



# English with AI: A new era of TOEIC learning for students majoring in airline services\*

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**Kim, Na-Young. 2022. English with AI: A new era of TOEIC learning for students majoring in airline services.** *Linguistic Research* 39(Special Edition): 97-122. The current study examines whether AI-assisted TOEIC learning program positively affects TOEIC scores of students majoring in airline services. The study focuses on how the effectiveness of AI technology differs by gender and proficiency. The experiment was conducted during the 2020 academic year. The participants were 119 EFL students from three intact classes at a university in Korea. For the study, the participants studied English through AI-assisted TOEIC learning technology called *Soljam* for the experimental period of 10 weeks. Before the treatment, all participants took a pre-test based on TOEIC and assigned to three different proficiency groups: Basic, Elementary, and Elementary Plus. After the treatment, all the participants took a post-TOEIC test. Major findings are as follows: First, AI technology positively affected the students' TOEIC scores at a significance level of .05. Second, students' improvement in TOEIC scores significantly differed by gender. However, statistically significant difference was not found regarding proficiency levels. There was no significant interaction effect of gender and proficiency. The findings of this study will shed light on the educational value of AI technology to promote language skills of Korean airline service students. (Sehan University)

**Keywords** AI, TOEIC, EFL, airline service, ESP learning

## 1. Introduction

English is an important skill for employability (Hsu 2014). It plays a particularly important role in airline business as the language is used for international aviation communication (Alderson 2009; Sittattrakul and Laovoravit 2018). According to Bani-Salameh et al. (2011), English proficiency is a pivotal qualification necessary for

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all airline staff since their language competence is directly related to flight safety and communication with passengers. They should be good at English not only to cooperate with cockpit crews by dealing with emergencies and unexpected situations but also to sustain a conversation with the passengers while performing their duties (Min and Lee 2013).

Airline applicants should have proficient English skills to meet their job requirement. In order to prove that they are qualified in English language skills for international communication, aviation students are often required to take official language tests and submit their test scores (Kim 2019). Especially in EFL environments, standardized English tests like TOEIC tests have been considered as an effective means when recruiting airline crews (Sirikanjanawong and Wasanasomsithi 2018). Thus, students majoring in airline service in EFL settings have struggled to make themselves competent in their job markets by increasing their TOEIC scores. They tend to focus on TOEIC preparation rather than English language for airline services (Jin and Kim 2017). English curriculum in the department of airline service also consists of courses focusing on TOEIC score improvement (Choi and Kim 2014).

Various forms of technology have been used to develop students' English skills (Kim and Kim 2019; Kim 2020). Multimedia technology, for example, has been considered to be a strong tool in promoting their English learning. Television, video, and computers have allowed them to achieve their pedagogical goal (Kim 2019). Recently, artificial intelligence (AI) technology has largely been applied to EFL classrooms to help the future airline staff to improve their language ability. In Indonesia, for example, aviation students showed positive improvement in TOEIC skills after experiencing AI technology (Kusumaningrum and Pertiwi 2021). Accordingly in Korea, Yang and Kim (2021) found the airline crews' positive perceptions toward the AI system and suggested its educational value in ESP fields. They concluded that AI technology can be beneficially used by EFL students especially who will be working in certain workplace like airline business.

Given that having English proficiency is essential for airline applicants (Alderson 2009; Bani-Salameh et al. 2011; Min and Lee 2013; Sirikanjanawong and Wasanasomsithi 2018; Sittattrakul and Laovoravit 2018), AI can be of great help in increasing their TOEIC level. However, how AI can be used for English teaching and learning has been examined through only a limited number of studies so far (Jones et al. 2018). Even so, there have been mixed findings regarding the effects of the use of AI technology particularly on EFL learning. While some scholars have proved its positive effects on TOEIC scores (Obari and Lambacher 2019; Kim et al. 2020; Obari 2020;

Obari et al. 2020; Kusumaningrum and Pertiwi 2021; Loh et al. 2021), there have been others who failed to show them (Shishido 2019; Hayashi and Sato 2020).

Moreover, studies on how AI technology can support ESP learning remain subpar. Although it is now quite common for EFL students to seek help from AI technology in their English learning (Jones et al. 2018), not so much research on AI has been carried out in ESP fields including airline business (Yang and Kim 2021). Given that Korean aviation students have trouble with English, it is required to come up with an effective way to help them improve their language proficiency (Kim 2019). In particular, considering the importance of TOEIC in the airline industry (Sirikanjanawong and Wasanasomsithi 2018), it is necessary to find a way to increase their TOEIC test scores.

The current study, therefore, aims to find possible ways to apply AI applications for aviation students in the Korean EFL setting. By integrating AI technology into EFL classrooms, the present study tries to determine whether and to what extent the AI applications help EFL students achieve TOEIC scores. In order to address this issue, the current study especially deals with the issue on gender and proficiency difference in EFL learning. According to Liu (2011), both gender and proficiency are the major factors that contribute to students' learning. Kim (2019) also claimed that gender difference should be taken into consideration in EFL studies. Hsieh et al. (2017) emphasized that proficiency should also be considered as an important factor for successful language learning.

Nevertheless, it has still remained unknown if students at different proficiency levels can equally benefit from AI-assisted learning. According to Kim et al. (2021), AI has a positive role in increasing English skills of students, but its effects do not differ by their proficiency levels. Furthermore, there is still the paucity in literature on the relationship between gender difference and EFL learning (Kang 2015). Even so, there have also been mixed findings on these human factors. While several scholars have found the gender difference in EFL learning (Motallebzadeh and Nematizadeh 2011; Zoghi et al. 2013; Babayigit 2014), no significant differences between genders were reported by others (Park 2001; Bernat and Lloyd 2007; Ko 2018). Taken all this together, the present study focuses on determining whether Korean EFL students' learning differs by gender and proficiency. In this regard, research questions for the study are formulated as follows:

1. What are some effects of AI technology on TOEIC test scores of Korean students majoring in airline service?
2. How does gender and proficiency affect TOEIC score improvement of Korean

students majoring in airline service?

