign of the word and sound. Node MCU control via Wi-Fi. The process was the machine's set point knowing which word to stop when they see the sensor and take timing when students push stop bottom, and students can control themselves. Students were in secondary education. They feel in Thai language that they do not know their words, and they cannot read simple terms. PID parameters will control the D.C. motor position via an Encoder. The machine game automatic for reading skill via IoT is used to, and the block diagram (Maneetham, 2018), and (Chaudhary, Kumar, 2019) is shown in Figure below:
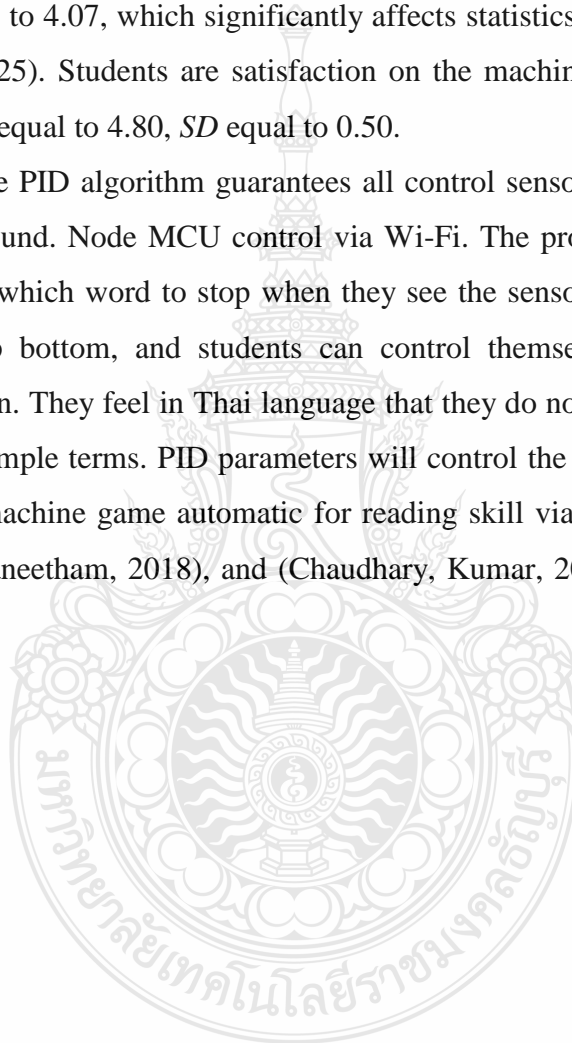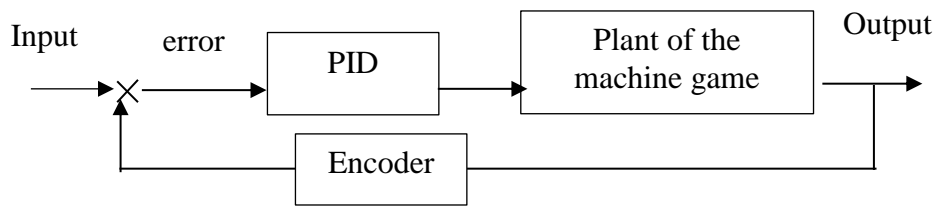
$$u(t) = kpe(t) + kpe(t) + ki\int_0^t e(t)dt + kd\,\frac{de(t)}{dt}.....u$$
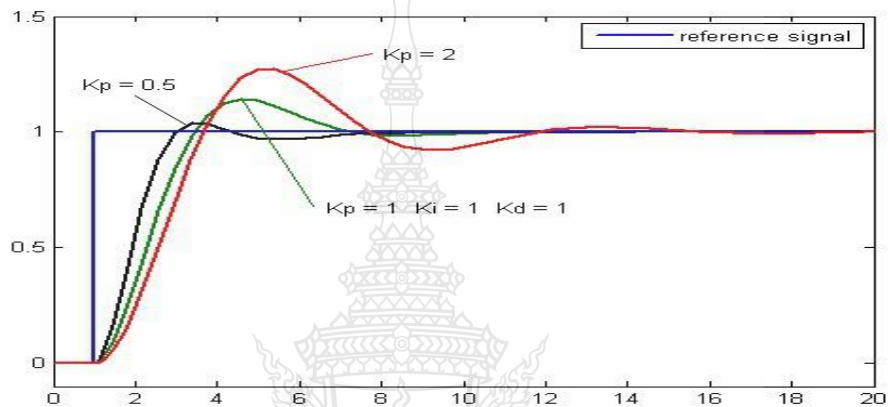
Figure 5.2 The PID controller is achieved with gain.

The PID term is achieved with gain as show in this chart, the equation that forms this circuit explants to (a) *Kp*: Proportion gain, variable. Will change the proportion of the error value Proportional response can be achieved by multiplying the error value by a constant. (b) *Ki*: Integral extension is proportional to the error's size and the duration of the error. (c) *Kd*: The rate of change of the process error is calculated from the slope of the error.

5.1.9 The block diagram of the machine game for reading skills via IoT.
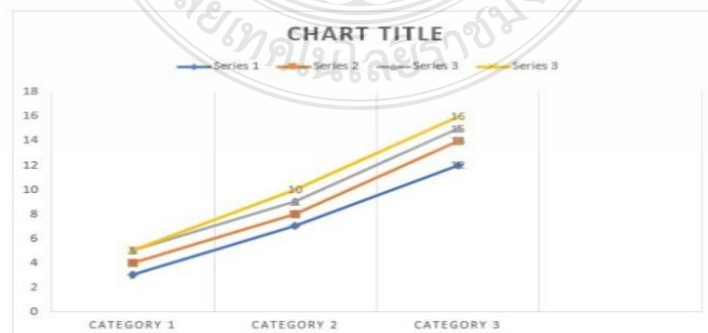
Figure 5.3 The block diagram of the machine game for reading skills via IoT.

The block diagram of the machine game automatic for reading skills via IoT. The validity accuracy of the calculations, the results are compared to available experimental data in the structure of the machine game automatic, as shown, are selected for this purpose.

5.1.10 Automatic via the IoT system the control machine game automatic. In recurrent years, the IoT being a scheme of interrelated computing devices that are provided with unique identifiers and with the ability to transfer data over a network without requiring a human-to-computer or even human-to-human interaction, there is a typical example of IoT that include smart technologies like Nest Smart Home, Kisi Smart Lock, canary security systems, mirrors, bags, watches, gloves, tracking systems among others, IoT have emerged in the computing arenas. With this increased usage of IoT in some aspects, its performance has not been focused on per the current studies. In this paper, we present a detailed a comprehensive study on the central performance of IoT. The main IoT have been further examined and analyzed, like a case, IoT security, IoT congestion control, IoT flow control, IoT energy consumption efficiency in different aspects of computing. The summarized table of the IoT performance evaluation can be used by researchers in developing models that solve the presented current technological issues. The machine game control via IoT and creation applications by bringing the wireless networks, since the machine game control via IoT and creation applications by bringing the wireless networks, sensors, and the Internet of Things. The machine game automatic, Platform games are a challenge faced by the automated system-level approaches for game testing-predicting the machine game automatic for reading skill via IoT. The mechatronic helps create this machine game via the Arduino code and Node MCU 8266 control, all mechanical of the machine game automatic for reading skill via IoT. There is a benefit to make its control bottom and sound, feedback, and stop that motivates students. The board is on the border to machine operation in reading skills to develop students' reading skills. The mechatronic control engineering specialization covers the fundamental scientific principles and technologies used in the design of modern computer-controlled machines and procedures and focuses on the synergies in the design process. Plant of the machine game automatic for reading skills via IoT.
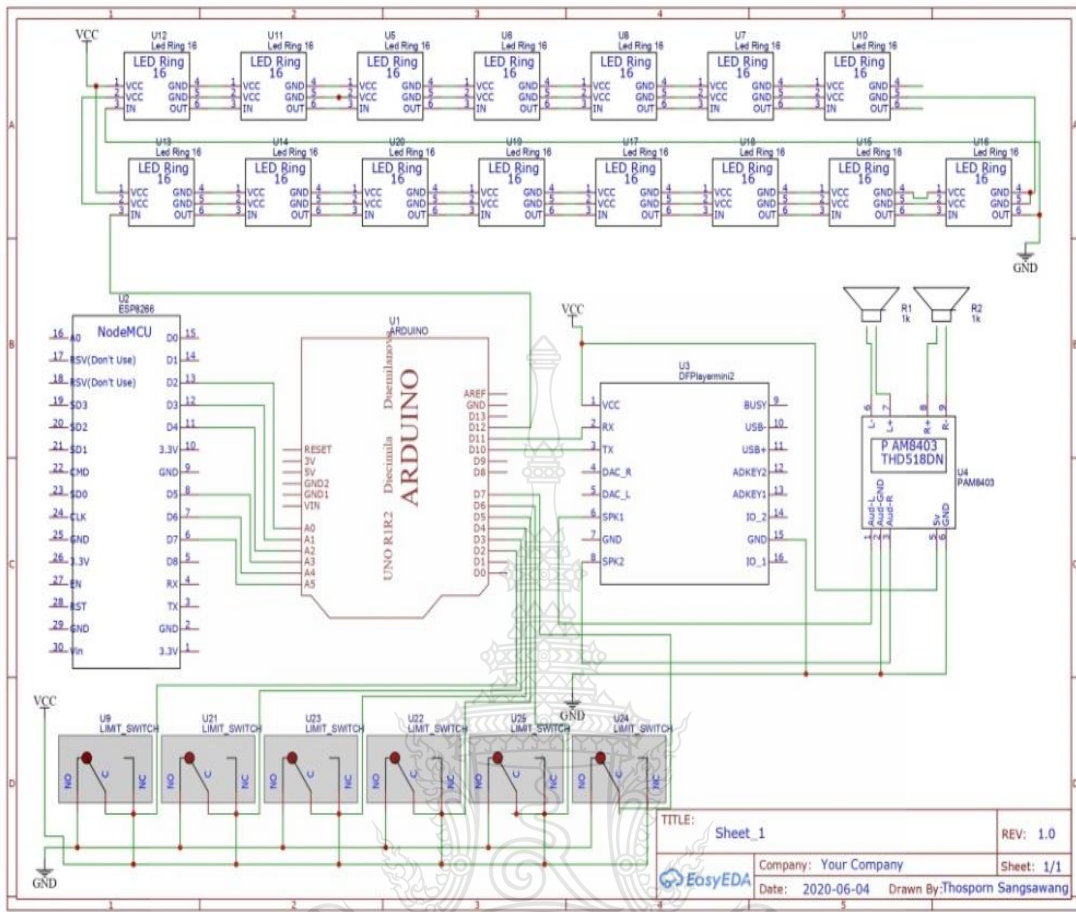
Figure 5.4 Circuit design for the control unit.

