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Abstract

In order to assist EFL students with low English proficiency in learning writing skill, we propose a framework of a virtual environment to evaluate common errors that the students often conduct in writing essay. The system is a service applied in platform linked with other NLP web services to help with language analysis. The system mainly focuses on finding the writing errors related to semantic meaning selection, incorrect structure to indicate the intended meaning, non-smoothing sentence in topic, and etc. The system improves the students' writing skill by providing questions relating to the matters they are writing.

Keywords: Single Idea of Concept, Unified Paragraph, English as Foreign Language Learning (EFL), Writing Skill, Low English Proficiency, Natural Language Processing (NLP), Web Service

1 Introduction

In language learning, four skills - reading, writing, speaking and listening, are required to be learnt and practiced. Among those skills, writing is skill for students to be acquired because it is mandatory to express students' thought in documents. Writing skill is one of the most troublesome skills in teaching [1] since it is difficult to measure on how to correct the written sentence matched with students’ thought. Apart from grammatical error, meaning and conceptual are more difficult to be corrected. For non-English-native students, the usage of words may be ambiguous due to the low efficiency and lack of understanding in word senses.

1.1 Lower-secondary school education in Thailand

In Thailand, English studying program in lower-secondary school education (Grade 7-9) isn't arranged as a study program in major likes in high school education (Grade 10-12) or University. All Students in lower-secondary school will study all the same curriculum in their own level. On the other hand, Students in high school education have to select what major they would like to study such as “Science and Mathematics program” or “Liberal Art in English program”.

Students who study English in lower-secondary school education will be taught English as one subject including all basic skills in one unlike students studying English in high school education will focus on specific skills in English such as English Writing, and English Reading. Teachers teaching English in lower-secondary school will have a mini test which is divided a test to examine each English skill in their students like Grammar, Reading, and Writing.

1.2 Low English Proficiency Students

Low English Proficiency Students (LEPS) will be the students who have under average score in English writing skill which the English teacher may choose those LEPS. In versus, the students who have good or excellent score in English writing skill are High English Proficiency Students.
LEPS are not able to develop their English skills independently. When they make some mistakes on their writing, they cannot recognize where the mistake are and why they make them wrong. They need an English teacher to suggest and explain about the reason of making mistakes. These will help them to develop their English skills gradually. The difference between High English Proficiency Students and the LEPS are the ability to study. The LEPS, they must ask their teacher more often than the High English Proficiency Students do in order to develop their learning skill step by step; whereas, the High English Proficiency Students can learn their mistakes without other helping. Thus, veEFL is built to assist improving English writing skill for the LEPS.

The best way of learning is to enable the student to develop his thinking by himself. Develop thinking is very important element to apply it into writing ability. When the student would like to share his idea, it is very essential to know how to begin, continue and end up the story. Some of the students have some difficulties on how to continue the story. As provided a writing assignment about “What is your favorite hobby?”, for example, most of the learners...”. On the other hand, the LEPS may come to impasse to construct sentence (or expand sentences) smoothly.

However, the problem is how they continue the rest of their favorite hobby. This is very necessary to help the student to develop his thinking and to write more sentences in his writing. Therefore, veEFL provides the students with questions relating to the matters they are writing. veEFL will generate the questions from the student’s input sentence at real time. veEFL will generate the questions from the student’s input sentence at real time. veEFL will analyzing structure of the input sentence and extracting into keywords. By this method, the student will expand the idea from the generated questions from veEFL. The result is that they can write more sentences related to the topic and understand by themselves how to construct more sentences relating to the keyword.

To implement the above-mentioned tools, there are several necessary Natural Language Processing (NLP) resources and tools such as WordNet [2] (for synonymous and hierarchical meaning), FrameNet [3] (for theme accordance), Syntactic Parser (for analyzing main verb, subject and complement), and so on. To facilitate the writing assistant tools, Web Service technology is introduced to link existing shared veEFL Web Service Resources.

2 Common Errors in EFL Writing skill of Low English Proficiency Students

Thai Grade 7 students have started studying English from vocabulary, part of speech, type of sentence and tenses respectively. For Thai Grade 8-9 students, they have practiced English writing. If the students want to create good English Writing skill, they need to know how to apply Unified Paragraph idea and Paragraph Composition together. This skill will make the students create their own ideal writing essay.

There are three obstacles of writing Unified Paragraph as follow: (1) Semantic Meaning Selection, (2) Incorrect structure to indicate the intended meaning, and (3) Non-smoothing sentence in topic. The last problem (Non-smoothing sentence in topic) is also a problem of creating Paragraph Composition.

2.1 Semantic Meaning Selection

Semantics is the study of the meaning of linguistic expressions. It concerns about the relation among words, phrases, signs and symbols. So, the problem on Semantic Meaning Selection is the problem of choosing an inappropriate word applied in a context in order to create a misunderstood translation and leads difficulty to find the intended meaning in the sentences from the written content.

