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The Evaluation of Implementing Digital Pedagogy to Teach English for Aeronautical Engineering Purposes

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Abstract

English is the primary language of communication in the aviation industry. Aviation English is a subset of English for Special Purposes (ESP) that applies to all air traffic controllers and anyone interested in aeronautics or aviation. However, it is more difficult because most pilots and crew members do not speak English as their first language. The researchers discovered that English is still a barrier for students to reach the criteria necessary for graduates of the Faculty of Aerospace Technology based on preliminary investigations conducted at the Institut Teknologi Dirgantara Adisutjipto (ITDA) Yogyakarta. Digital pedagogy is an approach that is focused on lecturers' technological abilities and how instructors as facilitators utilize technology to enhance students' cognitive and dynamic elements. To evaluate the extent to which teachers implement digital and pedagogical techniques with their students, the researchers utilized a methodology named TPACK The design of this research was a form of qualitative research: a case study. The instruments were questionnaires, observation checklists, and interview questions. Based on the finding, digital pedagogy enables teachers to utilize various types of technology in learning, such as video, animation, and interactive, which can enrich students' learning experiences. The researchers conclude that the ITDA Yogyakarta lecturers can implement the technology in digital pedagogy to teach the English language for Aviation.

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INTRODUCTION

English is the primary language of communication in the aviation industry. Aviation English is a subset of English for Specific Purposes (ESP) that applies to all air traffic controllers and anyone interested in aeronautics or aviation. The use of one language in the world of aviation is the right way to ensure and prevent accidents (Merisi & Pillay, 2020). However, it is more difficult because most pilots and crew members do not speak English as their first language. Just like in China, according to Aiguo (2007), teaching Aviation English in countries where English is not the native language requires the right strategy and method because someone working in the aviation industry must be not only able to speak English fluently but also be able to do the job properly and professionally. According to Pertiwi (2016) and Tatzl (2015), English for Aeronautical Engineering Purpose (EAEP) is an ESP field for aeronautical engineers responsible for aircraft design, manufacture, and operation. Aeronautical engineers play an essential role in the safety and development of air transportation (O'Neill, 2012). The researchers discovered that English is still a barrier for students to reach the criteria necessary for graduates of the Faculty of Aerospace Technology based on preliminary investigations conducted at the Institut Teknologi Dirgantara Adisutjipto (ITDA) Yogyakarta. According to Purfitasari et al. (2019) and Kivunja (2013), digital pedagogy is an approach that is not only focused on the teacher's technological ability but also on how instructors as facilitators utilize technology to enhance students' cognitive and dynamic elements. Students are at the core of learning, and technology is employed to establish a dynamic, curious learning environment in which students observe and construct the current world. This circumstance will build a critical attitude, curiosity, empathy, and seek solutions to reality so that it does not just make knowledge but also social intelligence.

In the study by Pertiwi et al. (2019), and Villegas et al. (2018), English is considered the primary and most important language for studying technology and aerospace. The vision of Institut Teknologi Dirgantara Adisutjipto (ITDA) aimed to become a competent and competitive institution of higher education in Southeast Asia. Therefore, to accomplish this objective, students must have excellent English skills. In the research, Pertiwi et al. (2019) also observed that most ITDA students are millennials who are very enthusiastic about digital technology. These students are more engaged in English classes delivered with digital technology than traditional media. Then, undoubtedly, teachers in the twenty-first Century should equip themselves pedagogically and technologically to teach more effectively and coordinate efficient learning.

Based on some of the occurrences and phenomena described above, the researchers became interested in how teachers applied their knowledge of technology, pedagogy, and the learning material in teaching English for aviation at the ITDA Yogyakarta. For this reason, the researchers took two English teachers who taught at the Department of Aerospace Engineering, the Department of Mechanical Engineering, the Department of Industrial Engineering, and the Department of Aeronautics as the subject of the study.

TPACK framework consists of seven district and interrelated elements, including Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (PCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006).

