

Effects of E-learning Based on Microlearning Approach on  
Undergraduate Students' English Pronunciation

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ผลของการเรียนการสอนผ่านสื่ออิเล็กทรอนิกส์ตามแนวการจัดการเรียนรู้แบบจุดภาคที่มีต่อการ  
ออกเสียงภาษาอังกฤษของนักศึกษาระดับปริญญาบัณฑิต



สารนิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต  
สาขาวิชาภาษาอังกฤษเป็นภาษานานาชาติ สาขาวิชาภาษาอังกฤษเป็นภาษานานาชาติ

บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย

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ลิขสิทธิ์ของจุฬาลงกรณ์มหาวิทยาลัย



ณัชชา บุญบุญบุญฤทธิ : ผลของการเรียนการสอนผ่านสื่ออิเล็กทรอนิกส์ตามแนวคิดการจัดการเรียนรู้แบบจุลภาค  
ที่มีต่อการออกเสียงภาษาอังกฤษของนักศึกษาระดับปริญญาบัณฑิต. ( Effects of E-learning Based  
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วิจัยฉบับนี้มีวัตถุประสงค์ 1) เพื่อพัฒนาสื่ออิเล็กทรอนิกส์ตามแนวคิดการจัดการเรียนรู้แบบจุลภาค และ 2) เพื่อ  
ประเมินคุณภาพสื่อที่ได้รับการพัฒนาขึ้น เครื่องมือที่ใช้ในการวิจัยเพื่อประเมินคุณภาพสื่อประกอบด้วย แบบทดสอบก่อนและ  
หลังเรียน แบบสำรวจการรับรู้ และแบบประเมินคุณภาพสื่อ กลุ่มตัวอย่างที่ใช้ในงานวิจัยนี้คือนักศึกษาชาวไทยระดับชั้นปริญญา  
ตรีที่ศึกษาอยู่คณะครุศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย จำนวน 21 คน มีการใช้สถิติเชิงบรรยายซึ่งได้แก่ ค่าเฉลี่ยและค่า  
เบี่ยงเบนมาตรฐาน (SD) และการทดสอบที (one sample t-test) ในการวิเคราะห์ข้อมูล ผลการศึกษาจากการทดสอบ  
ที่ซึ่งแตกต่างกันอย่างมีนัยสำคัญทางสถิติที่ระดับ .05 แสดงให้เห็นถึงความสามารถในการออกเสียงของนักศึกษาที่พัฒนาขึ้น  
หลังการทดลอง อีกทั้งผลที่ได้จากแบบสำรวจการรับรู้พบว่านักศึกษามีการรับรู้เชิงบวกต่อสื่ออิเล็กทรอนิกส์ดังกล่าว ผลการ  
ประเมินจากผู้เชี่ยวชาญสะท้อนให้เห็นคุณภาพสื่อระดับสูง การศึกษาค้นคว้าครั้งนี้สามารถสรุปได้ว่าการพัฒนาและการใช้สื่อ  
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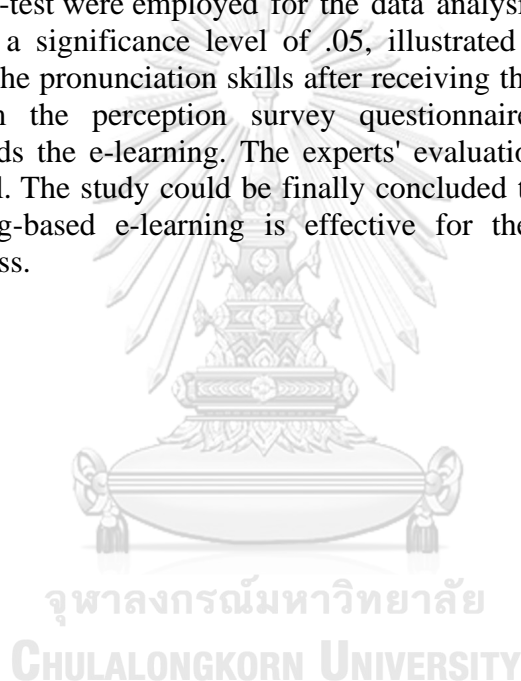
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# # 6288035720 : MAJOR ENGLISH AS AN INTERNATIONAL LANGUAGE

KEYWORD e-learning, microlearning approach, pronunciation, English ending  
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This study aimed 1) to develop an e-learning based on the microlearning approach and 2) to examine quality of the developed e-learning. To examine the quality, three research instruments including pretest and posttest, a perception survey questionnaire and a quality evaluation form were used. The sample group consisted of 21 Thai undergraduate students in Faculty of Education at Chulalongkorn University. Descriptive statistics which were mean and standard deviation (SD) and one sample t-test were employed for the data analysis. The findings from one sample t-test, at a significance level of .05, illustrated the students' noteworthy improvement of the pronunciation skills after receiving the treatment. Furthermore, the results from the perception survey questionnaire revealed their positive perception towards the e-learning. The experts' evaluation score also reflected its high-quality level. The study could be finally concluded that developing and using the microlearning-based e-learning is effective for the English phonetics and pronunciation class.



Field of Study:	English as an International Language	Student's Signature
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		Advisor's Signature
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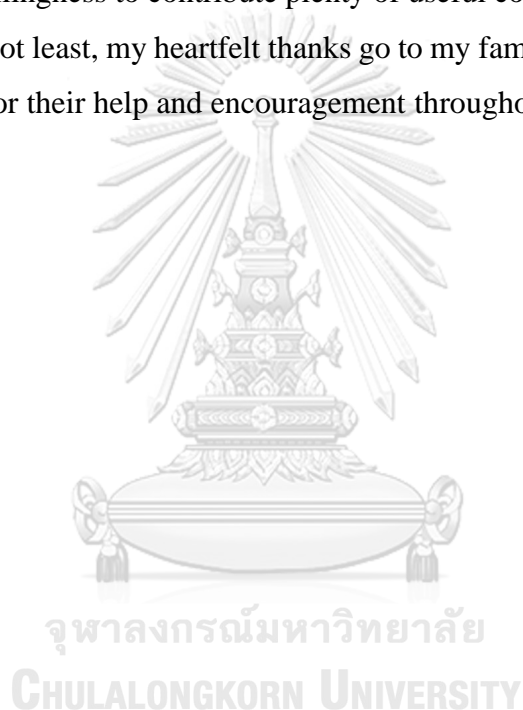
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# CHAPTER I

## INTRODUCTION

### 1.1 Background of the Study

Despite important roles of grammar and vocabulary, making minor errors in these elements can still form effective oral communication Harmer, 2007 as cited in Gilakjani (2012). However, it is impossible to communicate successfully if the speaker's pronunciation is incomprehensible (Çakır, 2014; Gilakjani, 2016). Therefore, the skill needs to be carefully developed to ensure the acceptable level. Language instructors ought to pay attention to their students' errors and coach them to develop the skills (Boran, 2005 as cited in Gilakjani & Sabouri, 2016). Nonetheless, many ESL and EFL teachers lack confidence in teaching pronunciation which becomes a major challenge of the education (Buss, 2017; Rofiq, 2014). The issue has been occurring in Thai education, and it is probably due to insufficient practices when these teachers were students. The time is quite limit in a face-to-face class. Accordingly, a pronunciation class needs to be reformed to ensure more adequate practices. Since preservice teachers not only learn as students but also are teachers-in-making, they are considered taking important roles in educational processes (Deocampo, 2020). It would be worth starting from reforming current preservice teachers' class. Graduating with specialized training, they would be qualified for coaching the skills effectively.

Today students – so called Generation Y or Millennials – tend to have different learning styles than those in the previous generations. Understanding their characteristics will likely help instructors know how best to teach them. As raised by technology, Generation Ys are so comfortable with a world of computers, smartphones and a variety of software programs (Battersby, 2017). With this preference, they become multitaskers which lead them to have short attention spans. Therefore, Battersby (2017) explained that, for this generation, the delivered information must be short and rapid. Additionally, individual students would have different learning strategies, learning paces and the fear of losing faces, so it might not be effective enough to review lessons and practices in class together (Nakazawa, 2012 as cited in Çakır,

2014). However, lectures and class discussion do not always mean an ineffective teaching method for Generation Ys, but creative strategies such as interactive activities are suggested for the class (Herrman, 2011 as cited in Battersby, 2017).

