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## Mobile Learning Application: Infusing Critical Thinking in the EFL Classroom

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### Abstract

*The emergence of mobile learning applications facilitates the pedagogical approach to developing students' critical thinking. However, there is a scarcity of investigation on mobile learning applications' impact on developing critical thinking as the learning outcome. Thus, this study reports the effect of a mobile learning application, 'English with Noni', designed to infuse critical thinking instruction in EFL classes on students' critical thinking level by employing a sequential explanatory mixed-method approach. A quasi-experimental study was conducted to examine the critical thinking level of 65 students of a junior high school in Jakarta, Indonesia, by administering a post-test assessed using a SOLO rubric. Semi-structured interviews to explore students' responses from using the 'English with Noni' application and class observation contributed to the qualitative findings. The quantitative result showed that the critical thinking level of the experimental group using this application improved significantly more than the controlled group did. The qualitative result suggested that the experimental group had positive responses to using it. They confirmed that it was interesting. They also admitted that it*

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*contributed to developing their critical thinking (i.e., predicting, providing reasons, expressing viewpoints, finding alternatives, and making conclusions), language skills (i.e., listening, reading, and writing), and sub-skill (vocabulary). The findings imply that critical thinking activities and learning affordances provided in the 'English with Noni' application is a potential tool to enhance students' critical thinking infused in the EFL class, especially during the COVID-19 pandemic situation, by emphasizing self-regulated learning.*

**Keywords:** Critical thinking, infused learning, mobile learning application, SOLO taxonomy.

## 1. INTRODUCTION

Critical thinking has become a global issue in the field of education and constitutes the main goal in education (Alnofaie, 2013; Chou et al., 2019; Espey, 2018; Saxton et al., 2012). Encouraging the students to think critically benefits them to succeed in their academic or future life. It entails more attention to be cultivated in the classroom to equip the students with the twenty-first-century skill. Nevertheless, its necessity remains understudied in the ELT context (Alnofaie, 2013; Defianty & Wilson, 2019).

A dearth of critical thinking practice in English classes occurs due to some factors such as assessment instruments, learning materials, education systems, teachers' recognition, pedagogical knowledge, and skill. Chou et al. (2019) revealed that teachers lack assessment instruments for measuring students' critical thinking, and the materials used do not facilitate students' critical thinking (Soufi & See, 2019). The education system in some countries, such as Thailand (Nanni & Wilkinson, 2015), Iran (Afshar & Movassagh, 2014), and Indonesia (Ilyas, 2015), emphasized more on rote memorization than critical thinking development. The teachers' recognition and pedagogical knowledge and skill are insufficient. Thus a small number of teachers do introduce critical thinking (Han & Brown, 2013), but they do not know how to effectively teach critical thinking to students in English language learning (Defianty & Wilson, 2019; Saxton et al., 2012; Soufi & See, 2019). They focused more on grammar and contents of the textbooks (Zhang, 2018) and language accuracy (Soufi & See, 2019) than critical thinking instruction.

Though critical thinking is essential, some studies discover that deficiency of critical thinking occurs around the world (Stapleton, 2011). First, the study conducted by Stapleton (2011) found Hong Kong high school students were not good at critical thinking. Second, Mehta and Al-Mahrooqi (2015) identified that Oman EFL undergraduates still had problems in developing their language and critical thinking. Third, Espey (2018) revealed that only a few college students in the United States had improved in critical thinking. In addition, the twelfth graders in South Africa (Jager, 2012) and senior high school students in Indonesia (Ilyas, 2015) did not have sufficient critical thinking since their learning materials did not encourage them to think critically.

Consequently, mobile learning has the potential to develop students' critical thinking (McCann, 2015) due to its affordances, such as easy access without time and

place restrictions (Ghorbani & Ebadi, 2020) and rich multimedia input to give interactive experience to the students (Booton et al., 2021). In addition, Ma (2017) explicated that it provides an online dictionary to aid the students to learn, mainly to understand the vocabulary. Furthermore, Floyd (2011) described that the more vocabulary students know, the better their critical thinking.