Based on the background described, the researchers conducted a study on The Evaluation of Implementing Digital Pedagogy to Teach English for Aviation, the Case at Institut Teknologi Dirgantara Adisutjipto (ITDA) Yogyakarta. After analyzing all previous research, the researchers can conclude that there is a gap between the data the researchers gathered in the field and the findings of previous studies. Although studies on digital pedagogy and TPACK have been undertaken for the past two

decades, many ITDA lecturers still believe these concepts are unfamiliar to their students. Some lecturers utilize technology in their teaching practices without being aware of the TPACK framework. Some studies have also focused on teaching and learning general English. However, many researchers have not studied English for Specific Purposes, mainly English for Aviation (Tosqui-Lucks & Silva, 2020; Martín & Esclápez, 2013).

The study about embedding digital pedagogy in higher education was conducted by Marriott et al. (2011); Kivunja (2013); Viera and Sánchez (2020); and Shing et al.(2015). Those studies strongly became the foundation of this research regarding the evaluation of implementing digital pedagogy to teach English to particular needs. In the 21st Century, a teacher must be mastered the technology to be able to adjust to students who are, from an early age, already familiar with technology both at home and at school. Embedding digital pedagogy in the skilling of these teachers is urgently needed to help them appreciate the role of technology in the teaching of pedagogy and content knowledge. Those papers demonstrate that social media digital tools can be embedded in pre-service higher education to help train pre-service teachers so they appreciate the TPACK model. Those papers concludes that it is incumbent upon higher education providers, to ensure that graduates are well prepared to be effective teachers for the digital generation.

Moreover, the study about TPACK and English Teachers' Professional Development was conducted by Drajati (2019); Putry et al. (2022); Aryani et al. (2021); Faizah and Sutopo (2021); Gumartifa et al. (2022); and Rahmatunnisa et al. (2021). The study examined pre-service and in-service teachers' perceptions and implementation regarding the literacy of the three above aspects. Using qualitative research, the researchers get the data from questionnaires of 100 pre-service teachers and in-service teachers. This study revealed the teacher demographic with technology, pedagogy, and content knowledge literacy (TPACK). The three points of TPACK literacy are Pedagogical Content Knowledge for Multimodal Literacy, Technological Pedagogical Knowledge (21'st Century Learning), and Knowledge about digital media tools (Chai & Koh, 2017; Rosenberg & Koehler, 2015; Kurt et al., 2014; Voogt & McKenney, 2017). The implications of this research give direction and the alternatives to implementing the TPACK model for English classrooms. In the future, it provides the advantages to developing the quality of English teachers' professional development. Digital pedagogy, which has roots in the theory of constructivism, is the study and use of contemporary digital technologies in teaching and learning that can be applied to online, hybrid, and face-to-face learning environments. Dr. Craig Blewett (Blewett, 2016), who has 25 years of experience in education and technology, has developed the first research-backed digital pedagogy taxonomy for schooling. There are four, and there may well be more, educational approaches appropriate to a digital world. The first is a move from a pedagogy of consumption towards a pedagogy of creation. The second is a move from content to conversation. The third is a move from correct to correcting. The fourth is a move from control to chaos. Each new academic approach interplays with the others to a lesser or greater extent depending on a teacher's adherence to the digital principles. The pedagogical implications of this research are explained below: the lecturers can provide knowledge and perspectives on the theory of pedagogical competence as the competencies that teachers and prospective teachers must master to improve their professional careers; the pedagogical value is that it allows teachers to research the ideas taught during school to teach their students both in the present and future, guide for schools to pay more attention to teaching staff in recognizing and deciding the course of the learning goals to be attained.