Due to daily-life electronic communications, providing an access to information in electronic formats becomes an obvious trend (Katermina, 2019). Since e-learning is reputable for supporting flexible pedagogies, it would support individuals' learning styles and paces well (Gordon, 2014). Its technological base promisingly suits today students' lifestyle and allows students to personalize what, how, and where to be learned according to their desires and needs. Hence, it is likely that applying the e-learning to pronunciation class would lead to more effective learning results. Unfortunately, not every e-learning is efficiently delivered to its target learners. As pointed out by Park and Kim (2018), most people fail to complete whole regular e-learning courses because the contents are too long to comprehend in a short period of time. Consequently, traditional styles of the e-learning may not suit for the current fast-changing world.

Exploring a microlearning approach, several characteristics, especially small chunks of knowledge and learner-driven experiences, shed an idea that microlearning-based e-learning could be a good alternative to relieve the issue. It would offer "a viable supplement to more time-consuming and formalized modes of learning" (Buchem & Hamelmann, 2010). As microlearning does not require long attention span, the chunks of lesson would help students learn well owing to lower cognitive loads (Buchem & Hamelmann, 2010). However, only few studies apply the approach to the language field. Hence, this study attempts to fill this research gap. It is anticipated that the use of microlearning-based e-learning in English pronunciation class for preservice teachers will effectively prepare them for the knowledge and train them to discriminate and pronounce the target sounds through a variety of practices. The specialized training would enhance desirable views and boost up confidence to teach pronunciation (Buss, 2017). Once these preservice teachers graduate, it is likely that they would be proficient to teach English pronunciation, coach their EFL students, and be good models. Replaced by these skillful language educators, the national education would have better quality, especially for the pronunciation teaching and learning.

## 1.2 Research Objectives

With regards to potentials of the e-learning to promote flexible active learning environments, the study aims:

1. to develop an e-learning based on the microlearning approach for English for Phonetics and Pronunciation for English Teachers class
2. to examine quality of the e-learning:
  - 2.1) to compare students' pronunciation before and after learning the developed e-learning
  - 2.2) to explore perceptions of the students toward the developed e-learning
  - 2.3) to evaluate its quality from the experts' evaluation

## 1.3 Research Questions

Based on the research objectives, the researcher came up with the following research questions:

1. What are the main components of a microlearning approach for developing e-learning for Phonetics and Pronunciation for English Teachers class?
2. To what extent of quality can the microlearning-based e-learning achieve?
  - 2.1) To what extent can the microlearning-based e-learning improve students' pronunciation?
  - 2.2) What are the students' perceptions toward the microlearning-based e-learning?
  - 2.3) At what quality level does the microlearning-based e-learning achieve from the experts' evaluation?

## 1.4 Statement of Hypothesis

The hypotheses of this study have been set up as follows:

1. Students' mean score of pronunciation in the posttest is significantly higher than their pretest mean score.
2. The evaluation score of the microlearning-based e-learning is at least medium-quality level.

## 1.5 Definition of Terms

**Pronunciation** refers to an ability to articulate and pronounce sounds in a language. As of this study, English ending consonant sounds are in focus, and the ability can be assessed by the pronunciation tests that the researcher developed.

**E-learning** refers to a stand-alone instructional media in which the learning takes place by means of electronic devices. As of this study, it would take place by means of Microsoft PowerPoint, allowing students to access on computers and smartphones by themselves.

**Microlearning approach** refers to lessons or contents that are comprised of small independent sections and served through simple and flexible platform in which interactions and activities are promoted. As of this study, seven characteristics of the microlearning principle are used in designing an instructional media: lifelong learning, small chunks of knowledge, connection of knowledge and skills, flexibility and adaptability for learners, learner-driven experiences, user-friendly structure, and independence but encourage social interaction.

**Microlearning-based e-learning** refers to the use of e-learning as a supplemental material which was designed based on principles of the microlearning approach for supporting different paces, spaces, and times. The lesson was clearly divided into sections. Each of the sections provides not only contents but also practices.

**Students** refer to Thai undergraduate English-major students. As of this study, students in the Faculty of Education at Chulalongkorn University are in focus.

## 1.6 Scope of the Study

For the context of this study, the developed e-learning would be implemented in Phonetics and Pronunciation for English Teachers (Phone Pronun Tchr) class which is a compulsory core course offered by Chulalongkorn University to students in Faculty of Education whose concentration is on English language teaching. The course description consists of theories of sound system, articulators, consonant sounds, vowel

sounds, word and sentence stress, intonation, pronunciation practice, and the use of phonetics in English language teaching.

The participants for whom the e-learning would be experimented were the second-year students with English major in the Faculty of Education who were enrolling for the course.

The learning contents that would be included in the e-learning focused on English final consonants and consonant clusters which are part of the topics that would be taught in the class. The contents would respond to the need analysis which covered six groups of problematic ending sounds for Thai EFL learners: inaudible release of plosive consonants, incomplete voiced endings, substituted sounds, -ed suffix, -s suffix, and two- to four-member consonant clusters.

The duration of the data collection in this study took in total of eight weeks.

### **1.7 Significance of the Study**

Developing and examining the quality of a microlearning-based e-learning in this study can reveal both pedagogical and research implications. As for the pedagogical implication, the development of an instructional media in this study could be a model for future pronunciation training. Language educators who are looking forward to adjusting their instruction would have some guidelines and insightful ideas of how to implement an e-learning in their class.

For research implication, the study confirms that using ADDIE model as a framework could help researchers develop their material systematically. Moreover, the results of the study shows that the e-learning designs based on microlearning approach can give satisfying results on both learners' performance and perception.



## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1 Definition of Pronunciation**

The meaning of “pronunciation” is variously defined by several linguists and scholars such as Celce-Murcia (1987), Richard and Schmidt (2002) as cited in Gilakjani and Sabouri (2016), Harmer, 2007 as cited in Gilakjani (2016), etc. For Celce-Murcia (1987), pronunciation is the sound production to generate meaning. This can also include attention to particular sounds of a language and aspects of speech that are beyond the level of individual sounds such as voice production, stress, intonation, etc. (Celce-Murcia, 1987; Harmer, 2007 as cited in Gilakjani, 2016). The definition details might vary depending on aspects that are in focus. However, it is accepted by the scholars that clear pronunciation plays a significant role in speaking contexts. The produced sounds, especially segmentals, could affect the intelligibility of interlocutors (Bent, Bradlow & Smith, 2006 as cited in Ketabi & Saeb, 2015).

#### **2.2 Importance of Pronunciation Teaching**

Using perfect grammar and vocabulary cannot guarantee right message interpretation if a speaker has incomprehensible pronunciation. Since pronunciation inaccuracy is one of the major obstacles for successful oral communication, it is undeniable that paying attention to EFL students’ errors is significant (Boran, 2005 as cited in Gilakjani & Sabouri, 2016). Though English is taught as a foreign language for the entire basic education in Thailand, approximately ten years, Thai learners of English still encounter serious pronunciation difficulties. Therefore, it is language educators’ responsibility to help their learners. They ought to present rules and principles together with coach their students to have comprehensible pronunciation; otherwise, no one will do it (Gilakjani, 2016). However, they must be trained precisely in order to perform the duty well.

### 2.3 Causes of Pronunciation Challenges for Thai EFL Learners

Pronunciation teaching and learning can be impacted by many factors such as accent, motivation, age, personality of learners, etc. Exploring factors that cause the problems in phonetics learning for Thai EFL learners, Sahatsathatsana (2017) asserted that the native language is the uppermost one. Interestingly, similarities and differences between Thai and English consonant sound systems was examined by Kanokpermpoon (2007), and it is found that most cases resulted from nonexistent sounds in Thai. Students are likely to replace those problematic sounds with the ones existing in their mother tongue (Lahdae, 2015).

In Thai, only eight final single consonant sounds are allowed: /kʰ/ (*Mae Kok*), /tʰ/ (*Mae Kod*), /b/ (*Mae Kop*), /ŋ/ (*Mae Kong*), /n/ (*Mae Kon*), /m/ (*Mae Kom*), /y/ (*Mae Koeiy*), and /w/ (*Mae Kew*) (Noss, 1964 as cited in Le & Boonmoh, 2020). The sounds are much more limited when comparing to English. Consequently, Thai EFL learners tend to have ending consonant pronunciation problems. As verified by Lahdae (2015), “the ending consonant sounds might impact on intelligibility more than the initial consonant sounds” (p. 29). That is a reason why people who are not familiar with Thai accent of English may not be able to comprehend the message.