## 2. AI and TOEIC in EFL settings

Artificial intelligence (AI) now is everywhere and intervenes anywhere in our lives. In educational fields, AI has been considered to have large potential and a great impact on learning (Jones et al. 2018). In particular, it has been experienced more efficiently and smoothly with the advancement of mobile technology. Not only has AI technology enhanced the construction of broader learning environments (Kepuska and Bohouta 2018), but also has transformed learning methodologies more effectively (Obari 2020). As Stone et al. (2016) stated, it has blurred the line between formal and classroom education and self-paced and individual learning. According to Troussas et al. (2017), as AI has changed educational environments, it has also facilitated students' learning. The development of AI technology has produced huge benefits in learning.

In EFL learning and teaching, AI technology has been widely used both in and out of classrooms. It has changed the traditional style of language teaching and learning in classroom settings (Jones et al. 2018). There are even programs offering language learning solely through AI. According to Woolf (2009), a number of AI applications have helped students with their language learning. By using AI, higher language ability can be achieved in significantly less time with more ease compared to using traditional methods. *Glossika*, for example, has provided language lessons through a mobile application based on AI technology. ELSA has also helped language learners to correct mistakes with their pronunciation. There are also other useful and smart applications such as *Amazon Alexa*, *Apple Siri*, *Google Assistant*, etc. These AI applications have been downloaded on mobile devices and helped language learning more easily and more quickly.

Now, it is quite common for EFL students to seek help from AI technology in their learning. Particularly in Korea, students make use of mobile applications based on AI to prepare TOEIC tests (Jones et al. 2018). One of them is *Santa TOEIC* developed by Korean researchers. According to Kim et al. (2020), this multi-platform AI tutoring service has more than a million users and is available through Android, iOS, and Web. As a 1:1 TOEIC tutor, it helps the users to prepare the TOEIC tests by diagnosing their current state and providing their expected TOEIC scores. *Santa* dynamically suggests learning items appropriate for the users' condition. This personalized AI tutor gives

educational and individual feedback to the users including customized explanation and tailored lecture. Key test strategies and tips are also provided. Jones et al. (2018) stated that this makes the users possible to increase their TOEIC level with more than 100 points within 5-7 hours. In this light, Loh et al. (2021) claimed that *Santa* provides the most efficient learning content to students preparing for the TOEIC tests.

Scholars in other EFL settings have also used different AI systems to increase students' TOEIC scores. In Japan, for example, *Google Home Mini* and *Amazon Alexa* have been introduced to students to improve their English proficiency. A number of related studies have proved that the two AI applications helped the Japanese EFL students to increase their TOEIC level (Obari and Lambacher 2019; Obari 2020; Obari et al. 2020). In the Indonesian EFL context, Kusumaningrum and Pertiwi (2021) adopted AI technology named Listening for the TOEIC Test. This program was also available via both *Android* and *iOS* applications. In the study, the participants' performance showed positive improvement particularly on their listening skills. The AI allowed the participants to engage in autonomous and flexible learning to get the feedback. Therefore, it was concluded that AI technology improved Indonesian EFL students' TOEIC skills.

However, there have been some different findings revealing no significant effects of AI technology on English proficiency. For example, Shishido (2019) conducted experimental research for eight months using an AI application called *SpeakBuddy*. The results of pre-and post-TOEIC tests did not show much improvement of EFL students in Japan. Although the students showed their willingness to study English with the application, AI technology turned out to be not so effective in increasing their actual TOEIC scores. Hayashi and Sato (2020) also yielded similar findings. They reported that Google Home gave Japanese EFL students positive impressions by enhancing their motivation and reducing their anxiety regarding English learning. Interestingly, despite these all benefits, the results of the TOEIC tests did show any statistically significant improvements.

Considering the merits of AI technology, it should be utilized by EFL students to improve their language learning (Yang and Kim 2021). Nevertheless, there is a lack of studies on how AI can be used for English teaching and learning (Jones et al. 2018). Even so, conflicting findings have been observed regarding the effects of the use of AI technology on EFL learning. Some scholars have shown its positive effects on EFL students' TOEIC scores (Obari and Lambacher 2019; Kim et al. 2020; Obari 2020; Kusumaningrum and Pertiwi 2021; Loh et al. 2021), but others have found different results (Shishido 2019; Hayashi and Sato 2020). Therefore, it is necessary to determine whether AI technology

has beneficial effects on English learning in the Korean EFL context.

### **3. TOEIC and ESP students majoring in airline services**

English for airline crews is a specific sub-branch of English as a Specific Purpose (ESP). What differentiates English for airline staff from other ESP sub-branches is that it has its own set of airline staff discourse. Words and phrases are related to describe the work procedures, passengers' services, and communication. Sector specific vocabulary based on aviation industry is emphasized in relation to airline staff and their practices. Some examples are giving information regarding navigation, security, and meteorology or handling complaints of passengers (Hidayat 2018).

For airline service major students, English education is crucial not only for safety management and emergent situations but also for service communication with passengers (Kim and Jin 2017). Therefore, English curriculum for students majoring in airline services should be developed by integrating with their professional practices. According to Xiaoqin and Wenzhong (2016), this is advantageous for them to acquire both basic language skills and occupational practices. By doing so, they can improve their English communication abilities required in their workplace in airline business.

English curriculum in airline services is mostly comprised of courses preparing for TOEIC (Choi and Kim 2014). The TOEIC test has long been used when recruiting airline staffs (Kim 2019). Pre-service flight attendant students have also acknowledged that the TOEIC test is very important to work for the airline industry (Han 2019). More importantly, it has been found that airline cabin crews have positive attitudes towards the TOEIC test. Sirikanjanawong and Wasanasomsithi (2018) investigated current flight attendants' attitudes towards TOEIC and found that they were all familiar with the test, all agreeing that TOEIC actually measures their everyday English skills that they need for their job. In general, the participants felt that TOEIC is useful and directly related to airline services (Sirikanjanawong and Wasanasomsithi 2018).