Most of Low English Proficiency of Thai students often uses Thai to English translation as a pattern applied in English writing. This leads them to use a word to word translation. As a matter of the fact that the simpler the word is, the more senses the word can represent, e.g. Thai verb “เขียน (write : verb, draw : verb, paint : verb)” can be used collectively with nouns such as “หนังสือ (book : noun)”, “เรื่อง (story : noun)”, “รูป (picture : noun)”, etc. while the translation must vary to the object. Thai students often incorrectly use the phrase “write a picture” instead of “draw a picture” from lacking of understanding of word sense.

In such circumstances, the teachers may find it particularly difficult to guess the accurate
meaning of students' thought without having personal discussion. In order to expedite the study of writing, tools for scoring are essential for writing a given topic and suggesting appropriate writing concept.

To resolve this problem, Thai knowledge should be applied as follow are needed (1) the most frequently misused word to word translation from Thai to English, (2) Thai WordNet [4], and (3) Thai FrameNet [5].

2.2 Incorrect structure to indicate the intended meaning

The structure of a sentence is a group of words gathering as a sentence in order to create the intended meaning. The structure is related to grammars. Incorrect structure is also grammar mistakes. Incorrect structure is more likely to express the wrong intended meaning.

In Thai language, there is no rule of verb inflection. They can use all the same verb in any time of situation but in English, we have to change the verb form to suit with the time of situation happens. Though this type of error is not serious mistakes, it can create the problem of misunderstanding.

This is an example sentence of “no rule of verb inflection” that reflects to this problem, “Yesterday, I go to school”. From this sentence, we all know that the word “Yesterday” is used to show that the situation was taken in the past but the verb in this sentence “go” is in present form. Therefore, the verb “go” must be changed to be “went”, past form of the verb “go”. The correct sentence must be "Yesterday, I went to school" in order to tell that the situation was already happened and finished.

This type of error is a common problem for Thai students because most of them usually think in Thai words and then translate into English. For example “เมื่อวานฉันไปโรงเรียน”. Due to lack of clear marker for word and sentence boundaries in Thai. We need to applied Thai word segmentation. The result are “เมื่อวาน” (yesterday), “ฉัน (I)”, “ไป (go)”, and “โรงเรียน (school)”. From translating Thai to English as basis, we can see the problem of wrong structure which can create wrong meaning.

“Yesterday, I go school” - Translation from Thai to English. The verb tense in this sentence is wrong and there is a missing of the preposition. The verb tense should be changed to be in past form and the preposition should be added also. The correct sentence should be “Yesterday, I went to school”. However, Semantic Meaning Selection problem is difference because it doesn't make the grammatical errors in the sentences.

2.3 Non-smoothing sentence in topic

When student write an essay, there are many groups of sentences gathering together as a paragraph in order to describe what the content is. Every single sentence in a topic will be arranged to generate the student's idea to the teacher's understanding. Smoothing sentence can help the reader easily sequence the concept (Topic). Therefore, we can imply that non-smoothing sentence in topic can lead both the student and the teacher misunderstood the intended content.

For example of the sequence of time. There are three sentences gathering together to tell the story:

1. I go to school
2. I study Math in the afternoon
3. I play football in the morning

From these three sentences, we can assume that “I go to school” must be the first sentence of this story because you have to go to school first in order to study and do some activities in the school. Then, the sentence number 3, “I play football in the morning”, will be the second sentence because we can recognize the word “in the morning”, the sequence of time happened before the word “in the afternoon”. Thus, the sentence number 2 will be the last one.

For example of non-coherence. There are three sentences gathering together to tell the story:

(1) “I go to school.” (2) “My father likes fishing.” (3) “My friend likes playing football.” from these sentences, none of these sentences is related together.

Lastly, writing smoothing sentences can help not only the students organize and generate their idea but also the teachers understand the story easier. To resolve this problem, Single Idea of Concept is applied to assist the student to writing more smoothing.

3 Single Idea of Concept

Unified Paragraph [6] is a paragraph which focuses on explaining one idea in one paragraph so Unified Paragraph is a part of “Single Idea of
Concept”. Unified Paragraph should consist of three parts; introduction, body and conclusion. All these three parts must be written with only one idea. A paragraph should consist of more than 200 words up which may be complicated for the student to write many sentences to be a paragraph. Due to the ability of the student, not many of them can write up to 200 words in English. Therefore, we would like to apply only the concept of Single Idea to this method. The aim of this method is to help the student developing his mind and focusing on what he is writing so Single Idea of Concept is more appropriate to apply in it.

