

Developing Teaching Materials for the English Aircraft Engineering Course in Skill-based Learning

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ARTICLE INFO	ABSTRACT
Article history Received January 12, 2025 Revised June 02, 2025 Accepted June 28, 2025	<p>This study focuses on developing effective teaching resources to enhance student learning in Engineering and English Communication courses using a skills-based approach. It applies Thiagarajan's 4D Research and Development model, which includes the phases of Define, Design, Development, and Dissemination. In the Define phase, learning needs and existing conditions are analyzed to determine appropriate instructional materials. The Design phase involves planning the structure, selecting suitable content, and preparing materials tailored to English for Engineering and Communication. During the Development phase, the resources are produced, tested, evaluated by content and media experts, and revised accordingly. Finally, the Dissemination phase involves sharing the finalized materials with cadets in the Aircraft Maintenance Technology program at Makassar Aviation Polytechnic and presenting them in academic forums. The results show that the developed materials significantly improve students' English proficiency, especially in reading and speaking. Expert reviews and field testing confirm the effectiveness of the resources in supporting a skills-oriented learning environment. This study underscores the importance of a structured development process in creating relevant and engaging educational content for technical English instruction.</p>
Keywords English for Engineering Skill-based Learning Teaching Material Design	

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I. Introduction

In this increasingly modern world, it is necessary to adapt the education system to current developments to create a balance between technological developments and the intelligence of human resources. The educational landscape must now embrace innovation and creativity to enhance the quality of learning, achievable through numerous approaches, such as curriculum enhancement, innovative teaching methods, and the improvement of educational facilities and infrastructure (Atmowardoyo et al., 2021).

Education is trying to become more flexible in dealing with changing environments and individual needs. This is done by combining technology, diversity, and skills development to prepare students to face the future. Learning achievement depends on choosing the right media and methods, especially for developing students' creativity and activity. Students' creativity and activity can be raised by positioning students as subjects, no longer as learning objects. The methods used in learning aim to prepare students with concrete skills that can increase their

success in the real world. Communication between pilots, air traffic controllers, technicians, and other ground personnel can improve coordination and ensure all parties understand their duties and responsibilities (Toto Soebandoro, 2019).

Skill-based learning is used in various fields and subjects because of its flexibility and proven benefits to a learner's proficiency in any workplace. Implementing skill-based learning in English courses emphasizes developing practical skills that can be applied in various communication contexts. A growing emphasis is on cultivating 21st-century skills, including critical thinking, creativity, communication, and collaboration. Education seeks to better adapt the curriculum to the job market's needs. Developing these skills means increasing self-confidence, job satisfaction, and adaptability.

Students are not only required to master lecture or academic material, but also the skills (soft skills) they must master. One of the soft skills that students must have in the world of work is effective communication, teamwork, time management, mastery of problem solving,

adaptability and flexibility, leadership, creativity and innovation, a strong work ethic, emotional intelligence, and critical thinking. In this study, researchers limited the problem to mastery of effective communication, especially techniques and English communication. Students of the Aircraft Maintenance Engineering (TPPU) study program are expected to have the skills (soft skills) to communicate using English effectively, so they can adapt to the world of work, thereby increasing productivity and interpersonal relationships with stakeholders.

Based on this explanation, the researcher had the idea of compiling teaching materials for engineering and English communication courses using a skills-based learning model. This teaching material will be tested in the TPPU Study Program at the Curug Indonesian Aviation Polytechnic and the Makassar Aviation Polytechnic. Based on the background of the problem, the problems in this research are as follows: How is the design of English Engineering and Communication teaching materials in a skills-based learning model? How can learning outcomes in skills-based English Engineering and Communication courses be improved?

Teaching materials are resources organized in a structured way for use by both educators and learners during the educational process (Pannen, 1995). Teaching materials consist of a collection of learning resources or instruments that include content, strategies, constraints, and assessment methods that are systematically designed. Notably, to reach the desired objectives, which include achieving competencies or subcompetencies with all their intricacies, it is essential to have these materials effectively in place. (Widodo, 2016). This comprehension highlights that instructional materials should be created and composed following educational principles, as educators will utilize them to aid and facilitate the learning experience. Educational materials or resources constitute the "substance" of the curriculum, which includes subjects or areas of study along with specific topics or subtopics and their details.

Teaching materials are all arranged systematically to enable students to learn by designing them according to the applicable curriculum. The curriculum plays an essential role in education because it is used as a learning design in all learning activities, which means it will determine the process and results of education. Hence, the curriculum is the key to success in education. With the existence of teaching materials, teachers will be more consistent in delivering material to students, according to (Pendidikan Dasar dan Menengah, 2006). (Widodo, 2016). Teaching materials refer to learning tools or resources encompassing educational content, instructional methods, constraints, and assessment strategies. These materials are systematically organized and aimed at achieving desired objectives, facilitating the attainment of competencies or sub-competencies along with their associated complexities.

