

Online English for Science and Technology Course Development to Enhance English Reading Proficiency of ESP Learners

Suphannee Arsairach^{1*} and Songpol Suksumek²

¹Department of Western Languages, Faculty of Liberal Arts, Rajamangala University of Technology Thanyaburi, Pathum Thani 12120

²English Department, Faculty of Education, Rajabhat Rajanagarindra University, Pathum Thani 12120

*To whom correspondence should be addressed. e-mail: suphannee.arsairach@gmail.com

Received: 01 May 2021, Revised: 01 June 2021, Accepted: 29 June 2021

Abstract

The objectives of this study were 1) to develop Online English for Science and Technology course (O-EST) to enhance the English reading proficiency of undergraduate students based on the efficiency criterion determined at 75/75, 2) to compare students' reading proficiency scores before and after applying for the online course, and 3) to examine students' satisfaction toward the online course. The samples, which were purposively selected, comprised of 67 students majoring in Information Technology and Computer Engineering. The research instruments were the O-EST course, a reading proficiency test, a satisfaction questionnaire, and a reflective journal. Data were analyzed by percentage, mean, standard deviation, and t-test while the data from the reflective journal were analyzed via thematic analysis. The results yielded that 1) the efficiency of the course was 75.97/77.56 which was higher than the designated value, 2) the reading proficiency score after applying course was higher with a statistically significant difference at the level of 0.05, and 3) The students' satisfied level toward the course was high ($\bar{X} = 4.37$, S.D. = 0.63).

Keywords : Online Course Development, English for Science and Technology, Reading Proficiency, ESP Learners

Introduction

English reading skill is important for people in science community because new knowledge and technologies in professions always are presented in English. Absorbing and accumulating such information is essential for job or higher-level education opportunities. Also, the information yields advantages when it comes to competition in the labor market. So, students in the field of science and technology or engineering need proficient English reading skill [1-3]

In the context of universities in Thailand, students in the science and technologies field need specific English skills in their professions to be ready for their job in the future. However, their reading proficiency is lower than students in social sciences fields. [4-5]. It was also consistent with the finding that 43% of the students who have studied in the science fields at Rajamangala University of Technology Thanyaburi (RMUTT) were unsuccessful with reading scientific texts. There were several studies on material constructions for the development of reading proficiency e.g. Chaovachuen [6], Nontasut [7], Boonbongkotrat, Chattiwat, Nilpan and Kositchaiwat [8]. The findings revealed that the students' reading proficiency was improved by using lessons and exercises which focused on English for Academic Purpose (EAP). However, among previous researches, there were only a few researches that developed English reading course for science and technology. Since traditional education was shifted to online education because of digital transformation and the COVID-19 pandemic. The studies emphasized investigating the effect on online learning [9], using the web-based approach for EAP [10], and constructing online lessons for other subjects [11] while the number of online courses for English reading in the context of science and technology was very limited. Therefore, this research aimed to develop online English reading courses for learners in science and technology fields.

In this study, the online course was developed according to ADDIE Model. There are five steps according to the model [12] as follows:

1. Analysis (A): This step is to understand teaching problems, goals and objectives of teaching, learning environment, and learners' background knowledge and skills.
2. Design (D): In this step, learning objectives, evaluation tools, exercises, contents, teaching plans, and materials are designed.
3. Development (D): The elements which were designed are developed in this step. The elements are tested and corrected.
4. Implementation (I): The developed elements are applied according to the set objective.
5. Evaluation (E): There are two parts of evaluation as 1) formative evaluation which is each element will be evaluated which leads to further development and summative evaluation which is an overall evaluation that leads to a decision about teaching methods.

ADDIE Model has been accepted because it can save time and cost via problem understanding. [13-14] The model is flexible. It can be used to design both traditional and online courses which correspond with the current situation of the COVID-19 pandemic.

