



Development and Application of AI Chatbot for Cabin Crews*

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ABSTRACT

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Artificial intelligence (AI) chatbots have been attracting increasing research interest in recent years with particular attention to their development and integration into language classrooms. However, the attempts and discussions on how AI chatbots could support the learning of English for specific purposes (ESP) remain subpar. To address this gap, this article aimed to suggest possible ways to develop and apply AI chatbots for ESP, especially focusing on cabin crews' English communication in their workplaces. A needs analysis consisting of ethnographic interviews and document analysis was conducted to identify the representative scenarios relevant to cabin crews' duty, serving as the basis for the development of the AI chatbot. Thereafter, a pilot study was conducted with 24 cabin crews. Data were then analyzed based on thematic analysis, descriptive statistics, and frequency analysis using SPSS 24. The results revealed the cabin crews' positive perceptions toward the chatbot, thereby supporting the educational value of the chatbot in the ESP field. The study also provided a list of implications for the future enhancement and application of AI chatbots for ESP.

KEYWORDS

cabin crews, needs analysis, task design, chatbot, English for specific purposes

1. Introduction

In the language learning field, the integration of artificial intelligence (AI) chatbots has been actively observed and relevant studies have been reported. Notably, AI chatbots are designed to simulate human-like conversations (Fryer, Ainley, Thompson, Gibson and Sherlock 2017). With the remarkable advancement in deep learning and natural language processing technologies, recent chatbots show more advanced capabilities to provide more human-like and authentic communication to chatbot users. Chatbots can be easily observed in diverse areas for different purposes. Chatbots in smartphones, Internet of Things devices, or smart speakers are commonly used in our daily lives. Chatbots are also easily found in customer services for e-commerce, other businesses, governments, and medical fields. In these areas, chatbots often replace human consultants who respond to customers' inquiries or requests. For example, chatbots in medical areas assist patients in reserving and changing dates for doctors' appointments.

The potential of chatbots has also been actively discussed in language learning. For example, text chatbots, such as *Kuki* (<https://www.kuki.ai/>) or *Cleverbot* (<https://www.cleverbot.com/>), allow English learners to type any questions or responses into the chat boxes after reading the chatbot's message on screens, which subsequently facilitates English learners' reading and writing practices. Voice chatbots allow users to produce target language utterances while listening to and/or reading chatbots' utterances during the conversation. Existing voice chatbots for English learners are viewed as valuable platforms that allow English learners to practice speaking and listening. With the increasing interest in the integration of chatbots for English learning, chatbots that are developed for domestic English learners in Korea have been released. For example, *Ellie* (<https://chatbot.smartteaching.or.kr>), developed by Chung-Ang University (Yang, Kim, Shin and Lee 2019), or *AI Pengtalk* (<https://pengtalk-student.ebse.co.kr/>), developed by the NHN Consortium, are developed for Korean English learners' English practices. Private English institutions also provide services to students with their AI chatbots, such as *SamSung Selena* (<https://elearning.samsungenglish.com/selena/public/login.php>) by Samsung English, or *Speaking Tok* (<https://test-cho.yoons.com/portal/page/prod/speakingTokList.html>) by Yoon's English School, to name a few. The aforementioned chatbots are representative chatbot integration cases for English for general purposes that often target English learners from elementary to college students.

Recent research on AI chatbots has shown several benefits of AI chatbots for English language learners who have relatively fewer opportunities to communicate in English as they provide speaking opportunities. Repetitive conversation with the chatbot contributed to lower learners' anxiety in speaking English (Chu and Min 2019) and enhanced learners' pronunciation (Kim, Cha and Kim 2021, Walker and White 2013). Furthermore, AI chatbots appeared to be beneficial for improving learners' achievement, motivation and satisfaction, as well as self-directed learning (Atwell 1999, Kim, Shin, Lee and Yang 2019). Language learners can obtain extended information and language input with the help of chatbot languages, which have great strengths vis-à-vis their authenticity and accuracy (Yoon and Park 2020).

Given the increasing use and merits of chatbots in English learning, chatbots seem to be utilized by English learners working in certain workplaces. However, not much research has been conducted in the field of English for specific purposes (ESP) compared to chatbot applications in learning English for general purposes. This study aims to make suggestions by exploring the needs of cabin crews for their effective communication in English in their vocational domains and by developing an AI chatbot designed for this purpose to contribute to a broader context or application of AI chatbots in ESP areas. To address the research purpose, this study focuses on the following three research questions:

- 1) What are the needs of cabin crews for mastery of their English competence at work?
- 2) What types of speaking tasks for the AI chatbot are required for cabin crews' work?
- 3) How do cabin crews perceive the AI chatbot as an English conversation partner to enhance their English competence?

2. Significance of English for specific purposes

English for specific purposes indicates “the teaching and learning of English as a second or foreign language where the goal of the learners is to use English in a particular domain.” (Paltridge and Starfield 2012, p. 23). Notably, ESP is further categorized into English for academic purposes, English for occupational purposes, English for medical purposes, English for vocational purposes, English for business purposes, English for legal purposes, and so forth (Belcher 2006).

The goals of ESP courses are: “1) to reveal subject-specific language use, 2) to develop target performance competencies, 3) to teaching underlying knowledge, 4) to develop strategies competence, and 5) to foster critical awareness” (Basturkmen 2006, p. 133). Tasks for ESP courses are developed in orientation to such objectives in target domains, including professional work situation or tertiary institutions. The contents of ESP courses deal with language, discourse characteristics specific to particular genres, and domains wherein language learners need to perform (Hyland 2011). Thus, the needs analysis of target language learners is required to uncover their “perceived needs and imagined futures” (Belcher 2006, p. 133). Needs analyses can be conducted using diverse methods, such as observation, and structured/unstructured interviews or surveys (Long 2005). Other methods, including focus group discussions and the analyses of target learners' diaries, could also add more robust information on target ESP domains (Brown 2009), and corpus analysis of larger quantities of texts also provides valid information on language characteristics and genres (Biber 2006).

English for occupational purposes (EOP) is relevant to professional and vocational areas, such as lawyers, doctors, civil servants, engineers, and so forth (Halliday, MacIntosh and Stevens 1964). Given their close relevance to certain occupations, EOP courses have more specific learning goals to achieve demanding job tasks (Dudely-Evans and St. John 1998), and they are constructed based on the “needs analysis of a specific purpose language situation” (Xiaoqin and Wenzhong 2016, p. 31). Needs analyses for EOP are often conducted via on-site observations that provide researchers with task-based language needs (Cowling 2007).

