

การพัฒนาแบบฝึกการอ่านภาษาอังกฤษเพื่อพัฒนาทักษะการคิดอย่างมี
วิจารณญาณสำหรับนักเรียนชั้นมัธยมศึกษาโดยใช้รูปแบบสเต็มศึกษาและ
เนื้อหาความเป็นท้องถิ่นของจังหวัดเพชรบุรีและประจวบคีรีขันธ์
A DEVELOPMENT OF ENGLISH READING WORKBOOK FOR DEVELOPING
CRITICAL THINKING SKILLS USING STEAM; EDUCATION MODEL FOR
SENIOR HIGHSCHOOL STUDENTS USING CONTENTS FROM
PHETCHABURI AND PRACHUAPKHIRI KHAN LOCALITY

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บทคัดย่อ

การวิจัยเรื่องการพัฒนาแบบฝึกการอ่านภาษาอังกฤษเพื่อพัฒนาทักษะการคิดอย่างมี
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ท้องถิ่นของจังหวัดเพชรบุรีและประจวบคีรีขันธ์ มีวัตถุประสงค์ 1) เพื่อพัฒนาบทเรียนตัวอย่าง
ของแบบฝึกการอ่านภาษาอังกฤษแบบสเต็มศึกษาโดยใช้เนื้อหาความเป็นท้องถิ่นของจังหวัด
เพชรบุรีและประจวบคีรีขันธ์สำหรับนักเรียนระดับมัธยมศึกษาตอนปลาย 2) เพื่อวิเคราะห์ความ
สอดคล้องด้านทักษะการเรียนรู้ภาษาอังกฤษ ด้านการพัฒนาความสามารถในการคิด และด้าน
การพัฒนาทักษะสเต็ม (STEAM) ที่ปรากฏในบทเรียนตัวอย่างของแบบฝึกการอ่าน การวิจัย
นี้ดำเนินการโดยใช้รูปแบบการวิจัยและพัฒนา (Research and Development) โดยใช้แบบสำรวจ
(Questionnaire) กับครูภาษาอังกฤษระดับมัธยมปลายที่สอนในโรงเรียนจังหวัดเพชรบุรีและ
ประจวบคีรีขันธ์ จำนวน 24 คน เพื่อทราบเนื้อหาที่ครูต้องการใช้สอนนักเรียนมากที่สุด
ผลการวิจัยพบว่า เนื้อหาที่ครูต้องการนำมาใช้ในแบบฝึกการอ่าน ได้แก่ การท่องเที่ยว ร้อยละ 24.17

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อาหารและขนมหวาน ร้อยละ 18.33 ศิลปะและวัฒนธรรม ร้อยละ 12.50 ทรัพยากรธรรมชาติ ร้อยละ 11.67 โครงการในพระราชดำริ ร้อยละ 7.50 เศรษฐกิจ ร้อยละ 5.83 ชุมชน ร้อยละ 5.83 เกษตรกรรม ร้อยละ 5.00 สภาพภูมิอากาศ ร้อยละ 5.00 และสภาพภูมิประเทศ ร้อยละ 4.17 ตามลำดับ และเมื่อวิเคราะห์ความสอดคล้องด้านทักษะการเรียนรู้ภาษาอังกฤษ ด้านการพัฒนาความสามารถในการคิด และด้านการพัฒนาทักษะสติม (STEAM) ที่ปรากฏในบทเรียนตัวอย่างของแบบฝึกการอ่าน พบว่าบทเรียนตัวอย่าง (บทที่ 1 เรื่อง Let's go travel) มีความเหมาะสมที่จะนำมาใช้เป็นเครื่องมือในการพัฒนาความสามารถของผู้เรียน โดยมีค่าความสอดคล้องด้านทักษะการเรียนรู้ภาษาอังกฤษที่ระดับ 0.95 ด้านการพัฒนาความสามารถในการคิดที่ระดับ 0.95 และด้านการพัฒนาทักษะสติม (STEAM) ที่ระดับ 0.89