Even though mobile learning is potential for students' learning improvement, there is a scarcity of studies on the impact of mobile learning applications on developing critical thinking through the emergence of mobile learning applications that facilitate the pedagogical approach to develop students' critical thinking (Chen et al., 2019). Thus, Hwang and Fu (2019) proposed an investigation of mobile language learning to gain critical thinking since it is sparse. A body of research delving into mobile-assisted language learning in terms of mobile learning applications often focuses on the language skills and sub-skill such as listening (Sorayyaei & Nasiri, 2014), oral presentation (Barrett et al., 2021), vocabulary (Sandberg et al., 2011; Stockwell, 2007), and grammar (Ghorbani & Ebadi, 2020). Hwang and Fu (2019) also agree that mobile language learning was mostly used to master listening, speaking, reading, grammar, pronunciation, and vocabulary as the learning outcomes.

Moreover, the result of a preliminary study conducted through a reading pre-test for Indonesian junior high school students suggested that their critical thinking was inadequate. Therefore, there is a clear need to continue investigating mobile learning and its impact on students' critical thinking in EFL settings. To address this urgency, this study has two purposes. First, this study aimed to investigate whether Indonesian junior high school students' critical thinking was developed or not through a mobile learning application named 'English with Noni' by providing critical thinking activities infused in English learning, for example, the use of a dictionary, teachers' feedback, and multimedia-based content, English subtitle, and navigation pane. The 'English with Noni' application activities refers to Ilyas' critical thinking framework (Ilyas, 2015). The students' critical thinking is measured using the SOLO (Structure of Observed Learning Outcome) rubric developed by Biggs and Tang (2011). The SOLO rubric is suitable for response (Gopal & Stears, 2007) or open-ended questions (Patterson, 2021). It fits to gauge learning outcomes of different subjects, levels, and assignments (Chan et al., 2002). Second, the aim is also to identify students' responses to using the 'English with Noni' application. Therefore, the following research questions are formulated:

1. Is there a significant difference in critical thinking level between students using the 'English with Noni' application and those using printed modules (without using the 'English with Noni' application)?
2. What are students' responses to using the 'English with Noni' mobile application?

## 2. LITERATURE REVIEW

### 2.1 Critical Thinking

Scholars have not clearly defined critical thinking since there is no consensus (Aloqaili, 2012; Cáceres et al., 2020; Toy & Ok, 2012). It is grounded in Dewey's work, known as reflective thinking concerning what to believe or do to enable someone to raise the question, search the information or evidence, and think about the reasons

for making the decision (Ennis, 2015). Some scholars conceptualized it as cognitive skills, a set of abilities, and thinking behavior. Critical thinking is a cognitive skill (Facione, 2015; Ayçiçek, 2021) that consists of analysis, interpretation, evaluation, inference, explanation, and self-regulation (Facione, 2015). Ayçiçek's (2021) definition is similar to Facione's (2015), but he added some cognitive skills such as making a decision, searching the reliable and valid data, and making evaluations. Similarly, Varenina et al. (2021) addressed critical thinking as skills to infer, reason, analyze, synthesize, evaluate and interpret data. Furthermore, Florea and Hurjui (2015) and Zubaidah et al. (2018) depicted it as the ability to make a plausible decision and solve problems. It is also conceptualized as an approach to understanding someone's thoughts, ideas, and problems by looking at the other perspectives (Vidoni & Maddux, 2002). In addition, Boulton-Lewis (1995) and Angeli et al. (2003) delineated critical thinking as seeking and explaining reasons and points of view by acknowledging credible sources. To conclude, critical thinking is characterized as cognitive skills to analyze, explain, interpret, synthesize, evaluate, make a decision, and solve the problems by considering different points of view and valid and reliable evidence.

One pedagogical approach to developing students' critical thinking is through the questions (Chen et al., 2019). Questioning is an effective strategy for EFL students to trigger their critical thinking (Defianty & Wilson, 2019). Open-ended (Almulla, 2018) and provoking questions (Bai, 2009) can improve students' critical thinking skills. This study addresses Ilyas' (2015) critical thinking framework by examining twenty critical thinking taxonomies, strategies, programs, and tests (Ilyas, 2015). Ilyas' (2015) critical thinking framework (see Table 1) consists of critical thinking questions comprising questions for:

- asking for clarification,
- assumption,
- reasons and evidence,
- viewpoints or perspectives,
- implication, consequences, and alternative,
- question,
- predictions,
- agreement and disagreement, and
- summary and conclusion

**Table 1.** Ilyas' (2015) critical thinking framework.

Questions to probe	Example
Clarification	What does it mean?
Assumption	What can you assume?
Reasons and evidence	Can you tell me your reason?
Viewpoints or perspective	What do you think of online learning?
Implication, consequences, and alternatives	What is the best solution to solve the problem?
Prediction	What will probably happen if people ignore wearing masks during the pandemic?
Agreement and disagreement	Do you agree with them? Why?
Summary and conclusion	What can you conclude?