Among the various occupations in ESP areas, studies especially on cabin crews seem to be neglected compared to those of other professional jobs. English competence is a pivotal qualification required for all cabin crews as their language ability is relevant to flight safety and successful communication with passengers (Bani-Salameh, Kabilan and Bani-Salameh 2011). Min and Lee (2013) defined the competency of cabin crews' English skills as follows: 1) ability to cooperate with cockpit crew members to ensure flight safety, 2) deal with unexpected situations or emergencies, and 3) sustain a conversation with passengers to perform duties.

Despite the significance of the English skills required for cabin crews, however, relatively few studies have been reported. To fill this gap, Xiaoqin and Wenzhong (2016) conducted a case study that aimed to design an English curriculum for cabin crew service in a Chinese airline company. The English curriculum for cabin crews was developed from three ESP perspectives—Content and Language Integrated Learning (CLIL) and Business Discourse. In terms of the curriculum design for EOP, they emphasized the integration of cabin crews' professional practices and discursive competence. This is because the integration is advantageous for cabin crews to obtain both language skills and occupational practices, thereby improving their communication abilities

as required in their workplaces. As a result of the study, the suggested English curriculum framework for cabin crews consisted of basic language skills, communication competence, and cabin service practices. Another study conducted by Min and Lee (2013) investigated the self-perceived English competence of cabin crews working for national and foreign airlines. The findings showed that cabin crews working for foreign airlines had higher levels of self-perceived English competence, self-esteem, and interpersonal relations than those working for national airlines. The researchers highlighted the need to provide English training programs to enhance cabin crews' English competence. Pawataungsunit (2014) conducted a study that examined the awareness of Thai Airways cabin crews about small talk. Interviews with cabin crews revealed that cabin crews often failed to interact and even avoid conversation with passengers when the topics were irrelevant to their duties. Thus, the researcher stressed the requirement for integrating "small talk" skills into the training programs for cabin crews so that they could enhance their confidence in speaking English, thereby subsequently providing more satisfactory service to passengers, especially during long flights. Considering the significance of their English competence and lack of research on cabin crews, future research focus on cabin crews.

3. Application of AI chatbots for learning English

Early studies on AI chatbots in English classrooms have attempted to utilize commercial chatbots, such as *Kuki* (previously known as *Mitsuku*), *Indigo*, *Google Assistant*, *Amazon Alexa*, and so forth. The results of these studies offer meaningful empirical evidence to substantiate the potential values of chatbots as language learning tools for EFL learners. For example, Kim (2017) examined students' understanding of negotiation strategies between student–chatbot voice chats via *Indigo* application and the student–student voice chat via *Kakaotalk messenger*. The findings showed that the students talking with the chatbot appeared to use more negotiation strategies than the student–student voice chat groups. Kim, Shin, Lee, and Yang (2019) compared two AI assistant bots—*Amazon Alexa* and *Google Assistant*—and examined their capabilities as conversation partners from English learning perspectives. The researchers talked with the chatbots while completing three tasks in terms of small talk, asking for information, and solving problems. The results showed that, overall, *Google Assistant* showed better performance than *Amazon Alexa* as the former's utterances were easier for EFL learners to comprehend, and it provided more explicit responses to users' ambiguous questions. However, both chatbots successfully responded to users' inquiries (86% success rates), and the vocabularies in their utterances belonged to the Korean national English curriculum (97%). Shin, Kim, Lee and Yang's (2021) research also examined the appropriateness of a commercial chatbot, *Mitsuku* (currently known as *Kuki*), for high school and college students in Korea. The analysis of the student–chatbot conversation log also supported the potential usefulness of the chatbot, given the students' high task success rates and an increase in the number of students' utterances during the conversation with the chatbot. The utterances of the chatbot appeared to involve an appropriate vocabulary level for EFL learners. To summarize, the aforementioned studies on commercial chatbots were meaningful because they suggested practical pedagogical guidance toward integrating chatbots into English classrooms. More importantly, however, the studies raised an issue for the necessity of AI chatbots that were developed especially for language learning purposes.

Given the necessity of developing chatbots for English learning purposes, a growing body of research has reported various AI chatbots that have been developed for this purpose. For example, *Ellie* was a chatbot developed for Korean EFL learners ranging from elementary to college students (Yang et al. 2019, Kim, Yang, Shin and Lee in press). The tasks in the chatbot were developed using a task-based language teaching (TBLT)

approach, and recent research on this chatbot revealed its educational value for English learners in Korea. For example, Yang et al. (2019) integrated *Ellie* into English classes in elementary schools in Korea. The results showed that the students appeared to be actively engaged in talking with the chatbot given the high number of conversational turns and students' use of conversation strategies, especially when communication breakdown occurred, indicating the students' active participation in chatting with *Ellie*. The study also revealed the limitations of the current chatbot owing to the relatively difficult level of chatbot utterances, lengthy and fast utterances of the chatbot, and *Ellie*'s lack of voice recognition capability. As another example, Sung (2019) suggested a flowchart-based chatbot designed mainly for English learners in Korean elementary schools. Using Dialogflow, an application programming interface (API) for the development of the chatbot, the researcher demonstrated detailed chatbot build-up procedures and suggested theoretical and pedagogical bases for the chatbot's development. The study emphasized the necessity of considering target students' interests when developing the chatbots so that the students could be better engaged in conversations with the chatbot. Pham, Pham, Nguyen and Nguyen (2018) introduced a mobile learning application in which an English learning chatbot was integrated. The chatbot, called *English Practice*, was designed to encourage English learners to practice or review daily lessons while interacting with the chatbot via typing or voice. Students were also able to have small talk with the chatbot and take vocabulary and grammar lessons and relevant quizzes.