Research Objectives

1. To develop Online English for Science and Technology course (O-EST) to enhance the English reading proficiency of undergraduate students based on the efficiency criterion determined at 75/75. The criterion at 75/75 was a minimum of the efficiency which could be acceptable for lessons or task constructions [15]. It was suitable for the O-EST including technical terms, specific language patterns and scientific texts.
2. To compare students' reading proficiency scores before and after applying for the online course.
3. To examine students' satisfaction with the online course.

Research Methodology

This research was a pre-experimental design and used a single-group pretest-posttest design. The followings are the extent and method of this study.

1. Population and samples

The population of this study was 214 undergraduate students who enrolled in the English for Science and Technology course at RMUTT. The samples of this study were 67 students who studied majoring in Information Technology major and Computer Engineering in 2nd year through 4th year. They were purposively selected. In detail, twenty-one students were from Information Technology major, the Faculty of Science and Technology and forty-six students from Computer Engineering major, the Faculty of Engineering.

2. Research Instruments

All instruments in this research were validated content validity by IOC from three experts. The comments and suggestions were brought to improve the instruments. The improved instruments were sent to validate by the experts again before applying. The instruments are as follows:

2.1 The course was constructed by the program "Hot Potato" and contained seven online reading lessons for reading proficiency development in science and technology. They were 1) New technology, 2) Computer system, 3) The internet system, 4) Artificial intelligence, 5) Data Analytics, 6) Digital Transformation Market, and 7) Blockchain Technology. Each lesson comprised of a topic, objectives, a ten-question-pre-lesson test, reading activities (pre-while-post reading), a post-lesson test (same questions as the pre-test), and a guideline for the activities. The IOC of the lessons was between 0.67-1.00.

2.2 The reading proficiency test contained 30 questions in multiple-choice items. The test was applied before and after the samples had studied the lesson. The IOC of the test was 0.98 by 3 experts. The difficulty index (p) was between 0.20-0.80. The discrimination level (r) was between 0.20-0.55. The reliability of both tests was 0.73.

2.3 The students' satisfaction questionnaire was a five-level Likert Rating Scale which comprised of five parts as 1) objectives, 2) content, 3) interaction, 4) interface design, and 5) learning and teaching design. The IOC of this questionnaire was 1.00.

2.4 The reflective journal was an open-ended question that stimulated the students to revise their experiences after they had learned the online lessons. The IOC of the journal was 1.00.

Data collection

There were two main steps of the data collection as follows:

1. Preparation: Researchers informed the samples about the features of online lessons, methods of engaging and learning the course, and the evaluation. The evaluation was separated into two parts: pre-and post-lesson tests and an overall course pre-and post-test. As a formative assessment, the pre-and post-lesson tests were used after studying each lesson. There were 10 items per online lesson or a total of 70 items from 7 lessons. The overall course pre-and post-tests were used as a summative assessment that evaluated their reading proficiency before and after the online course.

2. Implementation: There were four steps as follows:

2.1 The samples were given 75 minutes to do the pre-course test to evaluate their reading proficiency before receiving the treatment.

2.2 The samples had studied the online lessons according to the designed procedure. They needed to do the pre-and post-lesson tests to evaluate their progress before and after learning each lesson.

2.3 After finishing all seven lessons, the samples were given 75 minutes to take the post-course test which was the same questions as the pre-course test.

2.4 After finishing the course, the samples took the satisfaction questionnaire and wrote a reflective journal about the course.

Data analysis

There were three parts as follows:

1. Reading proficiency scores from pre-and post-test were analyzed via t-test independent.

2. The sample personal information and satisfaction scores were analyzed by percentage, mean and standard deviation. The satisfaction score was ranged from 5 (most satisfied) to 1 (least satisfied). The score was interpreted as the following criteria; 4.50-5.00 = most satisfied, 3.50-4.49 = very satisfied, 2.50-3.49 = moderated satisfied, 1.50-2.49 = less satisfied, 1.00-1.49 = least satisfied.