### 2.4 Problematic Ending Consonant Sounds for Thai EFL Learners

Previous studies (Chakma, 2014; Chanthawee & Rungruang, 2020; Kanokpermpoon, 2007; Le & Boonmoh, 2020; Ruengkul, 2020; Rungruang, 2017; Wei & Zhou, 2002) reported various characteristics of English ending consonant sounds that are problematic for Thai EFL learners. The issue could be grouped into three main categories: single consonants, suffix endings, and consonant clusters.

Even though some consonant sounds share in both languages, the occurrence in different environments can lead to pronunciation issues. The work of Chakma (2014) reported that some non-problematic sounds can cause difficulties when occurring in the final position. There are three unique characteristics for single-consonant problems including inaudible release, incomplete voicing, and sound substitution. To explain, ending aspiration of voiceless plosives such as /p/, /t/, and /k/ are likely to be inaudibly

released (Kanokpermpoon, 2007), voiced endings are replaced by the voiceless counterparts (Wei & Zhou, 2002), and sounds that are absent in Thai tend to be substituted by the similar native sounds. For example, Thai does not have the “*th*” sound in the language system, so it is replaced by [t̃] (Kanokpermpoon, 2007).

Thai learners of English also have difficulties in pronouncing some suffix sounds which are *-ed* (Ruengkul, 2020) and *-s* endings (Chanthawee & Rungruang, 2020). As revealed by Ruengkul (2020), the most problematic *-ed* ending pronunciation is /t/ after voiceless endings as in *finished* [-ft] and *picked* [-kt]. For the *-s* endings, the study of Chanthawee and Rungruang (2020) asserted that the most problematic sound is /z/ since the sound does not appear in Thai.

In addition, Thai EFL learners have pronunciation problems to produce English coda consonant clusters because Thai sound system allows only single consonant sounds at the final position while up to four-member are allowed in English (Le & Boonmoh, 2020). They find it hard to pronounce such groups of consonant sounds, especially when the last members are fricatives namely [ʃ, tʃ, z, s] as in *sevenths* [-nθz] and *depths* [-pθs] (Rungruang, 2017). Moreover, Rungruang (2017) added that the four-member consonant clusters are the most complex issue that Thai learners of English could not handle.

## 2.5 Definition of E-learning

The advancement of technology nowadays has influenced on several fields, no exception for education. Therefore, e-learning is introduced to be an alternative for teaching and learning practices (Wongwuttiwat et al., 2020). Basically, e-learning is the use of technology for teaching and learning (Mayes, 2005 as cited in Janelli, 2018). For Katermina (2019), it is viewed as “a transformative movement in learning”. The teaching and learning processes would be facilitated by educational technologies such as computers, communication devices and software and transformed to online learning that allows learning at convenient times and places (Tselios et al., 2011 as cited in Wongwuttiwat et al., 2020). Accordingly, it would provide greater opportunity and flexibility which help students to access learning resources easily and repeatedly at their own pace.

## 2.6 Definition and Significance of Microlearning

To obtain a clear concept of microlearning approach, defining the term of “microlearning” would be necessary. Microlearning refers to independent small contents that are served through simple and flexible interactions and activities (Gabrielli et al., 2006; Mohammed et al., 2018; Park & Kim, 2018). It is so small that Giurgiu (2017) called it as “bite-sized”.

According to Park and Kim (2018), people are likely to fail completing traditional e-learning courses due to too long contents. The length does not suit for comprehending in a short period of time. To solve the issue, the microlearning concept is proposed as an alternative. This would provide students opportunities to personalize their learning and make it selective. Giurgiu (2017) also noted that “a short content may increase information retention by 20%”.

## 2.7 Characteristics of Microlearning

Exploring previous studies of the microlearning approach (Buchem & Hamelmann, 2010; Gabrielli et al., 2006; Major & Calandrino, 2018; Mohammed et al., 2018), the following unique characteristics are found:

### 2.7.1 Lifelong Learning

Normally, knowledge from traditional teaching styles tends to be easily forgotten. The way knowledge and skills are put into understandable fractions could help students integrate learning into their daily activities more conveniently. Learning informally, students would be motivated to learn new things leading to longer period of memorization.

### 2.7.2 Small Chunks of Knowledge

To reduce learners’ cognitive loads, slicing the information into microlearning sections would be helpful. These microcontent units ought to be contextualized in order to enhance meaningfulness and applicable experiences. Each section needs to be understood by itself and should take at the maximum of 15 minutes. Additional URLs might be attached for learners to retrieve more knowledge when they are willing to.

### 2.7.3 Connection of Knowledge and Skills

Since the target audience of microlearning is learners aiming at exploring ideas or solving practical issues, the knowledge should be built by showing connection between past and current experiences and promoting creativity.

### 2.7.4 Flexibility and Adaptability for Learners

Teaching formats and materials should be flexible enough so that students can self-direct and manage the learning based on their preferred styles, strategies, and paces.

### 2.7.5 Learner-driven Experiences

Instead of letting students explore lessons in hierarchical orders and sequences, the design of contents, activities, and materials should support individuals' active participation. In other words, learners would act as prosumers rather than consumers of the content. Therefore, microlearning is much more dynamic when comparing it to the traditional styles of teaching.

### 2.7.6 User-friendly Structure

Materials ought to be easy to access and support various situations of learning. To illustrate, students should be able to access the content through different gadgets regardless their location.

### 2.7.7 Independence but Encourage Social Interaction

Even though microlearning allows students to independently personalize their learning, it still needs to encourage social interactions. To say, students may have discussion regarding the content or share some ideas with their peers.

## 2.8 ADDIE Instructional Design Model

It is undeniable that “appropriate instructional models are needed to produce effective learning materials” (Ghani & Daud, 2018). ADDIE is one of the popular dynamic instructional models used by educators, researchers, and instructional

designers. It consists of five non-linear stages: Analyze, Design, Develop, Implement, and Evaluate. McGriff (2000) summarized sample tasks and outputs in each stage, as illustrated in Table 1.

*Table 1: Sample Tasks and Sample Outputs of ADDIE Instructional Model*

<b>Stages</b>	<b>Sample Tasks</b>	<b>Sample Outputs</b>
<i>Analysis</i> the process of defining what is to be learned	- Needs assessment - Problem identification - Task analysis	- Learner profile - Description of constraints - Needs, Problem Statement - Task analysis
<i>Design</i> the process of specifying how it is to be learned	- Write objectives - Develop test items - Plan instruction - Identify resources	- Measurable objectives - Instructional strategy - Prototype specifications
<i>Development</i> the process of authoring and producing the materials	- Work with producers - Develop workbook, flowchart, program	- Storyboard - Script - Exercises - Computer assisted instruction
<i>Implementation</i> the process of installing the project in the real-world context	- Teacher training - Tryout	- Student comments, data
<i>Evaluation</i> the process of determining the adequacy of the instruction	- Record time data - Interpret test result - Survey graduates - Revise activities	- Recommendations - Project report - Revised prototype

To briefly elaborate Table 1, it starts from the analysis of needs and problems to see learners' existing knowledge and issues which are a great source of information for establishing instructional goals. The design phase involves conceptual construction of contents, assessments and strategies giving a vivid picture of how the product will look like, then, develop it in the phase of development. In the implementation stage, it is to deliver and distribute the material to students for further feedback. Finally, an evaluation phase is carried out to measure an achievement of the desired goal. A formative evaluation would take place throughout the process to see if anything needs to be modified while the summative one concerns on the effectiveness, efficiency and value of the instruction. One of the studies conducted by Ghani and Daud (2018) proved

that the use of ADDIE framework to develop an e-learning website for Arabic learners helps educators design their material well.



## **CHAPTER III**

### **RESEARCH METHODOLOGY**

This study aims 1) to develop the e-learning based on the microlearning approach 2) to evaluate its quality. Therefore, the e-learning would be developed following ADDIE model which includes:

#### **3.1 Analyzing Stage**

To define what to be included in the e-learning, this early stage involves problem identification. A Thai instructor of English phonetics and pronunciation class was purposively selected for a private semi-structured interview. The questions focused on problems and needs that the instructor had encountered. Based on the need analysis, a significant issue of teaching and learning materials was reported. There is a shortage of final-consonant materials as most available materials focus on the initial consonant sounds.

Then, the literature regarding pronunciation issues of Thai EFL learners was reviewed to understand more about the problems and needs. The findings from the literature review shed the light on problematic English ending consonant sounds which could be grouped as follows:

1. Inaudible release of plosive consonants
2. Incomplete voiced endings
3. Sound substitution
4. -ed suffix
5. -s suffix
6. Coda consonant clusters

#### **3.2 Designing Stage**

Based on the results from the analyzing stage, the microlearning-based e-learning was designed as follows:



### 3.2.1 Learning Objectives

The e-learning intended to accomplish the following objectives:

1. Students would be able to discriminate different ending consonant sounds of English words.
2. Students would be able to pronounce English consonant endings.

