

## Developing Thai Reading Skills for Primary School students by Tailoring Them to each Learner Using Machine Learning Technique

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### Abstract

The objective in this research is to solve Thai reading skills to primary school students with developing e-Learning system, which uses the Machine Learning technique for adapting the lesson in each student. The sample group in this research uses 350 students from many schools, which are in Bangkok. The efficiency of Machine Learning technique can memorize behavior of students, while those students are doing their exercises. For example, the students read Thai words in their exercises and the students cannot read some Thai words, e-Learning system records those Thai words and gives an opportunity to redo those exercises. Furthermore, Machine Learning technique can know the Thai reading skill when students used the system and can help to adjust the lessons, which are within this e-Learning system by to suit the potential of each individual. The results of this research are 1) the students more spent times for reading with the e-Learning system than spent times for reading with Thai books. In addition, and 2) this research can increase the reading skills to primary school students, who approximately increase ten percent.

**Keywords:** Machine Learning, e-Learning, primary school students, Thai reading skills.

### Introduction

Thai Language is a language that has been developed for a long time, has value, and is important to all Thai people. Therefore, the Thai language is a national identity and a cultural treasure that creates unity. In addition, the Thai language is also a communication tool to create consistent understanding and to meet the objectives. Moreover, the Thai language is also a tool for seeking knowledge to develop knowledge and to be creative to keep up with social changes.

Thai reading skill in the primary school students is the big problem to developing country. Because of, this skill is used to learn in each course. In addition, Thai reading skill can help the primary school students for developing the knowledge, thinking, intelligence and living in society. Therefore, Thai reading skill is very necessary for many students to grow and live normal lives in the future.

Currently, Thailand is still facing problems related to the COVID-19 epidemic. The province with the highest epidemic of the disease is Bangkok. Schools in Bangkok have adapted their teaching methods to teaching in an online format. In addition, it was also found that students preferred playing games over reading. According to the statistics report in 2018, the Thai reading of 173,837 primary school students in Bangkok found that 23,015 students with reading disabilities accounted for 13.24 percent [1]. In addition, it was found that the number of teachers teaching Thai subjects was insufficient for the number of students. Therefore, it affects the care of a large number of students and makes them unable to provide comprehensive care.

Nowadays, the world society must communicate. Learning can happen anytime, anywhere. The Ministry of Education has a policy to encourage students at all levels to have digital skills. Schools in Bangkok are most equipped with digital skills enhancement tools. However, online learning is still a problem for teachers and students. Because of, teachers in each field still lack the skills to create an online teaching model. Many teachers still choose to use different tools and programs. that are commercially available on the internet. From the survey of programs, the researcher found that it cannot be a program that improves teaching and learning for individuals. From the survey of programs, the researcher found that it cannot be a program that improves teaching and learning for individuals. Due to the problems and the situation of the epidemic of Covid-19, Thailand still has to change the teaching style to be *100* percent reliant on the use of internet technology. In addition, the development of Thai language learning among primary school students is urgently needed.

Therefore, the researchers are interested in solving the above problems. The researchers developed an e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique. Objective to solve problems related to primary school students in Bangkok who are unable to read.

Next will be a present on the relevant theoretical techniques, methodology, experimental results, and a summary of experimental results.

### **Theoretical Techniques and Related Researches**

#### *2008 Basic Education Core Curriculum*

The Ministry of Education has promulgated the basic education curriculum in the 2004 academic year in pilot schools and network schools, and has been introduced in general schools from 2003 to the present [2]. The main principles of this course are 1) as a course for national unity, 2) an education for all, 3) a decentralized education program, 4) a flexible program of study in terms of learning subject matter, time, and learning management, 5) a student-centered course, and 6) a formal and informal course of study.