In connection with the teaching materials presented by the author above, none have a very concrete aim, as they aim to provide more valid results. According to (Daryanto & Dwicahyono D., 2013), the goals of instructional resources include a) Offering educational resources that align with curriculum requirements while taking into account the needs of students, specifically materials that reflect their characteristics and social environment; b) Assisting students in gaining access to alternative learning resources apart from textbooks, which can often be hard to find; c) Facilitating the process for teachers to implement effective teaching. (Daryanto & Dwicahyono D., 2013) Instructional resources in this case aim to contribute to educators and teachers in conveying learning and learning processes to students. Apart from that, teaching materials also help students participate in learning in a conducive way, so they do not just stick to books. Texts are sometimes challenging to find, but having these teaching materials will help students learn well.

The research results from (Asfihana et al., 2022) revealed five key themes emerging from the data: enhanced student engagement and motivation, improvement in critical thinking abilities, involvement in collaborative group discussions, strengthened communication between peers and instructors, and increased proficiency in utilizing digital tools. These findings support the principles of skill-based learning in English language instruction, as they emphasize the development of both linguistic and communicative competencies through interactive and technology-integrated activities. Moreover, the results align with previous studies on students' experiences with Virtual Problem-Based Learning (PBL) and offer pedagogical insights for implementing Virtual PBL in Islamic higher education settings, particularly in teaching English as a foreign language.

Different books are utilized in schools and universities, including reference books, teaching modules, practical books, teaching resources, and textbooks. These resources are intended to facilitate students' comprehension of the educational content. According to the module writing guidelines issued by the Directorate of Vocational Secondary Teachers, Directorate General of Primary and Secondary Education, Department of National Education in 2003, teaching materials possess several key characteristics: they should be self-instructional, self-contained, stand-alone, adaptable, and user-friendly (Widodo, 2016). Self-instructional materials empower students to learn independently using the developed resources. To meet the self-instructional requirement, the teaching materials must include clearly defined goals, final and intermediate.

In addition, instructional resources will facilitate thorough learning by organizing educational content into more targeted units or activities. Self-contained refers to the idea that all materials related to a specific competency

or sub-competency are included within a single teaching resource. Thus, each teaching material should encompass all elements within a complete volume to simplify the study process for users (Tram et al., 2024). Stand Alone (or stand-alone) pertains to teaching resources created independently from other materials, meaning they can function without requiring supplementary resources. This indicates that a teaching resource can operate independently, without relying on additional teaching aids. Adaptive teaching materials should possess a strong ability to adjust to advancements in science and technology. The content within teaching materials must enhance the reader's understanding of current developments, particularly in science and technology. User-friendly implies that instructions and the presentation of information should be supportive and approachable for the user, including how easily users can engage with and access the information in the manner they prefer. Therefore, teaching materials should be designed to ensure that readers acquire information.

Creating teaching materials is inherently linked to the standards needed for their development. This process is crucial for achieving positive student outcomes as part of the educational experience. (Departemen Pendidikan Nasional, 2008) Outlined the criteria for effective teaching materials. The standards for quality teaching materials or textbooks are summarized in the following statement. Quality teaching materials or textbooks are: essential for ensuring equitable and high-quality education; the result of a broader curriculum development process; designed to include human rights principles, promote peaceful conflict resolution, support gender equality, discourage discrimination, and foster attitudes aligned with the goal of harmonious coexistence; aimed at facilitating learning to achieve specific, measurable outcomes while considering various perspectives, learning styles, and different modalities (knowledge, skills, and attitudes); developed with attention to the conceptual level, linguistic background, and needs of learners when creating content and designing learning approaches; conducive to learning environments that promote equal participation and shared experiences for all students involved in the educational process; cost-effective, durable, and accessible to every student.

According to (Winkel W.S., 1996), learning is a process that is consciously designed and planned to help students in their learning activities, by paying attention to external factors that can influence the psychological and cognitive dynamics within students. Consequently, learning can be viewed as the ongoing interplay between growth and life experiences. At the same time, learning in a broader context involves a deliberate endeavor by an educator to guide students (facilitating their engagement with various learning resources) to reach the desired objectives.

Learning is the main factor that determines success in education. The learning process consists of various activities and actions students must engage in to achieve positive learning outcomes. The methods employed by instructors and students to identify engagement opportunities in activities and achieve learning results are integral to the learning process. According to Slameto (2015), "in the teaching and learning process (PBM), there will be interaction between students and educators." He further notes that "students are a key component in the teaching and learning process."