Despite an increasing interest in AI chatbots for English learning, however, research on AI chatbots in the field of ESP areas is still scarce. For example, Chang (2021) proposed the integration of AI chatbots for ESP areas, specifically focusing on tourism-inclined English learners. She demonstrated AI chatbot tasks that aimed to facilitate the target students' English learning by dealing with the essential knowledge of culture and the ability to recognize and solve problems associated with the tourism industry. She emphasized the necessity to enhance English learners' abilities by including AI chatbot conversation tasks concerning tourism knowledge and content. Considering the significance of English competence required in a broader scope of workplaces, the findings of previous studies seemed to shed light on the potential values of AI chatbots to promote the English skills of ESP learners. Thus, the present study was conducted to demonstrate how an AI chatbot could be developed for cabin crews and provide valid empirical evidence to support the values of the chatbot.

4. Method

This study was conducted following the ADDIE model, which comprises analysis, design, development, implementation, and evaluation (Molenda, Perishing and Reigeluth 1996). Figure 1 depicts the overall procedure of the present study. In Phase 1, a needs analysis was implemented by conducting ethnographic interviews and document analyses. Phase 2 aimed to develop tasks for the chatbot for cabin crews. Phase 3 was relevant to the development of the chatbot based on the findings from previous phases. In Phase 4, a pilot study was conducted with experienced cabin crews. In Phase 5, the quality of the chatbot was determined based on the cabin crews' responses to the questionnaire after their conversation with the chatbot. Qualitative and quantitative data were obtained during data collection at different phases. The results of the data analyses were then triangulated to develop chatbot tasks and evaluate the quality of the developed chatbot.

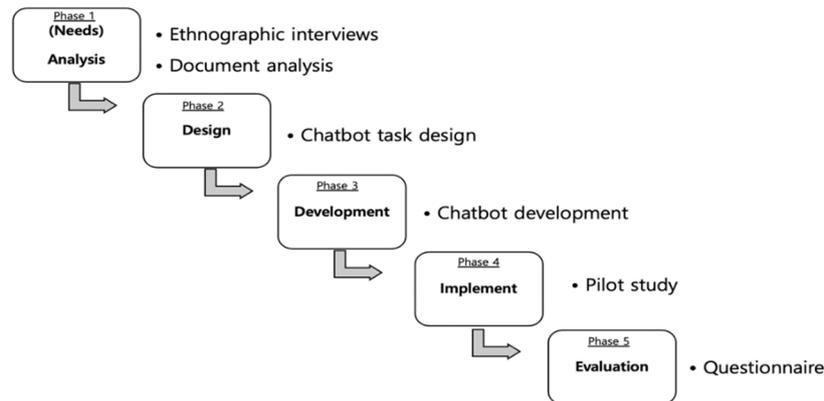


Figure 1. Procedures of the Present Research

4.1. Participants

The participants were experienced cabin crews working in airline companies in Korea. All participants in this study signed consent forms before the commencement of the study. For the needs analysis (Phase 1), five cabin crews participated in the ethnographic interviews. They were females who had between 5 and 12 years of work experience. They took international flights more frequently than domestic flights; thus, they had sufficient opportunities to use English while they were on duty. The five participants were particularly chosen as most of them had worked as cabin crews for approximately 7 to 10 years. As they also currently worked at the point of data collection, their views as insiders were necessary to portray live and full descriptions of their work. In addition, five informants’ interviews allowed the researchers to confirm internal consistency by crosschecking their explanations to the same questions about their workplaces and duties.

For the pilot study (Phase 4), 24 participants talked with the chatbot and partook in the online questionnaires after they had used the chatbot. As shown in Table 1, they consisted of 20 females and 4 males. Of the participants, 13 cabin crews had working experience from 7 to 10 years. Eight of them had 4 to 6 years of working experience, followed by three participants that had worked for less than 3 years. The level of their English speaking and listening skills were asked via the six-point Likert scale statements in the online questionnaire. Overall, they believed that their listening ability (listening skill in general: $M = 4.54$; listening skills relevant to their work duty: $M = 4.79$) was better than their speaking ability (speaking skills in general: $M = 3.21$; speaking skills relevant to their work duty: $M = 3.79$).

Table 1. Participant Information for the Pilot Study (Phase 4)

Demographic category		No.	%
Gender	Female	20	83.3
	Male	4	16.7
Age	20s	6	25.0
	30s	17	70.8
	40s	1	4.2
Working experience	Less than 3 years	3	12.5
	4–6 years	8	33.3
	7–10 years	13	54.2
Total		24	100

Note. All names in Phase 1 are pseudonyms

4.2 Materials

For the needs analysis (Phase 1), ethnographic interviews and document analyses of English textbooks for cabin crews were carried out. Above all, the ethnographic interview was specially chosen to obtain “an insider’s view of the ESP situation” (Paltridge and Starfield 2012, p. 346). Detailed ethnographic interviews with target learners provided the researchers with the proper understanding of language use and interviewees’ needs in the target domain, although the data from ethnographically collected information was not generalizable to other ESP settings. Furthermore, document analyses were conducted by analyzing four English textbooks and online resources for cabin crews. The purpose of the document analyses was to identify topics or situations that cabin crews often encountered on flights. In addition, English expressions or vocabulary relevant to such topics and situations were extracted to serve as language inputs for the chatbot tasks.

For evaluation (Phase 5), online questionnaires were completed by the cabin crews who participated in the pilot study (Phase 4). The first section of the questionnaire asked about the participant’s background information, such as their gender, age, work experience, and their English speaking and listening levels. The question types were multiple choice questions and six-point Likert scale statements. The second section asked about the participants’ overall perception of the chatbot after talking with them. Six questions were asked based on six-point Likert scale statements. The last part mainly asked about their opinions about the extent to which the chatbot tasks were associated with their practical work situations. Twelve six-point Likert scale statements and five open-ended questions were employed.

4.3. Data Collection and Data Analysis Procedures

This section illustrates the detailed procedure for the data collection and analyses following each phase of the study. Different types of data were collected for each phase.

4.3.1 Phase 1: Needs analysis

For the needs analyses, ethnographic interviews and document analyses (of English learning resources for cabin crews) were conducted. The data obtained from the two methods served as a basis for developing the chatbot tasks in Phase 2. Figure 2 illustrates the procedures of the needs analysis for this study.