The Machine Game Automatic Platform
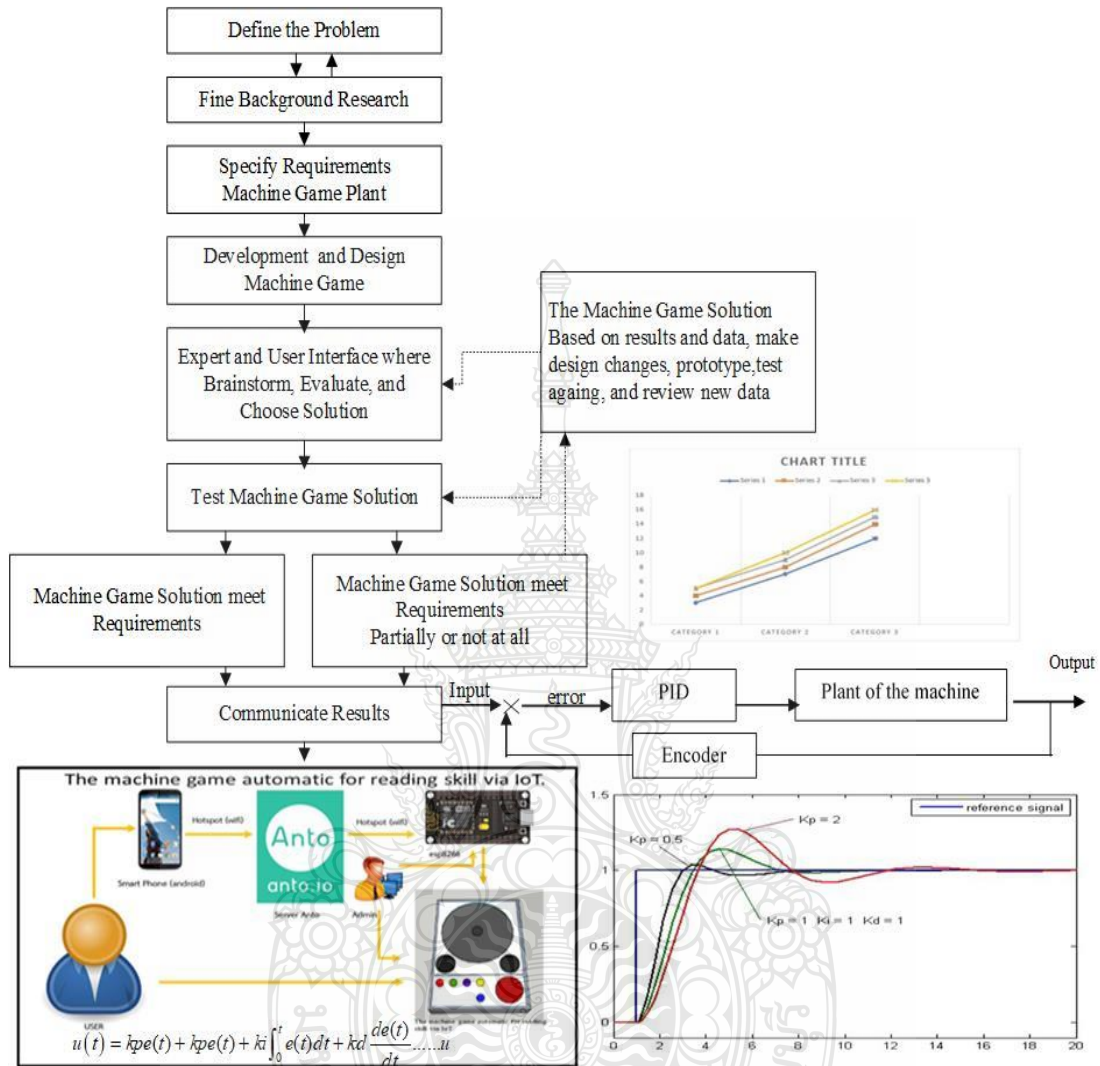
Figure 5.5 The Machine Game Automatic Plant via IoT.

5.1.11 ESP8266 code control for the machine game automatic for reading skills via IoT.

```c
#include <AntoIO.h>
#include <WiFiClientSecure.h>
#include <DNSServer.h>
#include <ESP8266WebServer.h>
const char *ssid = "pp";
"dTFbDdZSK7hy2oEJyIz1jDVYuxAZj8nldlsCE0iE";
const char *thing = "NodeMcu";
// initialize AntoIO instance
AntoIO anto(user, token, thing);
int value = 0;
void setup() {
 Serial.begin(115200);
 delay(100);
 Serial.println();
 Serial.println();
 Serial.print("Anto library version: ");

Serial.println(anto.getVersion());
 Serial.print("\nTrying to connect ");
 Serial.print(ssid);
 Serial.println("...");
 anto.begin(ssid, pass, messageReceived);
Serial.println("\nConnected Anto done");
 anto.sub("LED2");
 anto.sub("LED3");
 anto.sub("LED4");
 anto.sub("LED5");
 anto.sub("LED6");
 //Port output
 pinMode(D1, OUTPUT);
 pinMode(D2, OUTPUT);
 pinMode(D3, OUTPUT);
 pinMode(D4, OUTPUT);
 pinMode(D5, OUTPUT);
 pinMode(D6, OUTPUT);
}
void loop() {
```

```c
 anto.mqtt.loop();
}
// a callback function for arriving data.
void messageReceived(String thing, String channel, String payload)
{
 Serial.print("Recieved: ");
 Serial.print(thing);
 Serial.print("/");
 Serial.print(channel);
 Serial.print("-> ");
 Serial.println(payload);
 if (channel.equals("LED1"))
}
else {
    digitalWrite(D5, LOW);
  }
 }
 ////////////////////////////
if (channel.equals("LED6")) {
  value = payload.toInt();
  if (value == 1) {
const char *pass = "87654321";
const char *user = "Petchkatanchal";
const char *token =
//Subscript Channels
 anto.sub("LED1")value = payload.toInt();
if (value == 1) {
   digitalWrite(D1, HIGH);
  }
  else {
   digitalWrite(D1, LOW);
  }
 }
 ////////////////////////////
 }
 if (channel.equals("LED2"))
{
   value = payload.toInt();
   if (value == 1) {
   digitalWrite(D2, HIGH);
  }
```

```c
 else {
   digitalWrite(D2, LOW);
  }
 }

 ////////////////////////////
 if (channel.equals("LED3"))
{
  value = payload.toInt();
  if (value == 1) {
   digitalWrite(D3, HIGH);
  }
  else {
   digitalWrite(D3, LOW);
  }
 }
 //////////////////////////    if (channel.equals("LED4")) {
  value = payload.toInt();
  if (value == 1) {
   digitalWrite(D4, HIGH);
  }
  else {
   digitalWrite(D4, LOW);
  }
 }
 ////////////////////////////
if (channel.equals("LED5")) {
  value = payload.toInt();
 if (value == 1) {
   digitalWrite(D5, HIGH);
  }
  else {
   digitalWrite(D6, LOW);
   digitalWrite(D6, HIGH);
  }
 }
}
```

Figure 5.6   C Language

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5.1.12 Application IoT for control of the machine game via IoT. How to the communication machine game via IoT. This research also concentrates on machine game automation through IoT. This system is advantageous mainly in reading skills, word category, and reading practices self-learning. The machine game can change memory cards and more word categories. It can be integrated learning in the Thai word category and count the number of mathematics. Communication via IoT will be infinite, and hence we get to control the devices from anywhere in the classroom. The internet-enabled microprocessor collects the data from the cloud as the data is sent from the android game.
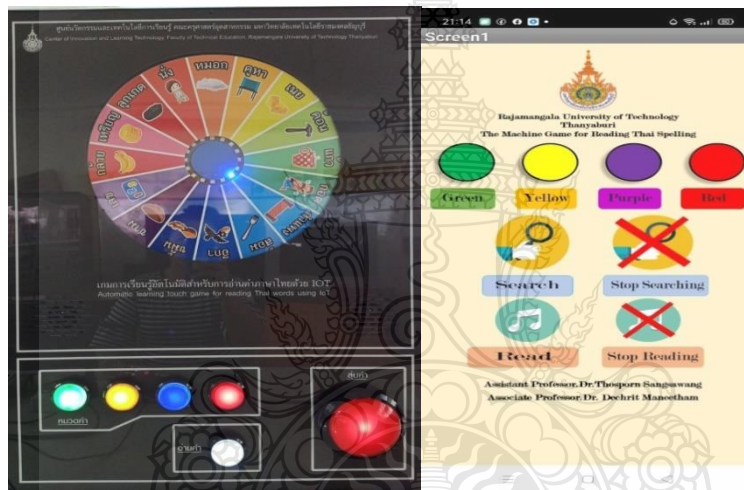
Ex.5.1 Green's word category

Ex.5.2 Blue's word category

Ex.5.3 Students play word category

Ex.5.4 Students used the IoT control machine.

Figure 5.7 Application IoT for control of the machine game via IoT.

5.2 Implication for Practice and Future Research

The machine game automatic for reading skills via IoT uses the ESP8266 board to write the code for controlling the machine game automatic for reading skills via IoT. (Lerman, 2013) The machine game uses the Arduino board in reading skill for learning in the development of the reading skill for Learning Disabilities using IoT is developed using the game the respective data is collected and sent to the cloud services, the microprocessor accesses this data and the appropriate signals are sent to the appliances as to match the game.

The research found that 1) Learning Disabilities students activities develop the reading skill for Learning Disabilities skills step by step, resulting in learning and increasing students' interest and enthusiasm in their studies, 2) Students are development the reading skill certificate level had on the average criteria equal to 82.25/81.56. The student's efficiency is higher than before the study, with the average equals to 15.44 with a standard deviation equal to 0.88. The average after the study equals 17.61, *SD* equal 1.55, 3) t-test analysis between pretest and posttest difference was equal to 17.61, which is significantly was equal at the level 0.05. Students the reading skill in the average of 4.80, considerable level, and 4) the student had a high level of satisfaction, with an average of 4.07.

They had knowledge and enjoyment, including taking action, being willing and enthusiastic about their studies, and performing their work correctly. They were more organized in the workplace because everyone had practiced it, which helped them to learn as well as being able to learn independently. There was also a mutual exchange of knowledge that allowed students to develop according to their potential by having teachers plan, encourage, challenge, encourage, and guide the way to find the right knowledge. Students will get the metacognition, and become active students; they could empower them tremendously because they understand that thinking and learning are processes they can control. The machine game is a learning strategy, which helps the learner engage with, process, remember, or apply information. The machine game helps the learner engage cognitively; they can remember the word and have reading skills. IoT technology is utilized to incorporate information technology and network image processing to create a monitoring and warning system for collecting field information.

The steps of learning should, according to the constructivism theory, the study results were to analyze the instructional design model of the multimedia games to develop the reading skills for children based on the data collected from 17 Thai experts. Content validity was verified (.97), and data is analyzed by content analysis.

The machine game automatic for reading skills via IoT should be managed by following the Constructivism theory these four steps: First, activate prior knowledge; inform expected outcomes of learners; manipulate the condition for inspiring a thinking process; and provide learning guidelines. Second, a fair question; learning control techniques are comprised of the following three steps: 1) Search for answers and adapt or change their thinking process. 2) Reflect their thinking by memorizing, analyzing, and applying. This second move can be made through three levels of control: (a) program control, (b) learner control. 3) Combination control. Third, judge discovery; learning control techniques refer to learners discovering their learning. Students can transfer knowledge; these techniques include task-based learning. The process of model synthesis and operant conditioning, and learning control techniques, which are keys to the new model, will be explained and discussed.

According to the Constructivism theory, the development of multimedia games using sign language for deaf children is the systematic development of instructional specifications, using learning and instructional theory to ensure instructional quality. Mechanics, using complicated linkages to coordinate motion, but today functionality has shifted to electronic control as machines game with electronic control features. (United Nations Education, Scientific, and Cultural Organization, 2019) It is the process of analyzing learning needs and goals and developing a delivery system to meet those needs. It includes instructional materials and activities and tries out an evaluation of all instructional and learner activities. (Sangsawang, 2017)

Therefore, the game can be categorized as very good both in terms of material and media. The student response test results showed an average value of 79.35%, which means that the students have an interest in the game developed, games can be used independently by students, and can increase learning motivation and students' learning outcomes. (Purba, Hufad, Amal, Ahyani, and Sutarni, 2020) The achievement cannot be separated from a collaboration between regular teachers and special teachers. Special

teachers play a role in conveying instructions to be simple and concrete. So, the IoT plays a more and more important issue in lifestyle through entertainment such as games. IoT environment games as the design and implantation of IT convergence framework for games as learning of IoT, when designing and implementing IT framework for games through contents using user's mobile devices and various sensors in the IoT environment and suggest related techniques. Then, games in the IoT environment create games and measure users' interactions in the IoT learning environment. It can help more students can collaborate at the same time learning. A quiet learning atmosphere in the absence of other audio-visual stimuli, besides experimental media, can make slow learner students more focused. The repetition factor of the subject matter by special teachers during the learning activities is beneficial because the characteristics of the slow learners are more likely to have short-term memories.(Aguspratomo, Andiwidodo, Achmadhufad, Sunardi, Asep, Bayudani, and Nandiyanto, 2020) Therefore, communication skills are based on simple scientific experiments with Deaf and Hard Hearing (DHH) is a hearing barrier that causes students to have limited hearing feedback, so that students' vocabulary is limited. This is the basis for developing their skills in communicating one event based on simple scientific observations. This research method used a single subject approach to DHH junior high school students. Data were obtained using pretest and posttest analysis. The experimental results showed that giving special teaching and treatment increased the ability of DHH students to get new vocabulary, knowledge and increase their communication skills. DHH students have no problem with receiving science and technology. The main barrier is how to transfer new knowledge. (Santikomaladini, Achmadhufad, Endangrochyad, Shyhabuddin, and Asep, Bayudaniyanto, 2020)