In addition, it should be noted that the TOEIC test itself includes many airline-related contents and questions. Figure 1 below shows examples of listening and reading questions in TOEIC regarding the airline industry. The listening questions are about an airport announcement. In order to solve the questions, test-takers are required to listen to the announcement made at the airport and understand its main purpose. They are also asked

to understand details in the announcement and solve the inference questions regarding the airport. In terms of the reading questions, there are text messages between two people. The questions test the test-takers' comprehension of the text messages regarding flight problems. The test-takers should understand specific information and make inferences based on flight information in the text messages.

## TOEIC listening: Airport announcement

Listening Script	Listening Questions
<p>Welcome to Global Airlines' inaugural flight from Portland to Tokyo.</p> <p>All passengers this morning will receive a commemorative medallion, as well as a \$50 coupon to be applied toward future flights on Global Airlines.</p> <p>To celebrate this special occasion, we are serving complimentary snacks and drinks in the lounge next to the boarding gate.</p> <p>There will be speeches by Global Airlines President Juan Gutierrez, and Portland mayor Jean Andreessen. Afterward, enjoy music by the local trio Three Tree Point.</p> <p>Boarding times for our flight will be as follows: All handicapped persons or those requiring special assistance will board at 3 o'clock. Business-class passengers will board at 3:10. Passengers in rows 1 to 30 will start boarding at 3:20, and passengers in rows 30 to 50 will begin boarding at 3:30.</p> <p>If you have any questions about the flight today, or about our new round-trip service to Tokyo, please visit the service counter.</p> <p style="text-align: center;">Thank you for choosing Global!</p>	<ol style="list-style-type: none"> <li>1) What is the main purpose of the announcement?                             <ol style="list-style-type: none"> <li>a. To introduce Global executives</li> <li>b. To initiate boarding procedures</li> <li>c. To answer customer questions</li> <li>d. To celebrate a new flight</li> </ol> </li> <li>2) What will each passenger receive?                             <ol style="list-style-type: none"> <li>a. A discount coupon</li> <li>b. A special trophy</li> <li>c. A commemorative T-shirt</li> <li>d. A complimentary dinner</li> </ol> </li> <li>3) What should passengers do if they have questions?                             <ol style="list-style-type: none"> <li>a. Ask the pilot</li> <li>b. Visit the customer-service counter</li> <li>c. Wait for a special announcement</li> <li>d. Receive a brochure!</li> </ol> </li> </ol>

## TOEIC reading: Flight problems

Text Message	Reading Questions
<div style="border: 1px solid gray; padding: 5px; background-color: #f9f9f9;"> <p style="text-align: center; margin: 0;"><b>Text Message</b></p> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray; padding: 2px 0;"> <span>SAM BACH</span> <span>11:59</span> </div> <p style="font-size: 0.8em; margin: 0;">My first flight was delayed, so I missed my connection in Beijing.</p> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray; padding: 2px 0;"> <span>SAM BACH</span> <span>12:00</span> </div> <p style="font-size: 0.8em; margin: 0;">So now, I'm going to be on a flight arriving in Kansai at 18:00.</p> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray; padding: 2px 0;"> <span>AKIRA OTANI</span> <span>12:05</span> </div> <p style="font-size: 0.8em; margin: 0;">OK. Same airline?</p> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray; padding: 2px 0;"> <span>SAM BACH</span> <span>12:06</span> </div> <p style="font-size: 0.8em; margin: 0;">It's still Fly Right Airlines. It will be later in the day but still in time for our client meeting.</p> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray; padding: 2px 0;"> <span>AKIRA OTANI</span> <span>12:06</span> </div> <p style="font-size: 0.8em; margin: 0;">I'll confirm the arrival time. Do you have any checked bags?</p> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray; padding: 2px 0;"> <span>SAM BACH</span> <span>12:10</span> </div> <p style="font-size: 0.8em; margin: 0;">I do. Would you mind meeting me at the door after I go through customs?</p> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray; padding: 2px 0;"> <span>AKIRA OTANI</span> <span>12:15</span> </div> <p style="font-size: 0.8em; margin: 0;">Sure thing. Parking spots can be hard to find, but now I'll have extra time to drive around and look.</p> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid gray; padding: 2px 0;"> <span>SAM BACH</span> <span>12:16</span> </div> <p style="font-size: 0.8em; margin: 0;">Yes, sorry about that. See you then!</p> <div style="display: flex; justify-content: space-between; padding: 2px 0;"> <input style="width: 80%; border: none; border-bottom: 1px solid gray;" type="text"/> <span style="border: 1px solid gray; padding: 0 5px; font-size: 0.8em;">Send</span> </div> </div>	<ol style="list-style-type: none"> <li>1) What is suggested about Mr. Bach?                             <ol style="list-style-type: none"> <li>a. He has been to Kansai more than once.</li> <li>b. He currently works in Beijing.</li> <li>c. He is on a business trip.</li> <li>d. He works for Fly Right Airlines.</li> </ol> </li> <li>2) At 12:15, what does Mr. Otani mean when he writes, "Sure thing"?                             <ol style="list-style-type: none"> <li>a. He has confirmed the arrival time of a flight.</li> <li>b. He is certain he will be able to find a parking place.</li> <li>c. He agrees to wait at the door near the customs area.</li> <li>d. He knows Mr. Bach must pass through customs.</li> </ol> </li> </ol>

Figure 1. TOEIC sample questions related to airline services (<https://www.ets.org/s/toEIC/pdf/toEIC-listening-reading-sample-test-updated.pdf>)

To summarize, it seems reasonable that TOEIC plays an important role in recruiting airline crews (Sirikanjanawong and Wasanasomsithi 2018). Since airline applicants have been requested to take the TOEIC test and submit their test scores (Kim 2019), departments of airline services in university settings have asked their students to prepare the TOEIC test by offering related course to support them (Choi and Kim 2014). The students have also struggled to increase their TOEIC scores to be competent in the airline industry (Jin and Kim 2017; Han 2019).

