



English Digital Dictionary for Teaching Technical Vocabulary for Engineering Students Based on Iot

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ABSTRACT

The research is aimed to assist both English teachers and students to learn English for Specific Purposes. Furthermore, it aims mainly to facilitate the students of Politeknik Negeri Jakarta (State Polytechnics of Jakarta), in learning technical English vocabulary. This research was conducted because students find some obstacles in memorizing technical vocabulary which are very commonly used in their workshops or laboratories. Not only that, they have to understand manual books for laboratory and workshop, such as: “pile”, “bench”, et cetera. The research’s result is the tool called **Smart Talk**, which can be used for practicing their vocabulary memory without using their handphones. This tool was using microcontroller ESP32. The tool is handy and flexible because it is easy to be carried anywhere. The students. As a result, the students are found one of the ways to overcome their problems of memorizing vocabulary. The tool is about 15cm long, 10 cm wide and 7 cm high. It consists of the screen, the speaker and the button. The significant difference with other tools is the Smart Talk has sound. This makes the tool more interesting comparing with other tools. The screen is for displaying the explanation, the button is for turning on and off and the speaker is the sound. Hopefully, the tool will motivate them to study and automatically they get good score in this subject.

Keywords: English Digital Dictionary, Smart Talk, Technical Vocabulary, IoT, ESP

INTRODUCTION

The rapid development of globalization, technology, and international collaboration has increased the importance of English language proficiency in higher education and professional environments. In particular, English plays a significant role in engineering because engineers are increasingly required to communicate with international colleagues, access scientific and technical literature, participate in professional meetings, prepare reports and presentations, and interact with clients and other stakeholders from different linguistic backgrounds (Nateghian, 2024). English has consequently become an important tool not only for academic study but also for professional communication in engineering contexts. Recent research indicates that engineering students need English to perform a range of academic and workplace-related tasks, including reading technical documents, writing reports, communicating orally, and discussing technical issues.

Within this context, English for Specific Purposes (ESP) has emerged as an important approach to English language teaching that focuses on learners' particular academic, professional, and occupational needs. Hutchinson and Waters (1987) emphasize a learning-centered approach to ESP, in which the teaching and learning process is designed according to the purposes for which learners need English. Similarly, Dudley-Evans and St John (1998) describe ESP as a distinctive area of English language teaching that considers specific contexts of language use and incorporates developments in discourse, genre, needs analysis, course design, and materials development. Thus, ESP differs from general English because its content, learning objectives, language skills, and instructional activities are closely connected to the learners' target situations.

In Engineering Department, State Polytechnics of Jakarta (PNJ), students must understand technical vocabulary. Teaching English for engineering students at PNJ must be given in order to make them ready to



work when graduating, so the knowledge of English will be applicable to industrial needs. Therefore, students deal with technical vocabulary. There are some words that students often use in the workshop or laboratories, especially in the department of Electronic and Electrical Engineering. They are really aware that English is very crucial for communicating and working.

For engineering students, ESP is particularly relevant because engineering communication involves language practices that are different from those encountered in general English courses. Engineering students may need to understand technical vocabulary, interpret diagrams and manuals, read research articles, write laboratory reports and technical documents, deliver presentations, participate in meetings, and communicate solutions to technical problems. These requirements demonstrate that engineering English should not be limited to teaching lists of technical terminology. Rather, it should develop students' ability to use English effectively in authentic academic and professional situations. A recent study of civil engineering contexts, for example, found that engineers use English for discussing technical issues, attending conferences and seminars, reading and writing specialized genres, and communicating orally in the workplace. The study also identified emails, project documents, and reports as important workplace genres.

Consequently, an ESP approach that integrates students' disciplinary knowledge with relevant English language skills has the potential to make English learning more meaningful, practical, and closely connected to students' future careers. The need of this model is becoming primary since English is as foreign language in our country, Indonesia. It is not easy for most Indonesian to learn English effectively. With this model, learners of English are assisted to study in more and flexible way. Frankly speaking, there is no such model found in the bookstores in Indonesia. Consequently, learners of English in Indonesia find difficulties to learn vocabularies. The product of this research is very fruitful to fulfill such needs. The result of this research is a kind of a software which is easy useable and portable to be carried out everywhere. By making use of technology development, like computer, learners find the solution to their problem.