METHOD

This qualitative research design was a case study (Cresswell & Creswell, 2018) because the researchers focused on figuring out and describing how teachers implement digital

pedagogy using TPACK theory in teaching English for Aviation in ITDA Yogyakarta. In this design, the researchers analysed words, reported detailed informants' views, and conducted a study in a natural setting and with realistic responses. This design gave the researchers a deeper understanding of the observed phenomena. The study participants were two English lecturers who worked at ITDA Yogyakarta. The object of the study was the teacher's pedagogical and professional competence in implementing digital pedagogy based on each component of TPACK. The teacher's pedagogical and professional competencies appear in the way of planning and designing the lesson, teaching and learning process, and evaluating the studies. In constructing and conducting this study, the researchers played some roles: the data collector and the data analyst. There were some steps in collecting the data for this study. The instruments were questionnaires, observation checklists, and interview questions. The researchers used descriptive qualitative techniques to analyze the data in this study. The researcher uses Miles and Huberman's (1984, as cited in Wong et al., 1995) model of analysis (Flow Model), which is an ongoing activity throughout the whole investigation. This model was selected because the data can be interactively and continually evaluated until the data is saturated. This model uses three steps to analyze data: reduction, display, and inferring data.

RESULTS AND DISCUSSIONS

The following are the findings from preliminary data collecting on the identity of the lecturers, including age, gender, teaching period, qualifications, and seminars or training attended.

Mrs. Dewanti Ratna Pertiwi, S.Pd., M.Hum., was 32 years old when the data was collected, had six years of teaching experience, and had attended seminars such as Workshop "Task Design and Techniques to Engage Students in the Perspective of Global Englishes"; Workshop "Developing Core Skills for Teachers by Incorporating ICT into Classroom"; Workshop "Innovative Pedagogy to Foster Whole Person Education (WPE); Peningkatan Keterampilan Dasar Teknik Instructional (PEKERTI); Kursus Bahasa Inggris Regular program IELTS Preparation oleh Pusat Bahasa UNY; dan Diklat Ahli Media #11.

The second lecturer named Mrs. Maria Asumpta Deny Kusumaningrum, S.Pd., M.Hum., was 31 years old, had five years of teaching experience, and had attended seminars such as The audience of "15 JETA International Conference; The audience of "1st International Technofest 2018"; The audience of "Developing core skills for teachers by incorporating ICT into classroom" workshop; The audience of "Innovative Pedagogy to Faster Whole Person Educational" Workshop; dan Presenter of "16th JETA International Conference".

The two lecturers have nearly similar teaching experiences, namely five years, are not too far apart in age, have the same educational background, and have sufficient experience in attending seminars that support their work in the field of teaching English, even though there are not many seminars with the theme of teaching technology. The two lecturers have taught at the Department of Aerospace Engineering, the Department of Mechanical Engineering, the Department of Industrial Engineering, and the Department of Aeronautics at ITDA Yogyakarta. They teach Technical English, and the lecturers use English for Special Purposes learning method (ESP).

Lecturer's implementation of digital pedagogy and the tpack framework to develop a lesson plan.

In the Technology Content Knowledge (TCK) element, the lecturers can collaborate elements of technology (TK) with certain learning materials (CK). This fact can be seen in the RPP Document. At the first meeting, the learning outcomes were that students could explain and define engineering fields. The method used is cooperative learning with lectures and group discussions. Even though the conditions at that time were online lectures,

teachers could hold group discussions with students using the Zoom application.

In the Technological Pedagogical Knowledge (TPK) element, lecturers can adjust technology (TK) with models, methods, and learning media. This fact can be seen in the RPP document. The lecturer teaches students to identify examples of videos shown. In addition, students are also directed to describe interests from videos and other sources. In a group, students explain their goals after graduating and becoming an Aeronautics scholar.

After observing and analyzing documents, the researcher conducted in-depth interviews using open-ended questions. From the results of interviews with Lecturer 1, an understanding was obtained that using digital pedagogy apart from printed books like before the pandemic, Lecturer 1 combined printed books with digital pedagogy. Concerning lesson plans, the lecturer makes student study schedules according to the academic calendar, even though it's a little uncomfortable because they have to teach online during a pandemic.

The lecturer makes lesson plans by including digital pedagogy, namely in the learning achievement column, students can identify conversations from the videos shown. There are also project assignments to make videos and upload projects on the digital Padlet application. To compile a syllabus with ESP material, where the concentration is on Mechanical Engineering, the lecturer describes the material for each meeting. Aviation is mainly about components and functions, for example, materials, metal and non-metal, examples, and the benefits of everyday life. Then for the conversion in transfer, there are three, for example, radiation, conduction, and convection, then explain its application in everyday life. Furthermore, with Lecturer 2, she combines materials useful for students in the world of work as a primary aspect or foundation in compiling a Syllabus or Lesson Plan.