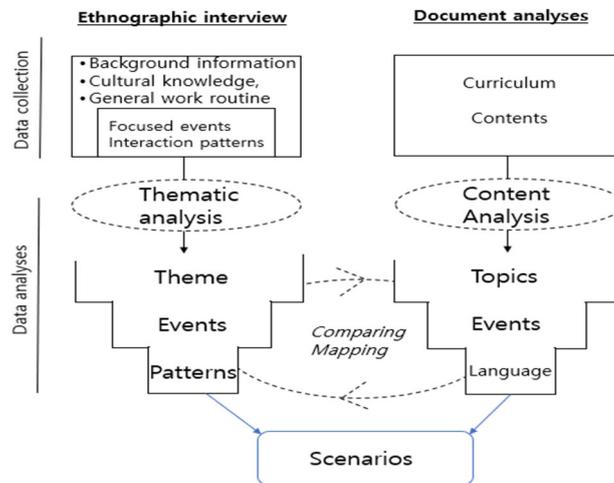


Figure 2. Process of Needs Analysis

Ethnographic interview

The ethnographic interview was conducted as it produced empirical data about the lives of people in certain situations by “getting inside their heads” (Rybski 1974, p. 10). The participants in ethnographic interviews are called informants with cultural knowledge, such as problems, concerns, and interests (Spradely 1980). In this study, the five cabin crews were the informants who were supposed to reveal explicit cultural knowledge at work by appraising their work experience in detail and within the context in which it occurred.

The interviews with each informant adhered to the following sequence: first, the interview began with questions about the informants’ background information, such as their gender, ages, duration of working experience as a cabin crew, frequencies of their flights per month, and their perceived English proficiency levels. Second, the informants were asked broad and general questions about their cultural knowledge at work and general work routines, from pre-flight to after landing. For example, the broad descriptive questions included, “Please describe your typical work routines from pre-flight to after landing,” and “What do you do during boarding or flights?” Such questions provided the full description of cabin crews’ work and what went on between cabin crews and passengers at different phases of flight operations. Third, the informants were asked more focused questions to identify specific events, which cabin crews often encountered, and interaction patterns between cabin crews and passengers at different stages of their work routines. To stimulate the informants’ experience and knowledge, a list of cabin crews’ work duties, including 28 duties categorized into 5 phases, was provided to the interviewees. During the interviews, they ranked the frequency of each duty based on six-point Likert scales and described each duty in detail. They were also asked to explain any duties that were missing or irrelevant to their work. For example, the informants commonly described the work duty for serving meals. The questions were phrased as follows: “How do you initiate the conversation when you serve the meals?” “What kinds of questions or requests do passengers often ask about meals and how do you answer?” and “What are cabin crews supposed to do when certain menus were exhausted?” The interviews were carried out via phone calls for 60 to 80 minutes, and they were audio-recorded. The recordings were then transcribed for the subsequent analyses.

For analyses, the transcripts were coded by two researchers based on thematic analyses. First, all the researchers highlighted repetitive themes that reflected cabin crews’ work duties at different work phases. Then,

explicit events that occurred between cabin crews and passengers were established. For each event, specific interaction patterns were identified. The interaction patterns reflected typical cabin crew–passenger conversations and cabin crews’ responses to resolve any issues or problems raised by passengers at work.

Document analyses

Document analyses were carried out to discover what was covered in the English learning curriculum and contents for cabin crews’ mastery of English required at work. From the content analyses of the documentations, topics taught normally in documents were classified. Thereafter, relevant events taking place between cabin crews and passengers were identified. For example, topic could be “serving meals”, in general. The events relevant to this topic included how cabin crews responded “before serving meals” or “passengers’ questions about the ingredients of the meals”. Finally, any language inputs, including vocabulary, expressions, and sample dialogues were collected and sorted for each event.

The findings from the ethnographic interviews and document analyses were then compared to match with or against each other. This process allowed the researchers to build a bridge between the informants’ expressed needs and the English learning curriculum. Furthermore, the comparisons between the interview data and the textbooks contributed to the comprehensive mapping out of the scenarios to design the chatbot tasks. Document analyses were conducted by two researchers and any disagreements between them were resolved through discussion.

4.3.2 Phase 2: Chatbot task design

The chatbot tasks were designed mainly based on a TBLT approach (Ellis 2003, Skehan 1998). Chatbot tasks were categorized into problem-solving (Type A) and shadowing (Type B). The problem-solving tasks required cabin crews to solve the problems while exchanging meanings in different scenarios at work. Shadowing tasks are mechanical drill-like exercises whereby cabin crews listen and repeat after the chatbot’s utterance about English expressions related to various work scenarios.

The problem-solving tasks were designed based on decision trees (DTs) (Shah, Jain, Agrawal, Jain and Shim 2018), which offered guidelines for chatbot developers to identify intents for predicting possible chatbot–user utterances (Lobo 2017). The systematic basis of DTs was adopted to formulate conversation flow between the chatbot and users, while simultaneously allowing users to accomplish the goal of the conversation (Kim et al. in press).

To ensure authenticity, the chatbot tasks were developed following procedures and reviewed by an expert and a native English speaker. Initially in the task development, 16 scenarios for the problem-solving tasks were designed. Next, an expert, who was an experienced cabin crew working for 7 years at an airline company, was invited to review the authenticity and adequacy of the scenarios of the tasks. The scenario reviews were conducted through an approximately 90-minute in-depth discussion between the researcher and the expert. The expert checked the topics and conversation flows for each scenario and provided feedback based on her experience. Any scenarios that were not authentic or irrelevant were revised. The revised scenarios for problem-solving tasks and English expressions for shadowing tasks were then proofread by an editor, who was a native English speaker. The editor was working as a faculty member in the English department at a university in Korea and had previous experience in editing English expressions for chatbots.

4.3.3 Phase 3: Chatbot development

The chatbot was developed using an open-source API platform, Dialogflow, provided by Google. Dialogflow allows users to create chatbot agents with ease by providing comprehensive and user-friendly platforms. Users can train the chatbot agents using Google's natural language processing and machine learning algorithms. Given its user-friendly function, an increasing number of researchers have reported the use of Dialogflow to develop their chatbots and integrate them into English classes (e.g., Sung 2020, Yang et al. 2019). The chatbot in the present study operates on multiple platforms such as laptops, mobile phones or tablet PCs with a Wi-Fi connection. Prior to its first release to participants of the study, each task was tested multiple times by the researchers to ensure its capability and function. The pre-test helped the researchers to identify users' possible utterances that were not stored in Dialogflow. Such utterances were then saved to Dialogflow so that the chatbot could respond to users' diverse responses without any communication breakdown. The detailed information for the chatbot tasks is provided in Results.