## 2.2 SOLO Rubric as a Critical Thinking Assessment

Saxton et al. (2012) deciphered that critical thinking assessment should emphasize the process of thinking, not accentuate the correct answer. It requires applying the proper instruments to measure students' critical thinking. Accordingly, Ku (2009) clarified no consensus has been reached to measure critical thinking because the measurements depend on the purpose, format, and context. Concerning this matter, SOLO (Structure of Observed Learning Outcome) fits to measure the students' critical thinking (Chan et al., 2002). Stålné et al. (2016) noted that it is one of the most prominent measurements to assess complex students' learning performance.

SOLO taxonomy was developed by Biggs and Tang (2011) as a systematic manner of portraying students' performance to master many academic tasks. The organized and hierarchical manner is useful for the teachers to develop students' thinking skills. SOLO taxonomy is used to classify students' different levels of responses (Gopal & Stears, 2007). It consists of five levels: prestructural, unistructural, multistructural, relational, and extended abstract (see Table 2). Furthermore, Lueg et al. (2016) described prestructural and unistructural levels as unsatisfactory, multistructural levels as surface learning, and relational and abstract levels as deep learning. The prestructural level addresses students' responses that miss the point and repeat the questions (students do not understand), while the unistructural level refers to students' responses that meet only one part of a task and miss other important attributes or points. The emphasis of the multistructural level is on students' responses that do not focus on the key issue and are only listing, describing, and narrating (showing a load of facts). The next level is the relational level showing students' responses to arguing a case, comparing and contrasting, and providing causal explanation and interpretation. The highest level, namely extended abstract emphasizes students' responses beyond what has been given and are coherent whole as well as breakthroughs or reflection.

Although the SOLO taxonomy has not been widely used to measure critical thinking in EFL classes in Indonesia, studies in other contexts have shown that it can provide valuable insights into students' developing abilities to apply critical thinking. Through task-based interviews, Patterson (2021) employed the SOLO rubric to assess cryptography understanding. Students' presentations and interviews of grade five in science class in Cape town (Gopal & Stears, 2007) and written essays of students aged 16-18 in Zimbabwe (Munowenyu, 2007) were assessed using the SOLO rubric.

## 2.3 Mobile Learning Application

Mobile learning or MALL (Mobile-Assisted Language Learning) has specific characteristics and affordances to support learning. It enables the students to learn a language anywhere and anytime without the time and place restrictions (Ghorbani & Ebadi, 2020; Koutromanos & Avraamidou, 2014). It is flexible (Önal et al., 2019), so it is used in the classroom setting and outside of class (Ma, 2017). Its technology is portable (Booton et al., 2021; Şad et al., 2020) with an easy wireless internet connection (Elaish et al., 2019; Şad et al., 2020). It enables students to learn at their own individualized pace (personalized) (Elaish et al., 2019; Şad et al., 2020). It provides multimedia input (Booton et al., 2021) and touch screen devices that give an interactive experience to the students (Booton et al., 2021). It also provides an online

dictionary assisting and scaffolding the students to learn the language (Ma, 2017; Şad et al., 2020).

Previous studies showed that mobile learning application supports students' learning performance, such as language skills, sub-skill, and critical thinking. Sandberg et al. (2011) examined the mobile learning application to encourage vocabulary learning. Besides, Wang (2017) applied the Learn English Audio and Video mobile application for developing reading skills. Ataeifar et al. (2019) also used MALL, Voice Thread, and Twitter to enhance speaking skills. Mobile learning application promotes not only students' language skills and sub-skill but also their critical thinking. Ebadi and Rahimi (2018), who applied mobile learning named WebQuest, discovered that students' critical thinking and academic writing skills developed, while Yang et al. (2013) investigated a virtual learning environment using Moodle and found that it contributed positive impact on students' critical thinking skills. A study conducted by Lee et al. (2016) also suggested that the mobile learning game designed for the Android platform, GPS, and Google Maps leveraged the students' critical thinking. Moreover, Prahani et al. (2020) scrutinized the mobile-based learning application for web and android versions and showed that the mobile-based learning application gained students' critical thinking skills.