#### *Principles of Reading Thai*

Institute for the Development of Academic Quality has said that Reading aloud words in Thai is an art that shows the reader's ability to pronounce correctly. Clear and convey emotions in accordance with the content of the reading. There are two types of Thai reading: *1)* prose reading and *2)* poetry reading. Prose refers to a beautifully arranged text. It is linguistically correct, but does not stipulate rules according to prosody. Poetry refers to words that are compulsory in composition. causing melodiousness from rhyme, rhythm and heavy sounds such as poems, Klong, Chan, Kap, and etc.

In addition, Thailand's reading comprehension experts have given an interesting read about reading comprehension, namely Noppawan Ketkamjorn (*2002*), meaning that is to read the text or the passage and be able to understand [3], Sakkriengkrai Panyawat (2005) defined that Reading comprehension is the process of perceiving through letters that requires knowledge, experience, or prior knowledge to be understood [4], and Krisada Phochairat (2013) defined it as reading information in order to understand the main idea [5].

The level of reading comprehension can be divided into *3* levels: *1)* Literal Level, *2)* Summary and Citation Level, and *3)* Critical Level.

#### *Machine Learning*

Machine learning is a branch of artificial intelligence that studies and builds algorithms that allow computers to learn from sample data or from their surroundings. Machine learning methods can create models or algorithms and apply or predict new data. The aim of machine learning is to improve or improve system performance [6],[7].

There are several types of learning as follows: *1)* Supervised learning. Supervisory learning is learning from the characteristics of the sample data in which the desired outcome or type is identified and then predicted by other data. who do not know the answer Instructor-based learning can be applied to data estimation, data

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classification, future data prediction, 2) Learning without an instructor (Unsupervised Learning), It's about creating a model that fits the data. without specifying the desired effect or type first. However, uneducated learning can be used to group data. (clustering) [7],[8].

The most popular and widely used algorithms used in Instructor Learning today are 1) Decision Trees, 2) Support Vector Machines, 3) Naïve. Bay, 4) K-Nearest Neighbor, and 5) Multi-layer Perceptron.

### *Support Vector Machine (SVM)*

Support vector machines are a popular technique in applications involving pattern recognition as well as solving problems in machine learning. Many SVM as well as nonconvex and more general problems with optimization, such as integer programming, bilevel programming, etc [9]. SVM is based on the principle of finding the coefficients of equations to form lines. It is best to separate the data segments that are fed into the teaching process for the system to learn by focusing on the discriminating lines.

When we consider a data consisting of two data groups as in equation 1.

$$D = \{(x_i, y_i); i = 1, 2, \dots, n\}, \quad (1)$$

$$\text{when } x_i = (x_{i1}, x_{i2}, \dots, x_{im}) \in R^m$$

Let  $y_i \in \{1, -1\}$  by 1 is the data of the first group and 2 is the data of the second group. Targeting SVM technique where SVM aims to find a decision function that can distinguish unknown values as in equation 2.

$$f(x) = \text{sign} \left\{ \sum_{k=1}^{n_v} w_k \varphi_k(x) \varphi_k(x_k) + b \right\} \quad (2)$$

$$\varphi(x) = [\varphi_1, \varphi_2(x_2), \dots, \varphi_n(x_{n_v})]^T \quad (3)$$

The x data group from equation 3 cannot be distinguished by linear equation, but it is converted into a form that can be used to distinguish straight-line equations. using the kernel function as shown in equation 4.

$$K(x, x_k) = \varphi(x) \varphi(x_k), \quad (4)$$

when  $\varphi(x)$  represents a function for converting nonlinear data into separable linear data,  $w_k$  represents the weight associated with feature space to output space,  $b$  is the bias value.  $x_k$  is the support vector, where  $k = 1, 2, \dots, n_v$ , and  $n_v$  represents the number of support vector.