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APPENDICES
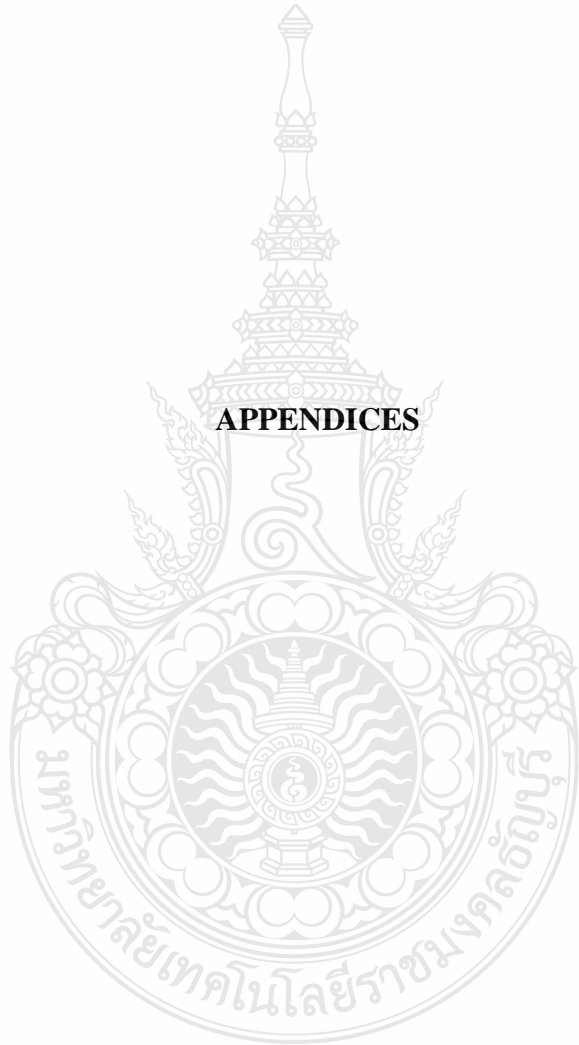
APPENDIX A

List of Experts

The experts were:

1. Prof. Dr. Chaiyong Brahmawong Senior Professor of Education (C-11 Professorship) Chief Operating Officer (Director/Dean), College of Internet Distance Education, Program Director, Ph.D. in eLearning Methodology Assumption University, Thailand.
2. Assoc. Prof. Dr. Nikom Tadang Faculty of Education, Sukhothai Thammathirat Open University.
3. Associate Professor Dr. Dechrit Maneetham. The Faculty of Technical Education Rajamangala University Technology Thanyaburi, Thailand.
4. Assoc. Prof. Dr. Myo Min Aung. The Faculty of Technical Education Rajamangala University of Technology Thanyaburi, Thailand.
5. Dr.Tenzin Rabgyal. Asian Institute of Technology (AIT).
6. Assistant Professor. Dr.Sutyasadi Petrus. Sanata Dharma. University of Indonesia.
7. Dr.Ana, A. Universitas Pendidikan Indonesia (UPI) university of Indonesia.
8. Dr.Asep Bayu Nandiyanto. Universitas Pendidikan Indonesia (UPI) university of Indonesia.
9. Assoc Prof.Dr.Kerim Karabachak.Sarakaya University of Turkey.
10. Assoc. Prof. Dr. Ravinder Koul. College of Education, Pennsylvania.
11. Prof. Ashutosh Biswal. MS University, Bhadodora, Gujrat, India
12. Assoc. Prof. Dr. Elizabeth Murphy, Faculty of Education, Memorial University, Newfoundland and Labrador, Canada.
13. Prof.(Dr.) Gyanendra Kumar Rout, IGNTU(A Central University) Amarkantak, Madhya Pradesh, India.
14. Prof.(Dr.) Bhuban Chandra Mahapatra. JJT University, Rajasthan, India.
13. Associate. Prof. Dr. Wisut Sunthonkanokphong. Department of Industrial Education King Mongkut's Institute of Technology Ladkrabang :KMUTL.
14. Asst. Prof. Thaimyod Pasawano. Faculty of Technical Education, Rajamangala University of Technology Thanyaburi, Thailand.
15. Prof. Yashpal, M.J.P. Rohilkhand University, Bareilly, U.P.
16. Prof. Anju Agarwal. M.J.P. Rohilkhand University, Bareilly, U.P.
17. Prof. Kaushal Kishore. Central University of South Bihar, Gaya, Bihar.

No. 0649.02/ 0471

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Invitation for Special Lecture to Master Degree students
Dear   Assistant Professor. Dr.Sutyasadi Petrus.
           Sanata Dharma. University of Indonesia.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

To gather information and guide the direction of future activities, we would like to kindly request you to complete the enclosed questionnaire with the object to design The Machine Game Automatic for Reading Skill Using Internet of Things.

The result of the questionnaire will be used for the preparation of a background paper to assess the current situation in Thailand.

To meet the deadline and plan, we would appreciate it if you could kindly return the completed questionnaire by email to: sthosporn@rmutt.ac.th to Miss Thosporn Sangsawang by 21 June 2020.

Thank you very much for your kind consideration and cooperation in this matter. We look forward to receiving your reply soon

Sincerely Yours,

Asst. Prof.Arnon Niyomphol
Dean of Faculty of Technical Education

Office of the Dean of Faculty of Technical Education
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Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

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Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Invitation for Special Lecture to Master Degree students
Dear   Assoc Prof.Dr.Kerim Karabachak.
          Sarakaya University of Turkey.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

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Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Request Assistance to Complete Questionnaire on

Dear   Assoc. Prof. Dr. Ravinder Koul.
          College of Education, Pennsylvania, U.S.A.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

To gather information and guide the direction of future activities, we would like to kindly request you to complete the enclosed questionnaire with the object to design The Machine Game Automatic for Reading Skill Using Internet of Things.

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Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Invitation for Special Lecture to Master Degree students

Dear   Assoc. Assoc. Prof. Dr. David Croolkall.
          Experiential learning, debriefing, international business communication,
          University de Nice Sophia Antipolis, France.

        On behalf of Faculty of Technical Education, Rajamangala University of
Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance
to Complete Questionnaire for Master Degree students in major of Mechatronics
Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.
        To gather information and guide the direction of future activities, we
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We look forward to receiving your reply soon

                                        Sincerely Yours,

                                        Asst. Prof.Arnon Niyomphol
                                        Dean of Faculty of Technical Education

Office of the Dean of Faculty of Technical Education
Tel: +66(0)-2549-4713   Fax: +66(0)-2577-5049

No. 0649.02/ 0496

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Invitation for Special Lecture to Master Degree students

Dear   Assoc. Assoc. Prof. Dr. David Croolkall.
         Experiential learning, debriefing, international business communication,
         University de Nice Sophia Antipolis, France.

         On behalf of Faculty of Technical Education, Rajamangala University of
Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance
to Complete Questionnaire for Master Degree students in major of Mechatronics
Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.
         To gather information and guide the direction of future activities, we
would like to kindly request you to complete the enclosed questionnaire with the
object to design The Machine Game Automatic for Reading Skill Using Internet
of Things.
         The result of the questionnaire will be used for the preparation of a background
paper to assess the current situation in Thailand.
         To meet the deadline and plan, we would appreciate it if you could kindly return
the completed questionnaire by email to: sthosporn@rmutt.ac.th to Miss Thosporn
Sangsawang by 21 June 2020.
         Thank you very much for your kind consideration and cooperation in this matter.
We look forward to receiving your reply soon

                                              Sincerely Yours,

                                              Asst. Prof.Arnon Niyomphol
                                              Dean of Faculty of Technical Education

Office of the Dean of Faculty of Technical Education
Tel: +66(0)-2549-4713   Fax: +66(0)-2577-5049

No. 0649.02/ 047

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject Invitation for Special Lecture to Master Degree students
Dear   Assoc. Prof. Dr. Elizabeth Murphy.
              Faculty of Education, Memorial University, Newfoundland and Labrador,
              Canada.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

To gather information and guide the direction of future activities, we would like to kindly request you to complete the enclosed questionnaire with the object to design The Machine Game Automatic for Reading Skill Using Internet of Things.

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Asst. Prof.Arnon Niyomphol
Dean of Faculty of Technical Education

Office of the Dean of Faculty of Technical Education
Tel: +66(0)-2549-4713   Fax: +66(0)-2577-5049

No. 0649.02/ ०५५७

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Request Assistance to Complete Questionnaire on
Dear   Assoc.Prof.Dr.B.C.Mahapatha, Innovation
          Innovation Center, India.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

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Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2   April 2020

Subject   Invitation for Special Lecture to Master Degree students
Dear   Prof.(Dr.) Bhuban Chandra Mahapatra. JJT University, Rajasthan, India.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

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Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2   April 2020

Subject   Invitation for Special Lecture to Master Degree students
Dear   Associate. Prof. Dr. Wisut Sunthonkanokphong.
               Department of Industrial Education King Mongkut's Institute of Technology
               Ladkrabang: KMUTL.

         On behalf of Faculty of Technical Education, Rajamangala University of
Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance
to Complete Questionnaire for Master Degree students in major of Mechatronics
Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.
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                                                               Asst. Prof.Arnon Niyomphol
                                                               Dean of Faculty of Technical Education

Office of the Dean of Faculty of Technical Education
Tel: +66(0)-2549-4713   Fax: +66(0)-2577-5049

No. 0649.02/ 0476

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2   April 2020

Subject   Request Assistance to Complete Questionnaire on
Dear   Asst. Prof. Thaimyod Pasawano.
          Universitas Pendidikan Indonesia (UPI)

      On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

      To gather information and guide the direction of future activities, we would like to kindly request you to complete the enclosed questionnaire with the object to design The Machine Game Automatic for Reading Skill Using Internet of Things.

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Dean of Faculty of Technical Education

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Tel: +66(0)-2549-4713   Fax: +66(0)-2577-5049

109

No. 0649.02/ 0476

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Invitation for Special Lecture to Master Degree students
Dear   Prof. Yashpal, M.J.P. Rohilkhand University, Bareilly, U.P.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

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Dean of Faculty of Technical Education

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110

No. 0649.02/ 0496

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Invitation for Special Lecture to Master Degree students
Dear   Asst. Prof. Dr. Sittiporn Boonsong.
          Faculty of Technical Education, Rajamangala University of Technology
          Thanyaburi, Thailand.

       On behalf of Faculty of Technical Education, Rajamangala University of
Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance
to Complete Questionnaire for Master Degree students in major of Mechatronics
Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.
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                                        Dean of Faculty of Technical Education

Office of the Dean of Faculty of Technical Education
Tel: +66(0)-2549-4713   Fax: +66(0)-2577-5049

111

No. 0649.02/0446

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject   Invitation for Special Lecture to Master Degree students
Dear   Prof. Anju Agarwal. M.J.P. Rohilkhand University, Bareilly, U.P.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

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112

No. 0649.02/ 0476

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi 39 Moo 1 Rangsit-Nakorn
Nayok Road, Thanyaburi, Pathumthani
12110 Thailand

2 April 2020

Subject Invitation for Special Lecture to Master Degree students
Dear   Prof. Kaushal Kishore. Central University of South Bihar, Gaya, Bihar.

On behalf of Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand. We would like to invite you to Assistance to Complete Questionnaire for Master Degree students in major of Mechatronics Engineering. Topic relate of The Machine Game Automatic for Reading Skill Using.