### 3.2.2 Contents

According to the results of need analysis, the researcher decided to include the six aspects of ending consonant sounds that are problematic for most Thai EFL learners as the learning contents. The focused sounds of each aspect were selected based on the literature review as illustrated in Table 2.

*Table 2: Learning Contents of the E-learning*

<b>Aspects of Problems</b>	<b>Focused Sounds</b>
Inaudible Release of Plosive Consonants	<ol style="list-style-type: none"> <li>1. /-p/</li> <li>2. /-t/</li> <li>3. /-k/</li> </ol>
Incomplete Voiced Endings	<ol style="list-style-type: none"> <li>1. /-d/</li> <li>2. /-g/</li> <li>3. /-v/</li> <li>4. /-z/</li> </ol>
Sound Substitution	<ol style="list-style-type: none"> <li>1. /-f/</li> <li>2. /-s/</li> <li>3. /-θ/</li> <li>4. /-tʃ/</li> <li>5. /-ʃ/</li> <li>6. /-l/</li> </ol>
-ed Suffix	/t/ after voiceless endings
-s Suffix	/z/ after voiced endings
Coda Consonant Clusters	All kinds of consonant clusters are problematic, especially when the last members are fricatives [ʃ, tʃ, z, s]

### 3.3 Developing Stage

This part presents the product of the e-learning which was comprised of seven sections as illustrated in Table 3.

*Table 3: Learning Sections of the E-learning*

<b>Learning Section</b>	<b>Objective(s)</b>
<i>1. Introduction</i>	- To point out the importance of English ending consonant sounds in terms of intelligibility effects
<i>2. Inaudible Release</i>	- To introduce ending voiceless plosives that tend to be inaudibly pronounced by Thai EFL learners and tips to improve pronunciation of the target sounds - To practice discriminating and pronouncing ending voiceless plosive sounds
<i>3. Incomplete Voicing</i>	- To introduce voiced consonant endings that tend to be devoiced by Thai EFL learners and tips to improve pronunciation of the target sounds - To practice discriminating and pronouncing voiced ending sounds
<i>4. Sound Substitution</i>	- To introduce consonant sounds that tend to be replaced by similar Thai sounds and tips to improve pronunciation of the target sounds - To practice discriminating and pronouncing ending sounds that are absent in Thai
<i>5. -ed Suffixes</i>	- To introduce pronunciation rules of -ed suffixes - To practice discriminating and pronouncing -ed suffix endings
<i>6. -s Suffixes</i>	- To introduce pronunciation rules of -s suffixes - To practice discriminating and pronouncing -s suffix endings
<i>7. Consonant Clusters</i>	- To introduce two- to four-member English coda consonant clusters - To practice discriminating and pronouncing ending consonant clusters

Each of the section was developed based on the seven principles of the microlearning approach.

### 3.3.1 Lifelong Learning

Students may not be interested in learning what seems unnecessary or unrelated to them. Therefore, it is important to promote lifelong learning. The e-learning began with a video reflecting pronunciation issues due to unclear ending consonant sounds. This is to help students aware of the importance of lesson. Seeing meaningfulness of the contents, students were likely to integrate learning into their daily life more informally which would extend the information retention period. Figure 1 illustrates the video sample.



Figure 1: Video reflecting unclear pronunciation issues

Moreover, instead of forcing them to explore long theories and be tested on theoretical memorization, real-life practicality was promoted through activities. *Google Pronunciation* was also introduced to integrate more practices in daily life.



Figure 2: Recommended platform to promote practices

### 3.3.2 Small Chunks of Knowledge

Due to Millennials' short attention span, the e-learning was clearly divided into sections to minimize students' cognitive loads. Each section would focus on only one distinct aspect of the ending consonant sounds and was estimated to take no longer than 15 minutes.



Figure 3: Seven sections of the e-learning

Having a narrator to explain the content, each section could be understood by itself. Some URLs were attached to allow students to retrieve additional information sources if they were willing to.

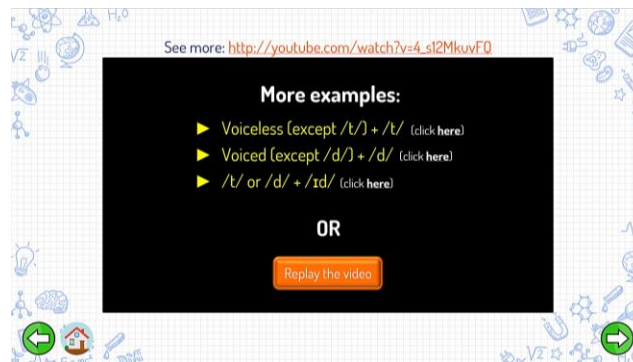


Figure 4: Accessible URLs to retrieve additional information

### 3.3.3 Connection of Knowledge and Skills

To respond to the leading practice-oriented trend, students were asked to explore some pronunciation rules and theories, then practice their skills. Sufficient practices would help them connect their theoretical knowledge into practices. The section of *-s suffix* would be used for vivid explanation. The lesson began with a video explaining the pronunciation rules of *-s* suffix, as shown in Figure 5.



Figure 5: Video explaining pronunciation rules of *-s* suffix

Then, students would have chance to practice using the rules in the following practices. Figure 6 illustrates an activity in which students have to select the suffix sound of the given words. The feedback would appear right away to enhance their understanding.



Figure 6: Activity to practice using -s suffix pronunciation rules

Before ending the section, students would have opportunities to practice their pronunciation. Figure 7 demonstrates *Let's Prepare Things for the Party*, an activity in which students have to fill the conversation between a delivery man and a customer. The blanks would focus on the plural nouns so that they can practice pronouncing the -s suffix. At the end, students can listen to the key and see the transcription to check if their pronunciation is correct. This way connects the knowledge and the skills together.



Figure 7: *Let's Prepare Things for the Party* (Activity Sample)

### 3.3.4 Flexibility and Adaptability for Learners

As students have different learning strategies, styles, and paces, the e-learning is designed as a standalone type to fit each individual well. In this way, students were allowed to explore the lessons by themselves and practice through various self-direct activities. This granted them learning flexibility so that they could personalize their learning according to their desired strategies, styles, and paces. For example, Figure 8 illustrates pronunciation speed options to support different paces of learning.

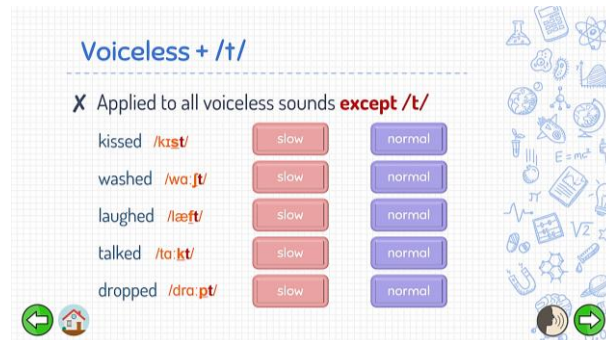


Figure 8: Features supporting learning paces

### 3.3.5 Learner-driven Experiences

Instead of providing passive lectures, students were engaged in active and selective learning through various interactive features. Buttons and URLs were offered so that students can be prosumers of the contents. To demonstrate, the content regarding place of articulators were not in the scope of the e-learning, but it would be helpful for students to pronounce some particular sounds that they were not familiar with. Instead of forcing them to consume the content, a hyperlink was provided as an extra tip. As shown in Figure 9, students could click it to access the information if they were willing to. This let students drive their own learning.

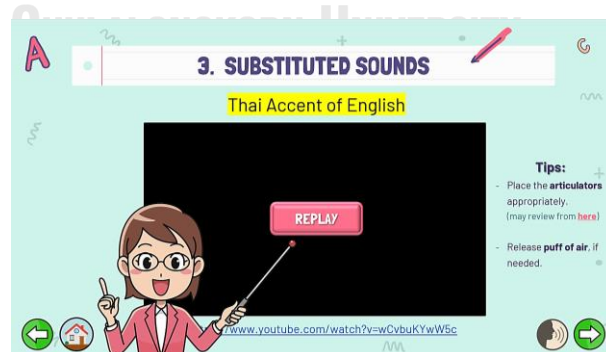


Figure 9: Features supporting learner-driven experiences

### 3.3.6 User-friendly Structure

Since Millennials are so comfortable with technologies and software programs, the e-learning was served through *Microsoft PowerPoint* so that they could access on different devices with free of charge. It would be easy to access from anywhere and anytime. Moreover, each section is easy to navigate. The system designs were consistent all along the e-learning. Clear instructions were also provided so that students could use the material by themselves. Figure 10 illustrates an example of instruction explaining roles of the key buttons.