Moreover, several studies suggested that the students had a positive response to using mobile learning applications (Fujimoto, 2012; Lin, 2014; Sorayyaei & Nasiri, 2014). In a similar vein, Ebadi and Rahimi's (2018) finding indicated that students responded positively after using WebQuest. Further, Barrett et al. (2021) discovered students' positive comments while they learned English using a designed mobile learning application named English Oral Presentation Application.

### **3. METHODS**

A mixed-method approach, both quantitative and qualitative, was employed to address the research questions. A posttest-only design to a quasi-experimental study (Creswell, 2012) was used to examine the impact of 'English with Noni' application on the students' critical thinking. A qualitative approach was also undertaken to explore the experimental group's response to using the application.

#### **3.1 Participants**

A convenience sampling method was selected for the participants comprising the eighth graders of a public junior high school located in West Jakarta, Indonesia, ranging from 12 to 14 years old. They were from a low-socioeconomic group. The participants consisted of the experimental group (Class A) with 30 students (13 males and 17 females) and the control class (Class B) with 35 students (15 males and 20 females). Their names were pseudonyms for confidentiality. They had similar English proficiency levels measured using reading tests administered in the preliminary study.

#### **3.2 Instruments and Procedure**

The data were collected through a post-test. The post-test comprised reading, listening, and writing sections referring to critical thinking questions developed by

Ilyas (2015). The test was validated by the two experts who are experienced in the field of ELT and critical thinking. In the reading section, students were asked to answer one explicit question and three implicit questions referring to probing reasons and evidence, providing alternatives, and predicting to promote critical thinking. In the listening section, they were asked to watch an animated video with English subtitles and answer one question to conclude. They were also asked to make a short essay to express their viewpoint or perspective in the writing section. Their answers were assessed using the SOLO rubric (as shown in Table 2). The students' answers were scored by two raters, an expert in the ELT assessment and the researcher separately.

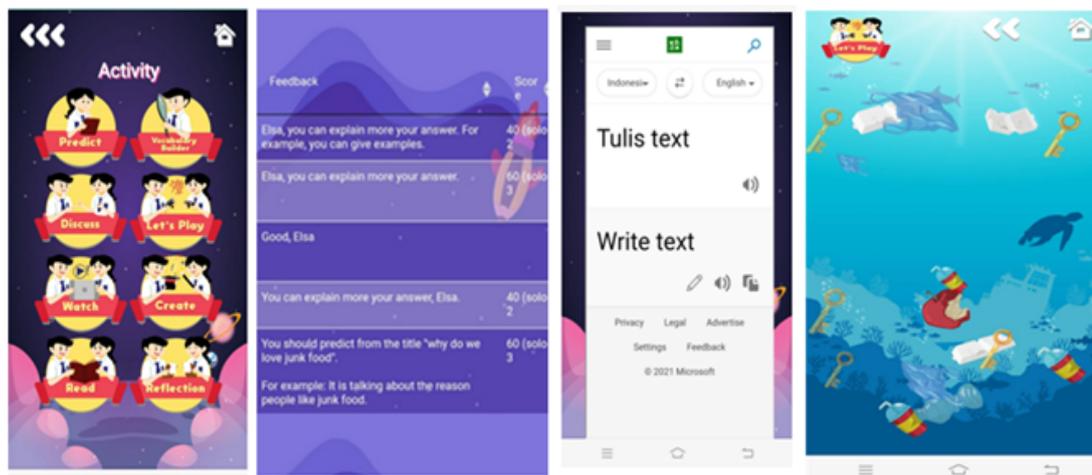
**Table 2.** SOLO (Structure of Observed Learning Outcome) taxonomy rubric.

Level	Score	Converted score	Description
Prestructural	1	20	Students' responses miss the point (they do not understand). Students' responses repeat the questions.
Unistructural	2	40	Students' responses meet only one part of the task. Students' responses miss other important attributes.
Multistructural	3	60	Students' responses do not address the key issue and just show a low of facts. Students' responses are only listing, describing, and narrating.
Relational	4	80	Students' responses are arguing a case, comparing and contrasting, and providing causal explanations and interpretations.
Extended Abstract	5	100	Students' responses are beyond what has been given. Students' responses are a coherent whole. Students' responses have breakthroughs or reflections.