4.3.4 Phase 4: Pilot study

Before talking with the chatbot, the 24 participants received detailed instructions about how to talk with the chatbot. Any questions or technical problems regarding using the chatbot were resolved beforehand to ensure that all the participants did not have any troubles. As the participants had different flight schedules during the data collection, they could talk with the chatbot at their convenient time but for a maximum period of one week. Thus, the entire duration of completing the chatbot tasks differed depending on the participant. During the talk, the participants were asked to talk with the chatbot by completing all the 11 scenarios in problem-solving (Type A). For shadowing (Type B), the participants were asked to choose any topics that they wanted to practice. Conversation logs between the chatbot and user were automatically saved in the chatbot database.

4.3.5 Phase 5: Evaluation

For evaluation, the 24 participants responded to the online questionnaire that aimed to explore their perceptions toward the chatbot. Their responses were extracted from the database and converted to Excel files for analysis. Their questionnaire responses were then analyzed via descriptive statistics and thematic analyses. Descriptive statistics and frequency analyses were computed to analyze the cabin crews' responses to the six-point Likert scale statements. Thematic analyses were conducted to analyze their written responses to open-ended questions to obtain more comprehensive and in-depth information about the participants' perception of the chatbot. Initial coding was conducted to explore the cabin crews' perceptions by assigning categories to each segment. The categories emerging from their responses were then classified to create the coding scheme. Next, focused coding was adopted, as the other coder cross-checked the segments in the categories that were defined in the initial coding procedure. Any disagreements between the two coders were resolved through discussion.

5. Results

5.1 Cabin Crews' Needs

The first research question aimed to explore the cabin crews' needs to enhance their English competence required at work. The findings from analyzing the ethnographic interviews revealed the cabin crews' concrete needs. First, the informants commonly stated that they required more chances to practice English skills so that they could interact confidently with passengers at work. Due to the limited opportunities, however, they felt challenged to sustain a conversation in English with passengers during flights. The following excerpts showed some examples of their necessity to interact with passengers in English.

- Informant 1: I think I cannot interact with passengers smoothly although I could use English expressions I had memorized before. For example, passengers wanted to make small talk during long flights, asking for famous places, restaurants, or Korean food, and so forth. However, I sometimes felt a burden in maintaining such conversations with English-speaking passengers. I think there are more situations where such interaction is required between passengers and cabin crews.
- Informant 4: I believe English skills for interacting with passengers are more required for cabin crews. We are familiar with using English for providing general instructions or explaining safety regulations because we have received training from our company but not for interacting with passengers. Thus, it is more necessary to communicate with English-speaking passengers.

Second, the informants expressed their difficulties in producing adequate English vocabulary or expressions when they encountered diverse work-related events. The events included various topics for small talk, abrupt questions from passengers, emergencies relating to sick, drunken passengers, or sexual harassment, and so forth. In the following excerpts, Informants 2, 4, and 5 explained their experiences in addressing passengers' questions for small talk. Informants 1 and 3 expressed their difficulties in speaking appropriate English to deal with abrupt situations or emergencies at work.

- Informant 5: During long flights, passengers came to the galley or the hallway to talk to me, and they ask me questions, such as "Where are good restaurants or sightseeing spots?" "How long have you worked as cabin crews?" "Which places did you like?" and "Are you having a hard time?"
- Informant 4: They often ask me certain questions, such as "Have you been there before?" "Do you know any good restaurants?" Some passengers even ask me questions about the political issues between South Korea and North Korea, or personal questions about me, my family, and so forth. I especially experienced difficulties in answering passengers' questions regarding my personal opinions on political issues or solving abrupt problems during flights.
- Informant 2: In business or first-class flights, I believe that there are more chances to have conversations with passengers compared to those of the economy class. There are times when passengers ask me about my daily life while making cocktails. I think I have a lot of small talk during that time.

- Informant 1: I think I can speak English quite well in typical situations or passengers' questions that are listed on the cabin crews' manual, such as how to transfer to connecting flights. I think it is difficult to express myself in English when unexpected situations occur.
- Informant 3: I can use memorized English phrases to deal with general situations, such as explaining regulations for emergency row seating or safety zones. However, I think I wanted to enhance my English-speaking skills especially when I was confronted with unexpected situations, including drinking or sexual harassment. I also did not know the words to describe certain sicknesses, including paralysis or autism.

Finally, the informants pointed out the frequent occasions for providing clear instruction in English and its significance. Compared to interaction with passengers, providing instruction is a one-way communication method to deliver explicit information to passengers, and it is more relevant to flight information or safety regulation. The excerpts below illustrated the cases when providing instructions was necessary during flights.

- Informant 1: General instructions are usually safety-related, so they are needed when taking off or landing.
- Informant 2: I think English for providing instructions could be used often in such situations as "open the window shield" or "straighten up your seat."
- Informant 5: I think I often use English to provide instructions to passengers unless they ask me questions.
- Informant 3: Of course, cabin crews need to communicate with passengers, for example, when serving meals or beverages. Other than in such situations, cabin crews also need to deliver instructions to passengers during flights.

Given the identified needs from the interviews and the comparisons with document analyses, the chatbot tasks were constructed based on the following criteria: first, the chatbot tasks were mainly designed to facilitate the cabin crews' interaction with passengers. Second, the topics for the chatbot tasks involved typical and unexpected events that occurred relatively frequently. Finally, the chatbot tasks included practices for cabin crews to provide explicit instructions to passengers. The details about the speaking tasks are explained in the next section.

5.2. Target Speaking Tasks for the Chatbot

The second research question aimed to explore and identify the types of speaking tasks needed for cabin crews. The scopes and the specific contents of the tasks were constructed based on the analyses of the ethnographic interviews and documentations. The chatbot tasks comprised problem-solving (Type A) and shadowing (Type B). The tasks were classified into three stages of flight operations, namely: 1) during/after boarding, 2) during flights, and 3) before/after landing.