A study conducted by Drajati et al. (2018), showed that the use of technology in learning can increase student motivation and improve their learning outcomes. However, this study does not consider how teachers can integrate technology into learning appropriately and effectively. This study complements the findings of previous studies by applying the TPACK framework in their research. This research shows that using technology in learning can provide more significant benefits when teachers properly know about technology and integrate it nicely into lesson plans. In addition, this research also shows that the use of technology in learning can help teachers to personalize learning and provide a more meaningful learning experience for students.

From the comparison of those studies, the researcher can provide an evaluation that this study expands our understanding of the use of technology in learning by considering in more detail how teachers can integrate technology in lesson plans appropriately and effectively. In this case, the TPACK framework is helpful for teachers in designing more integrated and practical learning activities using technology as a learning aid.

Lecturer's Implementation of Digital Pedagogy and the TPACK Framework to Teach English for Aeronautical Engineering Purposes in the Digital Classroom.

From the observation, the researcher found that based on Technology Knowledge (TK), the lecturers are very capable of following the latest technological developments, understanding the essential components of computers, using word processing programs, numbers, presentation programs, and applications on mobile phones and computers, storing data on digital media, and also use the Internet and digital media for communication. Based on Content Knowledge (CK), the lecturers can use the latest sources, such as books and international journals, participate in seminars or activities related to the field of science being taught, and design and implement learning. Based on Pedagogical Knowledge (PK), the lecturers can apply varied learning in online classes, manage and master online classes very well, use various online assessment methods and

techniques, and take reflective action to improve the quality of learning in online classes.

Based on Pedagogical Content Knowledge (PCK), the lecturers are very capable of choosing the approach and learning strategy that is on the existing learning material, measuring students' understanding of the material being taught, choosing the lesson by giving a comprehensive picture of the material presented, choosing the suitable learning model, using appropriate learning methods, conveying learning material about aviation in detail, choosing suitable media to convey learning material. Moreover, the lecturers are very capable of giving questions to students about learning the material, opening lessons to encourage students to learn at the beginning of a lesson, providing reinforcement and appreciation for students for their achievements, and providing varied stimuli for learning so learning is not monotonous, and also explaining learning material patiently and professionally.

Based on Technology Content Knowledge (TCK), the lecturers are very capable of arranging material using technology, utilizing technology in delivering learning material, explaining technology to students, and training students who cannot use technology. Based on Technological Pedagogical Knowledge (TPK), the lecturers can use computer applications in online learning, such as Microsoft Word and PowerPoint, or applications used on Mobile Phones, such as Youtube, WhatsApp, and others. Moreover, the lecturers are very capable of choosing technology appropriate to the learning approach and strategy in the learning practices, using social media, adjusting the use of technology to the characteristics of students, and using learning media creatively.

Based on Technological Pedagogical Content Knowledge (TPACK), the lecturers can choose learning strategies and technologies appropriate to the material delivered in practical learning activities. Then, the lecturers are very capable of combining the knowledge and technology possessed to realize effective learning, applying different learning strategies and using various applications to implement learning practices, applying IT appropriately, using the latest technology skillfully, stimulating students not to get bored listening to explanations, and making students more enthusiastic about learning with the material presented.

To further strengthen the researcher's confidence in the lecturers' ability to implement digital pedagogy and TPACK, the lecturers completed a closed-ended questionnaire. From the results of completing the questionnaire, information was obtained that Lecturer 1 felt confident and able to use technology, for example email and its features. Lecturer 2 is also confident and able to use mobile applications in his teaching activities. The results of the Lecturer 1 questionnaire can be seen in Appendix 3, and the results of the Lecturer 2 Questionnaire can be seen in Appendix 7.