3. The data from the reflective journal were analyzed via thematic analysis [16].

Results

1. The efficiency of the online course was shown in Table 1.

Table 1. Results of online course efficiency analysis

Score	Full score	Mean	S.D.	Percentage
While-study score (E1)	70	30.39	3.31	75.97
Post-study score (E2)	30	23.27	2.76	77.56

From Table 1, the E1 and E2 percentages were 75.97 and 77.56 respectively which corresponded to the efficiency at 75/75 criteria. The full score of the While-study score derived from the post lesson test. There were 10 test items (10 points) per each lesson. The Post-study score derived from the overall course post-tests. The first was much than the latter because it was the formative assessment.

2. The comparison between pre-test scores and post-test scores yielded that the score was higher as shown in Table 2.

Table 2. Comparison between pre-test and post-test reading scores

Test	N	Full score	\bar{X}	S.D.	t	df	Sig (2- tailed)
Pre-test	67	30	14.51	2.99	28.77*	66	0.0000
Post-test	67	30	23.27	2.76			

*P < 0.05

From Table 2, the mean of the pre-test score was 14.5 and the mean of the post-test score was 23.67. The t-test score was 28.77 which showed that the reading proficiency scores after learning the online course were significantly higher (P < 0.05).

3. The results about the satisfaction toward the online course were as follows:

The satisfaction data were analyzed and the results were shown in Table 3.

Table 3. Students' satisfaction toward the online English for Science and Technology course

Aspects	\bar{X}	S.D.	Satisfaction level
1. Objectives	4.56	0.61	Most satisfied
2. Contents	4.40	0.60	very satisfied
3. Lesson interaction	4.24	0.68	very satisfied
4. Interface design	4.34	0.64	very satisfied
5. Learning and teaching design	4.32	0.63	very satisfied
Total	4.37	0.63	very satisfied

From Table 3, the overall satisfaction score was very high (\bar{X} = 4.37, S.D. = 0.63). In each aspect, 'objectives' got the highest score (\bar{X} = 4.56, S.D. = 0.61) and 'content' was the second most. On the other hand, the lowest score aspect was 'lesson interaction' (\bar{X} = 4.24, S.D. = 0.68).

4. The results from reflective journal analysis revealed that all students realized that the learning yielded their benefit because the reading skill was crucial to their profession. Updated knowledge, know-how, and innovation were written in English and the students were assigned to read the specific texts in English. The EST online reading lessons could help and encouraged them to practice and learn by themselves which will benefit them when they come to compete in the labor market.

Most of the participants (70.28%) reflected that they can apply the skill to their future profession. The first student, a third-year student from Information Technology major, said that '*Reading English in the field of information technology is interesting and it matches with what I have learned.*'. The second student and the fourth year in Computer Engineering reflected that '*I think that it will benefit me in the future because I know more vocabulary about technology.*'. The same went for the fourth student, the second-year student from Computer Engineering major as he said '*It was good to know new vocabs.*'.

Fifty-four percent of the participants reflected that the online course corresponded with the current situation of the COVID-19 pandemic because relying on only textbooks was not enough. Online learning was very different from traditional classes and they needed to do more self-study than in traditional situations. The online reading course helped them to develop reading skill and guided them about reading techniques and self-study. The fourth student said that '*Before this, I could not understand English text but I was better after*

learning the online course. It was easier for me but I need a lot more practice.' The fifth student, a second-year student from Computer Engineer major, reflected the same attitude as 'I don't like online learning. It was very different but I understand about the (COVID) situation. Your online course helped me more understand about reading techniques.'

In conclusion, the students were very satisfied with the online course because the content can benefit their profession and the course encourage them to practice the reading skill and techniques. Moreover, they could manage their learning according to their preference. The sixth student, a second-year from Computer Engineering major, reflected that 'the course is cool. I can learn many times and anytime.' which aligned with the first student's comment as 'It is very convenient. There are some contents other than only in the textbook. That helps me able to practice more.' Furthermore, from positive reflections, some students suggested that there should be more lessons in the form of online course.