Considering the beneficial impacts of AI technology on TOEIC score improvement (Jones et al. 2018; Obari and Lambacher 2019; Kim et al. 2020; Obari 2020; Obari et al. 2020; Loh et al. 2021), AI can be of great help in increasing airline service students' TOEIC level. Indeed, aviation students in Indonesia have shown positive improvement in TOEIC skills after experiencing AI technology. Kusumaningrum and Pertiwi (2021) reported that the AI-assisted TOEIC learning program helped Indonesian aviation students to learn some skills and strategies to excel the TOEIC test. The students' test results showed that AI allowed them to increase their test scores.

Korean EFL students majoring in airline services, however, still have trouble with English, and it is necessary to come up with an effective way to help them improve their language proficiency (Kim 2019). According to Yang and Kim (2021), a limited number of studies on AI have been conducted in Korean ESP fields, especially regarding airline business. Despite an increasing interest in artificial intelligence for EFL learning, related research is still scarce and more studies should be carried out.

In order to fill this gap, the present study was carried out to demonstrate how AI technology could be utilized for students majoring in airline services by providing empirical evidence to support its educational value in EFL settings. Given the importance of the TOEIC test in the airline industry (Sirikanjanawong and Wasanasomsithi 2018), the current study aims to find an effective way of using AI applications for airline service students to increase their TOEIC scores. The study hopes to provide insights into the educational value of AI technology for ESP students in airline service departments.

## **4. Methodology**

### **4.1 Subjects**

Subjects in the current study consisted of students in the department of airline service



at a university in Korea. They were students taking an English course for 100 minutes a week. It was non-credit but mandatory for the students to graduate from school. A total of 119 students participated in the study. There were 50 male and 69 female students. All subjects were native speakers of Korean. No one had experienced in studying abroad. Their age ranged from 19 to 25.

The current study investigates the effectiveness of AI technology in EFL classrooms. The focus of the study was to determine whether gender and proficiency difference had a notable effect on AI-assisted language learning. In order to check their proficiency levels, all participants took a pre-test based on TOEIC. The participants' proficiency level was determined based on the results of the TOEIC pre-test. Mason and Krashen (2014) related TOEIC levels with real-world competence on a six-level scale based on *TOEIC Conversion Table* from <http://wie.ac.nz/toEICconversion.htm>.

Table 1. Distribution of subjects by gender and proficiency

Gender	Proficiency			Total
	Basic	Elementary	Elementary Plus	
Male	16	18	16	50
Female	15	36	18	69
Total	31	54	34	119

Table 1 above shows the total number of participants in the current study. According to the conversion table by (Mason and Krashen 2014), the participants were divided into three proficiency levels: Basic, Elementary, and Elementary Plus proficiency levels. There were 31 students in Basic proficiency level with TOEIC scores ranging from 10 to 250. 54 students were grouped into Elementary proficiency level with scores ranging from 255 to 400. In terms of Elementary Plus proficiency level, there were 34 students who scored from 405 to 600.

#### 4.2 AI-assisted TOEIC learning program

The current study aims to investigate the effectiveness of AI technology in EFL settings. To be specific, this study examined whether and how AI-assisted learning helped Korean aviation students to increase their TOEIC scores. For the study, all students were asked to use their computers to engage in AI-assisted TOEIC learning program. During

class, the students joined the AI program and complete the tasks that AI has assigned to them.

The current study adopted AI-assisted TOEIC learning program, *Soljam* ([www.soljam.net](http://www.soljam.net)). It is known to increase users' TOEIC scores by AI adaptive learning. This AI tutor evaluates students' TOEIC levels by referring to millions of users' data. It has accumulated the user interaction data solving TOEIC test-prep questions. After analyzing the relationship between the questions and a user's current knowledge level, it selects questions that can best evaluate the user's current score. *Soljam* automatically learns about the user. Based on the difference between the user's current and target score, this AI program provides the optimal learning path.

Figure 2 describes the flow of a user entering and using the program. When a new user first visit *Soljam*, they run into a diagnostic test that consists of questions that resemble those appearing on the TOEIC test. There is also a vocabulary test that includes essential vocabulary of the TOEIC test. While the user progresses through the tests, *Soljam* records the user's activity and the AI engine models the individual user. After the tests, the user continues their study based on the analytics of their problem-solving process in the tests.

*Soljam* provides everything necessary for TOEIC learning including lectures, explanations, practice test, and score prediction. Its user can also learn the essential vocabulary of TOEIC. More importantly, this AI tutor identifies the user's weak points and provides weakness analysis report to help the user improve on those weak spots in the actual exams. Through the personalized course, the user can focus on and intensively study the areas he or she is relatively weak at. They can practice their vulnerable TOEIC questions spending less time but learning more.

In the current study, a teacher's role was to assist students in English learning with artificial intelligence. While the students joined the AI-assisted TOEIC learning program, the teacher provided guidance for the effective use of the program. The teacher help the students to engage in the program without difficulty by answering their questions.

This AI-assisted program not only recommends the tailored lectures from concepts to tips and tricks for a higher test score, but also provides customized questions part-by-part. The user can manage his or her own learning history and review their wrong answers. By repeatedly solving similar problems, they can fix their weaknesses intensively, and consequently, they can increase test scores within the short amount of time.

**화면 로그인 후 메인 화면**

1. [영어] 탭 클릭

2. [커리큘럼 레벨테스트 시작] 버튼 클릭

3. [영어] 탭 클릭

**설명**

복수 개 학급에서 슬롯을 활용하는 경우 상단에서 과목을 선택해 주세요.

레벨테스트를 시작합니다.