Informed consent was obtained from school principals, teachers, and students. The students of two groups (experimental and control groups) participated voluntarily. The experimental group (Class A) used the developed 'English with Noni' application to provide critical thinking activities. It provides critical thinking activities or exercises, including a simple game in the post-reading activity to stimulate and motivate students to learn. It is also equipped with a dictionary and feedback space consisting of teachers' comments and scores (see Figure 1). It provides backward and forward touch screens to help the students replay the content or repeat the exercise they want and pitch control to slow down or fast forward the video play. The video also has subtitles to help them while listening. In the first session, the experimental group of students installed the 'English with Noni' application on their mobile phones by following the teacher's (researcher) instructions. They were given the username and password to access it. They were trained and introduced to all of its features. The teaching and learning process took 12 meetings. Meanwhile, the control group (Class B) was also instructed similar to the experimental group, but they were provided the printed modules containing similar activities. They were asked to use their digital or printed dictionary to build their vocabulary. The instructional process was also for 12 meetings. They were given written feedback in their modules or oral feedback.

Both experimental and control groups were explained the SOLO rubric as the assessment instrument. Subsequently, they practiced critical thinking in English instruction by encouraging them to express their reasons and evidence, viewpoints or perspectives, alternatives, predictions, agreements or disagreements, and conclusions.

Both of the groups had two 70-minutes periods each week on a different day. After a few meetings, they had to learn at home using Zoom meetings due to the COVID-19 pandemic. Finally, in the last meeting (twelfth meeting), those groups took the post-test (reading, listening, and writing sessions), which was undertaken and supervised by the teacher. The questions were presented via Zoom meeting, and the students were asked to send their answers to the teacher's WhatsApp privately and synchronously.



**Figure 1.** Features of 'English with Noni' application.

The semi-structured interviews were undertaken with 15 students (seven males and eight females) of the experimental group to explore their responses to using the 'English with Noni' application via mobile phone. Due to the COVID-19 pandemic, the interview was conducted via phone calls. It took approximately 15 minutes for each participant to be interviewed. The interview protocol adapted [Lin's \(2014\)](#) work on Technology Acceptance Model (TAM), addressing students' perceived usefulness, ease of use, and satisfaction. Each interview was recorded and transcribed. The interview used the Indonesian language to explore the students' answers deeply. The results were confirmed by the students to establish credibility ([Creswell, 2012](#)).

### **3.3 Data Analysis**

For quantitative analysis, this study employed a non-parametric test, the Mann-Whitney test, to investigate the students' critical thinking level between groups learning with the 'English with Noni' application and without it (the printed modules) because the data were not normally distributed. The normality of data was examined through histogram, Skewness, and Shapiro-Wilk. Besides, the students' responses to using the application through interviews were analyzed qualitatively by employing thematic analysis. The interviews transcribed were coded and categorized.

## **4. RESULTS**

### **4.1 Students' Critical Thinking Level**

The post-test comprised of reading, listening, and writing sections were examined by using the Mann-Whitney test. The results showed that the experimental

group's mean was 64.00 and the control group was 46.29. There is a significant difference between those groups with a p-value of 0.001 (see Table 3).

**Table 2.** Mean difference and Mann-Whitney test of both groups.

Indicators	Experimental group	Control group	P-value
Mean	63.07	46.29	0.0001
Median	64.00	48.00	
Std. Deviation	9.377	10.728	
Std. Error	1.712	1.813	

As shown in Table 4, the experimental group was at the multistructural level, and the control group was at the unistructural level. SOLO rubric showed that the multistructural level is at 60 points, and the control group is at 40 points (see Table 2). The Mann-Whitney test result indicated that the critical thinking level of students using the 'English with Noni' application was better than those learning without it. In more detail, each section of the post-test between the experimental and control group is in Table 4.

**Table 3.** The mean differences in critical thinking areas of the two groups.

Post-test	Experimental group		Control group	
	Level	Point		Level
<b>Reading section</b>				
Reason and evidence question	Multistructural	3	Reason and evidence question	Multistructural
Prediction question	Multistructural	3	Prediction question	Multistructural
Alternative question	Multistructural	3	Alternative question	Multistructural
<b>Listening section</b>				
Conclusion question	Unistructural	2	Conclusion question	Unistructural
<b>Writing section</b>				
Viewpoint question	Relational	4	Viewpoint question	Relational
The average	Multistructural	3	The average	Multistructural

The experimental group outperformed in the reading section compared to the control group. The reading section providing reason and evidence questions suggested different results between the experimental and control groups. The experimental and control groups were multistructural and unistructural, respectively. However, those groups had a similar level at predicting and giving alternatives for the problem, namely multistructural level. Secondly, the experimental and control group were similar in the listening section containing the conclusion question. They were at the unistructural level. Thirdly, the experimental group was more improved than the control group to express their viewpoint in the writing section. The experimental group was at the relational level, whereas the control group was at the unistructural level. The samples of students' original answers are in Table 5.