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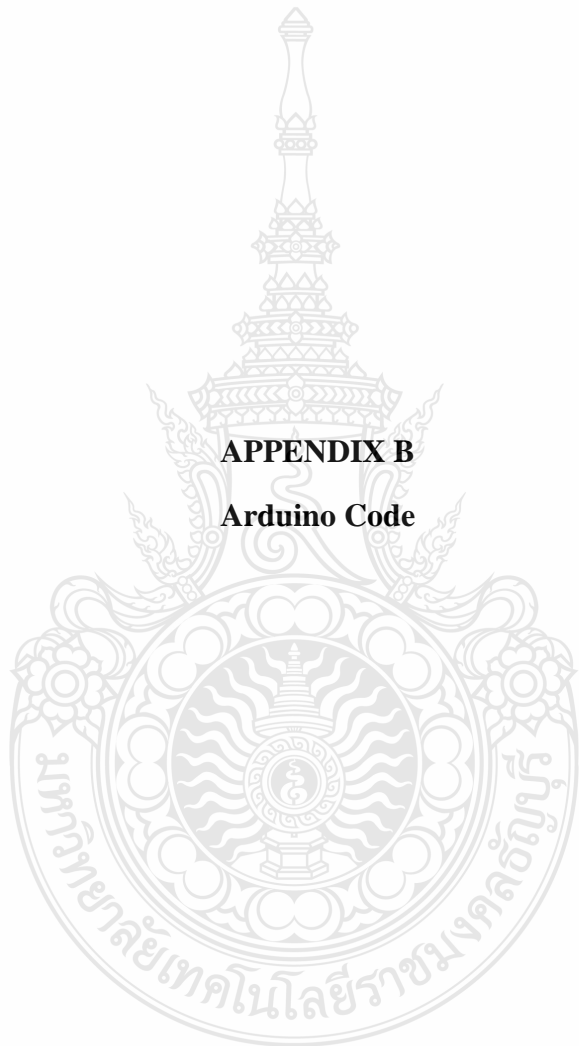
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Asst. Prof.Arnon Niyomphol
Dean of Faculty of Technical Education

Office of the Dean of Faculty of Technical Education
Tel: +66(0)-2549-4713 Fax: +66(0)-2577-5049

APPENDIX B

Arduino Code

Arduino Code

```
#include <SoftwareSerial.h>

#include <DFPlayer_Mini_Mp3.h>

SoftwareSerial mySerial(10, 11); // RX, TX

int inB = 53;

int inS = 51;

int inCh1 = 49;

int inCh2 = 47;

int inCh3 = 45;

int inCh4 = 43;

int motor = 6;

int pwm = 7;

int IR1 = A15, IR2 = A14, IR3 = A13, IR4 = A12, IR5 = A10, IR6 = A11, IR7 = A9,
IR8 = A8, IR9 = A7, IR10 = A6, IR11 = A5, IR12 = A4, IR13 = A2, IR14 = A3, IR15 =
A1, IR16 = A0;

int S1;

int S2;

int S3;

int S4;

int S5;

int S6;

int S7;

int S8;

int S9;

int S10;

int S11;

int S12;

int S13;
```

```
int S14;

int S15;

int S16;

int speck;

void setup() {

  Serial.begin(9600);

  pinMode(motor, OUTPUT);

  pinMode(pwm, OUTPUT);

  digitalWrite(motor, LOW);

  mySerial.begin (9600);

  mp3_set_serial (mySerial);  //set softwareSerial for DFPlayer-mini mp3 module

  mp3_set_volume (100);

  delay (1000);

  mp3_play (69);

  delay (5000);

}

void loop() {

  //////////////////Button//////////////////

  int StateB = digitalRead(inB);

  int StateS = digitalRead(inS);

  int StateCh1 = digitalRead(inCh1);

  int StateCh2 = digitalRead(inCh2);

  int StateCh3  = digitalRead(inCh3);

  int StateCh4  = digitalRead(inCh4);

  /* Serial.print("StateB ");

    Serial.print(StateB);

    Serial.print(" StateS ");
```

```
  Serial.print(StateS);

  Serial.print(" Ch1 ");

  Serial.print(StateCh1);

  Serial.print(" Ch2 ");

  Serial.print(StateCh2);

  Serial.print(" Ch3 ");

  Serial.print(StateCh3);

  Serial.print(" Ch4 ");

  Serial.println(StateCh4);*/

/////////////////////////////////////////

/////////////////IR/////////////////////

  int IN1 = analogRead(IR1);

  int IN2 = analogRead(IR2);

  int IN3 = analogRead(IR3);

  int IN4 = analogRead(IR4);

  int IN5 = analogRead(IR5);

  int IN6 = analogRead(IR6);

  int IN7 = analogRead(IR7);

  int IN8 = analogRead(IR8);

  int IN9 = analogRead(IR9);

  int IN10 = analogRead(IR10);

  int IN11 = analogRead(IR11);

  int IN12 = analogRead(IR12);

  int IN13 = analogRead(IR13);

  int IN14 = analogRead(IR14);

  int IN15 = analogRead(IR15);

  int IN16 = analogRead(IR16);
```

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```
/*Serial.print(" IN1: "); Serial.println(IN1);
 delay(1000);
 Serial.print(" IN2: "); Serial.println(IN2);
 delay(1000);
 Serial.print(" IN3: "); Serial.println(IN3);
 delay(1000);
 Serial.print(" IN4: "); Serial.println(IN4);
 delay(1000);
 Serial.print(" IN5: "); Serial.println(IN5);
 delay(1000);
 Serial.print(" IN6: "); Serial.println(IN6);
 delay(1000);
 Serial.print(" IN7: "); Serial.println(IN7);
 delay(1000);
 Serial.print(" IN8: "); Serial.println(IN8);
 delay(1000);
 Serial.print(" IN9: "); Serial.println(IN9);
 delay(1000);
 Serial.print(" IN10: "); Serial.println(IN10);
 delay(1000);
 Serial.print(" IN11: "); Serial.println(IN11);
 delay(1000);
 Serial.print(" IN12: "); Serial.println(IN12);
 delay(1000);
 Serial.print(" IN13: "); Serial.println(IN13);
 delay(1000);
 Serial.print(" IN14: "); Serial.println(IN14);
```

```
  delay(1000);

  Serial.print(" IN15: "); Serial.println(IN15);

  delay(1000);

  Serial.print(" IN16: "); Serial.println(IN16);

  delay(1000);*/

//////////////////////////////////////

int sensorValue1 = analogRead(A0);

//Serial.print("V1 : ");

// Serial.println(sensorValue1);

if (StateB == HIGH)

{

  while (1)

  {

    int StateB = digitalRead(inB);

    Serial.println("StateB++++ ");

    analogWrite(pwm, 255);

    digitalWrite(motor, HIGH);

    delay(1000);

    if (StateB == LOW)

    {

      analogWrite(pwm, 180);

      digitalWrite(motor, HIGH);

      delay(5000);

      break;

}

}

}
```

```
else
{
  digitalWrite(motor, LOW);
}
if (IN1 > 500) {
  Serial.println(" IN1: TEST ");
  speck = S1;
  TEST();
}
if (IN2 > 500) {
  Serial.println(" IN2: TEST ");
  speck = S2;
  TEST();
}
if (IN3 > 500) {
  Serial.println(" IN3: TEST ");
  speck = S3;
  TEST();
}
if (IN4 > 500) {
  Serial.println(" IN4: TEST ");
  speck = S4;
  TEST();
}
if (IN5 > 500) {
  Serial.println(" IN5: TEST ");
  speck = S5;
```

```
  TEST();

}

if (IN6 > 500) {

 Serial.println(" IN6: TEST ");

 speck = S6;

 TEST();

}

if (IN7 > 500) {

 Serial.println(" IN7: TEST ");

 speck = S7;

 TEST();

}

if (IN8 > 500) {

 Serial.println(" IN8: TEST ");

 speck = S8;

 TEST();

}

if (IN9 > 500) {

 Serial.println(" IN9: TEST ");

 speck = S9;

 TEST();

}

if (IN10 > 500) {

 Serial.println(" IN10: TEST ");

 speck = S10;

 TEST();

}
```

```
if (IN11 > 500) {

  Serial.println(" IN11: TEST ");

  speck = S11;

  TEST();

}

if (IN12 > 500) {

  Serial.println(" IN12: TEST ");

  speck = S12;

  TEST();

}

if (IN13 > 500) {

  Serial.println(" IN13: TEST ");

  speck = S13;

  TEST();

}

if (IN14 > 500) {

  Serial.println(" IN14: TEST ");

  speck = S14;

  TEST();

}

if (IN15 > 500) {

  Serial.println(" IN15: TEST ");

  speck = S15;

  TEST();

}

if (IN16 > 500) {

  Serial.println(" IN16: TEST ");
```
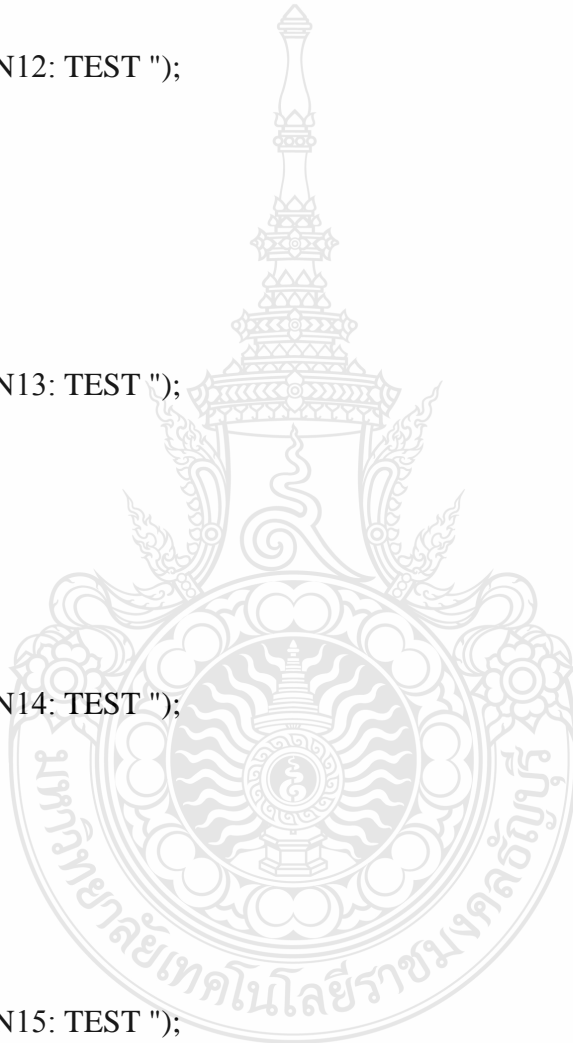
```
  speck = S16;

  TEST();

 }

/* mp3_play (S1);

 delay (20000);

 mp3_play (S2);

 delay (20000);

 mp3_play (S3);

 delay (20000);

 mp3_play (S4);

 delay (20000);*/

/////////////////////////Ch////

if (StateCh1 == HIGH)//แดง

{

 mp3_play (65);

 delay (5000);

 S1 = 1;

 S2 = 2;

 S3 = 3;

 S4 = 4;

 S5 = 5;

 S6 = 6;

 S7 = 7;

 S8 = 8;

 S9 = 9;

 S10 = 10;

 S11 = 11;
```

```
    S12 = 12;
    S13 = 13;
    S14 = 14;
    S15 = 15;
    S16 = 16;
}
if (StateCh2 == HIGH)//ม่วง
{
    mp3_play (66);
    delay (5000);
    S1 = 17;
    S2 = 18;
    S3 = 19;
    S4 = 20;
    S5 = 21;
    S6 = 22;
    S7 = 23;
    S8 = 24;
    S9 = 25;
    S10 = 26;
    S11 = 27;
    S12 = 28;
    S13 = 29;
    S14 = 30;
    S15 = 31;
    S16 = 32;
}
```

```
if (StateCh3 == HIGH)//เหลือง

{

 mp3_play (67);

 delay (5000);

 S1 = 33;

 S2 = 34;

 S3 = 35;

 S4 = 36;

 S5 = 37;

 S6 = 38;

 S7 = 39;

 S8 = 40;

 S9 = 41;

 S10 = 42;

 S11 = 43;

 S12 = 44;

 S13 = 45;

 S14 = 46;

 S15 = 47;

 S16 = 48;

}
if (StateCh4 == HIGH)//เขียว

{

 mp3_play (68);

 delay (5000);

 S1 = 49;

 S2 = 50;
```

```
    S3 = 51;
    S4 = 52;
    S5 = 53;
    S6 = 54;
    S7 = 55;
    S8 = 56;
    S9 = 57;
    S10 = 58;
    S11 = 59;
    S12 = 60;
    S13 = 61;
    S14 = 62;
    S15 = 63;
    S16 = 64;
}
Serial.print(" S1: "); Serial.println(S1);
Serial.print(" S2: "); Serial.println(S1);
Serial.print(" S3: "); Serial.println(S2);
Serial.print(" S4: "); Serial.println(S4);
Serial.print(" S5: "); Serial.println(S5);
Serial.print(" S6: "); Serial.println(S6);
Serial.print(" S7: "); Serial.println(S7);
Serial.print(" S8: "); Serial.println(S8);
Serial.print(" S9: "); Serial.println(S9);
Serial.print(" S10: "); Serial.println(S10);
Serial.print(" S11: "); Serial.println(S11);
Serial.print(" S12: "); Serial.println(S12);
```

```
Serial.print(" S13: "); Serial.println(S13);

Serial.print(" S14: "); Serial.println(S14);

Serial.print(" S15: "); Serial.println(S15);

Serial.print(" S16: "); Serial.println(S16);

}

void TEST()

{

Serial.print(" S: "); Serial.println(speck);

int StateS = digitalRead(inS);

if (StateS == HIGH)

{

 mp3_play (speck);

 delay (20000);