Discussions

From the analysis, the results could be discussed as follows:

1. The efficiency of the online course was 75.97/77.56 which was consistent with the set criteria at 75/75. This might be because the course was designed to encourage learners to complete reading tasks. Also, the learning activity process was designed as pre-, while- and post-reading activities including exercises for each lesson that related to the content. These findings were in line with those of previous studies e.g. Candlin [17]; Nunan [18] confirming that designs with clear objectives and procedures could give a positive impact on English lessons or tasks/exercises.

Also, each lesson in the online course was designed according to students' need analysis and a course description which was derived from the English for Science and Technology course – a general education course of RMUTT. They needed ESP courses to develop themselves to meet the requirement of the global labor market. Moreover, the content that conformed with students' interests made them more motivated and willing to participate in the activities. This corresponded with Velandia, Torres & Ali [10]; Spence & Lui [19]; and Poedjiastutie & Oliver [20].

2. Reading proficiency scores after learning the online course increased with a statistically significant difference at the level of 0.05. This positive result might be from the appropriate lesson design. It was because reading texts could relate to students' profession, and also activities were suitable for their language levels and skills that could stimulate them to engage the study, the evaluation that was valid and reliable as well. The students realized the benefits of the lessons led to the success in reading that comprised of both knowledge and practice. [6, 8, 9]

Aside from the benefit from the analytic design, the online lesson enhanced learners' reading proficiency scores as same as the studies of Wang & Wang [21]; Wang, Tsao & Chen [22]; and Wang [23]. These studies claimed that using technologies and web-based learning positively affected second language learning. The reading skill and vocabulary learning was developed effectively via online learning. With the advantage of online learning, learners can control their pace of progress and perform self-directed learning and become autonomous learners [9, 24].

3. Satisfaction score toward the online course was high. This might because the reading text was systematically designed based on students' needs. The content was specific to their profession and the difficulty was suitable for the students. The match of students' needs and the course could motivate them to participate in learning more effectively. These results aligned with studies of Crookes & Schmidt [25]; and Dooley [26]. The online course interacting with students was able to stimulate students' interests, and they were able to immediately self-evaluate their progress. The mentioned factors, also with the flexibility of the learning, made learners satisfied with the online course which was similar to the findings of studies of Kalapakdee & Sangsawang [11] and Wang [23].

Conclusions

The result yielded that the online course was efficient. After studying with the course, the students' reading proficiency increased. The post-test score was significantly higher and the satisfaction score was high (very satisfied). The contents in the online course suitably conformed to specific needs in the field of science and technology because the course was developed according to the need analysis and the course description following the curriculum. The online course was flexible to access, the learners could do the study anywhere at any time.