Based on a previous study conducted by Rosenberg and Koehler (2015), TPACK's previous research on English teaching methods in the classroom has shown some differences and similarities in its application. Some of the comparisons include focusing on the use of technology, the roles of teachers and students, learning contexts, and learning objectives.

Previous TPACK research has focused more on technology in teaching English in the classroom. Several studies have shown that technology, such as videos and online learning platforms, can increase student engagement and motivation in learning English. Previous TPACK research also shows the different roles of teachers and students in learning English. Several studies have shown that a student-centered learning approach can improve student learning outcomes and assist students in developing better English skills.

Lecturer's implementation of digital pedagogy and the TPACK Framework to develop assessments.

Based on the results of in-depth interviews with the two lecturers, it was found that the lecturer encountered obstacles, one of which was a bad internet connection, so in giving assessments, there were often problems, but not problems that could not be overcome. The

lecturer feels helped by the sophistication of technology because it makes students more enthusiastic about learning English. They prefer to open lecture material with a touchscreen compared to printed books. Besides that, in making corrections or assessments, the lecturer feels the application is to make assessments more enjoyable, easy, and fast.

In communicating with students, the lecturer uses the WhatsApp application facility, in which a group coordinates with students regarding the assignments given. The lecturer also uses EDMODO, an online learning platform designed for teachers and students. This application provides various features and tools that can be used to facilitate the learning process inside and outside the classroom. The Edmodo application allows teachers and students to communicate online. Teachers can send students or the class messages to provide information or instructions. Students can also use the Application to send questions or provide feedback to teachers. In terms of collecting and grading assignments, Edmodo allows teachers to give assignments online and collect assignments from students. In addition, teachers can also provide assessments and feedback on student assignments that have been collected. The most important thing is that the lecturer can track student progress in learning, for example, seeing assignments submitted, grades are given, and evaluating student progress as a whole. In the context of aeronautical engineering ESP English learning, using TPACK can assist teachers in designing more effective assessments by technical content. For example, online platforms or simulation software can help students practice their English skills related to aviation techniques interactively and more effectively. In addition, TPACK can assist teachers in developing more diverse assessments, such as project assignments or performance-based assignments that test students' ability to apply their English skills in real-world situations. Although no specific research has explored the use of TPACK in assessments in aeronautical engineering ESP English lessons, their use can improve the quality of learning and assessment in that learning context.

CONCLUSION

Based on the finding, the researchers concludes that the ITDA Yogyakarta lecturers can implement the technology in digital pedagogy to teach the English language for Aeronautical Engineering Purposes. This fact is proven by the lecturers involved in technology since before the pandemic hit Indonesia. Therefore, the lesson plan and syllabus have already been prepared and completed using technology to make the students understand the materials well. Before the semester begins, the lecturers also have already tried the technology they will use so that the lecturers can master the technology first before teaching the students to operate each technology. Digital pedagogy enables teachers to utilize various types of technology in learning, such as video, animation, and interactive, which can enrich students' learning experiences. The technology also helps the students to visualize better things they have not seen before. For example, using VR gives the students the experience of going to the airport. By leveraging technology in learning, teachers can expand accessibility for students with physical, geographical, or environmental challenges. For example, students can access course materials from home or their mobile devices. On the other hand, technology also helps the lecturers to be more efficient in time evaluating the students' projects or assignments because when the students submit their work on the online platform such as Edmodo or Elena- the website that the ITDA Yogyakarta provides to support the online learning and teaching process. This condition increases efficiency in learning. In technology-based teaching, teachers can easily monitor student performance, evaluate student learning outcomes in real-time, and provide feedback to help students improve their performance. However, even though technology helps a lot in the teaching and learning process, there is still an obstacle that the students and lecturers have to overcome. The lecturers and students somehow get challenged to use the technology because the

internet access or signal in Indonesia, especially in remote places, is complicated or unstable. Sometimes, the students must pay extra money to buy an internet package to join the lesson. But, although the students buy extra packages for their internet, sometimes the problem is with the signal if they are living in a remote place in Indonesia. Therefore, the researchers hopes that the internet connection in Indonesia will be better to help the teaching and learning process well for every student and teacher.

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