}

}
```
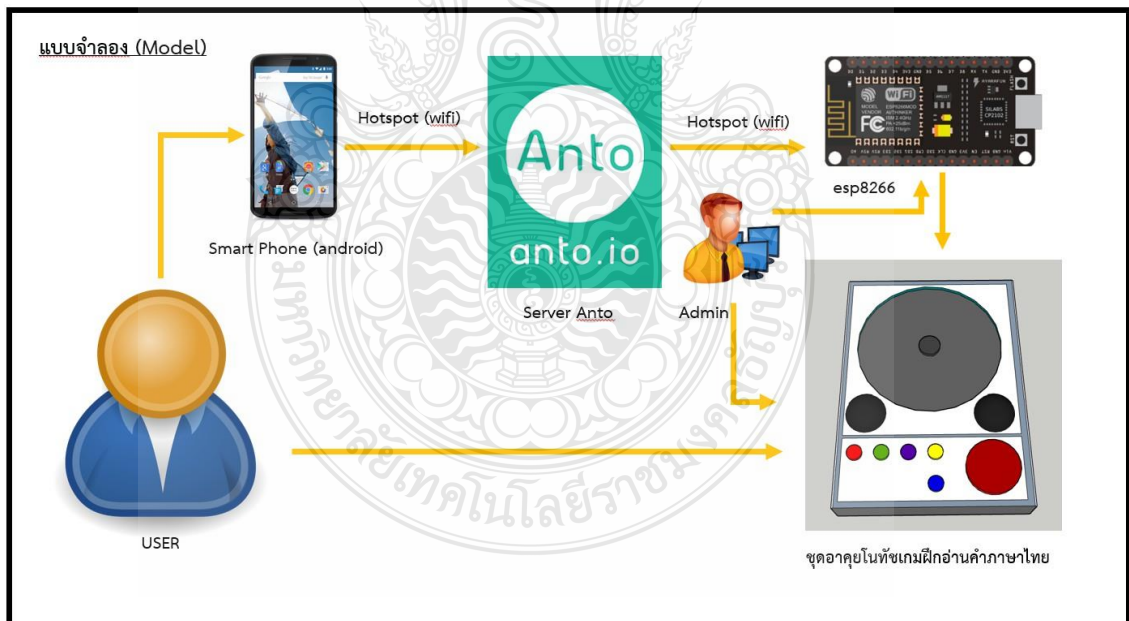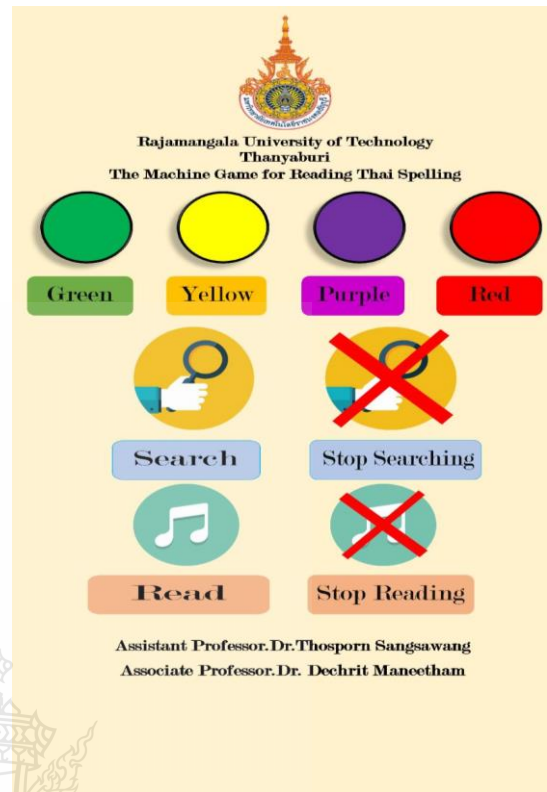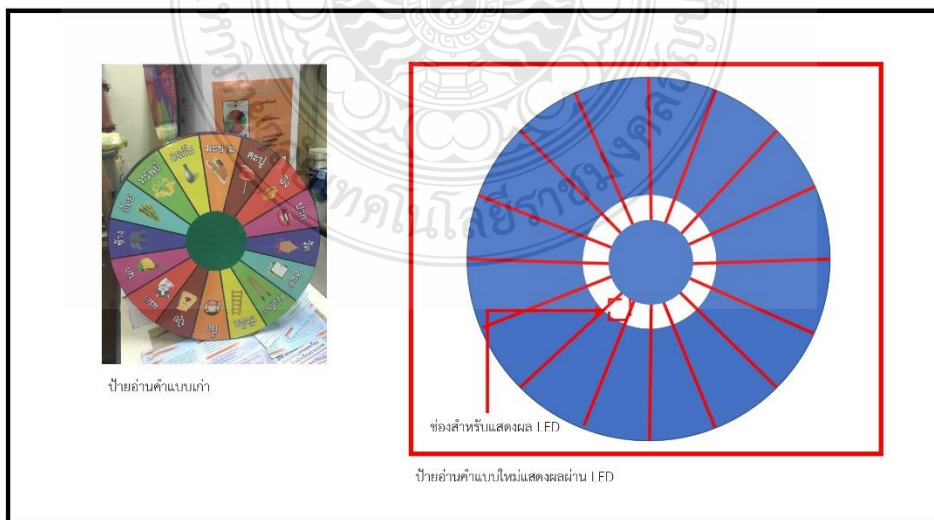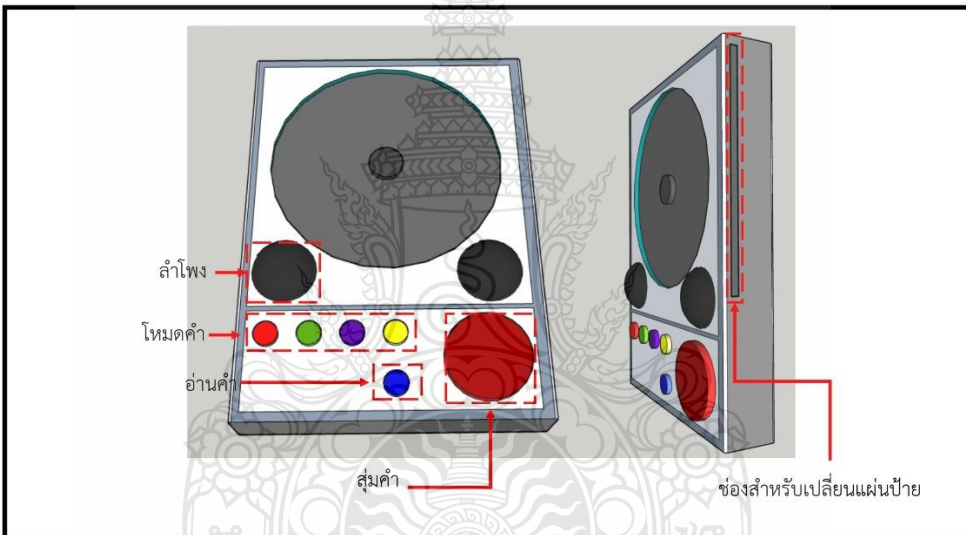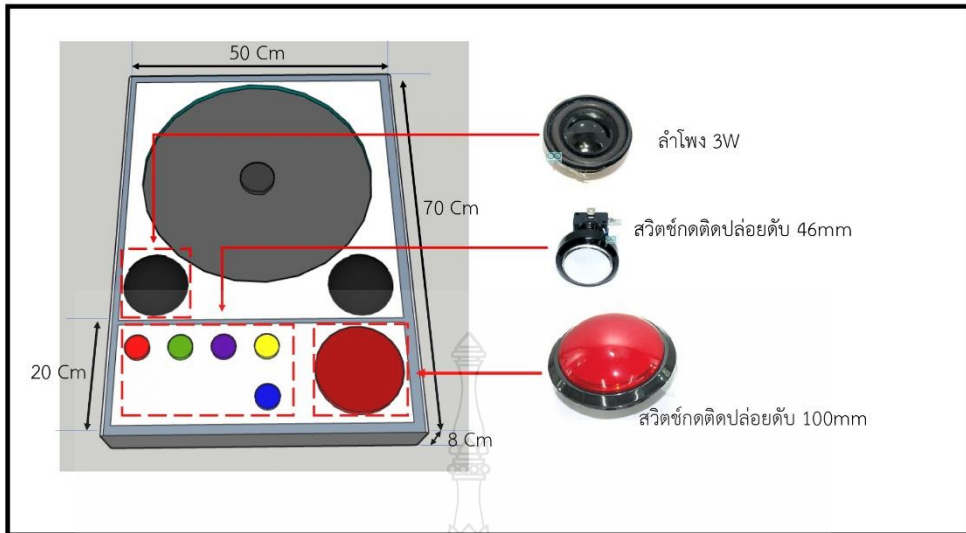
APPENDIX C

Picture of the Machine Game Automatic for Reading Skill Using

Internet of Things

Rajamangala University of Technology
Thanyaburi
The Machine Game for Reading Thai Spelling

Green Yellow Purple Red

Search Stop Searching

Read Stop Reading

Assistant Professor.Dr.Thosporn Sangsawang
Associate Professor.Dr. Dechrit Maneetham

แบบจำลอง (Model)

Hotspot (wifi)   Hotspot (wifi)

Smart Phone (android)   Server Anto   esp8266

Admin

USER

ชุดอาคุยโนทัชเกมฝึกอ่านคำภาษาไทย

50 Cm

70 Cm

20 Cm

8 Cm

ลำโพง 3W

สวิตช์กดติดปล่อยดับ 46mm

สวิตช์กดติดปล่อยดับ 100mm

ลำโพง

โหมดคำ

อ่านคำ

สุ่มคำ

ช่องสำหรับเปลี่ยนแผ่นป้าย

ป้ายอ่านคำแบบเก่า

ช่องสำหรับแสดงผล LED

ป้ายอ่านคำแบบใหม่แสดงผลผ่าน LED

คุณสมบัติของเครื่อง

7. ขนาดเครื่อง 50 เซนติเมตร × 70 เซนติเมตร

แบบจำลอง (Model)

ชุดตาคุยโนทัชเกมฝึกอ่านคำภาษาไทย

คุณสมบัติของเครื่อง

1. ระบบการทำงานอัตโนมัติ อ่านคำได้ 4 หมวด
2. ระบบการทำงานอินเทอร์เน็ตอัตโนมัติผ่าน App
3. ระบบการสุ่มคำด้วยการประมวลผลด้วย LED
4. ระบบสุ่มเค้าด้วยการประมวลผลแสดงผล
   ด้วย Sound
5. ระบบเปลี่ยนแผ่นป้ายคำศัพท์
   และแผ่นป้ายคำศัพท์ 4 หมวด
6. ระบบควบคุมไร้สาย

มหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี
ชุดกิจกรรมเกมส์ มาตราตัวสะกด

สีเขียว

สีเหลือง

สีม่วง

สีแดง

ค้นหาคำ

หยุดค้นหาคำ

ฝึกอ่านออกเสียง

หยุดฝึกอ่านออกเสียง

ผู้ช่วยศาสตราจารย์ ดร. ทศพร แสงสว่าง
รองศาสตราจารย์ ดร. เทอฤทธิ์ มณีธรรม

เกมการเรียนรู้อัตโนมัติสำหรับการอ่านคำภาษาไทยด้วย IoT

START ไปสนุกกันเถอะ

คู่มือการใช้งาน

ออกจากระบบ

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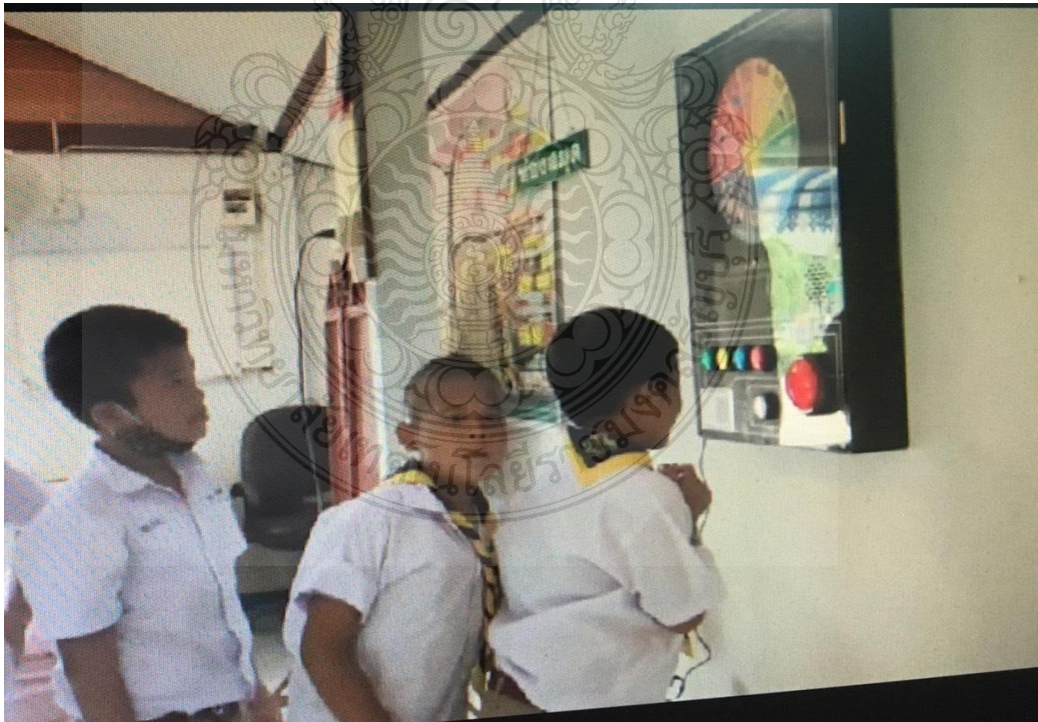# มทร.ธัญบุรี มอบเครื่องช่วยอ่าน และสะกดคำภาษาไทยอัตโนมัติให้ 23 โรงเรียนในเครือข่าย

รศ.ไพบูลย์ แย้ม-
เผื่อน ที่ปรึกษา มทร.
ธัญบุรี มอบสื่อ "ชุดอา-
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อ่านคำภาษาไทย" ให้
23 โรงเรียนเครือข่าย
เพื่อพัฒนาครูกลุ่มสาระ
การเรียนรู้ภาษาไทย.

APPENDIX D

Publication: International Journal

Miss.Thosporn Sangsawang. SCOPUS : https://orcid.org/0000-0002-7926-6949

Sangsawang, T., and Maneetham, D., Muktiarni, M. (2020). The Machine game automatice for reading skill using internet of things. **Journal of Engineering Science and Technology Speccial Issue of AASSEEEC 2020**, December (2020). pp.47-54. SCOPUS (Q2)

Sangsawang, T., and Maneetham, D. (2020). The machine game for development in reading skill of learning disabilities students. **International Journal of Advanced Science and Technology**, 29(7s), pp.251-261. SCOPUS (Q3)

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THE MACHINE GAME AUTOMATIC FOR
READING SKILL USING INTERNET OF THINGS

THOSPORN SANGSAWANG[1], DECHRIT MANEETHAM[1,*], M. MUKTIARNI[2]

[1]Department of Mechatronic Engineering, Faculty of Technical Education,
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[2]Universitas Pendidikan Indonesia, Jl. Setiabudhi No. 229 Bandung 40154, Indonesia
*Corresponding Author: dechrit_m@rmutt.ac.th

Abstract

The machine game automatic for reading skills via the Internet of Things as a self-learning activity has been helping students to read and improve their reading skills. This research aims to find the machine's effectiveness via IoT's overall satisfaction. Thirty students were randomly selected from the 23 school networks. The pretest was their reading skills before introducing the self-learning activity package followed by a posttest and a satisfaction questionnaire. The t-tests were used to analyse the data. E_1/E_2=82.25/81.56 as the hypothesis, the average percentage of study scores (E_1) = 82.25 and the average rate of a posttest (E_2) = 81.56. Analysis results can see in the posttest (M=17.61, SD.=1.55) shows that the reading skills of the students improved significantly from the pretest (M=15.44, SD.=0.89), t (4.07) =17.61, p<.05., and Sig.(2-tailed=0.0025). The total average for the satisfaction of learning disabilities equals 4.80 with a standard deviation equals 0.50. They were satisfied and found the self-learning activity via machine useful.

Keywords: Automatic, Internet of thing, Machine game, Reading skill.

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The equation that forms this circuit explant to Kp, and it will change the proportion of the error value. The proportional response can be achieved by multiplying the error value by a constant. Ki is an integral extension. It is proportional to the error's size and the duration of the error. Kd is the rate of change of the process error and is calculated from the slope of the error.

4.3. The block diagram of the machine game for reading skills via IoT.

Chart diagram of the automatic machine for reading skills via IoT is shown in Fig. 4

Fig. 4. The block diagram of the machine game for reading skills via IoT.

The precision from the calculations and the results were compared to available data in the structure of the machine game automatic for reading skills via IoT, as shown, and are selected for this purpose.

4.4. Plant of the machine game automatic for reading skills via IoT.

The fundamental reason for applying IoT is predictive maintenance to manage your assets. Figure 5 describes the analytical methods and design charts used to predict the plant of the machine game automatic for reading skills via IoT.

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This research also concentrates on machine game automation through IoT. This system is advantageous mainly in reading skills, word category, reading practices self-learning. The machine game can change memory cards and more word categories. It can be integrated into learning in the English word category and count numbers in Mathematics. Figure 5 describes the IoT application for control of the machine game via IoT. The communication via IoT will is infinite, and hence we get to control the devices from anywhere in the classroom. The internet-enabled microprocessor obtains data from the cloud, and the data is transferred from the android game.

The automatic machine game for reading skills via IoT uses the ESP8266 board to write the code to control the machine game automatic for reading skills via IoT [6]. The machine game uses the Arduino board in reading skills to develop the reading skill for students with learning disabilities. The respective data will be obtained, collected, and

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The mechatronic helps create this machine game via the Arduino code and Node MCU 8266 control. The control theory for mechatronics engineering is related to the synergistic combination of electronics, mechanical, computer engineering, control, and the critical factor being the integration of these areas. The structure of the machine game for reading skills via IoT describes in Fig. 1. The mechatronic control engineering specialization covers the fundamental scientific principles and technologies used in the

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design of modern computer-controlled machines and procedures, and also it focuses on the synergies in the design process.
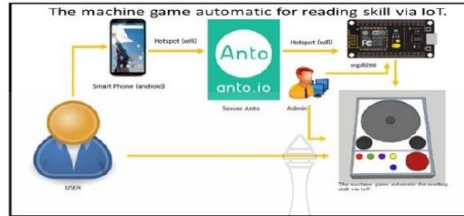
Fig. 1. Structure of the machine game for reading skills via IoT.

3. Method

The research sample involved thirty students with learning disabilities that were randomly selected from the 23 school networks. The students registered for the self-learning activity via machine game. The variables independent are a machine game for students with learning disabilities reading skills development. Also, the dependent variables are the efficacy of the machine game for development in the reading skill of students with learning disabilities, the student's achievement, and students who are satisfied with the machine game for development in teaching disabled students. Data amassment experimented with the researcher. A specific selection chose the sample one group for the pretest-posttest design learning. Statistics and amassment data after the experiment and calculation E_1/E_2 for the mean (x) and then compared. Arrangement for the experimental model by offline and online in the process for students' self-study, the researcher puts some data amassment. Based on cooperation with 23 the school networks, the reading skills for learning disabilities were planned by analysing the course, the course objective, determining the behavioral purposes, and analysing students' condition. Process learning by using the machine game for students with learning disabilities reading skills development conducted in three steps.

3.1. Conceptual framework.

The conceptual framework in this study is divided into two main sections, namely independent and dependent (see Fig. 2).

Fig. 2. Conceptual framework the machine game automatic for reading skills via IoT.

3.2. Data analysis.

The statistics used to analyse data to find the efficacy of the machine game for students' development in reading skills by E_1/E_2. To compare the achievement of students, it was scrutinized between pretest and posttest on the machine game of Arduino boa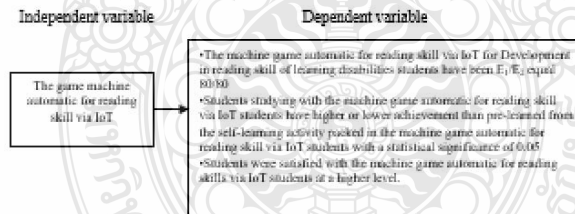rd via Node MCU 2866. To assess students' satisfaction in the machine game, was conducted using the mean and standard deviation.

4. Results and Discussion

4.1. The efficiency of the machine game in reading skills.

The efficiency of the machine game by Arduino board via Node MCU 2866 can be enhanced by practicing reading skills and developing reading skill for students with learning disabilities. The analysis results are the machine game in reading skill aptitude for learning in developing the reading skill for students with learning disabilities with pretest and posttest. The research found that the machine game in reading skills can be learned, and the development of the reading skill based on the average criteria equals 82.25/81.56. The efficiency of the students after the study is higher than before the course, with the average equal 15.44 and stand vision equals 0.89. The standard after the study equals 17.61 with a standing vision equals 1.55, t-test equals 4.07, which is different significantly on statistics at the level 0.05 and Sig. (2-tailed=0.0025). Students' satisfaction on the machine game in reading skills equals 4.80 with a standard deviation equals 0.50.

4.2. The PID term is achieved with gain, and respectively.

The PID algorithm guarantees all control sensors and controls the sign of the word and sound. Node MCU controls via Wi-Fi. The process is the machine's set point knowing which word to stop when they see the sensor and take timing when students push the stop button, and students can control themselves. Students were in secondary education. PID parameter will control the D.C. motor position via an encoder. The automatic machine game for reading skills via IoT is used and the block diagram [5]. The PID term is achieved with gain and respectively as displays in Fig. 3. The PID term is achieved respectively.
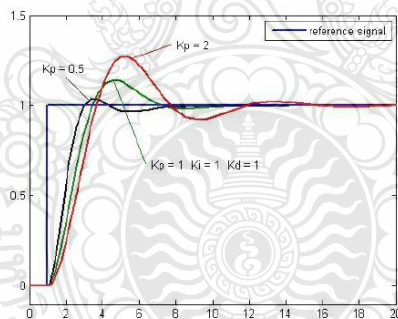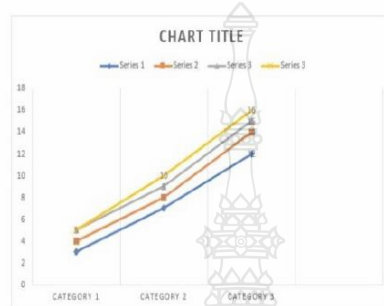

Fig. 3. The PID term is achieved with gain and, respectively, of the machine game for reading skills via IoT.