Problem-solving (Type A) tasks were developed to reflect the cabin crews' diverse work-related scenarios. The task required cabin crews to have one-to-one conversations with the chatbot while solving the chatbot's specific requests in different scenarios. Problem-solving (Type A) consisted of 11 tasks in total and was classified into two levels of task difficulty, namely, seven tasks for Level 1 (easy) and four tasks for Level 2 (difficult). Figure 3 depicts an example of problem-solving tasks (Type A) which are related to serving meals. The specific directions and missions are provided on the left side of the webpage. Cabin crews were required to complete four missions to conclude the conversation, namely: 1) to ask for the name of the passenger who did

not receive the special meal for confirmation, 2) to explain and apologize for missing special menu, 3) to introduce possible alternative menus, and 4) to explain the ingredients of the menus and serve them.

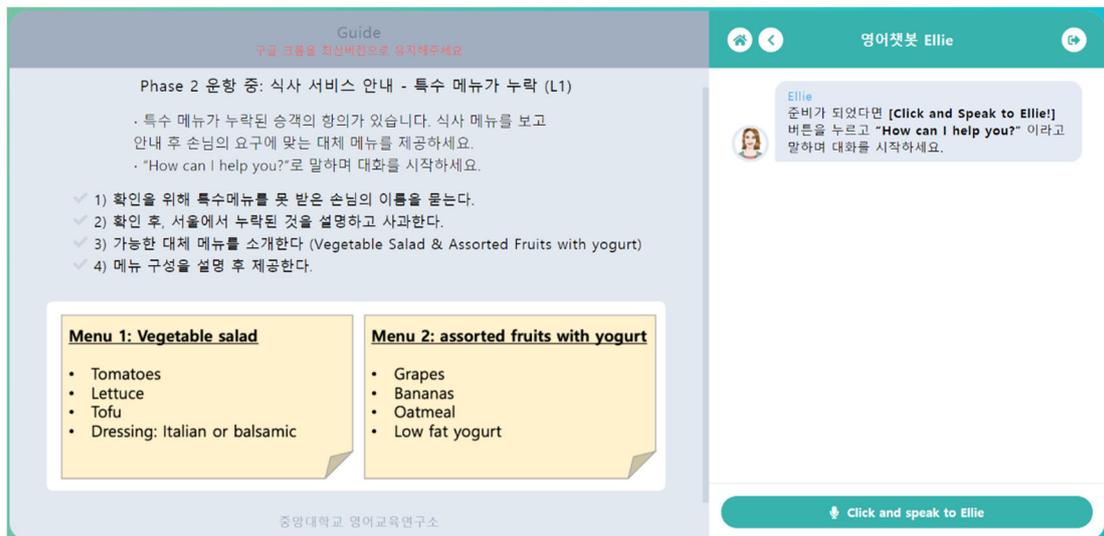


Figure 3. Screenshot of the Conversation Practice Tasks (Type A): Special Meal

The following excerpt illustrates an actual dialogue between a cabin crew (Participant 12) and the chatbot. During the conversation, it was found that the cabin crew used different meaning negotiation and interaction skills to solve the given tasks. For example, in line 5, the cabin crew attempted to use different expressions to solve the given mission when the chatbot did not understand their responses in line 4. In the following lines, the cabin crew responded smoothly by responding to the questions from the chatbot on the menu.

Excerpt 1:

- 1 User: How can I help you?
- 2 Chatbot: Excuse me, I requested a low cholesterol meal when I made a reservation.
- 3 User: Really?
- 4 Chatbot: Say that one more time?
- 5 User: Would you let me know your name, please?
- 6 Chatbot: Ellie Wilson
- 7 User: Sorry, we missed your menu from the Seoul.
- 8 Chatbot: That's unacceptable! I intentionally ordered a low cholesterol meal. Do you have any similar items on the menu?
- 9 User: Sure, we have a vegetable salad and I'm sorting fruit with yogurt.
- 10 Chatbot: What's in the vegetable salad?
- 11 User: It is contained tomatoes, lettuce to for dressing with Italian
- 12 Chatbot: Can I choose a dressing?
- 13 User: Sure, you can choose Italian or balsamic.
- 14 Chatbot: Italian dressing, please.
- 15 User: Okay, thank you.
- 16 Chatbot: Thank you.

Shadowing (Type B) tasks were mechanical drill-like activities that allowed cabin crews to listen and repeat after the chatbot’s utterances. It provided diverse and authentic English expressions that could be used for different situations. Figure 4 below presents an example of a shadowing task, which entails providing instructions in preparations for take-off. Cabin crews can read the target sentences relevant to taking off on the left side of the screen. While completing the tasks, cabin crews were asked to listen and repeat after the chatbot’s utterances on each sentence. When they failed to correctly pronounce some words, the chatbot asked them to pronounce them repeatedly until they pronounced them accurately. Cabin crews were also able to skip to the next sentences by simply saying “Pass” to the chatbot. A mission complete pop-up window appeared when users read all the target sentences correctly.

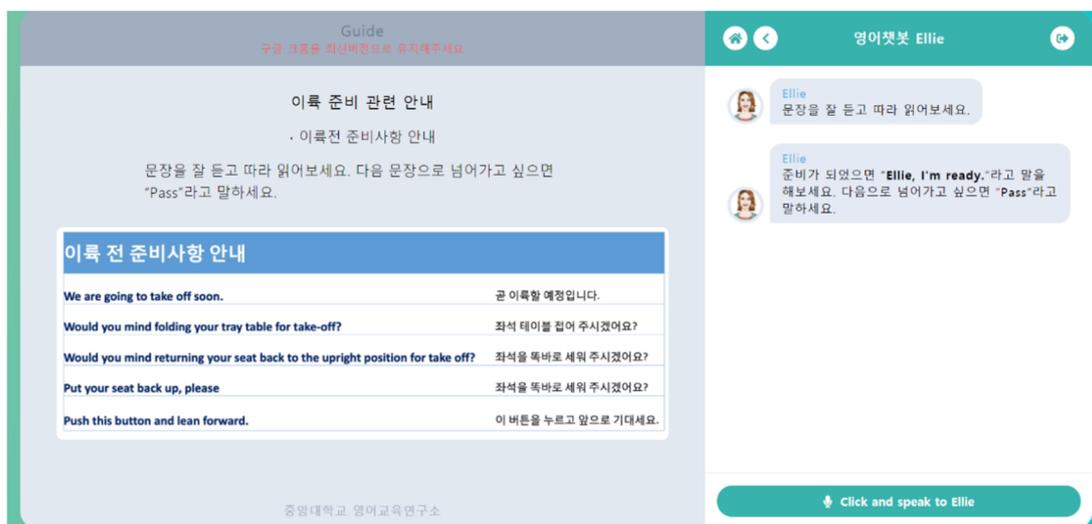


Figure 4. Screenshot of the Shadowing (Type B) Task

Excerpt 2 describes the speaking practice of Participant 7. Participant 7 appeared to correct their pronunciation until the chatbot recognized it accurately. The participant’s pronunciations for “Push” and “Lean forward” were recognized as “Who’s” (line 4) and “Lymph award” (line 2), respectively. The participant thus repeatedly pronounced the given words and finally succeeded in line 6.