**Table 5.** Sample of students' original answers to each section.

Section	Critical thinking question	Question	Experimental group	Control group
Reading	Reason and evidence	Why are plastics dangerous to marine life? Explain your answer	S10: Dangerous, because it can damage the ecosystem and the environment because impeding breeding and contaminating seawater (multistructural)	S30: Because many animals want to live in the sea. If there is a lot of plastic waste in the sea then the animals in the sea will die (unistructural)
Listening	Conclusion	What can you conclude from Daisy, Oliver, and Alfie's conversation? Explain your answer	S1: The video talks us about using the simple word present tense in everyday compilation conversations while we are at school and everywhere (unistructural)	S26: What they talked about was about a daisy who liked jack but feels that is impossible. with all their daisy busy they can't go together (unistructural)
Writing	Viewpoint	You can't go outside your home because of the Coronavirus outbreak. You also cannot go to school. You must spend your activities at home. What do you think about it? Make a paragraph to explain that issue (You can relate to your own experience)	S23: A very good and appropriate step from the government because that way fewer people will be infected with the virus. Because if we keep doing outside activities so many people will be infected, because we do a lot of hand contact with other people that we don't know if the person has been infected or not then this is the right step in a situation like this. However, if it continues in the house, people will be lazier and may experience weight gain. Because what is done in the house just playing on a cell phone eating and sleeping all day long makes people become lazy and repeat it tomorrow (relational)	S14: I think it's very good to not go outside of the home because of the virus corona. We must obey the rules of government for social distancing (unistructural)

As shown in Table 5, in the reading section, the experimental group was at the multistructural level. For example, S10 just listed her ideas; her answers indicated that

she could not explain them critically (i.e., she only mentioned some effects of contaminated marine life, but she could not explain the reasons for the damaged ecosystem). On the other hand, the reading section revealed that the control group was at the unistructural level. For example, S30 only provided one idea (i.e., she just mentioned animals in the sea will die). Furthermore, in the listening section, both groups' samples were at the unistructural level. For instance, S1 and S26 only provided one idea and missed the other important points or ideas. It indicated that they were not able to conclude what they watched. The sample of the experimental group's answers in the writing section noted their position at the relational level. Here, S23 was seen able to provide a causal explanation and compare and contrast some arguments. However, the control group was at the unistructural level. At this point, S14 expressed one idea to respond to the question without explicating his argument.

## 4.2 Students' Responses to Using 'English with Noni' Application

The next research question explored the students' responses to using the 'English with Noni' application. The students of the experimental group were interviewed to explicate their learning experiences. The themes that emerged from the data are language and critical thinking skill improvement, the impact of written feedback and dictionary in the application, and the positive feeling to learn using it.

### 4.2.1 Language and critical thinking skill improvement

When asked about the language skills progress after learning using the 'English with Noni' application, all students reported that their language skills such as reading (100%), listening (100%), and writing (100%) were quite improved compared to the previous experiences. All of them (100%) also perceived that they had more vocabulary than before. The interview excerpts translated into English were as follows:

- S3 : My reading skill is better than before.  
 S16 : I think my listening skill is better because I know grammar and pronunciation better. If I do not understand, I replay the video and take notes of new vocabulary.  
 S7 : My writing is better though I lacked vocabulary at first. But now, I am encouraged to open the dictionary frequently.  
 S1 : I have more vocabulary than before. I also understand them.

The students were also asked how their critical thinking skills improved after using the application. Student fairly improved their critical thinking skill such as predicting (100%), providing reasons (100%), expressing viewpoint (100%), finding the alternative (100%), and making conclusions (100%). However, one student (7%) felt that she had difficulty in accomplishing the critical thinking questions at first, but later on, she got used to it. Their report can be seen in the following excerpts.

- S10 : I know how to make a prediction.  
 S4 : At first, I was confused about giving reasons. But I gradually understand and can give them now.  
 S1 : It is easier for me to express my opinion.  
 S9 : I can give solutions to problems.  
 S14 : My ability to conclude is better.

#### 4.2.2 *The impact of written feedback and dictionary on the application*

Concerning the questions ‘Are the feedbacks in ‘English with Noni’ application useful to accomplish your work better?’ and ‘Is the dictionary useful to accomplish your work?’ All of them (100%) revealed that the teacher’s written feedback was valuable and impacted their learning. Besides, all students (100%) reported that the dictionary provided in it aided them to learn, especially to find the meaning of the words that they did not know.