**영어 과목 레벨테스트:**

1. 커리큘럼 레벨테스트 (10~25분 소요)

2. 단어 레벨테스트 (2~5분 소요)

\* 영어인 경우, 커리큘럼 레벨테스트와 단어 레벨테스트 2가지를 모두 완료하세요

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**화면 레벨테스트 후 메인 화면**

1. [확인] 버튼 클릭

2. [메뉴바에서 [내 정보]를 클릭하면 커리큘럼과 레벨을 상시 확인 가능합니다.

3. [확인] 버튼 클릭

4. [확인] 버튼 클릭

5. [확인] 버튼 클릭

6. [확인] 버튼 클릭

**설명**

레벨테스트를 모두 완료하면 5형 커리큘럼이 준비됩니다.

메뉴바에서 [내 정보]를 클릭하면 커리큘럼과 레벨을 상시 확인 가능합니다.

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**화면 메인 화면 > 과제 오픈 후**

1. [영어] 탭 클릭

2. [단어 암기] [듣기] [읽기] [말하기] 탭 클릭

3. [시작] 버튼 클릭

4. [시작] 버튼 클릭

5. [시작] 버튼 클릭

6. [시작] 버튼 클릭

**설명**

커리큘럼 진도에 따라 매주 수업 시작시간에 한 주 동안 학습할 과제가 오픈됩니다.

과제는 단어 암기, 정구 학습, 오답 복습으로 이루어져 있습니다. 빨간 숫자가 있는 탭을 클릭하세요.

활성화된 (학습하기) 버튼을 눌러 학습을 시작하세요.

빨간색 숫자는 과목별 미완료 과제수로, 과제를 모두 완료하면 빨간색 숫자가 사라지고 과제 완료 메시지가 나옵니다.

수업시간에 학습하고 남은 과제는 다음 수업 시작 전까지 완료해 오면 됩니다.

Figure 2. AI-assisted TOEIC learning program

### 4.3 TOEIC listening and reading tests

All participants of the current study were Korean aviation students trying to strengthen their English skills to make themselves proficient for competitive job markets. In order to confirm whether AI-assisted TOEIC learning program had a notable effect on Korean aviation students' TOEIC scores, the current study adopted TOEIC-based pre-and post-tests.

The TOEIC tests used in the current study were paper-and-pencil, multiple-choice assessments. There were two timed sections – listening and reading – with 100 questions in each section. All tests questions were adopted from a test preparation book: *Tactics for TOEIC® Listening and Reading Test* (Trew 2007). Given the original test-taking time, the students were given 45 minutes for the listening section while 75 minutes for the reading section. There were a total of 120 minutes to complete the both sections.

Score	List	Read	Score	List	Read	Score	List	Read	Score	List	Read
100	495	495	79	415	355	58	285	240	37	125	90
99	495	490	78	405	345	57	275	230	36	115	85
98	495	485	77	400	340	56	265	220	35	105	80
97	495	485	76	395	335	55	260	215	34	100	75
96	495	475	75	385	330	54	255	210	33	95	70
95	495	470	74	375	325	53	245	205	32	90	65
94	495	460	73	370	320	52	235	195	31	85	60
93	495	455	72	365	315	51	230	185	30	80	55
92	490	450	71	360	310	50	225	175	29	70	45
91	485	440	70	355	300	49	220	170	28	60	40
90	480	435	69	350	295	48	215	160	27	55	35
89	475	425	68	345	295	47	205	155	26	50	30
88	465	420	67	340	290	46	200	145	25	45	25
87	460	415	66	335	285	45	190	140	24	40	20
86	455	405	65	330	280	44	180	135	23	35	15
85	445	395	64	325	275	43	175	130	22	30	10
84	440	390	63	320	270	42	170	125	21	25	5
83	435	385	62	310	260	41	160	120	20	20	5
82	430	375	61	300	255	40	150	115	19	15	5
81	425	370	60	295	250	39	140	105	18	10	5
80	420	360	59	290	245	38	135	95	1-17	5	5

Figure 3. TOEIC conversion table (from <http://wie.ac.nz/toeicconversion.htm>)

Test scores were given by the number of correct answers. One credit was assigned to one question. Thus, the scores ranged from 0 to 100 for each section. The students' test scores were applied to the TOEIC Conversion Table provided by Waikato Institute of Education (from <http://wie.ac.nz/toeicconversion.htm>). Finally, each student was given their test scores on a scale from 10 to 990, following the conversion table (see Figure 3).

#### 4.4 Research procedure

All The present study aims to investigate how AI technology can be utilized for Korean students majoring in airline services by increasing their TOEIC scores. In particular, this study deals with the issue on gender and proficiency difference in ESP learning. For the current study, a total of 119 participants were recruited from the department of Airline Service at a university in Korea. The students were taking a non-credit but mandatory English course. There were 50 male and 69 female students from the three intact classes. All classes were designed to improve students' TOEIC test scores. They were held once a week for 80 minutes and run by the same teacher.

The whole experiment was carried out during the students' regular class hours. There were 10 sessions of 80-minute English class during ten-week experimental period (5 weeks before the mid-term exam and another 5 weeks before the final exam). All students used their desktop or laptop computers to experience AI-assisted English learning. During class, the students joined *Soljam*, the AI-assisted TOEIC learning program, and completed the tasks assigned to them. Due to the COVID-19 regulations, they took the course both online and offline. The online class was held via Zoom. The students engaged in the program while Zoom was open. For the offline classes, they brought their laptop computers. When they forgot to bring them, smartphones were allowed for the study.

After evaluating the students' TOEIC levels through a diagnostic test, the AI program provided the students with personalized lectures, explanations, and practice tests. The students were also given the essential vocabulary of TOEIC. In addition, *Soljam* found the students' weak spots and helped them to improve on their weak points by providing weakness analysis report. Through the tailored course and customized questions part-by-part, the students were able to focus on and intensively study the areas they were relatively weak at. By repeatedly solving similar problems, the students tried to fix their weaknesses intensively.