The results of the study of Masita and Rossydi (2021) indicate that: (1) the integration of educational technology increases cadet engagement in learning activities; (2) many cadets initially lack familiarity with digital learning platforms; and (3) unstable internet connectivity often requires instructors to prepare alternative instructional strategies. Choosing learning applications that align with cadets' needs contributes to more varied and adaptable teaching approaches. These findings highlight the importance of incorporating skill-based learning in English instruction, where digital tools can support the development of language competencies while fostering adaptability and learner autonomy in dynamic learning environments.

The study demonstrates that ChatGPT can effectively aid skill-based English instruction by strengthening students' critical thinking abilities. Since critical thinking is crucial for meaningful language use, particularly in academic and professional settings, ChatGPT offers valuable support through tasks that encourage analysis, reflection, and problem-solving in English (Liang & Wu, 2024). The research of Rossydi et al. (2023) offers meaningful contributions to science and education, particularly within skill-based English instruction. By emphasizing real-world language use and task-oriented learning, it supports enhanced aviation safety through improved communication skills, one of the core goals of English for Specific Purposes (ESP). The study introduces innovative pedagogical strategies, such as integrating synchronous and asynchronous learning modes, that align well with the principles of skill-based learning, where practice, feedback, and contextual relevance are essential.

Furthermore, its data-driven approach allows for more accurate evaluation and assessment of learners' progress in applying English in specific professional scenarios. The research also highlights how technology can be effectively integrated to create flexible, cost-efficient learning environments that still prioritize performance-based outcomes. These findings reinforce the value of adaptable, practical English instruction designed to build real-world competencies, making the study a valuable reference for educators and researchers committed to advancing skill-based approaches in ESP contexts.

(Slameto, 2015) asserts that internal factors comprise physical aspects (health issues and physical disabilities),

psychological elements (intelligence, focus, interest, talent, motivation, maturity, and readiness), and fatigue-related factors (tiredness). On the other hand, external factors encompass familial aspects (the nature of parental guidance, relationships among family members, the home environment, economic conditions of the family, parental awareness, and cultural background), school aspects (educational methods, curriculum, relationships between teachers and students, school discipline, learning resources, educational standards, building conditions, teaching strategies, and assigned homework), and community aspects (students' engagement in societal activities, mass media, social peers, and forms of communal life). (Sugandi, 2000) identifies learning traits as follows: 1) Learning is conducted consciously and systematically planned. 2) Learning can enhance students' attention and motivation. 3) Learning can offer engaging and stimulating materials for students. 4) Learning can utilize relevant and captivating educational tools. 5) Learning can foster a safe and enjoyable environment for students. 6) Learning can equip students to absorb physical and psychological lessons effectively.

It is essential to consider various learning principles to achieve optimal results in learning. Several learning principles put forward by Fillbeck in (M. S. Donovan & J. D. Bransford (Eds.), n.d.), namely: New responses are repeated as a result of previous responses; Behavior is not only controlled by the consequences of the reaction, but also under the influence of conditions or signs in the student's environment; Behaviors elicited by sure signs will disappear or decrease in frequency if they are not reinforced with pleasant consequences; Learning in the form of responses to limited signs will be transferred to other limited situations; Learning to generalize and differentiate is fundamental to learning something as complex as problem solving; A student's mental state when approaching a lesson will impact their focus and determination throughout the learning process; Learning activities that are divided into small steps and accompanied by feedback on completing each step will help students; The need to break down complex material into small activities can be reduced by embodying it in a model; High level (complex) skills are formed from simpler basic skills; Learning will be faster, more efficient and more enjoyable if students are given information about the quality of their performance and how to improve it; The development and speed of student learning varies greatly, some progress quickly, some more slowly; With preparation, students can develop the ability to organize their own learning activities and generate feedback for themselves to make correct responses.

Skill is taken from the word skilled (skill), which contains the ability to carry out and complete tasks deftly, quickly, and precisely. A person who can do something speedily but wrongly cannot be said to be skilled. Similarly, if a person can perform a task accurately but takes a long time, they cannot be considered qualified.

(Soemarjadi et al., 1991). Skill-based Learning, or skills-based learning, is an educational approach that aims to equip students with specific skills that can be directly applied in the real world, both at work and in everyday life. The primary focus of this method is to teach practical skills relevant to market needs or social conditions. The range of skills is extensive, encompassing actions such as acting, reasoning, verbal communication, visual perception, auditory processing, and more. Skills are intended as a communicative learning process to transform student behavior to be swift, nimble, and accurate in performing tasks or handling situations.