S14 : The feedback is useful. Before doing my task, I look at the feedback first.

S13 : It (the feedback) benefits me because I can learn deeply.

S10 : It is useful for me because I know my mistake and know to improve in the future.

It seems that the most beneficial feature of the application was the feedback, as expressed in the responses above. Obtaining feedback from the teachers assisted them to do a reflection on their learning by identifying their mistakes, and encouraged them to make corrections and do better in the future. The dictionary which was always ready and available for them to use as long as the internet was good was also a good impact on their learning. The dictionary enabled them to conduct a quick search and translate new words instantaneously.

S5 : The dictionary is useful because sometimes I do not know new words, and I search for them using the dictionary.

#### 4.2.3 *The positive feeling to learn using it*

The students were also asked, ‘Do you think that the ‘English with Noni’ application is beneficial for you?’ Approximately 93% of them (14 students) had a positive feeling about using the application, meanwhile, 7% (1 student) was neutral. They felt that it developed their English language skill, increased their motivation to learn English, aided them in learning English to be more fun and easier, providing them with a dictionary to translate.

S4 : The application is good because it helps us to learn English faster. The activities are fun and get us engaged. We gain a lot of new vocabulary. Our reading and listening are better.

Most of all, almost all of the students claimed that this activity was a gained learning experience compared to learning without technology assistance. The use of the application in language learning encouraged their individual learning and growth, enhanced peer collaboration, and resulted in better engaged and effective learners by connecting them and turning them into active learners.

S9 : It is good. It is hard if we find difficult words in the textbook. But the ‘English with Noni’ application is equipped with a dictionary. We can work together or individually to find new words and translate them using it, so it becomes easier to understand.

Overall, the findings indicated that students had positive responses to using the ‘English with Noni’ application that impacted their critical thinking, language skills, and sub-skills. It included tasks or exercises that required students to communicate their arguments, opinions, predictions, conclusions, and alternatives in response to critical thinking questions.

## 5. DISCUSSION

The quantitative findings showed that mobile learning ‘English with Noni’ was more effective than the printed modules. The average score of students was 64.00 and 46.29 for experimental and control groups, respectively. Furthermore, the critical thinking level of the experimental group achieved the multistructural level, and the control group was at the unistructural level. The findings indicated that the experimental group outperformed the control group in terms of critical thinking levels. The finding was consistent with the results from previous studies conducted by [Vidoni and Maddux \(2002\)](#), [Yang et al. \(2013\)](#), [Ebadi and Rahimi \(2018\)](#), and [Chang and Yeh \(2021\)](#) that mobile learning had the potential to enhance students’ critical thinking. The finding could be due to mobile learning ‘English with Noni’ providing the affordances to support students’ learning so that students had opportunities to access and learn the material and teachers’ feedback easily and watched the video several times anytime and anywhere. The teachers’ feedback provided a chance for the students to identify their mistakes. The feedback was beneficial for them to complete their tasks ([Ataeifar et al., 2019](#); [Ghorbani & Ebadi, 2020](#)).

The mobile learning ‘English with Noni’ was also equipped with a dictionary to help them scaffold or express their idea if they had limited vocabulary. The dictionary aided the students to accomplish their tasks ([Ma, 2017](#); [Şad et al., 2020](#)). The mobile learning ‘English with Noni’ also facilitated the students to learn based on their individualized pace, which corroborated [Elaish et al.’s \(2019\)](#) and [Şad et al.’s \(2020\)](#) findings.

This finding suggested that mobile learning ‘English with Noni’ provided an instructional environment to encourage students’ critical thinking. It consisted of the activities or exercises containing critical thinking questions which engaged the students to express their reasons, viewpoints, prediction, conclusion, and find the alternatives ([Ilyas, 2015](#)). The finding was in agreement with [Ebadi and Rahimi \(2018\)](#), who revealed that mobile learning in terms of WebQuest provided the contents stimulating students’ critical thinking in analyzing, evaluating, and giving the reason.