Excerpt 2

- 1 Chatbot: Push this button and lean forward
- 2 User: Push this button and lymph award
- 3 Chatbot: Push this button and lean forward
- 4 User: Who's this button and lean forward
- 5 Chatbot: Push this button and lean forward
- 6 User: Push this button and lean forward.

5.3 Cabin Crews’ Experience and Perceptions toward the Chatbot

The third research question focused on examining cabin crews’ perceptions toward: 1) the overall chatbot’s performance, 2) problem-solving, and 3) shadowing tasks of the chatbot. Their perceptions were asked based on

six-point Likert scale statements and open-ended questions in the questionnaire.

The participants showed relatively positive attitudes toward the overall quality and experiences in talking with the chatbot as shown in Table 2. Among the six questionnaire items, the participants showed the most positive opinions about the chatbot's usefulness for their improvement in listening ($M=4.92$) and speaking ($M=4.83$) skills. They also revealed that it was fun to talk with the chatbot ($M=4.63$). In addition, they showed not too strong but somewhat positive views on the speed of the chatbot's talk ($M=3.75$), and the similarity between the chatbot and the human beings as a conversation partner ($M=3.58$). However, they also provided relative negative feedback, especially about the chatbot's voice recognition ability ($M=2.63$). In the open-ended questions from the questionnaire, most participants chose the limited capability of the chatbot's voice recognition as one of the noticeable weaknesses, which will be discussed in the later part of this section.

Table 2. Cabin Crews' Perceptions of the Overall Chatbot's Performance (n = 24)

Items	Strongly Disagree (%)	Disagree (%)	Somewhat Disagree (%)	Somewhat Agree (%)	Agree (%)	Strongly Agree (%)	<i>M</i>	<i>SD</i>
The chatbot talks fast.	0 (.0)	2 (8.3)	6 (25)	12 (50)	4 (16.7)	0 (.0)	3.75	.85
Talking with the chatbot is similar to a conversation with human beings.	3 (12.5)	3 (12.5)	5 (20.8)	4 (16.7)	8 (33.3)	1 (4.2)	3.58	1.50
The chatbot understands my utterances well.	1 (4.2)	14 (58.3)	3 (12.5)	5 (20.8)	1 (4.2)	0 (.0)	2.63	1.01
It is fun to talk with the chatbot	0 (.0)	1 (4.2)	3 (12.5)	6 (25.0)	8(33.3)	6 (25.0)	4.63	1.13
Talking to the chatbot helps me improve my speaking skills in work-related English	0 (.0)	2 (8.3)	2 (8.3)	0 (.0)	14 (58.3)	6 (25.0)	4.83	1.17
Talking to the chatbot helps me improve my listening skills in work-related English	0 (.0)	2 (8.3)	0 (.0)	5 (20.8)	8 (33.3)	9 (37.5)	4.92	1.18

The next part of the questionnaire focused on the participants' impression of the problem-solving tasks. The cabin crews thought that the problem-solving tasks reflected the authentic work situations ($M=5.33$). They also showed a positive impression of the usefulness of the chatbot for learning English ($M=4.58$), for enhancing their confidence in speaking English ($M=4.38$), and the easiness of completing the problem-solving tasks ($M=4.46$).

Table 3. Participants' Perceptions on the Problem-solving (Type A) Tasks

Items	Strongly Disagree (%)	Disagree (%)	Somewhat Disagree (%)	Somewhat Agree (%)	Agree (%)	Strongly Agree (%)	<i>M</i>	<i>SD</i>
The speaking tasks are relevant to my actual work.	0 (.0)	0 (.0)	0 (.0)	3 (12.5)	10 (41.7)	11 (45.8)	5.33	.70
I can learn diverse English expressions relevant to my work by completing the tasks	0 (.0)	1 (4.2)	3 (12.5)	6 (25.0)	9 (27.5)	5 (20.8)	4.58	1.10
It is easy for me to complete the tasks	0 (.0)	1 (4.2)	3 (12.5)	8 (33.3)	8 (33.3)	4 (16.7)	4.46	1.06
I can enhance my confidence in speaking English	0 (.0)	1 (4.2)	5 (20.8)	4 (16.7)	12 (50.0)	2 (8.3)	4.38	1.06

Similar response patterns were observed in the participants' perceptions toward the shadowing tasks. They showed the most positive views on the relevance of the shadowing tasks to their work duties ($M = 5.17$). Thereafter, they revealed overall favorable opinions about the usefulness of the chatbot for learning diverse English expressions ($M = 5.08$), enhancing their confidence in speaking English ($M = 4.88$), and its easiness to complete the tasks ($M = 4.54$).

Table 4. Participants' Perceptions about the Shadowing Tasks

Items	Strongly Disagree (%)	Disagree (%)	Somewhat Disagree (%)	Somewhat Agree (%)	Agree (%)	Strongly Agree (%)	<i>M</i>	<i>SD</i>
The speaking tasks are relevant to my actual work.	0 (.0)	0 (.0)	2 (8.3)	5 (20.8)	4 (16.7)	13 (54.2)	5.17	1.05
I can learn diverse English expressions relevant to my work by completing the tasks	0 (.0)	0 (.0)	2 (8.3)	5 (20.8)	6 (25.0)	11 (45.8)	5.08	1.02
It is easy for me to complete the tasks	0 (.0)	3 (12.5)	1 (4.2)	7 (29.2)	6 (25.0)	7 (29.2)	4.54	1.32
I can enhance my confidence in speaking English	0 (.0)	1 (4.2)	4 (16.7)	1 (4.2)	9 (37.5)	9 (37.5)	4.88	1.23

Their positive experiences in talking with the chatbot were further supported by the participants' responses to the open-ended questions in the questionnaire. Above all, the participants reported that various chatbot tasks that reflected authentic work situations led them to feel as if they talked with real passengers.