This AI tutor not only provided concepts for the test preparation, but also offered tips and tricks for a higher test score. It also allowed the students to manage their own learning history and review their wrong answers. Although all the students joined the AI-assisted TOEIC learning program to increase their TOEIC scores, they were not taught the same curriculum depending on their diagnostic test results and weak spots. Through this AI adaptive learning with tailored lectures, customized explanations, and personalized practice tests, it was believed that the students were able to increase their TOEIC scores.

Before the treatment, all participants took a pre-test based on TOEIC. The proficiency levels of the participants in the current study were confirmed based on the results of this TOEIC-based pre-test. They were determined according to the previous research on a six-level scale based on TOEIC Conversion Table (Mason and Krashen 2014). In the current study, the participants were grouped into three proficiency levels: Basic, Elementary, and Elementary Plus proficiency levels. In order to confirm whether the AI technology indeed affected Korean students' TOEIC score improvement, all participants took a post-TOEIC test after the treatment. The pre- and post-TOEIC tests were paper-and-pencil, multiple-choice assessments. There were two listening and reading sections with 200 questions. The participants were given a total of 120 minutes to complete the both sections. The test scores were converted on a scale from 10 to 990, provided by Waikato Institute of Education (<http://wie.ac.nz/toEICconversion.htm>).

#### **4.5 Data analysis**

This study aimed to explore the effects of AI technology on airline service students' TOEIC test scores. Data obtained from the current study were analyzed with SPSS statistical program version 20. In order to determine whether AI-assisted TOEIC learning program had a notable effect on participants' TOEIC score improvement, pre- and post-test scores were compared through a paired samples *t*-test. In order to find out whether the effectiveness of AI technology differed by gender and proficiency, a two-way ANOVA was administered with two independent variables – gender and proficiency – and with one dependent variables: TOEIC score improvement. *P* value was set at .05.

### **5. Results**

#### **5.1 Effects of AI on TOEIC scores of students majoring in airline services**

This study aimed to explore the effects of AI-assisted TOEIC learning program on TOEIC test scores of students majoring in airline services. In order to investigate how AI technology affected the test scores, the pre- and post-test scores were compared using a paired samples *t*-test. Table 2 below shows the descriptive statistics and the results of the *t*-test.

Table 2. TOEIC pre- and post-test scores

Pre-Test ( <i>n</i> = 119)		Post-Test ( <i>n</i> = 119)		<i>t</i>	<i>p</i>
<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
345.08	111.08	389.08	134.77	-5.868	.000

As can be seen from Table 2, there was a statistically significant difference ( $p < .05$ ). To be specific, a significant mean score difference was found between the pre-test and post-test scores ( $t = -5.868$ ,  $p = .000$ ). The mean score of the pre-test was 345.08 ( $SD = 111.08$ ) while that of the post-test was 389.08 ( $SD = 134.77$ ). The result of the t-test indicates that the students increased their TOEIC scores at a significance level of .05 ( $p > .05$ ).

To sum up, it was found that AI application helped students majoring in airline services to be more proficient in English after the treatment. Their mean score difference between the TOEIC-based pre-test and post-test was found to be statistically significant. It can be said that the AI technology played a beneficial role in increasing TOEIC scores of the students in the airline services department. After experiencing AI-assisted TOEIC learning technology, they were able to increase their TOEIC scores.

## 5.2 Effects of AI on TOEIC score improvement by gender and proficiency

The current study also examined whether the AI technology differently affects students' TOEIC score improvement by gender and proficiency. It was aimed to determine which gender and/or proficiency group benefits more from AI-assisted TOEIC program. In order to compare the improvement in TOEIC scores by gender and proficiency, mean score differences between pre- and post-tests were analyzed using a two-way ANOVA. It was conducted with the gender and proficiency as independent variables and TOEIC score improvement as a dependent variable. Table 3 below shows the means and standard deviations of TOEIC score improvement of students.

As can be seen from Table 3 below, it was found that the male students and the female students at three proficiency levels all improved their TOEIC scores. To be specific, the male students at the basic proficiency level increased their scores with 23.44 points ( $SD = 57.18$ ) while those at the elementary proficiency level did with 6.67 points ( $SD = 77.91$ ). The mean score increase of the male students with the elementary plus proficiency level was 30.63 ( $SD = 47.92$ ). The female students at the basic proficiency level increased their

scores with 86.00 points ( $SD = 82.44$ ) whereas those at the elementary proficiency level did with 45.69 ( $SD = 65.61$ ).

Table 3. Means and standard deviations of TOEIC score improvement

Proficiency	Basic ( $n = 31$ )		Elementary ( $n = 54$ )		Elementary Plus ( $n = 34$ )		Total ( $n = 119$ )	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Gender								
Male ( $n = 50$ )	23.44	57.18	6.67	77.91	30.63	47.92	19.70	62.58
Female ( $n = 69$ )	86.00	82.44	45.69	65.61	73.06	128.37	61.59	89.64
Total ( $n = 119$ )	53.71	76.27	32.69	71.66	53.09	99.98	43.99	81.78

The mean score increase of the female students with the elementary plus proficiency level was 73.06 ( $SD = 128.37$ ). In total, the basic proficiency group increased their TOEIC scores with 53.71 points ( $SD = 76.27$ ) while the elementary proficiency group did with 32.69 points ( $SD = 71.66$ ) and the elementary plus group did with 53.09 points ( $SD = 99.98$ ). The total mean score increase of the male students was 19.70 ( $SD = 62.58$ ) while that of the female students was 61.59 ( $SD = 89.64$ ).

Findings of the descriptive statistics represent that all students benefitted from AI technology regarding their TOEIC score improvement. The study found positive mean score changes between pre- and post-tests for both male and female students at all the three proficiency levels: Basic, Elementary, and Elementary Plus Proficiency levels. From the descriptive statistics result, it can be said that AI-assisted TOEIC learning program positively affected the students' improvement of TOEIC scores.

Table 4. A two-way ANOVA

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Gender	62748.909	1	62748.909	9.950	.002
Proficiency	20293.540	2	10146.770	1.609	.205
Gender * Proficiency	2807.733	2	1403.867	.223	.801

The two-way ANOVA was computed to find out whether there were significant differences in the TOEIC score improvement (the dependent variable) by gender and proficiency (the two independent variables). It was used to find out whether there were significant differences in the TOEIC score improvement (the dependent variable) by gender and proficiency (the two independent variables).