Figure 10: Instruction explaining roles of the key buttons

### 3.3.7 Independence but Encourage Social Interaction

Having fears of losing faces, some students might prefer practicing alone. Hence, feedbacks were provided in all activities to allow students to complete them independently. However, these activities could be adjusted to suit one's needs. Students might pair up with their friends to take turn in practices and activities if they were willing to. Their partner may give further feedbacks which somewhat promote social interaction among learners.

An example is given in Figure 11, a pronunciation activity called *Spin the Wheel and Read it Aloud*. Students had to spin the wheel to get a number and read a word or a sentence that they got out loud. Clicking the number would allow learners to hear how the word or the sentence should be pronounced. Therefore, they could practice alone. Yet, if students would like to practice with their friends, they may pair up with a partner



and take turn in spinning the wheel. In this way, the social interactions could be promoted.

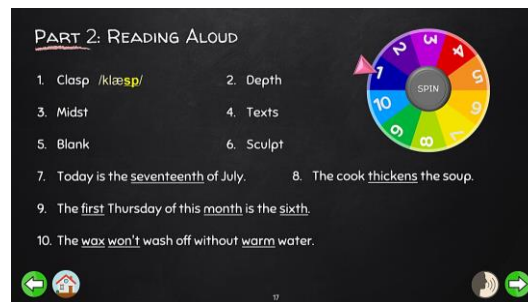


Figure 11: Spin the Wheel and Read it Aloud (Activity Sample)

### 3.4 Implementing Stage

After the e-learning was developed, this stage was to conduct a tryout to answer the research questions. The study was conducted with one experimental group.

#### 3.4.1 Participants

In this study, the participants were 21 Thai undergraduate students at Chulalongkorn University, Thailand. They were selected by using a purposive sampling method. All the twenty-one participants were students in the Faculty of Education who were taking *Phonetics and Pronunciation for English Teachers* class in the first semester of the Academic Year 2020.

#### 3.4.2 Research Instruments

Three main types of instruments were implemented for data collection: 1) pretest and posttest, 2) perception survey questionnaire, and 3) e-learning evaluation form.

### 3.4.2.1 Pretest and Posttest

To compare students' pronunciation ability before and after learning the developed e-learning, pretest and posttest were used as an instrument. The purpose of the tests was to compare students' pronunciation ability of problematic ending consonant sounds before (pretest) and after (posttest) using the instructional media. The same items were included in both tests to ensure the consistency between the tests but with the shuffle sequence. Also, results of the pretest were not revealed to the students in order to diminish the possibility of memorizing accurate answers. Both tests were rated by a linguistic instructor with more than ten-year teaching experiences.

The tests were comprised of four main parts in which the first two sections aimed at assessing the students' sound-discriminating skill while the other two assessing their pronunciation ability. Table 4 elaborated the test structure.

*Table 4: Structure of Pretest and Posttest*

<b>Part</b>	<b>Objective(s)</b>	<b>Number of Items</b>	<b>Scoring</b>	<b>Time Allocated</b>
1	To test ability to discriminate single ending consonant sounds and suffix endings	10 Multiple Choices	10 marks	3 minutes
2	To test ability to discriminate ending consonant clusters	5 True-False	5 marks	2 minutes
3	To test ability to pronounce consonant ending sounds at a word level	20 words	20 marks	5 minutes
4	To test ability to pronounce consonant ending sounds at a sentence level	15 sentences	15 marks	5 minutes
<i>Total</i>		<i>50 items</i>	<i>50 marks</i>	<i>15 minutes</i>

For Part 3 and 4, the scoring rubric guided by New York State LOTE assessments were summarized in Table 5.

Table 5: Scoring Rubric for Part 3 and 4

Part	Points		
	Excellent (1)	Good (0.5)	Poor (0)
3 <i>Word-Level Pronunciation Test</i>	- Student's pronunciation is phonetically correct.	- Student's pronunciation interferes meaning, and/or impedes comprehensibility. - Student's pronunciation has no difference between counterparts.	- Student's pronunciation is incomprehensible. - Student has no attempt.
4 <i>Sentence-Level Pronunciation Test</i>	- Student's pronunciation is comprehensible, generally correct.	- Student's pronunciation error confuses listener and requires guessing at meaning. - Student's pronunciation error interferes with comprehension of the message	- Student's pronunciation error makes an utterance incomprehensible. - Student has no attempt.

Developing pretest and posttest, the research instruments were validated by three experts in the field of English language. The IOC result was at the average of 0.98 with no less than 0.67 in each item.

#### 3.4.2.2 Perception Survey Questionnaire

To respond to the research objective which is to explore students' perception toward the microlearning-based e-learning, a perception survey questionnaire was used as an instrument. The questionnaire consisted of twelve modified items from the previous work by Alarcón et al. (2017). Participants had to indicate the extent to which

they agree or disagree with each statement by selecting one of the four boxes: *strongly disagree*, *disagree*, *agree*, or *strongly agree*. Moreover, students could freely reflect their opinions in an open-ended question.

### 3.4.2.3 E-Learning Evaluation Form

To examine the quality of the microlearning-based e-learning from experts' point of view, the e-learning evaluation form was used as an instrument. The form consisted of fifteen Likert-scale items which were based on unique features of the microlearning approach. Each of them was with three grades listed as 3 for *High Quality*, 2 for *Medium Quality*, and 1 for *Low Quality*. An open-ended question was also provided for additional comments. All items were evaluated by three experts in the field of language teaching and educational technology and communications.

The criteria to judge its overall quality are as follows:

- *Low Quality*            if the overall mean score falls between    0.00 – 1.00
- *Medium Quality*       if the overall mean score falls between    1.01 – 2.00
- *High Quality*            if the overall mean score falls between    2.01 – 3.00

### 3.4.3 Data Collection

The data was collected in the first semester of Academic Year 2020. The researcher began with collecting the pretest to assess students' pronunciation skill before using the e-learning. The testing was conducted on-site in early September 2020. Then, the e-learning was released to the students to learn about Thai EFL learners' problematic English ending consonant sounds for fourteen days. To ensure that the results were purely from the treatment, the e-learning was the only source for learning final consonant sounds without other sources in both contents and practices. Moreover, the LINE chat application was employed to monitor the students. After that, the posttest and the perception survey questionnaire were collected on-site to assess their pronunciation skill and figure out their perception after using the e-learning. Finally, the developed e-learning was evaluated by the three experts in the field of language teaching and educational technology and communications.

*Table 6: Weekly Schedule for Data Collection*

<b>Week</b>	<b>Description</b>
Week 1	Pretest
Week 2	Orientation and introduction to e-learning
Week 3–5	Use of the e-learning
Week 6	Posttest and collecting perception survey questionnaire
Week 7–8	Experts' evaluation

### **3.5 Evaluating Stage**

To answer the research questions, the data collected in the implementing stage was analyzed.

#### **3.5.1 Data Analysis**

With regards to the scores from pretest and posttest, perception survey questionnaire and experts' evaluation, this study adopted the quantitative research to analyze the data. Descriptive statistics including mean and standard deviation (SD) were reported as follows:

1. The mean and the standard deviation of the pretest and the posttest score
2. The mean and the standard deviation of the questionnaire rating score
3. The mean and the standard deviation of the Likert-scale evaluation score

To compare the difference between the pretest and the posttest mean scores, one sample t-test was reported. Moreover, students' opinions through the interview questionnaire were analyzed through categorization in which the data would be grouped logically according to the keywords.

## **CHAPTER IV**

### **RESULTS AND FINDINGS**

The section reports the findings of this study, divided into four parts corresponding to the research objectives. The first part presents the product of the e-learning developed based on microlearning approach; the second part presents the results from the pretest and posttest; the third part presents the results from perception survey questionnaire; the fourth part presents the results from the experts' evaluation of the e-learning quality.


#### **4.1 Development of an e-learning based on microlearning approach**

Developing an e-learning based on microlearning approach, the final product was named as “Micro E-learning and Problematic English Pronunciation for Thai EFL Learners” and intended to achieve two learning objectives which were:

1. Students would be able to discriminate different ending consonant sounds of English words.
2. Students would be able to pronounce English consonant endings.