The best way to find the dividing line is to add a border (margin) and to the line on both sides and create a line that touches the data value in the nearest feature space. Therefore, the dividing line with the widest border is the best dividing line and the nearest data touch position from this edge addition is called. "Support Vector". Since in some cases the group segregation is not completely accurate, the tolerance variable must be defined by adding variable  $\xi$  (slack variable) as in equations 5 and 6.

$$w^T x + b \geq y - \xi_i, \text{ when } y = 1 \quad (5)$$

$$w^T x + b \leq y + \xi_i, \text{ when } y = -1 \quad (6)$$

From configuration  $\xi_i > 0$ , this enables the structure of the support vector machine to achieve the objective of two parts: maximizing the separation distance and minimizing the prediction error, shown in equation 7.

$$\text{Minimize } \frac{1}{2} \|w\|^2 + c \sum_{i=1}^N \xi_i, \tag{7}$$

by  $y_i(w^T \varphi(x) + b) + \xi_i - 1 \geq 0$

$$\xi_i \geq 0, i = 1, 2, \dots, N.$$

*Naïve Bayes*

Naïve Bayes is a method that has a very good classification result that is not different from other methods. There is a simple algorithm. Therefore, the learning of Naïve Bayes is learning using the principle of probability. This technique is based on Bayes' theory. or the theory of the likelihood of events which uses conditional probability calculations [10] can be shown as equation 8.

$$P(h | D) = \frac{P(D | h) \times P(h)}{P(D)} \tag{10}$$

Let  $P(h)$  is the probability of the assumption that the class is  $h$ .  $P(D)$  is the probability of the assumption that the class is  $D$ .  $P(h | D)$  is the probability of the hypothesis that the data is  $D$  to have a class  $h$ .  $P(D | h)$  is the probability of the hypothesis that the data is  $h$  to have a class is  $D$ .

**METHODOLOGY**

This research develops e-Learning system, which uses the Machine Learning technique. There are selecting a group of students who are expected to study with the e-learning system using SVM and adapting the lesson in each student by Naïve Bayes. In addition, this system is designed for helping learners by lesson adjusting that the system can change to follow ability of each student. In fact, students have concentration in the classrooms not over thirty minutes so they may ignore all things. However, they can endure and want to spend much time if they like such as games, cartoons and so on. So, this e-Learning is created on foundation of student's liking. Machine Learning is applied with e-Learning system in this research. It can help to analyze or to decide about lessons selection after accomplishing tests. e-Learning system detail is shown in figure 1 and 2.

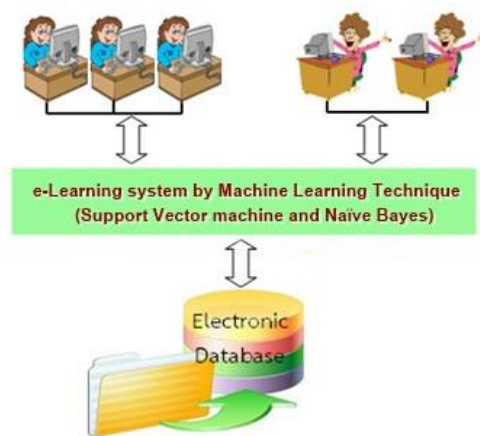


Fig. 1. e-Learning system with Machine Learning (eLs-ML) Architecture

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Figure 1 shows e-Learning system with Machine Learning Architecture that there are three elements as follows: electronic database, eLs-ML and user interface. Electronic database is data store, can record about lessons, tests and reports. eLs-ML is e-Learning application, is controlled by Machine Learning. There is flexible performance because it can automatically adapt lessons for students all time. User interface is a part of this system that it is used for connection between users and eLs-ML.