The ANOVA results in Table 4 above show that the effects of AI technology on TOEIC



score improvement significantly varied between male students and female students. Statistically significant differences did occur between the two genders ( $F = 9.950, p = .002$ ). However, ANOVA indicates that proficiency level did not affect students' improvement in TOEIC scores. A statistically significant difference was not found among students with different proficiency levels ( $F = 1.609, p = .205$ ). Likewise, as for interaction of the two independent variables (gender and proficiency), there was no significant difference found ( $F = .223, p = .801$ ). This result indicates that gender and proficiency exerted their effects independently. To sum up, only gender had significant effects on TOEIC score improvement.

## 6. Discussion

### 6.1 Effects of AI on TOEIC scores of students in airline services

This study investigated how AI technology affected the TOEIC scores of students majoring in airline services. The students' pre- and post-test scores were also compared using the paired samples t-tests. The t-test result shows that the students improved their TOEIC test scores as a result of engaging in AI-assisted TOEIC learning program. It seems that the students became more proficient in English after the treatment. These findings of the study are in accordance with the previous studies suggesting that AI systems help EFL students to increase their TOEIC scores (Obari and Lambacher 2019; Obari 2020; Obari et al. 2020; Kusumaningrum and Pertiwi 2021).

AI-assisted TOEIC learning systems such as *Santa* and *Soljam* not only help students to prepare the TOEIC tests by diagnosing their current state and providing their expected test scores but also help the students to increase their test scores by suggesting appropriate learning items and by giving individual feedback including explanation and lecture, depending on the students' condition. Furthermore, they provide the students with key strategies and tips for improving the test results (Kim et al. 2020). As Kusumaningrum and Pertiwi (2021) noted, students can engage in autonomous and flexible learning through this AI technology.

According to Jones et al. (2018), Korean EFL students frequently use AI technology for their learning. They actively make use of AI applications to prepare the TOEIC tests and actually increase their test score through the AI-assisted TOEIC learning systems. In this light, Loh et al. (2021) asserted that AI applications can be the most efficient learning

tool for students preparing the TOEIC tests. In accordance with the previous research, the findings of the study also revealed that AI played a beneficial role in preparing the TOEIC test for students majoring in airline services (Kusumaningrum and Pertiwi 2021).

The current study also supports Yang and Kim's study (2021) indicating a positive relationship between AI technology and ESP learning. As there is an increasing interest in artificial intelligence for ESP learning, the authors stressed the need for research on how AI can support English learning of students in the department of airline services. However, a limited number of studies on AI have been conducted in ESP fields, especially regarding airline department (Jin and Kim 2017; Han 2019). In this regard, the current study shed light on the educational value of AI for students majoring in airline services.

## **6.2 Effects of AI on TOEIC score improvement by gender and proficiency**

The current study also examined whether the effects of AI-assisted TOEIC program differ by gender and proficiency. According to Liu (2011), both gender and proficiency are the major factors that contribute to students' learning. In order to determine whether gender and proficiency affect students' TOEIC score improvement, a two-way ANOVA was carried out. The findings show that there was no interaction effect of gender and proficiency on TOEIC score improvement. Thus, it can be concluded that the two variables independently affect students' TOEIC score improvement.

In terms of gender, the study confirmed significant gender difference in TOEIC score improvement. In the current study, it was found that the effectiveness of AI-assisted TOEIC learning program significantly differed by gender. That is, male students and female students differently improved their TOEIC scores. As can be seen from Table 3 in the previous section, the female students increased their TOEIC scores more than the male students. The study confirmed more positive mean score changes between pre- and post-tests for the female students. It can be said that the female students majoring in airline services benefitted more from AI technology than their counterparts, regarding the TOEIC score improvement.

According to Kim (2019), gender difference should be taken into consideration in EFL studies. It has been seen that language is dominated by females, and the female students show better performance in class assessments and participation than the male students do (Mathew et al. 2013). Many previous scholars in EFL settings have also proved that the female students perform better than the male students in English language

(Motallebzadeh and Nematizadeh 2011; Zoghi et al. 2013; Babayiğit 2014). The findings of the current study support these previous findings showing the female students' superior performance in TOEIC score improvement.

Interestingly however, the previous studies in the Korean EFL context found no significant differences between genders regarding language learning. After examining the gender difference in English oral proficiency, Kim (2019) found no statistical significance among Korean EFL students. Furthermore, in her study, both male and female students showed positive perceptions of technology- assisted English learning. Bernat and Lloyd (2007) also discovered that Korean male and female students held similar views on EFL learning. Similarly in Ko's (2018) study, no significant gender differences existed between the male and female students in their anxiety. Park (2001) witnessed no gender differences in strategy use. Kim (2017) added that gender has no significant effect on the strategy use of Korean EFL students.

Considering the paucity in literature on the relationship between gender difference and EFL learning in Korea (Kang 2015), this study provides evidence on how Korean EFL students' language learning differs by gender. Although the findings of the current study corroborate many EFL studies showing gender difference in English learning (Motallebzadeh and Nematizadeh 2011; Zoghi et al. 2013; Babayiğit 2014), previous studies in the Korean EFL context have shown opposite results (Park 2001; Bernat and Lloyd 2007; Ko 2018; Kim 2019). Given the conflicting findings, further research is needed to determine whether significant differences existed by gender in AI-assisted English learning environment in Korea.

Regarding the proficiency issue, the current study found no significant relationship between the students' proficiency level and their TOEIC score improvement. In the present study, proficiency did not affect students' TOEIC score improvement. All students improved their TOEIC scores regardless of their proficiency levels. As can be shown in Table 3 in the previous section, the students at all proficiency levels were able to benefit from AI-assisted TOEIC learning program. From the findings of the study, it can be said that students' improvement in TOEIC scores did not differ by proficiency.