The contents were divided into seven sections. In each section, tasks and activities were provided to help students achieve the objectives. Table 7 summarizes objective and activities in each section.

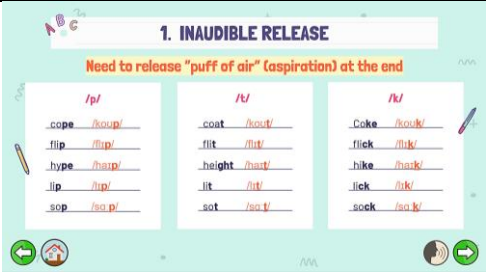

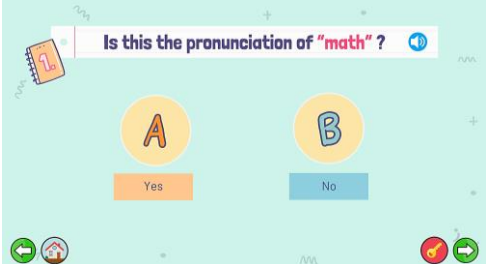
Table 7: Summary of E-learning Lesson Sections

Micro E-learning and Problematic English Pronunciation for Thai EFL Learners		
Sections	Objectives	Activities
1. Introduction	- To point out the importance of English ending consonant sounds in terms of intelligibility effects	-
2. Inaudible Release	- To introduce ending voiceless plosives that tend to be inaudibly pronounced by Thai EFL learners and tips to improve pronunciation of the target sounds - To practice discriminating and pronouncing ending voiceless plosive sounds	<p>2.1) <i>Select What You Hear</i></p> <p>To practice discriminating ending consonant sounds of the voiceless plosives, students have to listen to an audio and select the words that they hear.</p>  <p>2.2) <i>Repeat It After Me</i></p> <p>To practice pronouncing ending consonant sounds of the voiceless plosives, students have to click each word to hear its pronunciation, then try to repeat what they hear. They may practice via <i>Google Pronunciation</i> to get further feedback.</p>

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**Micro E-learning and Problematic English Pronunciation for Thai EFL Learners**


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Sections	Objectives	Activities
3. Incomplete Voicing	<p>- To introduce voiced consonant endings that tend to be devoiced by Thai EFL learners and tips to improve pronunciation of the target sounds</p> <p>- To practice discriminating and pronouncing voiced ending sounds</p>	 <p>3.1) <i>Roll the Dice and Read It Aloud</i></p> <p>To practice pronouncing ending voiced consonant sounds, students have to roll a dice and read aloud a sentence given by the number they get.</p> 
4. Sound Substitution	<p>- To introduce consonant sounds that tend to be replaced by similar Thai sounds and tips to improve pronunciation of the target sounds</p> <p>- To practice discriminating and pronouncing ending sounds that are absent in Thai</p>	<p>4.1) <i>Correct or Not</i></p> <p>To practice discriminating single consonant ending sounds, students have to listen to an audio and identify if the pronunciation belongs to the written word.</p>  <p>4.2) <i>Let's Get to the Destination</i></p>

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**Micro E-learning and Problematic English Pronunciation for Thai EFL Learners**


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**Sections****Objectives****Activities**

To practice pronouncing single consonant ending sounds, students have to listen to an audio telling directions (a map is provided) and say the destination out loud.



5. -ed Suffixes - To introduce pronunciation rules of -ed suffixes including:
1. voiceless endings (except /t/) + /t/
  2. voiced endings (except /d/) + /d/
  3. /t/ or /d/ + /ɪd/
- To practice discriminating and pronouncing -ed suffix endings

**5.1) My Melody**

To practice discriminating -ed endings, students have to listen to a song and an appropriate word to fill the lyric.

**5.2) This is What They Said**

To practice pronouncing -ed suffixes, students have to listen to a speech and transform it into the reported form (past form of verbs).

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**Micro E-learning and Problematic English Pronunciation for Thai EFL Learners**


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**Sections****Objectives****Activities**

## 6. -s Suffixes

- To introduce pronunciation rules of -s suffixes including:
1. voiceless endings (except /s/, /ʃ/, /tʃ/) + /s/
  2. voiced endings (except /z/, /ʒ/, /dʒ/) + /z/
  3. /s/, /z/, /ʃ/, /ʒ/, /tʃ/, or /dʒ/ + /ɪz/

- To practice discriminating and pronouncing -s suffix endings

6.1) *Seek Me If You Can*

To practice discriminating plural suffix endings, students have to pick up things hidden in a picture according to what they hear.

6.2) *Let's Prepare Things for the Party*

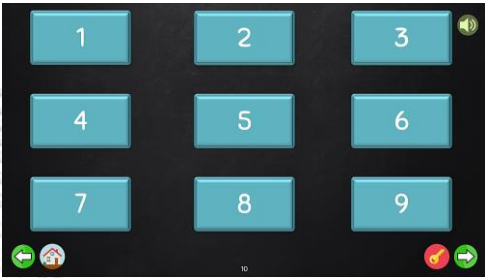
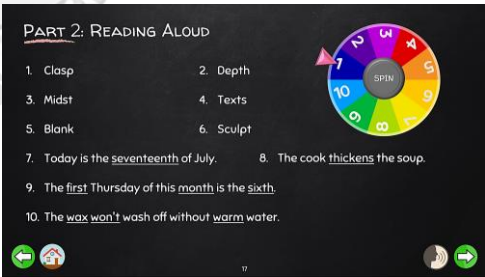
To practice pronouncing -s suffix endings, students have to speak out plural nouns to make the conversation complete.



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**Micro E-learning and Problematic English Pronunciation for Thai EFL Learners**


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Sections	Objectives	Activities
7. Consonant Clusters	- To introduce two- to four-member English coda consonant clusters - To practice discriminating and pronouncing ending consonant clusters	7.1) <i>Where Are Consonant Clusters?</i> To practice discriminating consonant cluster endings, students have to listen to an audio and select the faced-down cards that include words ending with consonant clusters.
		
		7.2) <i>Spin the Wheel and Read It Aloud</i> To practice pronouncing consonant cluster endings, students have to spin a wheel and read aloud a word/sentence given by the number they get.
		

#### 4.2 Effectiveness of using microlearning-based e-learning to improve English pronunciation ability

Results from students' performance in pretest and posttest determined whether the use of microlearning-based e-learning in English phonetics and pronunciation class was effective for improving English ending consonant pronunciation ability. The total score of each test was 50, with one mark for each item. The test results are presented in Table 8.

Table 8: Pretest and Posttest Mean Scores

Score	n	mean	SD	t	df	p
Posttest	21	39.81	14.06	15.82	20	0.00*
Pretest	21	26.05	17.45			

\* $p < .05$

Data results demonstrate that the posttest mean score ( $\bar{x} = 39.81$  out of 50) is higher than the pretest mean score ( $\bar{x} = 26.05$ ). The one sample t-test result reveals statistical significance at .05. The 't' value ( $t = 15.82$ ,  $p = 0.00$ ) indicates that the mean score of the posttest is significantly higher than the pretest, signifying the students' improvement in the pronunciation skills after receiving the treatment. It could be interpreted that the microlearning-based e-learning was an effective and useful means for developing students' pronunciation ability. A variety of interactive activities supporting students to practice discriminating and pronouncing English ending sounds at their flexible, preferred paces are likely to help students improve their skills.

#### 4.3 Perception toward the microlearning-based e-learning

To respond to the research question regarding students' perception toward the e-learning, the responses from the perception survey questionnaire were analyzed. The results are separated into two main parts: 1) overall perception towards the e-learning and 2) additional reflection.

In the first part, the responses were numerically valued from 1 to 4: *strongly disagree* (1), *disagree* (2), *agree* (3), or *strongly agree* (4). The mean score of each statement is illustrated in Table 9.