Single Idea of Concept is a basement of writing ability which helps the student not to miss his objective of writing so Single Idea of Concept is a concept of thinking in one story at a time. Single Idea of Concept is to enable applying with LEPS because it doesn't expect the student to write it as a full paragraph. Most of LEPS are not able to write a full form of paragraph which is required more skillful in explaining English with long sentences or many short sentences to be a paragraph. Therefore, we would like to use Single Idea of Concept to help the student to express his mind by not focusing on the correct form of a paragraph in order to avoid narrowing the student's idea. Single Idea of Concept will help the student developing his mind on what the content of his story should be discussed on. Single Idea of Concept will help the student by focusing on one keyword of the story and then extending more questions related to the keyword.

For example, the student has an assignment about telling about your hobby. Single Idea of Concept will be used to help the student of what his hobby is. The student will be given the question relating to the word "hobby" such as “What is your hobby?”, “Where do you do your hobby?”, “When do you do your hobby?”, “Who do you do your hobby with?”, and “Why do you like your hobby?”

Then, the student can begin his story by answering those above questions.

For example,

My hobby is playing football. I play football at garden yard. I play football after finishing school. I play it with my father. I like play football because it is fun and good for health.

Though, this is not a full form of a paragraph but it helps the student to express his idea and write more sentences about his story. Single Idea of Concept is to use to help the student developing his mind with one idea in one story. It is a basic of good writing to write the story straight to the point of what he would like to talk about.

Coherence and cohesion is one of technical elements to create a good comprehensive paragraph. Coherence [7] is to use semi-technically of the way in which the content of connected speech or text hangs together to make the content meaningful. Cohesion [7] is to connect a text together linguistically. Therefore, coherence is to connect the content of text smoothly and create good comprehension. Cohesion is to connect the text linguistically whether it creates smooth good understanding or not.

Single Idea of Concept is different from coherence and cohesion because of the aim to apply on it. Single Idea of Concept is to focus on one single idea in the context by not focusing on the term of grammatical construction and good combination to create smooth comprehension. According to our target group, Single Idea of Concept is to help them get free from the struggle of inability to write. Single Idea of Concept is not used to point to correct grammatical construction, create good sequence and pass on knowledge smoothly. We use Single Idea of Concept to encourage whom are not able to write and continuous their writing to be able to write more sentences. Coherence and cohesion acquire more skillful from the writers to write correct grammatical construction and link those sentences with good explanation to the readers.

In summary, Single Idea of Concept is different from cohesion and coherence because of the aim of it and the suitability to the target group (LEPS). Single Idea of Concept aims to encourage the target group whom has not much knowledge on English to be able to write and continue their writing by not pushing on correct grammatical construction and good sequence to pass on the content smoothly which require more advanced knowledge in English.

4 System Architecture

Developing innovative products needs a lot of time and budget consumption. If there is not good
enough platform, it is very difficult to accomplish the innovative service. The current trend on research is to aim collaboration among other parties and to develop a large scale project. The management of project is to integrate all components and become a challenging task.

We propose a new web service platform named “a Virtual Environment for English as Foreign Language Learning Platform” (veEFL) that is compliant with WS-I. WS-I [8] is a specification for maximizing compatibility with Web Service Platforms. This platform will support Document/literal wrapped SOAP message binding style, REST with Token-based Authentication for easy to consumed web service, and HTML5 WebSockets [9] for two-way communication over the Internet. The System Architecture and the application based on veEFL Platform show in Figure 1.

This system is designed by concern of 3 difference aspects as follow (1) Common Errors in Writing of EFL learner aspect (2) Infrastructure aspect, and (3) NLP aspect. veEFL is acted as a service broker to synergize all aspects together.

4.1 Common Errors in Writing of EFL learner aspect

This viewpoint focuses on how these platforms can help Thai students who have Low English Proficiency.

English writing assignment for Thai Grade 8-9 students, the teacher often specifies writing topics for students. Writing topics will be simple open-ended questions about the life style of the students.

Examples of simple assignment for English writing:
- What is your hobby?
- What do you do on your free time?
- What would you like to be in the future?
- What will you do when you finish school?
- How do you go to school?
- Tell me about your school.

Though these questions are simple, they are still difficult for LEPS. They are more likely not capable to write many sentences joining as an essay. They are capable to write it, nonetheless; the sentences they wrote won’t be linked up as a
same story line. They aren’t capable to write sentences to clarify details. Most of their writings have a problem of non-smoothing sentences in a topic because of not understanding of Single Idea of Concept.

A guideline to solve student’s weakness, non-smoothing sentences in a topic, is to build a tool for motivating LEPS to apply a story line concept as to be a single idea concept. This tool is a writing guideline as a story line. The initial concept is shown in Figure 2.