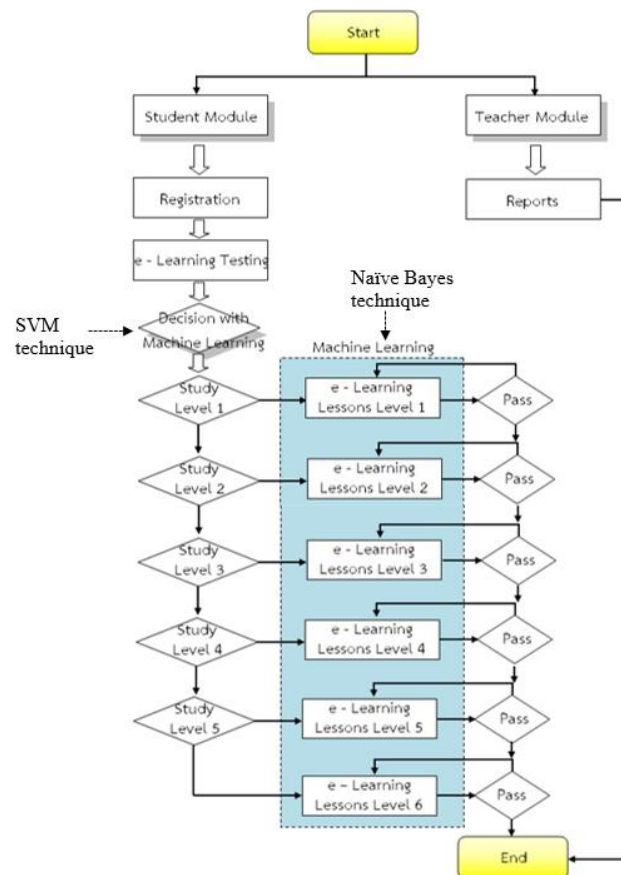


Fig. 2. System Flow Chart

Fig. 2. Introduces working system flow chart which has two modules, Student module and Teacher module. Users can in e-Learning by registration. Basically, this e-Learning wants to data their users. After that, if users are students, they are tested with electronic system before into the lessons. In this section the SVM technique is used to classify and to divide students (to study by e-Learning system and to study by teachers). In the next section, machine Learning by Naïve Bayes is used to analyze their testing because e-Learning system must arrange the best lesson for those learners. Each level of lesson can be adapted to follow ability of learners. In this part, some teachers may not know about ability of their students because they can not correct all students' tests.

Teacher module is part of this system. It can show many reports such as score reports, studying reports and so on. It is very easy and save time for teacher's preparation.

### RESULTS AND DISCUSSION

This research has developed an e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique. It can be used students of many schools, a primary school at Laksi district in Bangkok, three hundred and fifty students. Those students were divided two groups, regular studying and studying with an e-Learning system about improving Thai reading skills for

primary school students, tailored to each learner using machine learning technique that results of this research can be described with figure 3 to figure 8.

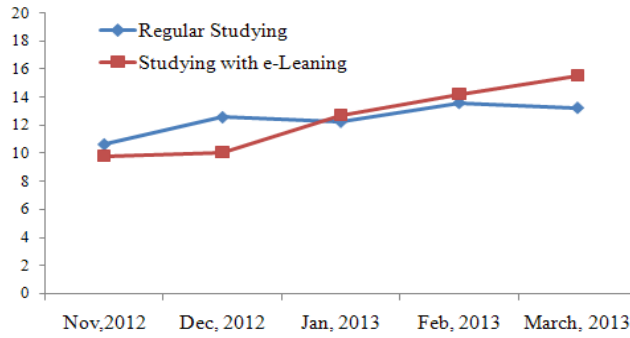


Fig. 3. Average scores between regular and

studying with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique in grade 1 graph

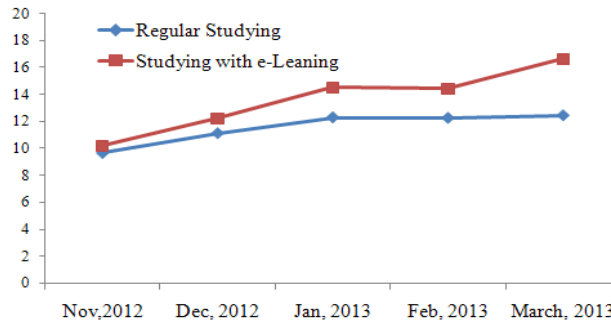


Fig. 4. Average scores between regular and

studying with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique in grade 2 graph