คำสำคัญ: แบบฝึกภาษาอังกฤษ, รูปแบบสติมศึกษาสำหรับการสอนภาษาอังกฤษ, ทักษะการคิดอย่างมีวิจารณญาณ

Abstract

The purposes of this research were to: 1) develop a sample unit of an English workbook which integrated STEAM education using content from Phetchaburi and Prachuap Khiri Khan Locality for senior high school students; and 2) analyze the congruency of English learning skills, thinking ability and STEAM skills existing in the sample unit of the workbook. The method used in this research is R&D. Based on the findings it can be concluded that the workbook should have the contents on tourist attractions (24.17%), food and deserts (18.33%), art and culture (12.50%), natural resources (11.67%), Royal initiative projects (7.50%), economy (5.83%), community (5.83%), agriculture (5.00%), weather (5.00%), and geography (4.17%) respectively. Based on the sample unit (unit 1: Let's go travel) developed by the researcher, it was found appropriate to be used as the material to enhance the learners' proficiency of English skills, critical thinking skills with the integration of STEAM and Phetchaburi and Prachuap Khiri Khan locality (IOC in overall = 0.89).

Keywords: English Workbook, STEAM Integrated Education in ESL, Critical Thinking Skills

Introduction

Critical thinking skills in learners can be improved by reading comprehension practice with questioning. In other words, systematic problem solving is practiced while students are trying to find out the answers of those given questions. According to Bloom's Taxonomy, students follow each level of learning objective orderly starting from 1) recognizing facts and recalling their background knowledge and experiences related to the text that is being read, 2) understanding the meaning of the content in the text so that they can classify or describe the key concepts and ideas, 3) applying the facts, rules, concepts, and ideas that they have learned before to the given questions or tasks that may contain other new situations for them to find out the solutions, 4) analyzing the text by breaking down information into component parts in order to differentiate, compare, or examine the ideas from the reading text, 5) evaluating text by selecting, judging or making decision based on what they have learned from the text, and 6) creating a whole new pattern of product or material (Chandi et al., 2016). Therefore, teachers in the 21st century have to learn and practice systematically on how to design learning activities properly, develop effective teaching materials, and evaluate learning achievement of the students accurately.

The challenge of world education in the 21st century is how to prepare our students to encounter the current world situations that directly affect their way of living. Teachers, therefore, play an important role on providing effective lessons for the students to make them understand more about their

society, economy, culture and environment for example. Learning skills are considered one of the most important elements of the 21st century. Learning skills not only have a great influence on people's thoughts and decisions, but is also an important element of people's core competency for studying and working. The integrated learning system becomes one of the most important keys to successful learning skills enhancement as it has a positive effect on student outcomes (Van Dusen & Worthen, 1994).

Nowadays, integrated STEM (Science, Technology, Engineering, and Mathematics) is widely used in a variety of educational levels. This blended learning shows students how the scientific method can be applied to everyday life focusing on mathematical thinking and problem solving skills based on real world applications (Hom, 2014). However, STEM alone cannot serve all innovation demands of the 21st century (Meada, 2013). To increase the effectiveness of the student's creativity, art should be added into the learning contents and materials. Teachers can use art to create a wide range of activities that attract students' attention. Moreover, using art can also improve students' designs and presentation of their materials (Southern Illinois University, 2015). Hence, instead of only integrated STEM education, STEAM can be one of the most effective solutions to developing problem solving, assertiveness, critical thinking, and sensory skills of the students (Maeda, 2013).