*Table 9: Students' Overall Perception Towards the E-learning*

<b>Items</b>	<b>Mean</b>	<b>SD</b>
1. The e-learning is useful for learning English pronunciation.	3.71	0.46
2. The e-learning motivates me to learn English pronunciation.	3.62	0.59
3. The e-learning makes it easier to learn English pronunciation.	3.76	0.54
4. The e-learning provides clear information about the practical content of the topic.	3.67	0.48
5. The e-learning offers opportunities to practice English pronunciation.	3.76	0.44
6. The way the e-learning is divided into chunks could enhance my learning focus.	3.76	0.44
7. Small slices of content in the e-learning enhance information retention than traditional long-form learning.	3.62	0.50
8. The information contained in the e-learning is academically precise.	3.76	0.44
9. The e-learning is easy to access.	3.48	0.68
10. The user-friendly design of the e-learning is appealing.	3.76	0.54
11. The content of the e-learning is well organized.	3.90	0.30
12. I am satisfied with the e-learning because it is accessible on various technologies such as computers, laptops, tablets, etc.	3.52	0.75
13. I am satisfied with the e-learning as a language learning tool.	3.76	0.54
<b>Total Average Score</b>	<b>3.70</b>	

The students' overall perception mean score ( $\bar{x} = 3.70$  out of 4) reveals that students positively perceive the e-learning as a resource of English phonetics and pronunciation learning. Their positive affections are likely to motivate them to participate and explore the lessons.

Importantly, the students' additional opinions in an open-ended question confirm the positive perception towards the use of the developed e-learning. Negative feedbacks regarding the e-learning performance issues were somewhat found.

*“I access the e-learning on my computer, but it is sometimes unstable. The program usually closes itself. However, the contents and the media are very interesting.” – Student 18*

*“The interface is easy to understand and navigate, but it sometimes causes confusion. However, I love the idea of dividing content into chunks which are easy to understand.” – Student 19*

However, most of the comments highlighted a satisfying result of their perception as follows:

*“I'm so happy and fun.” – Student 1*

*“It is very organized and easy to understand.” – Student 8*

*“E-learning is easy to learn and not boring at all.” – Student 9*

*“I really like it! because it is easy to understand, and the design is very cute. It is fun to learn. Many sound effects are provided.” – Student 12*

*“It was fun to learn! Thanks for your effort.” – Student 15*

*“The lesson is easy to understand.” – Student 21*

#### **4.4 Quality of the developed microlearning-based e-learning according to experts' evaluation**

To respond to the research question regarding the e-learning quality, the scores from experts' evaluation measured whether the developed e-learning was comprised of high-quality components. The results from experts' evaluation are presented in Table 10.

*Table 10: E-learning Quality Evaluation Mean Scores*

<b>Rating Areas</b>	<b>Mean</b>	<b>SD</b>	<b>Result</b>
1. Lifelong-learning Support	3	0.00	High Quality
2. Flexible Interactivity	3	0.00	High Quality
3. Learner-driven Experiences	2.67	0.47	High Quality
4. Appropriateness of Content Slices	2.67	0.47	High Quality
5. Ease of Use	2.67	0.47	High Quality
6. Alignment with Learning Outcomes	2.67	0.47	High Quality

Rating Areas	Mean	SD	Result
7. Variety of Activity	2.67	0.47	High Quality
8. Language Appropriateness	2.67	0.47	High Quality
9. Interest Level & Engagement	2.67	0.47	High Quality
10. Practice & Feedback	2.33	0.47	High Quality
11. Technical Quality & Accessibility	2.33	0.47	High Quality
12. Sufficient Guide & Directions	2.33	0.47	High Quality
13. Bias Free	2.33	0.47	High Quality
14. Media Design	2.33	0.47	High Quality
<b>Total Average Score</b>	2.42		High Quality

Data results indicate that the mean score of overall quality is 2.53 (out of 3) meaning that the developed e-learning was considered high quality. The evaluation also reflects that the instructional media was comprised of high-quality components, especially the support for lifelong learning and flexible interactivity. Therefore, it was anticipated to be an effective material used as a resource for the English phonetics and pronunciation class.

To sum up based on the research hypotheses, students' mean score of the posttest is significantly higher than their pretest mean score. The statistical values of pretest and posttest proved that their pronunciation ability improved after learning the developed e-learning. With regard to experts' evaluation, it confirmed that the developed e-learning consisted of high-quality components. Thus, all research hypotheses have been accepted.

## CHAPTER V

### DISCUSSIONS

Developing and experimenting the microlearning-based e-learning indicated positive impacts of the material. This section would discuss how the developed e-learning is an effective tool in terms of training skills, delivering language lessons, and motivating learners in English phonetics and pronunciation class.

As quantitatively corroborated by the one sample t-test scores, the developed e-learning could help students improve their pronunciation skills of the target problematic consonants. Since the pretest and the posttest were constructed based on the identical test item specification, the findings undoubtedly reflect the difference between students' prior performance before and their achievement after receiving the treatment. Accordingly, it could be interpreted that the developed instructional media could lower down the problem of insufficient in-class practices, resulting from learners' different preferable strategies, learning paces and the fear of losing faces (Nakazawa, 2012 as cited in Çakır, 2014). Generally speaking, flexible learner-driven supports are likely to help students improve their ability to discriminate and pronounce English ending consonant sounds.

Although e-learning is notable for flexible learning, the content length of traditional e-learning lessons tends to be a major challenge for most people. They fail completing the whole course because of the too long content for short time comprehension (Park & Kim, 2018). Nowadays, quick learning is needed to suit the world rapid changes (Gassler, Hug & Glahn, 2004 as cited in Mohammed et al., 2018). This vividly demonstrates that the microlearning approach is a great guide for teachers to have successful lesson delivery. Students are likely to learn well through small chunks of lesson owing to lower cognitive loads (Buchem & Hamelmann, 2010).

In addition, the success in applying the microlearning approach to language teaching could be supported by students' positive perception. The gathered comments reflect that the e-learning properties, especially small chunks of contents and appealing designs, increase learners' desire in navigating the lessons. The more they enjoy, the



more they are willing to participate in the provided activities leading to improvement in the target skills. To say, the students' dramatic skill improvement and positive perceptions firmly verify how the e-learning based on microlearning approach is an effective tool for the English phonetics and pronunciation class.

### **Limitation of the Study and Suggestions for Further Studies**

There were some challenges in developing and experimenting the e-learning. To begin with, different versions of Microsoft PowerPoint are available on different gadgets leading to some performance issues. Therefore, the researcher would like to give the suggestion for further studies that they need to be aware of the material quality of a software and/or application on different devices. It is crucial to ensure that their developed material or media could be supported well by most or all versions of a particular program. Furthermore, the set of e-learning in this study was served for only one unit which is about the ending consonant sounds, so the findings could not be generalized for all phonetics and pronunciation teaching and learning. With the positive results of the study, it urges a promising impact for future studies to examine the effects of microlearning-based e-learning on other aspects in order to have more explicit results.

## CONCLUSION

Comprehensible pronunciation plays significant roles in oral communication, so the pronunciation skills need to be attentively developed to ensure the acceptable level. Nonetheless, in-class pronunciation teachings and practices are challenged by such factors as lacking-confident ESL and EFL teachers (Buss, 2017; Rofiq, 2014), learners' different preferable strategies, learning paces, and fear of losing their faces (Nakazawa, 2012 as cited in Çakır, 2014). Since an e-learning could offer learning flexibility, it becomes an alternative solution. However, traditional e-learning styles may not suit for the fast-ever-changing world. The microlearning approach is, therefore, taken into consideration to be applied in an English phonetics and pronunciation class.

In this study, a set of e-learning was developed based on the assumption that students' pronunciation learning would be efficiently enhanced through learner-driven experiences and small chunks of contents. The findings from pretest and posttest illustrate noteworthy improvement. The posttest mean score was significantly higher which means that students' ability to discriminate and pronounce English ending consonant sounds was improved after receiving the treatment. Furthermore, the developed e-learning was positively perceived by the students. Experts' evaluation also confirmed the high quality of the e-learning. The study could be finally concluded that using the set of e-learning based on microlearning approach is effective for the English phonetics and pronunciation class.