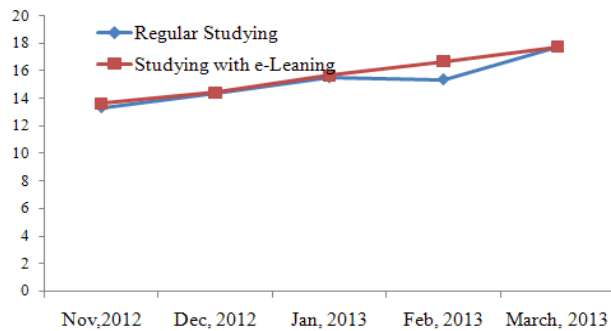


Fig. 5. Average scores between regular and

studying with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique in grade 3 graph

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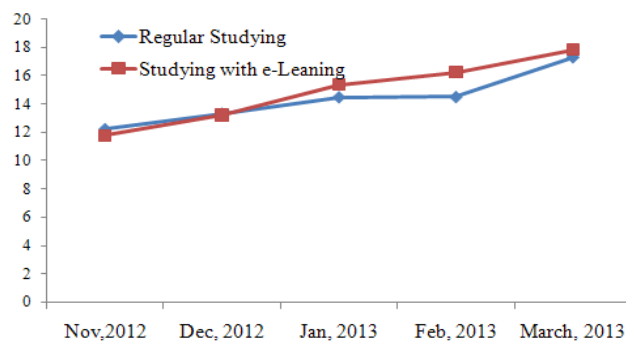


Fig. 6. Average scores between regular and

studying with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique in grade 4 graph

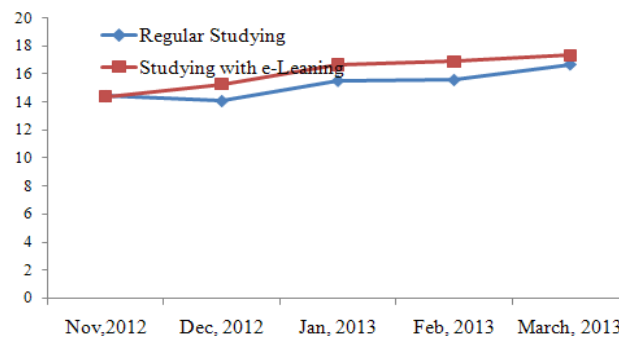


Fig. 7. Average scores between regular and

studying with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique in grade 5 graph

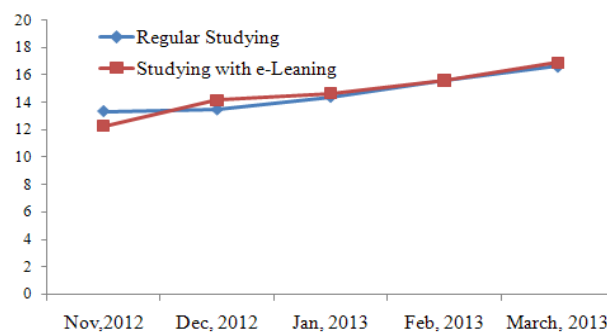


Fig. 8. Average scores between regular and

studying with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique in grade 6 graph

Figure 3 To Figure 8 show graphs of average scores between grade 1 to grade 6 from many primary schools in Laksi district at Bangkok capital of Thailand. there are comparing two sampling, regular studying and studying with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique. All graphs slowly increased between November, 2019 and March, 2020. All average scores of studying with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique were higher than regular studying between January, 2019 and March, 2020.

They can be seen learning with e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique can be used for studying in primary schools. Furthermore, students can learn with this e-Learning system that teachers do not control them.

### Conclusion

Many teachers in primary schools have many works in present time and the spread of COVID-19 continues to be a concern in Thailand. Then, they may not prepare their teaching documents. Especially, teaching about the reading skills in Thai language is impacted with this cause too. The e-Learning system about improving Thai reading skills for primary school students, tailored to each learner using machine learning technique is used to solve in reading skills of primary school students and any students can read Thai books when they learn with this e-Learning. Moreover, the teachers have much time for preparation about their subjects. However, English language is problem of Thai students too. So, researcher will study about a tool development for this solving to the future.

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