In the aspect of English teachers, ESL students not only have to learn and understand English vocabulary and structures, but they also need to improve their language skills through many different activities and materials that are provided by the teachers. As a result, English skills development seems to be impossible for those students who have insufficient English proficiency. However, English skills can be highly improved through reading, because it allows the students to gain advantages of improving their English skills; for instant, learning vocabulary from texts, models and patterns of English writing and seeing

correctly-structured English. Furthermore, one of the most critical advantages of reading is that the students can work at their own speed with unlimited repetition. Nevertheless, the topics for reading should be thoroughly considered by the teachers because the students are motivated to acquire language knowledge and skills when they are interested in the topic. In fact, the schema existing in readers directly affects their reading comprehension improvement (Essberger, 2010). It can be explained that when the readers have some background knowledge and vocabulary related to the text they are reading, his/her reading comprehension possibly rises. For this reason, teachers should therefore provide the proper reading contents for their students based on what are familiar to the students' background knowledge and environment. Meanwhile, critical thinking is one of the effective tools to activate or construct schema because it provides all elements that are important for not only activating existing schemata, but also constructing new knowledge (Norris & Phillips, 1994). In conclusion, one of the most crucial objectives of teaching is to improve critical thinking skills in students (Halpern, 1999). To achieve critical thinking skills development in students, teachers also have to work hard on learning process management including; 1) determining learning objectives, 2) teaching through questioning, 3) practicing before assessment, 4) reviewing and 5) providing feedback and proper teaching strategies that allow the students to improve their skills of critical thinking which is considered to be one of the most important factors to achieve learning of the 21st Century (Higgins, 2014).

At present, using English workbooks with integrated STEAM contents to enhance student's critical thinking skills is hardly found among Thai educational institutions, so most English teachers decided to use textbooks with some exercises that emphasis more on understanding language structures rather than fostering critical thinking skills. Besides, English teachers also prefer those

teaching materials which only focus on common English usage even though it is found that integrated learning can be more attracted to students and they can learn through the lessons with more satisfactions and higher scores of achievement (Posri, 2013). Consequently, developing a suitable workbook that integrates English language learning and STEAM content with tasks and exercises that can improve critical thinking skills can possibly be one of the most effective ways to generate sustainable development on communicative skills and learning skills of the students in the 21st century.

Objectives

1. To develop a sample unit of an English workbook which integrates STEAM education using Phetchaburi and Prachuap Khiri Khan Locality content for senior high school students.
2. To analyze the congruency of English learning skills, thinking ability and STEAM skills existing in the sample unit of the workbook.

Hypothesis

The content in the sample unit, which is developed by the researcher, consists of the topic related to the locality of Phetchaburi and Prachuap Khiri Khan provinces with the integration of STEAM education model that is proved its congruency of English learning skills, thinking ability, and STEAM skills.

Methodology

The researcher use R and D Method based on Richey (2007: 7) which is divided into 3 parts: exploring (research), developing (design and development), and evaluation (design research) (Rokhayati, 2016). This study analyses the exploring stage, the developing stage is still in process. So, the exploring stage or preliminary study will be the only the topic that is discussed in this study.

The tool of this research is demonstrated by 3 experts who are English lecturers at Phetchaburi Rajabhat University.

1. Research Sampling Group

In this study, 24 local high-school English teachers (12 teachers were from Petchaburi and another 12 teachers were from Phrachuap Khiri Khan) were selected by the purposive sampling method to determine most requested topics to teach the high-school students in Phetchaburi and Prachuap Khiri Khan provinces.

2. Research Tools

Questionnaire was used as the research tool to find out what content should be put into the workbook. In the questionnaire, 10 topics were identified for the respondents to select 5 most-wanted topics for teaching high school students in Phetchaburi and Prachuap Khiri Khan Provinces.

3. Data Collection

After the questionnaire was produced, the researcher sent the copies of the questionnaire to the sampling group and collected them back in one week later to prepare for the data analysis.

4. Data Analysis

After all copies of the questionnaire were returned from the sampling group, the researcher analyzed the data by the statistical mean to find out what local teachers want their students to learn the most. This is to be used as the topics in the workbook later.

Research Findings

To develop an effective English workbook with which integrates STEAM and the locality of Phetchaburi and Prachuap Khiri Khan Provinces, there are several steps that must be done by the researcher.