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**APPENDICES**

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**Appendix A**  
**Pretest and Posttest**

**Part 1: Listen to the audio and select the word that you hear. Each word will be read twice. (10 marks)**

- |               |           |            |
|---------------|-----------|------------|
| 1. A. lock    | B. log    | C. lot     |
| 2. A. match   | B. mash   | C. math    |
| 3. A. cat     | B. cash   | C. catch   |
| 4. A. shock   | B. shop   | C. shot    |
| 5. A. shade   | B. shape  | C. shave   |
| 6. A. peak    | B. peaks  | C. peaked  |
| 7. A. chained | B. chain  | C. changed |
| 8. A. ace     | B. aches  | C. eggs    |
| 9. A. goods   | B. goose  | C. geese   |
| 10. A. wished | B. wishes | C. wish it |

**Part 2: Listen to an audio and indicate whether the pronunciation belongs to the word. Each item will be read twice. (5 marks)**

- |          |            |              |
|----------|------------|--------------|
| 1. Left  | A. Correct | B. Incorrect |
| 2. Range | A. Correct | B. Incorrect |
| 3. Next  | A. Correct | B. Incorrect |
| 4. Fold  | A. Correct | B. Incorrect |
| 5. Texts | A. Correct | B. Incorrect |

**Part 3: Read the following words aloud. (20 marks)**

- |           |            |
|-----------|------------|
| 1. safe   | 11. shrink |
| 2. save   | 12. sense  |
| 3. graze  | 13. help   |
| 4. grace  | 14. health |
| 5. soothe | 15. bulb   |
| 6. suit   | 16. pond   |
| 7. lag    | 17. fifth  |
| 8. lack   | 18. gist   |
| 9. butch  | 19. exempt |
| 10. bush  | 20. asks   |



**Part 4: Read the following sentences aloud. (15 marks)**

1. This useful thread is free.
2. Flies buzz round his eyes.
3. You can't switch direction.
4. The atheist has lost faith.
5. I think I found it on Friday.
6. Let me clasp you in my arm.
7. I suggest an injection into the joint.
8. Mr. Smith's tooth is loose.
9. There will be twelve visitors on Wednesday.
10. It's my sixth birthday tomorrow.
11. What have you decided to do after college?
12. The cook mashed potatoes with butter.
13. This is the season for weeds.
14. The aged judge urges the jury.
15. He rushes on to the roof.

*\*\*The items were shuffled for the posttest\*\**

## Appendix B

### E-learning Perception Survey Questionnaire

This questionnaire survey is part of the research named "Effects of E-learning Based on Microlearning Approach on Undergraduate Students' English Pronunciation". The main objective is to explore the perception of media users towards the developed e-learning in learning English pronunciation. All data will be kept confidentially and only used for the research purpose.

Please indicate the extent to which you agree or disagree with each of the following statements by ticking one of the four boxes: *Strongly Disagree*, *Disagree*, *Agree*, or *Strongly Agree*.

Items	Strongly Disagree	Disagree	Agree	Strongly Agree
1) The e-learning is useful for learning English pronunciation.				
2) The e-learning motivates me to learn English pronunciation.				
3) The e-learning makes it easier to learn English pronunciation.				
4) The e-learning provides clear information about the practical content of the topic.				
5) The e-learning offers opportunities to practice English pronunciation.				
6) The way the e-learning is divided into chunks enhances my learning focus.				
7) Small slices of content in the e-learning enhance information retention than traditional long-form learning.				
8) The information contained in the e-learning is academically precise.				
9) The e-learning is easy to access.				
10) The user-friendly design of the e-learning is appealing.				

Items	Strongly Disagree	Disagree	Agree	Strongly Agree
11) The content of the e-learning is well organized.				
12) I am satisfied with the e-learning because it is accessible on various technologies such as computers, laptops, tablets, etc.				
13) I am satisfied with the e-learning as a language learning tool.				



## Appendix C

### E-learning Quality Evaluation Form

Expert's Name: \_\_\_\_\_

A set of e-learning is developed based on the microlearning approach with the aim of achieving the following learning objectives:

1. Students will be able to discriminate different ending consonant sounds of English words.
2. Students will be able to pronounce English consonant endings.

Please evaluate the overall quality of the e-learning according to your opinions and provide further comments by using the following criteria.

Rating Area	High Quality (3)	Medium Quality (2)	Low Quality (1)	Score
1. Lifelong-learning Support	Fractions of lesson could motivate students to learn new things informally which makes the knowledge memorable for a period of time. Topics are clearly divided into chunks without obstructing students' flow of learning.	Fractions of lesson may motivate students to learn new things informally which makes the knowledge memorable for a period of time. Topics are divided into chunks but may obstruct students' flow of learning.	Fractions of lesson will likely not motivate students to learn new things informally or make the knowledge memorable for a period of time. Topics are not divided clearly and/or likely to obstruct students' flow of learning.	
2. Appropriateness of Content Slices	E-learning provides various activities which allow students to practice pronunciation in different ways.	E-learning provides various activities but may not allow students to practice pronunciation in different ways.	E-learning provides only few activities which will likely not allow students to practice pronunciation in different ways.	
3. Variety of Activity	E-learning offers students skill or knowledge practices and information that helps them improve their skills.	E-learning offers students some skill or knowledge practices and information that sometimes helps them improve their skills.	E-learning does not offer students any skill or knowledge practice, nor information that helps them improve their skills.	
4. Practice & Feedback	E-learning is flexibly interactive which enhances	E-learning is interactive but still needs more features to enhance	E-learning are not interactive, so it cannot enhance students to	
5. Flexible Interactivity				

Rating Area	High Quality (3)	Medium Quality (2)	Low Quality (1)	Score
6. Learner-driven Experiences <i>(Example: Given URLs allow students to explore lesson in more details by themselves, if needed.)</i>	students to learn and practice at their preferable paces. Most features on e-learning enable students to independently personalize their learning.	students to learn and practice at their preferable paces. Some features on e-learning enable students to independently personalize their learning.	learn and practice at their preferable paces. No features on e-learning enable students to independently personalize their learning.	
7. Ease of Use	E-learning follows easy-to-use patterns with nothing to confuse students.	E-learning follows patterns that are easy to follow most of the time, with a few things to confuse students.	E-learning follows no patterns, so students are very confused in most of the time.	
8. Alignment with Learning Outcomes	Use of e-learning should enhance student learning in terms of ability to discriminate and pronounce English ending sounds.	Use of e-learning may enhance student learning in terms of ability to discriminate and pronounce English ending sounds.	Use of e-learning will likely not enhance student learning in terms of ability to discriminate and pronounce English ending sounds.	
9. Interest Level & Engagement	E-learning are well-designed so that students are likely to be interested and actively engaged in learning.	E-learning is about to interest students most of the time and engage most students in learning.	E-learning is presented so as not to interest students and not engage them in learning.	
10. Language Appropriateness	Language (e.g. vocabulary, sentence structures, etc.) used in explaining the lesson is	Language (e.g. vocabulary, sentence structures, etc.) used in explaining the lesson is nearly	Language (e.g. vocabulary, sentence structures, etc.) used in explaining the lesson is clearly	

Rating Area	High Quality (3)	Medium Quality (2)	Low Quality (1)	Score
	appropriate and understandable for students.	above/below students' proficiency.	inappropriate for students' proficiency.	
11. Technical Quality & Accessibility	E-learning is accessible on devices (e.g. PCs, laptops, etc.) with only few technical errors.	E-learning is accessible on devices (e.g. PCs, laptops, etc.), but several technical errors are found.	E-learning is accessible only on a particular device, and several technical errors are found.	
12. Sufficient Guide & Directions	The user guide is an excellent resource, and directions should help students use the material.	The user guide is a good resource, and directions may help students use the material.	The user guide is a poor resource, and directions do not help students use the material.	
13. Media Design	E-learning appearance is appealing, and fonts and colors are easy to read.	E-learning appearance is appealing, but some fonts and/or colors may be hard to read.	Hard-to-read fonts and/or colors are found all along the e-learning.	
14. Bias Free	E-learning is presented with no evidence of objectionable bias.	E-learning is presented with little evidence of bias.	E-learning is presented with much evidence of bias.	
<b>TOTAL SCORE</b>				

Additional comment(s):

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## **Appendix D**

### **Qualifications of the Experts and Test Rater**

#### ***Experts Evaluating E-learning Quality***

1. Asst. Prof. Dr. Pornsuk Tantrarungroj  
Affiliation: Department of Educational Technology and Communications  
Faculty of Education, Chulalongkorn University
2. Asst. Prof. Dr. Chansongklod Gajasen  
Affiliation: Department of Teaching English as a Foreign Language  
Faculty of Education, Chulalongkorn University
3. Dr. Nida Boonma  
Affiliation: Institute for English Language Education  
Theodore Maria School of Arts, Assumption University

#### ***Experts Validating Pretest and Posttest***

1. Dr. Chayada Thanavisuth  
Affiliation: Department of Business English  
Theodore Maria School of Arts, Assumption University
2. Dr. Chutamas Sundrarajun  
Affiliation: Department of Business English  
Theodore Maria School of Arts, Assumption University
3. Ms. Jitravadee Singhaniyom  
Affiliation: Department of Business English  
Theodore Maria School of Arts, Assumption University

#### ***Expert for Rating Tests***

1. Dr. Supakorn Panichkul  
Affiliation: Department of Business English  
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