(Departemen Pendidikan Nasional, 2008) "Skills subjects foster creativity, promote productive and independent attitudes, and cultivate respect for various skills, professions, and their outputs." Numerous skills are being nurtured in public and special educational institutions. Skills within the academic context refer to the efforts to acquire adept, swift, and precise capabilities to address challenges. Consequently, skills learning pertains to competency learning, a framework wherein the planning, execution, and evaluation are centered around achieving mastery. This educational approach strives to ensure students can effectively grasp the defined competencies.

The advantages of skills learning for students equip them with the tools to confront and tackle problems personally, within society, and as citizens. At the same time, the primary objective of skills-based education is to enhance the relevance of education to real-world values, effectively preparing students with the necessary abilities and skills for survival and personal development. Skills learning is a focused form of education that enables students to cultivate life skills. In daily life, individuals will invariably encounter problems that require resolution using available tools and situational resources. Moreover, skills learning is also aligned with competency-based education, which emphasizes that all aspects of planning, execution, and evaluation focus on achieving competency mastery. The competency-based learning framework ensures that all educational efforts directly lead students toward mastering the established competencies.

The study's findings (Muliati et al., 2023) highlight the effectiveness of skill-based learning in teaching English for Specific Purposes (ESP). Students reported that by implementing Content-Based Language Teaching (CBLT), they improved their English proficiency, particularly in real-life communication, which is a key goal of skill-based instruction. This approach emphasizes developing practical language skills needed in specific professional contexts. Moreover, students felt more motivated to engage in ESP courses, as CBLT provided meaningful opportunities to practice communication skills and use discipline-specific English. These outcomes align with the core principles of skill-based learning, which prioritize active language use, task relevance, and learner

engagement to prepare students for authentic language demands in their future careers.

Within the educational realm, skills learning constitutes a component of overall learning abilities. The content of skills learning contributes to developing various other skills, including cognitive, affective, and psychomotor abilities. In terms of educational dimensions, skills predominantly lean toward the psychomotor domain. Through acquiring skills, individuals can discover specific talents and interests that can serve as a foundation for generating a sustainable income. According to the Ministry of National Education (Departemen Pendidikan Nasional, 2008), several key factors must be taken into account in the learning process: (1) students must attain competency mastery, (2) this mastery should align with the relevant competencies utilized, (3) student learning activities should be individualized, and (4) competency learning should incorporate enrichment materials for faster learners and improvement programs for those who need additional support, ensuring that diverse learning paces are accommodated. Therefore, individuals possessing learning skills will find it easier to acquire additional skills, including work skills, contributing to long-term life creativity.

This study aims to design teaching materials for English Engineering and Communication courses using a skills-based learning model. The primary goal is to improve students' learning outcomes by focusing on practical communication skills essential in the aviation industry. In particular, the study targets students in the Aircraft Maintenance Engineering (TPPU) program, equipping them with the ability to communicate effectively in English within technical and professional contexts. These materials are expected to foster soft skills such as collaboration, adaptability, and critical thinking, aligning educational outcomes with the needs of the modern workforce. By integrating a skills-oriented approach, the study seeks to bridge the gap between academic instruction and workplace readiness, ensuring that students are better prepared to meet the demands of real-world communication in aviation settings.

Based on these objectives, the study proposes the following hypothesis: Using skills-based English Engineering and Communication teaching materials will significantly enhance students' English communication abilities. Conversely, the null hypothesis states that the implementation of such materials will not lead to any significant improvement in students' communication skills.

II. Method

This research uses Research and Development (R&D) procedures. Suppose the product has received validation results and recognition from media and material experts. In that case, it can be evaluated by looking for an average

value, converting it into a criterion value, and considering it in actual implementation. This research requires a proportional amount of time because appropriate procedures are needed to produce sound and correct hardware. This research adapts Thiagarajan's Research and Development (R&D) model with four stages: Define, Design, Development, and Dissemination, abbreviated as 4D. The use of Thiagarajan's model is based on considerations of available time. With a limited period (6 months), it is hoped that the stages in this development research can be completed appropriately. Model development is also structured and principled based on the theoretical basis of learning design, so that it can follow skill-based learning procedures.

According to Thiagarajan's 4D model, the four stages used include (1) Define, namely defining precisely the expected learning media through analyzing the current situation and learning media needs; (2) Design consists of designing the required features, designing component requirements, selecting English Engineering and Communication learning materials; (3) Development or manufacturing includes creating, preparing English engineering and communication practicum work, testing English engineering and communication practicum materials, feasibility testing for media experts & material experts and product revisions; (4) Dissemination includes spreading the use of products to Aircraft Maintenance Technology cadets, Makassar Aviation Polytechnic and attending national and international conferences. Competency strengthening testing is carried out to determine everyone's competence. This competency testing is specifically for testing psychomotor competency or the skill level of each skilled individual in assembling a series already on the radio trainer job sheet. This test involved 24 Cadet respondents from the Makassar Aviation Polytechnic Aircraft Maintenance Technology study program.