1. Literature study

The literature study has been started since the researcher proposed the research plan asking for the research grant. Thailand Basic Education Core Curriculum of English, various English textbooks and workbooks, as well as other reading comprehension tasks and exercises from different sources related to the topics discussed have been studied by the researcher. These materials are very supportable as the basic resource that can help the researcher to determine what to put in the workbook as well as how to design the layout of activities in different units of the workbook.

2. Material design

The researcher started the material design process by asking 24 teachers using a questionnaire which was developed to study the demand of English content that is needed to be taught at the high school level. The following items are details found from the result:

A. Respondents: 24 local high-school English teachers (12 teachers were from Phetchaburi and another 12 teachers were from Phrachuap Khiri Khan) were given the questionnaires in which the list of learning contents were provided. They were asked to select the 5 most essential topics for teaching their students.

B. Contents to learn: local teachers want their students to learn about their local tourist attractions, food and desserts, art and culture, natural resources, and Royal initiative projects respectively. It is shown in the following table:

Table 1: The contents used in the workbook

Contents to Learn	Number	Percentage
1. Economy	7	5.83
2. Tourist attractions	29	24.17
3. Agricultures	6	5.00
4. Art and culture	15	12.50
5. Food and deserts	22	18.33
6. Royal initiative projects	9	7.50
7. Natural resources	14	11.67
8. Community	7	5.83
9. Weather	6	5.00
10. Geography	5	4.17
Total	120	100

Note: Watchara Yenprem (2018)

C. Model of learning: After the language content analysis was done, the researcher determined topics and created a model of reading task and exercise for each unit in the workbook. The following figure shows the pattern of tasks and exercises which are arranged in each unit in the workbook:

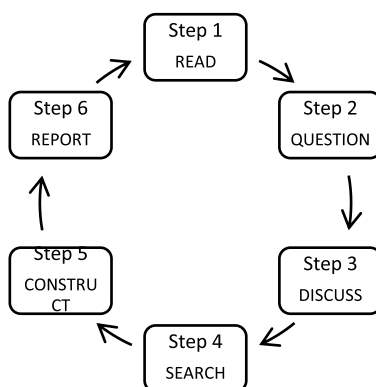


Figure 1: Model of learning for each unit (6 steps)

Note: Watchara Yenprem (2018)

D. Evaluation: After the model of learning was completed, the researcher developed a sample unit (unit 1: Let's go travel) of the workbook and proposed it to the 3 experts to analyze the congruence in terms of the English learning contents, thinking abilities, and STEAM integration by using Index of Item-Objective Congruence (IOC) as a measurement tool. The IOC evaluation analysis is as follows:

Table 2: IOC evaluation analysis

No	Issues to analyze	IOC evaluation			Total	IOC
		by 3 experts				
		#1	#2	#3		
English Learning Contents						
1.	English vocabulary knowledge	1	1	1	3	1.0
2.	English grammar knowledge	1	1	1	3	1.0
3.	Appropriateness of language use for high school level	1	1	1	3	1.0
4.	English language accuracy	1	1	1	3	1.0
5.	Integrated content of Phetchaburi and Prachuap Khiri Khan Provinces	1	1	1	3	1.0
6.	Appropriateness of reading tasks and exercises	1	0	1	2	0.67
Percentage of English Learning Contents						0.95
Thinking Skills						
7.	Efficiency to improve knowledge	1	1	1	3	1.0
8.	Efficiency to improve understanding	0	1	1	2	0.67
9.	Efficiency to improve application	1	1	1	3	1.0
10.	Efficiency to improve analysis and synthesis	1	1	1	3	1.0
11.	Efficiency to improve assessment and evaluation	1	1	1	3	1.0