- It was good to talk about various work-related situations that were similar to the actual conversation with passengers. I could learn useful expressions that I did not know so that I could use them in the future. (Participant 6)
- I liked that the tasks were similar to authentic situations that I frequently encountered on flights. (Participant 8)
- The chatbot talks similarly to what passengers say in real situations, so I thought it would be helpful to practice how to use English and respond to their requests. (Participant 19)

As the tasks included diverse useful English expressions or vocabulary, they were able to learn new and rich expressions relevant to different work situations.

- It was good to learn useful conversations and vocabulary for different work situations not just general English conversation practice. (Participant 12)
- It was good to be able to practice the overall work situations from before to after boarding. I also got to learn English expressions that could be used in specific situations. (Participant 1)
- It was good to learn and practice various sentences in shadowing tasks. The shadowing tasks were grouped into different and specific situations; thus, I could choose the situations I needed to practice more. (Participant 6)

Next, they also appreciated that they could repeatedly practice their pronunciation while interacting with the chatbot. As the chatbot displayed users' utterances on screens, the participants were able to correct their pronunciation if their utterances were not correctly recognized by the chatbot.

- It was good to be able to check and listen to what I just said on the chatbot screen because I could see which words I pronounced incorrectly and correct the parts. (Participant 9)
- It was good to compare my pronunciation with the chatbot by listening and repeating after the pronunciation examples. (Participant 18)
- It was helpful for the chatbot not to recognize the parts that were not pronounced correctly. I could realize which parts I often mispronounced like linking sound and listen to the chatbot's utterances. (Participant 21)

Conversely, the participants also expressed limitations of the chatbot after talking with it. The most noticeable weaknesses of the chatbot they mentioned were regarding its voice recognition ability. As shown in the following excerpts, the users experienced difficulties in pronouncing some words correctly as the chatbot was unable to recognize their pronunciation. Moreover, the chatbot was sometimes unable to recognize certain, contractions, such as I'll or You'll.

- The chatbot could not recognize my pronunciation especially when I used contractions, such as I'm. (Participant 9)
- The chatbot could not recognize certain words correctly. For example, it recognized "I'll" as "our" and "all" as "are". (Participant 14)
- The chatbot sometimes recognized "bag" as "back." It was helpful for me to correct my pronunciation, but, simultaneously, it was challenging to repeat the words. (Participant 23)

The other weakness was relevant to the speed of the chatbot's utterances and its response. Depending upon the users, the speed of the chatbot differed; thus, it would be nice for users to control the speed of the chatbot's utterances by adjusting the settings to their listening abilities. In addition, the chatbot sometimes failed to recognize their full utterances especially when users spoke relatively long utterances, the chatbot.

- I think the chatbot talks fast. I hope I could control the speed of the chatbot's utterances. (Participant 3)
- If I could control the speed of the chatbot's talk, I could be able to practice more similar to a real situation. In real life, it is hard to see passengers speaking that slowly. (Participant 9)
- The chatbot stopped recognizing my voice while I was talking, especially when my answers got long. (Participant 24)
- The chatbot's voice recognition sometimes got cut off while I was talking, so I had to repeat my talk several times. (Participant 16)

The other suggestions for future improvements in the chatbot were relevant to the chatbot's functions, such as more diverse English intonation and availability of male voices.

- I wish I could practice with various accents. In addition to the common U.S. and British pronunciation, I think the conversation may feel more difficult when facing passengers with other English accents, such as India, Singapore, and France. (Participant 7)
- I wish the chatbot also has a male voice, so male users can follow its tone and intonation better. (Participant 14)

6. Conclusion

The present study was conducted to an AI chatbot for cabin crews and their perceptions toward the chatbot were examined. First, findings from the needs analyses suggested the cabin crews' needs for enhancing their English skills required at work and the guidelines for developing the chatbot tasks. The cabin crews expressed that they required more opportunities to use English skills to interact with passengers. They also needed to be familiar with English vocabulary or expressions especially when they encountered different work-related events. Finally, they highlighted their need to use proper English to provide clear instruction to passengers during flights. Next, given the identified needs from the needs analyses, the chatbot tasks were developed in terms of problem-solving and shadowing. The problem-solving tasks allowed cabin crews to interact with passengers by solving given missions that reflected authentic requests or inquiries from passengers. The shadowing tasks provided passengers with practices to repeat after various expressions about their work duties. Lastly, the investigation of the cabin crews' experience and perceptions toward the chatbot supported their positive attitudes toward it. The participants recounted their pleasant experiences while talking with the chatbot to accomplish the diverse tasks. They also expressed the positive potential of the chatbot, as a conversation partner, for enhancing listening and speaking skills. Their perceptions toward the problem-solving and shadowing tasks provided evidence to support the authenticity and usefulness of the given tasks to enhance English competence. The results of the pilot study also pointed out significant limitations of the chatbot that needed to be resolved, including the limited chatbot's voice recognition capability, speed of the chatbot's utterance, and restricted English intonation of the chatbot.

The present study remains with some limitations. Above all, the chatbot was the pilot version that would require further enhancements in terms of the diversity of chatbot tasks and voice recognition capability. The current chatbot consisted of 11 tasks for situation conversation. The tasks with more diverse situations could provide more robust opportunities for cabin crews to practice English-speaking skills relevant to their work duties. Moreover, the improvement in voice recognition ability is another aspect of the chatbot that requires further development.

Notwithstanding some limitations, the current study had a number of implications to the field of English education, especially for ESP areas. Above all, this study offered a viable methodological model as it fully described how to approach to develop an AI chatbot for cabin crews' English competence. Needs analysis conducted through ethnographic interviews and document analyses provided valuable chances to recognize cabin crews' actual needs in their competence required at work. Each task of the chatbot was constructed given the identified needs of cabin crews, and thus reflected various authentic work-relevant scenarios which often taking place during flights. Moreover, the participants' overall positive perceptions on the chatbot supported for the significant roles of AI chatbots as an English conversation partner at work. Although the current study was restricted to cabin crews, the findings suggested the future integration of AI chatbots into broader range of other occupations or English learning contexts in the field of ESP. Thus, further research on developing chatbots for diverse ESP areas is required.

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Examples in: English

Applicable Languages: English

Applicable Level: Tertiary