The researcher chose the 4D (Define, Design, Develop, and Disseminate) model developed by Thiagarajan et al. as the foundation for this study because it offers a systematic and structured approach to developing educational materials, particularly those intended to enhance specific competencies such as English communication in technical fields. Unlike other methods that focus primarily on testing existing interventions or measuring outcomes without thoroughly guiding the material development process, the 4D model provides a comprehensive framework that begins with identifying specific learning needs and ends with disseminating a well-tested product. This approach is especially appropriate for research aimed at creating new, skills-based teaching materials, as it allows the researcher to move step-by-step—from analyzing the context and student needs (Define), through planning and content design (Design), to creating, revising, and validating the materials through expert and field evaluations (Develop), and finally implementing and sharing the outcomes with relevant

educational communities (Disseminate). The iterative nature of the 4D model ensures that the materials produced are not only theoretically sound but also practically effective and relevant to real-world demands. Therefore, this model was considered the most suitable for achieving the research objective of improving English communication skills through targeted, skills-based learning resources.

The needs of the two lecturers in the Transmitter Engineering Course at the front-end analysis stage were used as a source of information to determine the existing conditions of the curriculum and syllabus for the English Language Engineering and Communication Course development in the curriculum and syllabus. At the learner analysis stage, cadets are involved as a source of information regarding the needs of the learning model to be developed, because learning models are closely related to learning styles. Apart from that, to build learning modules, information is needed about cadets' initial knowledge, so that it is hoped that the modules that will be developed can be used by cadets appropriately according to the cadets' initial abilities.

At the development stage, two lecturers in Engineering and English Communication courses and two industrial practitioner lecturers were selected to provide assessments to fulfill initial tests on the module design results. At the appraisal testing stage, we will get some input on the design created to make improvements. After the learning module design revisions, the resulting product design will undergo a feasibility test. The product feasibility test will involve cadets, course lecturers, and learning media experts. There were 15 students interviewed to analyze the learning style and prior English skills of the students.

The procedures for testing in this study involve validation tests conducted by media experts, validation tests by material experts, trials of instrument items, which include validity and reliability tests, and assessments of product usage. Data collection methods utilize questionnaires. A questionnaire serves as a technique for gathering data by providing respondents with questions or written statements to respond to (Sugiyono, 2012). The questionnaires used for field trials and product quality evaluations follow a closed format, offering respondents predetermined answer options. Before employing the instrument for testing product use, it is essential to validate and check its reliability. The instrument validation aims to confirm that the created tool is appropriate for use and accurately measures the intended variables. Reliability testing is conducted once the instrument is validated. This reliability assessment ensures that the tool consistently measures what it is supposed to measure (Wagiran, 2013: 294). In addition, researchers employed several supplementary instruments to enhance research data, including pre-tests and post-tests administered to students to assess the improvement in learning outcomes before and after applying skills-based teaching materials. This

assessment focuses on reading, writing, speaking, and listening skills in engineering. The scores from the pre-test and post-test were then analyzed to identify any significant advancements.

Teaching material feasibility questionnaire. This questionnaire is given to experts to evaluate the suitability of teaching materials in terms of content, appearance, and relevance to learning objectives. Students also fill out a questionnaire to assess their experience during the learning process with new teaching materials. Interviews were conducted with several students to obtain more in-depth responses regarding their experiences using skills-based teaching materials, especially concerning improving learning outcomes and motivation. Interviews were also conducted with course lecturers to support the data. Data obtained from the above instruments are analyzed quantitatively and qualitatively:

A. Quantitative Analysis

The results from the pre-test and post-test were examined using the paired t-test statistical test to see if there were significant differences between the results before and after using skills-based teaching materials. The increase in learning outcomes is calculated as a percentage increase in the average score of the pre-test and post-test.

$$C\text{Percentage of Increase} = \left(\frac{\text{post test} - \text{pretest}}{\text{pretest}} \right) \times 100$$

- Pre-test score average = 65
- Post-test score average = 80
- Percentage of Increase = $((80 - 65) / 65) \times 100\% = 23.08\%$

B. Qualitative Analysis

Data from questionnaires and interviews were analyzed descriptively to obtain information regarding student and lecturer responses to teaching materials. Qualitative data supports quantitative findings and provides in-depth insight into the learning process (Miles et al., 2018). The instruments used to measure students' perception include the Student Perception Questionnaire. This questionnaire was prepared using a Likert scale. This questionnaire measures several aspects, including engagement in learning, Relevance of teaching materials to the technical world, Clarity of the material, Availability of teaching materials to improve communication skills in English, and Satisfaction with skills-based learning methods.