The equation that forms this circuit explant to Kp, and it will change the proportion of the error value. The proportional response can be achieved by multiplying the error value by a constant. Ki is an integral extension. It is proportional to the error's size and the duration of the error. Kd is the rate of change of the process error and is calculated from the slope of the error.

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transferred to the cloud services. Thus, the microprocessor can access this data, and the appropriate signals were sent to the appliances to match the Internet of Things (IoT).
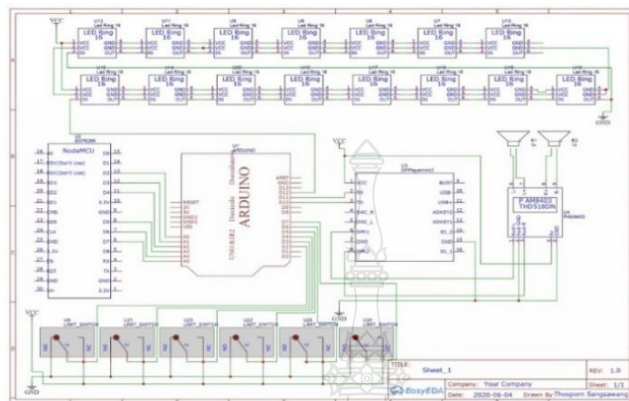
Fig. 5. Analytical methods and design charts used to predict the plant of the machine game automatic for reading skills via IoT.

The research found that activities given gradually to develop the reading skills for students with learning disabilities results in learning and increases students' interest and enthusiasm in their studies. After the study, the student's efficiency is higher than before with the average equal *to* 15.44 with a standard deviation equals *to* 0.88. The average after the study equals *to1* 7.61, with a standard deviation equals *to* 1.55. The t-test analysis between before and after learning is equal *to* 17.61, which is different significantly on statistics at the level 0.05 and the satisfaction of the students towards the machine game by Arduino board in is in the average of 4.80 at the significant level.

The students have a high level of satisfaction, with an average of 4.07. Students have improved knowledge and enjoyment, including taking action and being willing and enthusiastic about their studies, and performing their work correctly. They were more organized in the workplace because everyone has practiced it, which helped them to learn as well as being able to learn independently. There is also a mutual exchange of knowledge that allowed students to develop according to their potential by having teachers plan, encourage, challenge, encourage, and guide the way to find the right knowledge.

When students learn with the machine game, they will get the metacognition, gain learning strategies, and become active students. It empowers them tremendously because they understand that thinking and learning are processes that they can control. The machine game is a learning strategy that helps the learner engage with, process, remember, or apply information. The machine game helps the learner engage cognitively. They can remember the word and have reading skills. IoT technology is utilized to incorporate information technology and network image processing to create a monitoring and warning system for collecting field information. The machine

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game automatic for reading skills via IoT should be managed by following the constructivism theory.

The development of multimedia games in utilizing sign language for deaf children is the systematic development of instructional specifications. Then, to ensure instructional quality, they use learning and instructional theory. Now, the functionality of it has been shifted to electronic control as a machine game with electronic control features [7]. It is the process of analysing learning needs and goals and developing a delivery system to meet those needs. It includes instructional materials and activities and tries out an evaluation of all instructional and learner activities. The machine game automatic for reading skills via IoT should be according to Constructivism theory when using sign language should facilitate Self–Discovery Learning [8].

Game instruction is one of the solutions to overcome problems that occur in learning activities. Therefore, the machine game can be categorized as very good both in terms of material and media. The results of student response test results showed an average value of 79.35%, which means that the students are interested in the game developed, games can be used independently by students, and can increase learning motivation and students' learning outcomes [9]. The achievement cannot be separated from a collaboration between regular machine games and students. They play a role in conveying instructions to be simple and concrete. The educational media can make students with learning disabilities be more focused. During the learning activities, it is beneficial because the characteristics of students with learning disabilities are more likely to have short-term memories [10,11]. The machine game automatic for reading skills via IoT uses the ESP8266 board, writes the code to control the machine game automatic for reading skills via IoT. Transfers new knowledge such as the Tyndall effect in the colloidal system to them [12].

5. Conclusion

Automated game machines for reading skills through IoT as a self-learning activity have helped students to read and improve their reading skills. Comparing students who improved between pretest and posttest on machine games with mechatronics help make this machine play through Arduino code and reading skills of the MCU 8266 Node control. Broadly speaking, students were satisfied and found self-learning through machines beneficial.

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26	Serangga	journal	0.241 Q4	4	34	96	1300	62	96
27	Jurnal Komunikasi: Malaysian Journal of Communication	journal	0.240 Q3	9	109	270	4573	245	270
28	International Journal of Business and Society	journal	0.236 Q3	15	105	303	4772	295	303
29	Asian Academy of Management Journal	journal	0.234 Q3	14	16	70	1060	88	69
30	Planning Malaysia	journal	0.232 Q2	7	98	264	2435	126	263
31	Journal of Engineering Science and Technology	journal	0.224 Q3	27	331	968	8871	925	968
32	Malaysian Forester	journal	0.223 Q3	8	30	77	874	38	77
33	Journal of Advanced Manufacturing Technology	journal	0.221 Q3	5	23	229	416	104	229
			0.218						

The Machine Game for Development in Reading Skill of Learning Disabilities Students

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Abstract

The machine game for development in reading skills of learning disabilities students, a self-learning activity has developed to help differently-abled students to improve their reading skills. This study aims to find the effectiveness of this machine and the overall satisfaction of students. Nine students were randomly selected and voluntarily participated in this study. A pre-test was conducted to assess their reading skills prior to the introduction of the self-learning activity package followed by a post-test and a satisfaction questionnaire. Descriptive statistics and t-test were used to analyse the data. The post-test (M=16.11, SD.=1.05) showed that the reading skills of the students improved from the pre-test (M=14.44, SD.=0.88) significantly, (4.08) =17.60, p<0.05 students were also satisfied and found the self-learning activity via machine useful.

Keywords: machine game, reading skill, learning disabilities

1. Introduction
1.1. The Machine Game

The machine game guide's conduct is grounded in empathic and instructive methodologies, expanding on past work. The machine game helps the student utilizing educational activities, for example, prompts, siphons and joins dependent on task execution, recorded expertise levels, and time in task. The machine game coach screens student's emotional states, levels of valence and excitement that are then used to adjust the utilization of educational activities. For instance, if the student is in a condition of low valence and excitement, which shows a condition of tiredness or fatigue the conduct of the machine game will be to engage and draw in the student. In the event that the student has positive valence recognizing states where the student is glad or loose, at that point the measure of educational activities are decreased. At the point when the student is disappointed, increasingly educational assistance is given. Social abilities preparing of kids with mental imbalance range issue (ASD) isn't a simple issue enough to regularly invest a ton of energy and redundant endeavors. As methods for help, we propose and look at the plausibility of a mechanical conduct intercession framework to encourage social advancement of the youngsters with ASD and mitigate operational weight during preparing process. To this end, in view of notable social treatment conventions, the machine game framework fuses automated incitement structure, acknowledgment modules for human exercises, and fortification method in the connection conspire plan. Utilizing these setup, it more than once play out a job of preparing eye to eye connection and perusing feelings focused at preschoolers with an advanced level in the arranged preparing process. Through demonstrating a preferred position in a relative investigation with control bunch educated by people, we checked that the proposed framework can add to bring out constructive reaction of kids with ASD and give work sparing impact on the clinical condition. With the progression in apply autonomy, more consideration has been paid to the advancement of instructive help robots that help with learning. Albeit most existing examinations report the impacts of community oriented learning between instructive help robots and solid kids, since the quantity of youngsters with formative issue in elementary schools has expanded yearly, it is important to create instructive help robots for kids with advancement issue. In this manner, an ongoing report built up a robot that shows kids with formative issue. Notwithstanding, existing examinations do not announce instructive help robots for kids who have potential manifestations of an advancement incapacity, additionally alluded to as "hazy area

youngsters." This investigation researches impacts of community oriented learning among robots and hazy area kids. In shared learning, the youngster and the machine game then again read out loud one page of educating material. These youngsters have side effects like ADHD and trouble learning over extensive stretches of time. The machine game is intended to work by the Wizard of Oz technique and cooperates with youngsters continuously.

1.2. Learning Disabilities

They are can neither see nor contact the components of their subject. At the point when educators bring conceptual ideas into professionally based learning, there can be wrong thoughts about the ideas instructed in class when just conventional materials are accessible. Terms, one must think about the suitable blend of conventional scholastic aptitudes, explicit understanding abilities, and nonexclusive, non-scholarly abilities, for example, correspondence, inspiration, and obligation. The arrangement is comparable, recognizing intellectual, specialized, and conduct aptitudes. A portion of every one of the three sorts of aptitudes required for almost all employments, the degrees of the various kinds of ability shift across readings [1]. Learning disabilities were commonly identified learning and performance characteristics, although all students with intellectual or multiple disabilities are distinct, several informal learning and performance characteristics have been identified. These characteristics should be addressed when planning individual programmers and instructions. The quantity of aptitudes gains from understudies with scholarly or different handicaps will be not exactly most understudies as they will learn them gradually [2]. This trademark brings about less aptitudes obtaining. Because of the less aptitudes learned, educators ought to guarantee that the abilities they instruct are useful to the understudy's present and future situations. There are many complex skills that a student with intellectual or multiple disabilities may not be able to acquire because of the complexity of skills.