Though students’ critical thinking level in the experimental group was quite better, it remained at the multistructural level. They had not reached relational and extended abstract levels. The finding was in contrast to [Hammer and Griffiths’ \(2015\)](#) that the students at the multistructural level were less sophisticated to argue, compare, or interpret their idea. They were sophisticated if they were at a relational level representing the ability to argue, compare, contrast, provide the causal explanation and interpret the ideas, concepts, or facts. The students in this study did not attain a relational or extended abstract level might be due to insufficient critical thinking practice. Learning critical thinking needs time because it is a developmental process in which teachers habituate the students to have thinking routines so it encourages them to have critical thinking skills steadily ([Gunawardena & Wilson, 2021](#)). It also needs much effort and continual practice to reach the expected critical thinking ([Marashi & Mirghafari, 2019](#); [Yulian, 2021](#)).

The qualitative findings further showed that students perceived that their critical thinking skills, English language skills (reading, listening, and writing), and sub-skill (vocabulary) developed after using the ‘English with Noni’ application. The findings are by supported [Chang and Yeh \(2021\)](#) that the students admitted the mobile learning application contributed to their critical thinking development due to the activities

provided and the opportunities to give diverse answers. The students' answers are not emphasized on the right or wrong ones (Hammer & Griffiths, 2015) but on the process to think (Saxton et al., 2012). The findings are also in line with Fujimoto's (2012) work that students who responded to mobile learning applications gained their vocabulary, grammar, writing, and listening. Previous related studies noted as well that mobile learning applications developed students' vocabulary (Stockwell, 2007), writing (Mallampalli & Goyal, 2021), and reading (Lin, 2014).

In addition, the qualitative finding showed that the students found the application to be easy in accessing the features in it, such as the dictionary, teachers' feedback, and students' score. A similar finding was reported by Chen et al. (2019) that a user-friendly and well-designed mobile learning application encouraged and maximized the students to accomplish their assignments easily and avoided students' frustration as they could use it with ease. And this is expected to contribute to developing students' critical thinking. The students felt that the dictionary provided in the 'English with Noni' application was an aid learning tool for them especially to find the meaning of words and to accomplish their exercise. This finding concurred with Rahimi and Miri's (2014) work that the mobile dictionary helps students find the vocabulary faster. The mastery of vocabulary can improve the students' language skills, such as reading, listening, and speaking (Zhang & Pérez-Paredes, 2021). The more vocabulary knowledge they had, the better critical performance they had because critical thinking might be influenced by it (Floyd, 2011).

The qualitative finding indicated that students positively perceived the use of the 'English with Noni' application due to the distinctive features such as a post-reading game (called the 'Let's Play' part) and a video with subtitles and pitch control. The findings corroborated Sorayyaei and Nasiri's (2014) study, suggesting that students' positive responses to using mobile phone learning are because it developed their language learning and provided exciting and innovative learning. The post-reading game provided could increase the students' motivation to learn (Koutromanos & Avraamidou, 2014; Önal et al., 2019). Besides, the mobile learning 'English with Noni' provided videos with English subtitles and pitch control. Those mobile learning features could encourage the students to watch and replay as many times as they wanted (Wang, 2017).

## **6. CONCLUSION**

The students' critical thinking skills can be fostered by incorporating mobile learning applications. The study showed that the mobile learning of the 'English with Noni' application had an impact on developing students' critical thinking more effectively. The students' critical thinking will be more developed if they are continually trained as it is a developmental process. Furthermore, the students positively perceived that the use of 'English with Noni' application contributed to their language skills (reading, writing, and listening) and sub-skill (vocabulary) as well as critical thinking development in predicting, providing a reason, expressing a viewpoint, finding the alternatives and making conclusions.

The study has implications for the teachers and students. The mobile learning 'English with Noni' was found to enable the teachers to teach their students critical thinking infused in the English instruction by concerning the critical thinking

questions, assessment in terms of the SOLO rubric, and feedback. The application also helped cultivate the students' critical thinking and language skills and sub-skill, thus they could be taught simultaneously and explicitly. The implication for the students is that they could learn critical thinking and the English language without time and place restrictions. They also could learn based on their pace (self-pace) due to the affordances of the application. Moreover, it enables them to have self-regulated learning.

The present study employed a small number of EFL students; therefore, generalizations cannot be made. Large-scale research with various participants from different levels is needed to investigate their critical thinking by using the mobile learning 'English with Noni' application for further study. In addition, this study did not further observe the long term possible difficulties that the students might face in using the application and its relation to their learning outcomes, which is regarded as the limitation of the study. Therefore, future related research should carry out a longer learning process with the 'English with Noni' application to develop students' critical thinking in an EFL setting since this present study only took one semester.

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