In language education, IoT can connect learners with smartphones, wearable devices, sensors, RFID or QR codes, smart displays, and other connected technologies. These devices can provide learners with language materials according to their location, activity, learning progress, or immediate needs. For example, a learner walking around a campus could scan a QR code or interact with a sensor to receive vocabulary, pronunciation, listening, or speaking activities related to that particular location. Particularly, researchers are exploring the potential for the Internet of Things to help learners in language learning (Kew, 2021). Research on ubiquitous language learning has demonstrated that technologies such as mobile devices, RFID tags, QR codes, and wireless networks can extend language learning beyond the traditional classroom and increase opportunities for learners to practice in real-world contexts. The use of IoT is particularly relevant to English as a Foreign Language (EFL) learning because language development requires frequent exposure, interaction, practice, and feedback. An early example is Liu's context-aware ubiquitous learning environment, which combined sensors, handheld devices, augmented reality, and ubiquitous computing to support English listening and speaking activities. The study reported improvements in students' English listening and speaking skills through activities connected to their campus environment

Based on this background, the present study focuses on English for Specific Purposes for engineering students, particularly on identifying the English language requirements that are relevant to their academic and professional contexts. By examining students' needs, difficulties, and expectations regarding English learning, the study is expected to contribute to the development of a more relevant and needs-based ESP curriculum for engineering education. The findings may also provide useful implications for English lecturers, engineering educators, curriculum developers, and higher education institutions in designing instructional materials and learning activities that better prepare engineering students for communication in both academic and professional environments.

METHOD

There are so many ways to learn English vocabularies in order to make learners easy to remember. Among others are repetition exercises, using picture dictionary, using definitions or descriptions, and using real objects (Hutchinson and Allan, 1987). These old ways are mostly used by language teachers to teach their



students in order to comprehend the topics taught. These also depend on the creativity of teachers to make teaching aids. Unfortunately, lecturers of English at State Polytechnics find difficulties to drill students on technical vocabularies. Those vocabularies are related with technical workshop and laboratories (Louis, 1985). These vocabularies are rarely used in daily conversation or sometimes they have different meaning if we see in general dictionary. For example, there is an object in the workshop called bench, it may mean long wooden seat placed in public garden (Oxford Dictionary, fourth edition). Meanwhile in technical terminology (English for Engineering, 1987), or it means work table used in the workshop or laboratory. These meanings may make students confused. Therefore, students need to be taught meaning of words related with engineering.

Previous studies have demonstrated the importance of conducting needs analysis among engineering students. Meiristiani and Ekawati (2018), for example, found that mechanical engineering students needed English skills involving listening, speaking, reading, writing, pronunciation, grammar, and vocabulary, as well as materials related to mechanical engineering and job applications. Similarly, research on civil engineering students in Indonesia reported that appropriate ESP instruction should be based on language skills and topics relevant to students' academic disciplines and future professional activities. More recent research has also shown that engineering students require English for both technical and interpersonal communication, indicating that ESP courses need to integrate general communicative competence with specialized engineering content. Other words related with technical terminology are connected with the topics, such as: Describing tools and instruments, Describing Process, Reading Math and Formulae, Reading Graphs and Table, Shapes and Angles, and Properties of Engineering Materials. John M. Davies (Communication for Engineering Students, 1996) says that multimedia will help someone learn English faster, so she/he easily understands difficult words. Moreover, he says that this is one of the effective ways to help teachers teach and explain English subject to their student.

Meanwhile the use of IoT (Internet of things) has become a crucial issue in learning language. The integration of the Internet of Things (IoT) into language learning requires a multidisciplinary theoretical framework that bridges Second Language Acquisition (SLA), educational technology, and cognitive science). Don, et al (2024) says that integrating IoT tool (smart classroom, sensor, wearables) with AI will stimulate students personally to have better communication contextually according to their skills. Their opinion is supported by another linguist, Li (2025) who say that another important advantage of IoT-based language learning is **personalization**. Tian and Liu (2026) add that connected devices can collect information about learners' performance and learning behavior, allowing educational systems to provide appropriate materials and feedback. Recent research combining IoT and artificial intelligence proposes adaptive English-learning systems that use learner data to personalize content, learning pace, pathways, and assessment. In line with these, Afidudin and Anggraeni (2025) agree that the use of IoT of smart voice assistant based on sensors and cloud platform improve students' performance significantly on their technical vocabulary mastery. Not only that, students are able to make technical report.