1.3. Skill Learner

The complex skills can be learned but will take longer time and effort. The importance of teaching functional skills for the student is again emphasized. The number of instructional opportunities and the amount of time needed for students to acquire skills by most students with intellectual or multiple disabilities require several learning opportunities before a skill is acquired [3]. Forgetting and recoupment of many students who have acquired skills will show a decrease in the performance of that skill if they do not use it for some time. It will take most students with an intellectual or multiple disabilities more time and instruction to return to their former performance level than it would be for a non-disabled student. Transfer and generalization, cannot be assumed that a skill acquired in one environment will automatically be performed elsewhere. Most students with intellectual or multiple disabilities have difficulty transferring or generalizing a skill from one context to another. They may require instructions in each of the environments where the skill is being used. There will be difficulty to put together or synthesizing skills learned in several contexts to use in a new context [4].

Therefore, the researcher needs to research in The Machine game for Development in Reading Skill of Learning Disabilities Students for Learning in the development of reading skills for Learning disabilities for developing reading skills. Such as to be adequate in the reading skills, learning skills, critical thinking skills, and the creation of works for promoted of a successful teaching experience The machine game by Arduino board in reading skill for Learning in the development of reading skills for Learning disabilities students. It will commonly identify the learning and performance characteristics, although all students with intellectual or multiple disabilities are distinct, several everyday learning and performance characteristics have been identified. These characteristics should be addressed when planning individual programmers and instructions.

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2. Methodology

2.1. Objectives

a. To find the efficacy of the machine game for development in reading skill of Learning disabilities students.

b. To compare students' achievement between pre and post on the machine game for development in reading skill of Learning disabilities students.

c. To assess the student's satisfaction with the machine game for development in reading skill of Learning disabilities students.

2.2. Hypothesis

H1-The efficacy of the machine game for development in reading skill of Learning disabilities students $E_1/E_2 = 80/80$

H2-Students studying with the machine game for development in reading skill of learning disabilities students have higher or lower achievement than pre-learned from the machine game for development in reading skill of learning disabilities students with statistical significance 0.05

H3-Students' satisfaction level with the machine game for development in reading skill of Learning disabilities students at a higher level

2.3. Sample of the Study

Research process used the population are the sample of this   research was learning disabilities students, nine students from a secondary school in Nonthaburi School that registered for the development of the reading skill courses during the first semester of 2019.

2.4. Conceptual Framework

Independent variable

Dependent variable

| The machine game for development in reading skill of learning disabilities students. | → | 1. The efficacy and development in reading skill for students have been E_1/E_2 equal 80/80
2. Students of reading skill have higher or lower achievement than pre-learned with statistical significance 0.05
3. Students were satisfied in reading skill at a higher level. |

Figure 1. Conceptual Framework the Machine game for development in Reading Skill of Learning Disabilities Students

2.5. Measures of the Study

The following scales were used in the present study in variables: independent variables are the machine game for development in reading skill of learning disabilities students. Also, dependent variables:

a. The efficacy of the machine game for development in reading skill of learning disabilities students.

b. The student's achievement.

c. Students are satisfied with the machine game for development in reading skill of learning disabilities students.

2.6. Content's Scope

In this research is used in semester two at Nonthaburi school for learning disabilities students, Nonthaburi includes to Reading skills in Thai language.

2.7. Data Assessment

The researcher experimented. A specific selection selected the sample. An experiment was one group pretest-posttest design. The measure and statistics and amassment are the self-learning activity-packed, pre-test, and post-test, questionnaire of satisfying data was Mean, Standard Definition, t-tests the dependent sample. Statistics and amassment data after the experiment and calculate (O1) and (O2) for Mean (x) and also compared, arrangement for the experimental model by offline in process, for students to learn by themselves, the researcher puts some data amassment as follow.

a. Request for cooperation with Nonthaburi School.

b. Plan the reading skill for learning disabilities subject by analyzed the course in, course objective; determine behavioral objectives, students' analysis.

c. Process learning by used the machine game for development in reading skill of learning disabilities students there are three steps as follows goal of learning, creative thinking, construction knowledge; pre-test; points; post-test; assess student's satisfaction; check pre-test and post-test.

2.8. Statistical Analysis

Data analysis used the statistics to analyze data. The efficacy is of the machine game for development in reading skill of learning disabilities students' subject by E1 / E2. Compare achievement of learning disabilities to students improve between pre and post on the machine game Arduino board in reading skill for learning in the development of the reading skill by pre-test and post-test as a research instrument. To assess learning disabilities students' satisfaction on the machine game for development in reading skill in the development of the reading skill by Mean, Standard Definition.

3. Results and Discussion
3.1. Results

Descriptive of the efficacy of the machine game by Arduino board in reading skill for learning in the development of the reading skill for learning disabilities students. (N=9).

Table 1: The Efficacy of the Machine Game for Development in Reading Skill of Learning Disabilities Students

The Machine Game by Arduino Board in Reading Skill for Learning in the Development of the Reading Skill for Learning Disabilities Students	The Average Percentage of Study Scores (E_1)	The Average Percentage of Post-Test (E_2)	E_1 / E_2
The invention of wallets from rags	81.55	82.65	
The invention of resin mobile phone frame	81.55	81.55	
The invention of gel candles	81.65	81.85	
The invention of flannel dolls keychains	81.00	81.98	
The invention of flower garlands	81.25	81.25	81.25/80.56
The invention of the pencil case	81.15	81.85	
The invention of wallets from plastic	81.50	81.65	
The invention of dolls case from plastic	81.00	81.59	
Average total	81.25	81.56	

From Table 1 shows that the efficacy of the machine game by Arduino board in reading skill for Learning in the development of the reading skill for Learning disabilities subject as follows

80/80 or E_1/E_2 = 81.25/80.56 as the hypothesis, the average percentage of study scores (E_1) = 81.25 and the average percentage of post-test (E_2) = 80.56.

The machine game by Arduino board in reading skill for Learning in the development of the reading skill for Learning disabilities students, analysis results can see in the following Table 2.

Table 2: Compare students improve achievement between Pre-Test and Post-Test

Experiment	Score	Mean	SD.	Percent	Average	E_1/E_2	t	Sig. (2-tailed)
Pre-test	20	14.44	0.88	81.25	65.00	81.25	4.08	0.0035
Post-test	20	16.11	1.05	80.56	17.11	80.56		

**significant at 0.05 level, (N=9)

From Table 2 shows the analysis results of the machine game by Arduino board in reading skill for Learning in the development of the reading skill for Learning disabilities with pre-test and after that students to learn and post-test as following with objectives. The efficiency of the machine game by Arduino board in reading skill for learning in the development of the reading skill for Learning disabilities students. The research found that the efficiently of the machine game by Arduino board in reading skill for Learning in the development of the reading skill based on the average criteria equal to 81.25/80.56, the efficient of the student after the study is higher than before the study, with the average equal to 14.44 and stand vision equal to 0.88. The average after the study equals to 16.11 with stand vision equal to 1.05, t-test value before and after the study equal to 4.08, which is different significantly on statistics at the level 0.05 and Sig.(2-tailed=0.0035).

Show by the mean and standard deviation for students' satisfaction on the machine game by Arduino board in reading skill for learning in the development of the reading skill for Learning disabilities students.

Table 3: Students Satisfaction on the Machine Game by Arduino Board in Reading Skill for Learning in the Development of the Reading Skill for Learning Disabilities

	Item	$\bar{x}$	SD.	Results (Satisfaction levels)
1	Teachers have to teach preparation on the machine game by Arduino board in reading skill for learning	5.00	0.00	The most
2	The content of the study is appropriate for the learners in reading skill for learning.	5.00	0.00	The most
3	The content studied helps to increase knowledge and understanding of the invention even more in reading skill.	5.00	0.00	The most
4	The study duration is appropriate.	4.89	0.33	The most
5	Teachers use the machine game for the equipment was suitable with LD students.	5.00	0.00	The most
6	Teachers intend to teach and give advice to LD students in activities.	4.89	0.33	The most
7	The teacher encourages LD students to have the initiative and to reading skill in Thai's word.	4.89	0.33	The most
8	Learning disabilities are involved in learning activities.	4.67	0.50	The most

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	Item	$\bar{x}$	SD.	Results (Satisfaction levels)
9	The materials and equipment for the invention are sufficient for LD students, thus as Illustration and content colorful, engaging, able to communicate clearly.	4.78	0.44	The most
10	The test and exercises are appropriate for LD students.	4.89	0.33	The most
11	Learning disabilities were satisfied with the learning set reading skills training.	4.89	0.33	The most
12	Learning disabilities receive knowledge and new experience in reading skill.	4.89	0.33	The most