No	Issues to analyze	IOC evaluation			Total	IOC
		by 3 experts				
		#1	#2	#3		
12.	Efficiency to improve creativity	1	1	1	3	1.0
Percentage of Thinking Skills						0.95
STEAM Integration						
13.	Integration of Science	1	1	1	3	1.0
14.	Integration of Technology	1	1	1	3	1.0
15.	Integration of Engineering	1	0	1	2	0.67
16.	Integration of Art	1	1	1	3	1.0
17.	Integration of Math	1	1	0	2	0.67
18.	Overall design	1	1	1	3	1.0
Percentage of STEAM Skills						0.89
Overall percentage		17	16	17	50	0.93

Note: Watchara Yenprem (2018)

Discussion

A. The results of the local teachers' questionnaire

Based on the results of the local teachers' questionnaire, it can be described that the high school English teachers who are teaching in Phetchaburi and Phrachuap Khiri Khan provinces think that their students should learn English with the contents of tourist attractions (24.17%), food and deserts (18.33%), art and culture (12.50%), natural resources (11.67%), Royal initiative projects (7.50%), economy (5.83%), community (5.83%), agriculture (5.00%), weather (5.00%), and geography (4.17%) respectively.

Seeing the results above focusing on the top 4 most-wanted content to learn, it can be described that both Phetchaburi and Phrachuap Khiri Khan are rapidly developing on tourism because there are more oversea tourists coming to visit these locations in every year (Ministry of Tourism and Sports, 2017). Besides,

Phetchaburi and Prachuap Khiri Khan are well-known for many reasons related to food, nature, art and culture, as well as the way of life of the native people. As a result, English teachers expect their students to learn these topics so that they can learn and understand what is important in their hometown from the tourists' perspective. In addition, English teachers also expect their students to improve their English skills because these topics are what attract tourists to visit these locations, not to mention any future advantages to their students as a result of a better mastery of the English language.

Based on the findings of the teachers' questionnaire, the researcher will be able use it as a guideline on what learning content will be needed to be taught. Therefore, the researcher will continue the next step of the research by selecting these 5 most-wanted content that were important to the local teachers as the main contents to learn in the full-version of the English reading workbook.

B. The result of IOC evaluation analysis

According to the IOC evaluation analyzed by the 3 English teaching experts, it can be concluded that the sample unit (unit 1: Let's go travel) of the English reading workbook is appropriate for using as the material to enhance the learners' proficiency of English skills, critical thinking skills with the integration of STEAM and Phetchaburi and Prachuap Khiri Khan locality (IOC in overall = 0.93).

With the 6 step learning model shown in figure 1 above blended with STEAM education and the content of the locality that is familiar to the students' background, students are expected to improve more in their reading and thinking skills. This result seems to be compatible with what Limbach and Waugh (2010), and Posri (2013) have previously stated that teachers can improve their students' reading and thinking skills by using the model of learning that includes different steps of learning and the contents should be connected with the students' background.

In terms of English learning contents and thinking skills, it has been proven that the sample unit is appropriate for using this material to improve English skills and thinking skills for high school learners ($IOC = 0.94$). However, STEAM integration ($IOC = 0.89$) in the sample unit seems to be less appropriate than those two aspects mentioned above especially in Engineering and Math. There are some comments from the experts related to this issue:

1. In terms of Engineering, it seems to be insufficient for tasks or exercises to build up engineering skills in the sample unit. The researcher should add more activities or content related to the engineering skills in other units of the book.

2. In terms of Math, there are contents and exercises in Math existing in the sample unit, but there should be more activities that allow the students to create their own questions to be discussed with their friends in class.

In summary, the sample unit (unit 1: Let's go travel) is proved for its appropriateness to be used as a guideline for the researcher to develop the other units of the English workbook. For the next step of the study, the researcher will develop a full text of English Reading Workbook which contains 5 different units including unit 1 – Let's go travel, unit 2 – Food and Deserts, unit 3 – Art and Culture, unit 4 – Royal Initiative Project, and Unit 5 – Economy. By following the pattern of the sample unit (unit 1: Let's go travel), it can be assumed that the full text of the English workbook will be able to help the learners to improve their skills of English as well as to enhance their critical thinking skills.

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