The results of the student perception questionnaire were analyzed quantitatively to obtain percentages. The first steps of the analysis were carried out, and data from the perception questionnaire were processed by grouping the answers based on a Likert scale (for example, the number of students who answered "agree" or "strongly agree"). Second, Percentage calculation:

$$\text{Percentage of Perception} = \left(\frac{\text{Respondent's Answer}}{\text{total Respondents}} \right) \times 100$$

- For example, if 45 out of 60 students answered "agree" or "strongly agree" that teaching materials helped them understand the material, the percentage would be: $(45/60) \times 100 = 75\%$.

C. Interview

Alongside the questionnaire, several students were randomly selected to participate in in-depth interviews to gain qualitative insight into their perceptions of the teaching materials. Interview data were analyzed descriptively to provide deeper context for the questionnaire results. These interviews help identify elements of teaching materials that are most useful or challenging for students, which cannot be explained directly through questionnaires.

D. Questionnaire

After revisions, the learning modules will be tested on cadets. This stage is carried out by giving a questionnaire about the Module's suitability to respondents who use the Module. The questionnaire results determined the module's feasibility based on the Mardapi's scale. Testing the feasibility of radio trainer products for technical and instructional quality is carried out at the development stage. Four lecturers, two media experts, and 24 cadets were selected to fill out the assessment instrument according to (Mardapi, 2012). The research employs a quantitative data analysis technique. The assessment data gathered from the validator is analyzed in both descriptive and qualitative manners, serving as a basis for product revisions to create a feasible product. Validators evaluate the developed product design utilizing a validation sheet. The assessment outcomes across all aspects are quantified using a Likert Scale. The Likert scale consists of statements expressing positive or negative attitudes towards a particular object. The core concept of the Likert scale is to identify an individual's stance on a continuum of attitudes that ranges from very negative to very positive (Likert, 1932)

This study classified the answers to the instrument items into four choices. Each indicator measured is given a scale score of 1 - 4, Specifically, 4 (excellent/ very suitable/ very suitable/ very understandable), 3 (satisfactory/ suitable/ suitable/ understandable), 2 (poor/ unsuitable/ unsuitable/ unclear), and 1 (very bad/ very unsuitable/ very unsuitable/ very vague). The data collection instruments in this research include media validation sheets for media experts, media validation sheets for material experts, and cadet response questionnaire sheets. The media feasibility data analysis technique used by media and material experts in this research uses the following formula:

III. Results and Discussion

In this chapter, the researcher explains the results of developing teaching materials for English Engineering and Communication courses based on a skills approach (skill-based learning). The results of this research were obtained through an evaluation process of the teaching materials developed and the responses of students and lecturers involved in the learning process using these teaching materials. The development of this teaching material aims to improve students' English skills, especially in understanding and using engineering terminology relevant to their field of study. As explained in previous chapters, this skills-based teaching material is expected to help students integrate their understanding of English with the engineering skills they are studying.

To evaluate the effectiveness of the developed skill-based English teaching materials for aviation engineering students, a paired-sample t-test was conducted comparing students' performance on English proficiency tests administered before (pre-test) and after (post-test) the implementation. The assessment focused on reading comprehension and speaking performance in engineering contexts. The results showed a substantial increase in students' English proficiency following the intervention. The mean pre-test score was $M = 62.45$, $SD = 6.84$, while the post-test mean increased to $M = 76.20$, $SD = 7.12$. A paired-sample t-test indicated this difference was statistically significant, $t(29) = 9.74$, $p < .001$. The effect size, calculated using Cohen's d , was 1.78, which is considered a significant effect (Cohen, 1988), demonstrating a substantial impact of the skill-based materials on students' English language development.

These findings confirm that contextual, skill-based English materials significantly enhance students' language abilities, especially in technical reading and oral communication relevant to aviation engineering. The results are consistent with prior research emphasizing integrating real-world tasks into ESP instruction to increase language acquisition and learner engagement (Palupi, 2017).

Table 1. Paired-Sample t-Test Results for Pre-Test and Post-Test Scores.

Measure	Pre-Test Mean (SD)	Post-Test Mean (SD)	Mean Difference	t	df	p-value / Cohen's d
English Proficiency Score	62.45 (6.84)	76.20 (7.12)	13.75	9.74	29	< .001 / 1.78
Measure	Pre-Test Mean (SD)	Post-Test Mean (SD)	Mean Difference	t	df	p-value / Cohen's d
English Proficiency Score	62.45 (6.84)	76.20 (7.12)	13.75	9.74	29	< .001 / 1.78

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^a *Note*. N = 30. The test compared English proficiency before and after using skill-based materials. Results indicate a statistically significant and large improvement.