References

- [1] Pritchard O, Nasr A. Improving reading proficiency among Egyptian engineering students: principles and practice. *English for Specific Purposes* 2004; 23: 425-445.
- [2] Venkatraman G, Premak P. English language skills for engineering students: a needs survey [Internet]. 2007 [cited 2021 Jan 10]. Available from <http://www.esp-world.info/contents.htm>.
- [3] Tsai YR, Chang Y. Enhancing Engineering Students' Reading Comprehension of English for Science and Technology with the Support of an Online Cumulative Sentence Analysis System. *SAGE Open* 2014; 4: 1-9.
- [4] Saengpakdeejit R. English reading strategies employed by science-oriented students in public universities. [dissertation]. Nakhon Rachasima: Suranaree University of Technology; 2009.
- [5] Charoenpong C. Strategies and problems in reading academic journal articles for undergraduate chemistry students. [thesis]. Bangkok: Thammasat University; 2010.
- [6] Chaovachuen T. The development of English reading exercises based on authentic materials by using the task-based reading activities for Mathayomsuksa 4 students. [thesis]. Nakhom Pathom: Silpakorn University; 2017.
- [7] Nontasut A. Development of supplementary English reading exercises based on local topics of Kanchanaburi province to improve reading comprehension for Matthayomsuksa four students of Srisawatpittayakom School, Kanchanaburi. *Veridian E-Journal, SU* 2012; 5:190-200.
- [8] Boonbongkotrat N, Chattiwat W, Nilpan M and Kositchaiwat S. The development of online reading instructional model through reading comprehension strategies integrating with cognitive academic language learning approach (CALLA) to enhance academic online reading ability and strategy use for undergraduate students. *Academic Journal of Phetchaburi Rajabhat University* 2020; 10: 4-12.
- [9] Zidat S, Djoudi M. Effects of an online learning on EFL university students' English reading comprehension [Internet]. 2010. [cited 2020 Nov 20]. Available from <https://www.researchgate.net/publication/290332871>.
- [10] Velandia R, Torres P. and Ali N. "Using web-based activities to promote reading: an exploratory study with teenagers [Internet]. 2012 [cited 2020 Nov 20]. Available from http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S1657-07902012000200002.
- [11] Kalapakdee J, Sangsawang T. Development of online learning self-directed learning on education innovation technology for undergraduate students, Rajamangala University of Technology Thanyaburi. *Journal of Vocational and Technical Education* 2016; 6:18-25.
- [12] Seels B, Glasgow Z. Making instructional design decisions. 2nd ed. Columbus: Prentice Hall; 1998.
- [13] Kirkpatrick D, Kirkpatrick K. Kirkpatrick's four levels of training evaluation. Association for Talent Development. Alexandria: ATD Press; 2016.
- [14] Peoplevalue. co. th [Internet]. What is Addie Model? [cited 2021 June 5]. Available from <https://www.peoplevalue.co.th/content/9119/addie-model>.
- [15] Promwong, C. The efficiency test on teaching materials or packages. *Silpakorn Educational Research Journal* 2013; 1:5-20.
- [16] Corbin M, Strauss L. Basics of qualitative research: techniques and procedures for developing grounded theory. 3rd ed. Thousand Oaks: Sage; 2008.
- [17] Candlin C. The communicative teaching of English: principle and an exercise typology. London: Longman group Co. Ltd.;1987

- [18] Nunan D. "Aspects of task-based syllabus design. Karen's linguistic" [Internet]. 2001 [cited 2020 Dec 15]. Available from <http://www3.telus.net/linguisticsissues/syllabusdesign.htm>.
- [19] Spence P, Liu G. Engineering English and the high-tech industry: A case study of an English needs analysis of process integration engineers at a semiconductor manufacturing company in Taiwan. *English for Specific Purposes*. 2013; 32: 97-109.
- [20] Poedjiastutie D, Oliver R. Exploring students' learning needs: expectation and challenges. *English Language Teaching* 2017; 10: 124-133.
- [21] Wang YH., Wang CN. (2010) Exploring EFL Taiwanese university Students' perceptions of a collaborative CALL environment. In: Pan JS., Chen SM., Nguyen N.T. (eds) *Computational Collective Intelligence. Technologies and Applications. ICCCI 2010. Lecture Notes in Computer Science*, vol 6421. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-16693-8_44.
- [22] Wang Y, Tsao H, and Chen G. Integration of computer technologies into an English language learning classroom. *Asian Journal of Empirical Research* 2013; 3: 1389-1400.
- [23] Wang Y. Developing and Evaluating an Adaptive Business English Self-Learning System for EFL Vocabulary Learning. *Mathematical Problems in Engineering* 2014; 2014: 1-7.
- [24] Dehghanpour E, Hashemian M. Efficiency of using a web-based approach to teach reading strategies to Iranian EFL learners. *English Language Teaching* 2015; 8: 30-41.
- [25] Crookes G, Schmidt RW. Motivation: reopening the research agenda. *Language Learning*. 1991;41: 469-512.
- [26] Dooley P. Students' perspectives of an EAP pathway program. *Journal of English for Academic Purposes*. 2010; 9: 184-197