FINDINGS AND DISCUSSIONS

Based on the previous invention, this study was motivated to make similar software or tool which would motivate students to learn technical vocabulary in engineering because sometimes students face difficulties when working with technical objects in the workshop. This research was done in the campus of State Polytechnics of Jakarta (PNJ). This had been done for eight months with four (4) steps. Those are (1) Planning, (2) Designing tool, (3) Building the tool, and (4) Implementation.

The first step is planning. In this step, the researcher discussed and analyzed the component to make the tool to be used in the module of the workshop in Electrical and Electronics Engineering Department. Based on this, choosing and then determining the appropriate software for the module is the toughest job in this step. Then the systems of ESP32 will support the software and make it more attractive.

The next step is to design the software. This is a very challenging job where each of the component of microcontroller ESP32 is analyzed in order to fit with the design. Based on the topics, the materials are identified and then the design is made. Last but not least, it is to install the tool. The tool may work with

wifi. The strong wifi is the better performance for the tool. It works similarly like chatgpt. Commonly students are not allowed to open handphone during the teaching-learning process in the classroom,

The schematic of the tool can be seen in figure 1:

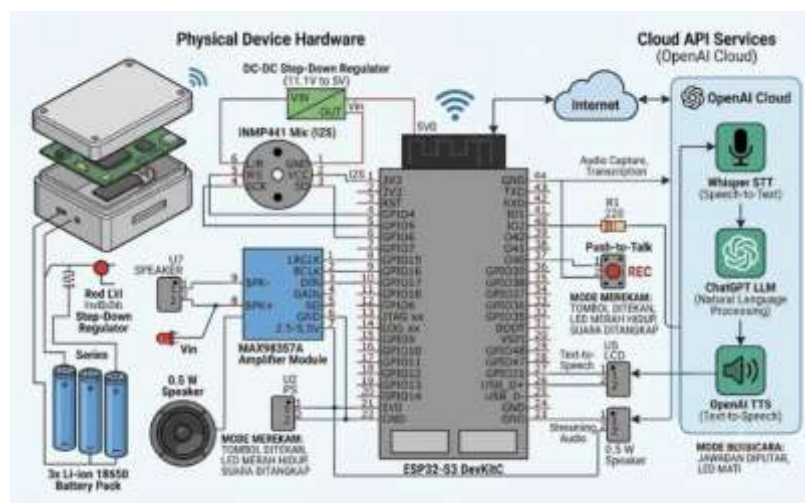


Figure 1. Schematic

This tool consists of three (3) kinds of features. The first feature is the button. It will be used for turning on and off the tool. The second feature is the speaker in which students may listen the explanation. The sound is given here to give positive impact to the learner's understanding. This way will motivate students to learn. In other words, this tool will make student study vocabularies naturally without being pressure because she/he can study vocabularies more fun. With this kind of tool, students can practice and memorize technical words without pressure. This will also give positive impression to them that understanding vocabulary is not as difficult as they think.

CONCLUSION

This interactive model for practicing technical vocabulary has been implemented in two English classes at Electrical and Engineering Department. From the try-out program, most students got improved in reading skill, especially related with guessing the meaning of difficult vocabularies. Furthermore, students got better enthusiasm in learning technical English than using the old ways of teaching, such as: repetition and memorizing. This has shown that mental attitude students are getting improved positively.

This tool has shown that it motivates both teachers and students to practice more often. It can be done in the classroom or outside classroom independently. So learning a foreign language will be fun and enjoyable.

It is also hoped that this tool will give fruitful contribution in educational system in general, especially in Indonesia where English is still considered as a foreign language. Since this tool relatively new in Indonesia, it expectedly will be sold commercially in the future.

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