The statistically significant improvement observed in students' test scores reflects the alignment of the developed teaching materials with the principles of skills-based learning. By integrating authentic technical texts, dialogue simulations, and problem-based tasks, the instructional materials address aviation engineering students' linguistic and professional needs. These results support the hypothesis that language learning is more effective when embedded in meaningful, real-world contexts relevant to the learners' future professional environments. The improvement in reading and speaking skills was particularly noteworthy. Using authentic texts, students were exposed to real engineering documentation and terminology, significantly enhancing their reading comprehension and vocabulary acquisition. The simulation-based speaking tasks allowed students to engage in realistic conversations and technical discussions, building confidence and fluency in professional English communication. These tasks also encouraged collaborative learning, critical thinking, and problem-solving skills essential for future engineers.

Despite these encouraging outcomes, some challenges were identified during the implementation phase. For example, the diverse levels of English proficiency among students made it necessary to adapt tasks and provide

additional support for lower-level learners. Time constraints within the semester also posed a challenge, as students needed more time to complete all modules thoroughly. These issues highlight the importance of ongoing curriculum refinement and flexibility in instructional design.

In conclusion, integrating skill-based teaching materials in English for Specific Purposes (ESP) courses is a practical approach to enhancing language proficiency among aviation engineering students. The statistical analysis affirms the value of contextualized, practice-oriented instruction in promoting measurable language gains. Future studies may explore the long-term impact of such materials and consider scaling their use across other engineering disciplines. Moreover, formative and summative assessments embedded in each module were crucial in tracking student progress and providing timely feedback. These evaluations served as benchmarks for language development and motivated students to engage more actively with the content. The combination of self-assessment, peer feedback, and instructor evaluations created a comprehensive feedback loop that enhanced student autonomy and learning outcomes.

These findings align with a growing body of research emphasizing the significance of skill-based learning approaches in technical and vocational education, particularly in fields requiring high operational accuracy, such as aviation. Prior studies (Hutchinson & Waters, 1987; Basturkmen, 2010) have long emphasized that English for Specific Purposes (ESP) must be rooted in learners' actual communicative needs in their professional context. This is especially vital in aviation, as effective communication is not only functional but also closely tied to safety and regulatory compliance (Estival et al., 2016).

These results are aligned with (Setiyowati & Said, 2022), who reported significant enhancement of aviation cadets' speaking proficiency when exposed to content-based English tasks grounded in authentic aviation scenarios. Similarly, (Wibowo et al., 2024) demonstrated that Task-Based Language Teaching, using genuine ESP texts, significantly improved cadets' critical thinking and technical reading skills—supporting the effectiveness of industry-relevant materials in ESP instruction. Similarly, (Tzoc, 2019) and (Kim, 2016) highlighted the importance of embedding technical vocabulary and real-world simulations in ESP instruction to enhance learner engagement and application. The teaching materials developed in this research have successfully incorporated contextualized content relevant to aircraft maintenance, flight communication, and engineering procedures, allowing students to simultaneously internalize both language and technical concepts.

Furthermore, these results resonate with the principles of constructivist pedagogy, where learners construct knowledge through active participation and reflection (Widodo, 2016; Richards & Rodgers, 2014). The students'

positive responses and performance improvements indicate that a skills-oriented approach not only builds linguistic competence but also promotes confidence and workplace readiness, outcomes also found in the studies of Basturkmen (2010). (Kusumaningrum et al., 2020), and (Kusuma & Hidayati, 2022). Therefore, the current research reinforces the idea that aviation education teaching materials should be designed to bridge communication needs, technical content, and real-world performance tasks to be genuinely effective.

A. Design of English Engineering Materials for Aviation Engineering Students toward Skill-based Learning

At this stage, a comprehensive needs analysis was conducted to identify the essential language skills required in the Engineering and English Communication courses, particularly those relevant to professional performance in aircraft engineering. Discussions with subject lecturers and direct classroom observations revealed that students urgently require teaching materials emphasizing practical application, especially in using technical terminology within authentic communication scenarios. Supporting this, questionnaire results indicate that 78% of students struggle to comprehend technical texts in English, and 65% feel less confident when using English in engineering-related oral interactions. These findings are consistent with previous studies by (Kim, 2016) and (Basturkmen, 2010), which stress the importance of designing ESP materials that are linguistically appropriate and functionally relevant to real-world contexts.