This system will receive input as a sentence. The system will assume the first sentence as a topic sentence. For an example, “How do you go to school?” The system will analyze the elements of each sentence such as “go to (v)” and “school (n)”. Then, the system will suggest the story which is related to the word appeared in a topic sentence. For example, the system will present the contents which are associated with the word “school” in order to be a guideline for the students to write on their story line such as

- What time do you go to school?
- Where is your school situated?
- What subjects do you study at school?

However, in some questions the system can give a possible answer such as “What subjects do you study at school?” so the answer will be the name of subjects. This will help the students to write more details (sentences) on their story. The Example of application based on veEFL Platform show in Figure 1 (in right side).

The left panel is shown the conceptual dependency of initial sentence from student, “I go to school”. The top-right panel is shown the extracted keywords from initial sentence. The application can extract into 2 keywords: “go to” and “school”. The highlight on “school” keyword is an active keyword. The bottom-right panel is shown generate questions relating to an active keyword. The student will see the questions and expand his idea to write other sentences.

4.2 veEFL infrastructure aspect

veEFL is a combination of several technologies for assisting English learning. It pares on increasing Thai student's writing skill.

The basis of the system is the development of unique task based service template (veEFL Resource Template) and sequencing them to accomplish the final objective. In the beginning phase, the initial service template would be a service for practicing basic skills such as translation service template.

The main system consists of (1) Virtual Environment Learning Platform Service Infrastructure Standard, (2) Learning Service Manager, (3) Virtual Learning Composite Workflow Builder, and (4) Learning Service Authoring Tools.

A Virtual Environment Learning Platform Service Infrastructure Standard is the one for service template on learning. It focuses on fast, simple and reusable generation of service template (veEFL Resource). The service template is designed to be connected as JSON style REST web service and supported to HTML5 WebSockets Technology for variety of service available such as stateful service, broadcast...
streaming service, real-time collaboration service and so on.

A Learning Service Manager is a controlling system of service flow and user permissible activity. Actually, veEFL system is coordinated with many veEFL Resource. veEFL Resources are the registration of User Account. The User Account of veEFL Resources will be the owner of his or her own resources. The owner can allow other User Account to reach the owner's resources. Many kinds of veEFL Resources are provided by veEFL platform, e.g. veEFL Atomic Web Service Resource – the resource that can be used as Web Service, veEFL Composite Web Service Resource – the resource that allow sequencing veEFL Web Service Resource, and so on.

A Virtual Learning Composite Workflow Builder is a connecting system to compose two or more existing services into complex service. It focuses on the simplicity of usage and instant composing existing services.

Learning Service Authoring Tools are the ones for composing services as components like Rich internet application (RIA). This tool is used to generate RIA application based on veEFL platform.

Finally, there are some reasons to use following technologies to support veEFL platform:

- REpresentational State Transfer (REST)
- Token-based Authentication
- HTML5 WebSockets

4.2.1 REpresentational State Transfer (REST)

SchoolNet is a Thai Government's project supporting internet availability to cover all schools in Thailand. This project is guaranteed the minimum standard of V.92 at 56 kbs over telephone network.

We should be concerned with the internet connection speed of SchoolNet. Thus, REST is more suitable than SOAP because of its lower overhead.

4.2.2 Token-based Authentication

WS-Security [10] is a standard security mechanism for SOAP web service. Unlike SOAP, REST is lack of standard mechanism for security and authentication. The platform needs a proper security mechanism and the best choice is Token-based authentication. It is easy to implement and can be harmonize with REST over HTTP. This technique will help user to consume Web Service easier. In case of higher security level, REST communication over a computer network is needed, HTTPS can be applied.

4.2.3 HTML5 WebSockets

Two ways communication between teacher and student interaction is ordinary task on learning. It means that the learning platform needs to provide efficient real-time, bi-directional, and full-duplex communications to serve user interaction. HTML5 WebSockets (or WebSocket in short) is a new W3C standard as part of HTML5 specification that enables all required functions needed by the platform.

4.3 Natural Language Processing (NLP) Aspect

To efficiently manage the English content, NLP tools are mandatory to handle language information. A Part-of-Speech (POS) tagging tool and a syntactic parser are subjected to syntactic analysis while semantic information is taken care by available English WordNet and FrameNet. These tools will be used to analyze students’ writing for correctness, compatible meaning and collocation of the sequence of the sequence of lexical constituents

6 Conclusion

In this paper, we propose a framework of A Virtual Environment for English as Foreign Language Learning Platform infrastructure (veEFL) as a new Web Service infrastructure platform. We apply the existing service of NLP tools with the idea of realizing a meaning of writing essay to find the connection between written content. We plan to develop a scoring system to evaluate the smoothness of topic between written sentences of EFL students who are Low English Proficiency, and develop a system to suggest the appropriate way on writing.
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References