The findings can corroborate some previous studies conducted in EFL settings. Kim et al. (2021) discovered that AI has a positive role in increasing English skills of students, regardless of their proficiency levels. Yoon (2019) investigated students' perspectives on AI technology for learning English by proficiency levels and found no statistically significant differences among the different proficiency groups, especially regarding listening

and reading skills. It was concluded that students' proficiency may not have effect on their perspectives on whether AI is necessary for English listening and reading skills.

In EFL classroom worldwide, language proficiency difference among students is a challenging pedagogical issue (Huang et al. 2017). Teachers often face a challenge teaching a language combining students at different language proficiency levels in the same classroom. This issue has not been addressed properly in current classroom settings. Although Hsieh et al. (2017) emphasized that proficiency should be considered as an important factor for successful language learning, it has still remained unknown if students at different language proficiency levels can equally benefit from AI-assisted learning (Kim et al. 2021).

However, the problems with students' language proficiency differences in EFL classroom can be solved through this study. The findings of the current study shed light on the issue of combining EFL students at different proficiency levels in the same classroom. In the present study, the students at different proficiency levels equally benefitted from AI-assisted TOEIC learning program. It was proved that all students were able to increase TOEIC scores regardless of their proficiency levels. By providing empirical evidence for its educational value, this study shows how AI technology could be used for future airline crews at different proficiency levels.

## **7. Conclusion**

The recent COVID-19 pandemic has changed teaching and learning systems all around the world. To prevent the widespread infection, institutions have implemented virtual and remote services with online learning systems. In this situation, AI technology provides a promising way to overcome these challenges the pandemic has brought to educational environment (Kim et al. 2020). Hayashi and Sato (2020) asserted that EFL students can especially benefit from AI applications during this pandemic. With AI, the students can reduce their anxiety while increasing their motivation and interests in English learning. According to Obari and Lambacher (2019), coexistence with AI became one of the survival skills necessary for 21st-century education. Especially in the With-Corona era, EFL learning with AI technology would become more popular than ever (Hayashi and Sato 2020).

In EFL contexts, where the TOEIC tests are high stakes official tests and have a crucial effect on students' future career (Kim 2019), AI systems have played a significant role in increasing the students' TOEIC scores. According to Jones et al. (2018), many

Korean EFL students have used AI applications to prepare TOEIC tests. Given that airline services students should take the TOEIC tests to prove that they are proficient in English (Sirikanjanawong and Wasanasomsithi 2018), AI can be of great help in increasing the students' TOEIC scores. From this point of view, the current study examined whether AI-assisted TOEIC learning program positively affects TOEIC scores of students majoring in airline services. The present study also aimed to investigate how the effectiveness of AI technology differs by gender and proficiency.

Major findings are as follows: First, AI technology positively affected the students' TOEIC scores. Students majoring in airline service increased their test scores at a significance level of .05 after engaging in AI-assisted TOEIC learning program. Second, students' improvement in TOEIC scores significantly differed by gender. To be specific, female students more increased their test scores than their counterparts. Statistically significant proficiency difference, however, was not found. Airline service students in Korea improved their TOEIC scores regardless of proficiency levels. Lastly, there was no significant interaction effect of gender and proficiency.

Korean students majoring in airline services have had trouble with English language, and it has been requested to devise an effective way to help the students to improve their English skills (Kim 2019). In particular, as the importance of TOEIC has been emphasized in the airline industry (Sirikanjanawong and Wasanasomsithi 2018), it has been focused on the way to increase TOEIC test scores. In light of this, the findings of the present study prove how AI-assisted TOEIC learning program could be utilized for students in the airline services department by providing empirical evidence to support its educational value.

According to Im and Park (2015), it is important to change not only the types of English course but also the ways of English teaching. For effective English teaching, teachers have used new and various types of technology in class. However, Kimura et al. (2011) pointed out that simply allowing students to use technology does not raise their academic achievement. The impact relies on the way the technology is implemented and the condition under which applications are used (Roblyer and Doering 2007). In this regards, the current study sheds light on the effective way of using AI-assisted TOEIC learning application, particularly showing how the effectiveness of AI technology differs by gender and proficiency.

Overall, the results of the present study suggest some implications. First, airline service students can increase their TOEIC scores when engaging in AI-assisted TOEIC learning program. In particular, female students can more improve their TOEIC scores than male

students can. AI technology seems more helpful for female students especially at basic proficiency level. Therefore, it is important to note that students' TOEIC score improvements can differ by gender. However, the study indicates that proficiency does not influence students' TOEIC score improvements. It is implied that students with different proficiency levels can all equally benefit from AI-assisted TOEIC learning applications.

Based on the results of the study, some pedagogical implications can be made. Through this study, EFL teachers can gain a better understanding of AI technology especially in relation to airline service students' gender and proficiency. Gender should be regarded as an individual factor that significantly influences students' TOEIC scores. Proficiency level, however, can be considered less significant. Therefore, the teachers should more carefully consider the use of AI-assisted learning applications for EFL male students, but they can adopt the AI applications in classrooms with students at different proficiency levels. Through the AI technology, EFL teachers can combine their students in the same classroom even if they have different proficiency levels .

Several limitations also emerged while conducting this study. Due to the accessibility to the subjects, the current research employed only three proficiency levels – Basic, Elementary, and Elementary Plus – among six levels. Furthermore, this study included a limited number of participants at each proficiency level. This makes it difficult to generalize the findings of the study to a larger population, requiring further investigation. Moreover, in the current study, the data were collected over a period of ten weeks. It also needs to be explored in a longitudinal study.

In addition, there are some factors other than gender and proficiency which can affect EFL learning. For example, EFL students' major are also one of the key factors that should be addressed in language learning (Gu 2002). Given that the current study was conducted only with the students in the airline services department, differences in participants' major need to be considered in future studies. Therefore, future studies should adopt a broader scale of samples from various contexts to achieve more generalizable and reliable results.

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