13	Learning disabilities can apply knowledge gained to practice as a supplementary career.	4.89	0.33	The most
	Total Average	4.90	0.51	The most

From Table 3, the satisfaction of learning disabilities is classified at the most -level all every item-total average equal to 4.90 with a standard deviation equal to 0.51. Learning disabilities at the development of the reading skill certificate level had on the average criteria equal to 81.25/80.56, the efficient of the student after the study is higher than before the study, with the average equal to 14.44 with a standard deviation equal to 0.88. The average after the study equals to 16.11 with a standard deviation equal to 1.05. The t-test analysis between before and after learning was t-test value before and after the study equal to 17.60, which is different significantly on statistics at the level 0.05 and the satisfaction of the students towards the machine game by Arduino board in reading skill for Learning in the development of the reading skill in the average of 4.90, considerable level. The students had a high level of satisfaction, with an average of 4.26. They had knowledge and enjoyment, including taking action and being willing and enthusiastic about their studies and being able to perform their work correctly. They were more organized in the workplace because everyone had practised it, which helped them to learn as well as being able to learn independently. There was also a mutual exchange of knowledge that allowed students to develop according to their potential by having teachers to plan, encourage, challenge, encourage, and guide the way to find the right knowledge. The machine game by Arduino board in reading skill for learning in the development of the reading skill for learning disabilities includes: Learning disabilities activities to develop the reading skill for Learning disabilities skills step by step, which results in learning and increase students' interest and enthusiasm in their studies. Arduino code for the machine game for development in reading skill of learning disabilities students [5].
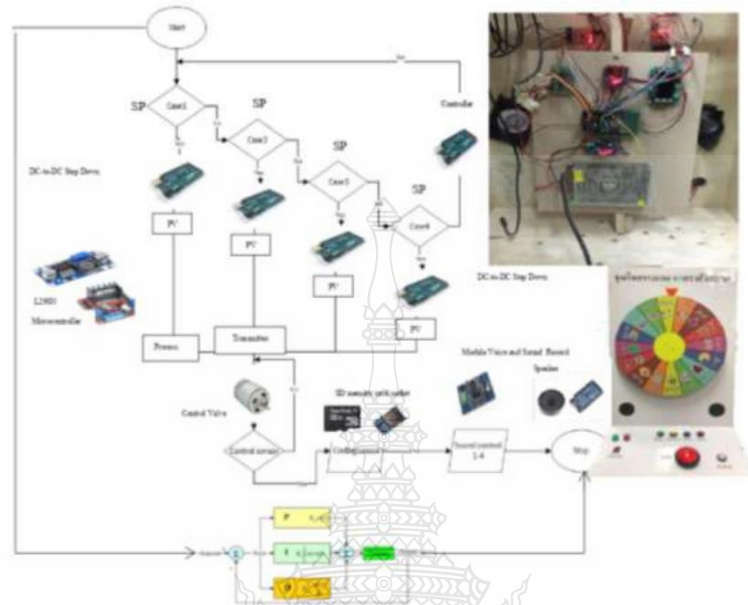
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Figure 1. The Arduino Code for the Machine Game

Flow crat of the machine game for development in reading skill of learning disabilities students, control, hard ware work with Arduino board.

**Figure 2. The Mechatronic Works with the Machine Game**

The mechatronic help to create this machine game via the Arduino code control, all mechanical of the machine game for development in reading skill of learning disabilities of students. There is a benefit to make its control bottom and sound, feedback, and stop that make the motivation for students. The board is in the border how to machine operation in reading skills for learning in the development of the reading skill for learning disabilities for students. The control theory for mechatronics engineering was related on the synergistic mix of mechanical, hardware, control and PC building. The key factor being the coordination of these regions during the plan procedure. The mechatronic control building specialization covers the central logical standards and innovations that are utilized in the plan of current PC controlled machines and procedures and put exceptional spotlight on the cooperative energies in the structure procedure.

The behaviors of a PID algorithm can be described as the input that it does guarantee, all control sensor and control the sign of the word and sound, and both of input and output regions are related by a set of rules [5]. The process was set point of the machine know that which word to stop when see sensor, and take timing when student push stop bottom, and student can control by them self. Students were Secondary education. They were fall in Thailangue, that they do not know their words, and they are can't read simple words. All this processes are confirm as in the result of the PID control is given as the PID term is achieved with gain and [6].

$$(u(t) = kpe(t) + kpe(t) + ki \int_0^t e(t)dt + kd \frac{de(t)}{dt} ..... u)$$

PID parameter will control DC motor position via an Encoder. The machine game is used to and block diagram show in Figure below.

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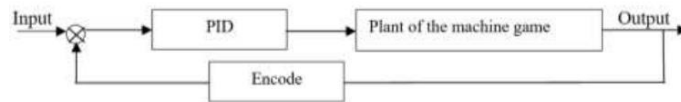
Figure 3. Block Diagram of the Machine Game

The use of the PID algorithm does guarantee, all control sensor and control the sign of the word and sound. The process was set point of the machine know that which word to stop when see sensor, and take timing when student push stop bottom, and student can control by them self. Students were Secondary education. They were fall in Thai langue, that they do not know their words, and they are cannot read simple words. When students learn with the machine game, they will get the metacognition, gain learning strategies, and become active students; it empowers them tremendously because they begin to understand that thinking and learning are processes that they can control. The machine game is a learning strategy, which helps the learner engage with, process, remember, or apply information. The machine game helps the learner engage cognitive, they can remember the word and have the reading skill.

Figure 4. The Machine Game Helps the Learner Engage Cognitive

The mechatronic help to create this machine game by Arduino board in reading skill for learning in the development of the reading skill for learning disabilities for students, the efficiency followed the aspect = 80.33/81.67 and 80/80 the learning disabilities students. They had higher achievement from the development of the reading skill with statistical significance 0.05 and student's satisfaction in high-level average. The researcher had noticed that students had more knowledge and enjoyment. The students had shown to take action with determination and enthusiasm. They enjoyed working with confidence. In accordance with the development of a multimedia courseware that can be used to educate children with Learning disabilities (LD).

3.2. Discussion

The game-based courseware helps with LD to investigate their abilities without forcing them to find different companions however to let them learn at their own pace of time. Mechatronic Control Engineering offers a developer that shows the understudy to make and control mechatronic frameworks and items and create correspondence with colleagues from different orders that the understudy ought to comprehend the significance of the incorporation of demonstrating and control building into the plan of mechatronic frameworks. The understudy comprehends and applies different controller structure systems.

e.g., traditional input control, state-space control, and Non-straight control strategies, that the understudy ought to gain a general comprehension of further developed control plan methods, e.g., course control, sliding mode control, versatile control, and criticism linearization that the understudy ought to comprehend the computerized usage of control systems and fundamental advanced structure procedures. That the understudy ought to have the option to utilize a microcontroller or DSP as a mechatronic framework part; and that the understudy ought to comprehend the programming and interfacing issues. The understudy had the option to apply skills to design a mechatronic system of the courseware. In [7] can be utilized as a medium to teach youngsters with LD, to animate their psycho-engine for utilizing the PC and furthermore to build up their reasoning aptitudes while having a ton of fun playing the games [8] as according to programming games show youngsters a few types of getting the hang of as per their own paced and some may be fulfilling. Other than that, games can likewise create dynamic commitment and enjoyment in learning and offer an influential arrangement for instructive conditions. In addition, contemplates have indicated that the utilization of deliberately chose PC games may improve thinking. Subsequently, numerous analysts have created games for instructive purposes [9], what's more, Education is one of the most essential stages since it effectively affects the individual's rest of life. Accomplished individuals add to citizenship life, expert, and public activity. Tragically, a few understudies have learning inabilities and must be dealt with and situated to the relating authorities to proceed with their Education effectively and to be powerful in the public eye later on [10]. The study has shown that learning disabilities can practically contribute to learning according to the student's satisfaction on the development of the reading skills because of the contents of the self-learning activity package is fun, colorful, enticing, and practical and the instructions are easy to follow [11]. Organization of teaching and learning activities, to achieve the objectives set by students, should be prepared by practicing the reading skill and the use of steps in the study through the self-learning activity-packed, in the development of the reading skill for Learning disabilities students, in detail at every step of organizing learning activities [12].

4. Conclusion

The learning under the machine game by Arduino board in reading skill for Learning in the development of the reading skill for Learning disabilities students applied to teach management at all levels of Education and all subject groups by adjusting the learning activities to be in line with the learning activities. Many participants may cause the learning management process not to meet the objectives of learning management. Creating manuals to prepare students to be as prepared as far as possible before practicing learning activities following the machine game by Arduino board in reading skill for Learning in the development of the reading skill for Learning disabilities students, according to the interest distributes the positive and significant influence on learning results. These suggestions agree in the learning process encourage the student to achieve a functional learning result Recommendations for the next research; the machine game by Arduino board in reading skill for Learning in the development of the reading skill for Learning Disabilities combines a model of a learning management process through the development of the reading skills in which teachers have activities that can interact with students at all times [13]. Establishing learning activities that consistently promote communication in the development of the reading skills between students and teachers or between students. Study of the effects of applying the learning model based on the machine game by Arduino board in reading skill for Learning in the development of the reading skills for Learning Disabilities through the

development of the reading skills to students' thinking process skills following other curriculum standards, such as creative thinking process skills, systematic thinking skills, and critical thinking skills. Study of the effects of applying the machine game by Arduino board in reading skill for Learning in the development of the reading skills for Learning Disabilities based learning styles through the development of the reading skills with students with different learning abilities to find ways to enhance students' ability [14].

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