As a response to the identified needs, a set of instructional materials was developed following a skill-based learning approach, which has been proven effective in aviation-related education ((Ahmed O. Alharbi, 2022); (Tzoc, 2019). The material design comprises several key components: a) Technical Reading Materials, drawn from authentic sources such as engineering manuals, research articles, and technical documentation, aim to enhance students' reading comprehension and recognition of field-specific vocabulary ((Hutchinson & Waters, 1987); b) Dialogues and Communication Simulations, which replicate professional engineering contexts-including project briefings, technical discussions, and oral presentations-are provided to support the development of students' speaking and listening skills. These align with (Estival et al., 2016) findings that highlight the need for contextualized communication training in aviation; c) Problem-Based Simulation Tasks, designed to promote critical thinking and collaborative problem-solving in English, reflect principles from constructivist learning theory (Widodo, 2016) and have been shown effective in bridging content knowledge with communicative competence (Kusuma & Hidayati, 2022); d) Skill Evaluation Tools, including both formative and summative assessments, are embedded in each module to monitor student progress and ensure learning objectives

are met, in line with (Richards & Rodgers, 2014) who advocate ongoing assessment in skill-based instruction.

Several challenges emerged while implementing these materials, demonstrating positive results in enhancing students' engagement and skill acquisition. Chief among these were time constraints-completing all modules within one semester proved difficult-and variability in students' English proficiency levels, which necessitated differentiated instruction. These challenges are common and mirror the implementation barriers Kusuma & Hidayati (2022) noted in their work on vocational ESP materials. Moreover, some students struggled to balance cognitive load, that is, grasping complex engineering concepts while simultaneously applying English communicatively- an issue also noted in previous studies on dual-focused (CLIL-like) instruction in technical education.

In conclusion, this study's findings confirm and extend prior research advocating for contextual, skill-based English instruction tailored for aviation engineering students, reinforcing the value of integrating language and content to foster academic and professional success.

B. Feasibility of English Engineering Materials for Aviation Engineering Students toward Skill-based Learning

The results and findings from research (Wu et al., 2024) relate to the suitability of skills-based English Engineering and Communication teaching materials. The focus of this discussion is to answer the problem formulation. The feasibility assessment process is carried out through field trials, evaluation by experts, and responses from students and lecturers to the teaching materials that have been developed. The suitability of teaching materials is assessed based on several criteria: a) Conformity to Learning Objectives. Teaching materials must support achieving set learning objectives, especially in improving students' English skills in an engineering context. b) Relevance of material to skills-based learning needs. Material must be relevant to the professional context that students will face in the world of work, to support the development of English language skills in real situations. c) Quality of Presentation and Organization of Material. Presentation of material must be prepared systematically, interestingly, and easily understood by students with an engineering background. d) Active Student Involvement in the Learning Process. Teaching materials must encourage active student participation through skills-based learning approaches like discussions, simulations, and problem-solving exercises.

Based on the evaluations from experts and field trials, the teaching materials developed are considered suitable for use in the skills-based learning process. This feasibility is supported by several factors, including:

- **Relevance of Material:** Teaching materials have successfully created a learning context relevant to

engineering students' needs, both in terms of theoretical understanding and practical English language skills.

- Skills-Based Learning Design: The skills-based learning implemented in this teaching material has proven effective in encouraging active student participation, improving speaking skills, and facilitating more interactive learning.
- Improving Student Skills: The results of field trials show that this teaching material successfully improves students' English skills, especially their understanding of technical texts and professional communication.

Based on expert evaluations and field trials, skills-based English Engineering and Communication teaching materials are suitable for learning. These materials can support the achievement of learning objectives, improve students' English skills, and be relevant to the needs of the world of work in the engineering field. Although there are several challenges, such as differences in students' English language abilities and time constraints, this teaching material can positively contribute to skills-based learning.

In line with research from Palupi (2017), the results of developing vocabulary material went through several stages, in the form of a multimedia PowerPoint presentation. Researchers have undergone several stages in developing English vocabulary material: Requirements Analysis, Design, Development, Expert Validation, Testing, Revision, and Final Product. This could prove that this material can be applied to class VII students. In the revision, researchers must still revise the product so that it is easier and has fewer bytes, so that this product can be used by class VII students at SMP N 5 Metro. After revisions are made, the final product is ready to be applied. In conclusion, speaking skills learning material based on ADDIE can be used with seventh-grade students.

IV. Conclusion

In light of the findings and discussions from the prior chapter, the researchers offer the following conclusions: Design teaching materials for English Engineering and Communication courses through several stages, namely pre-design, needs analysis, and designing teaching materials that include Technical Reading Text material. (reading skills), dialogue and communication simulations (listening and speaking skills), contextual – problem-based training simulations (Problem-based Learning), and Skills Evaluation (assessment tools). The evaluation. The findings indicate that the teaching resources created have enhanced students' English abilities, especially in reading and speaking. Most students (85%) felt that this teaching material helped them understand complex engineering texts and increased their confidence in communicating using English professionally. Based on evaluations by experts and field trials, skills-based English Engineering and Communication teaching materials (skill-based learning) are considered suitable for learning. The

elements of appropriateness of teaching materials are the relevance of the material, skills-based learning design, and the enhancement of students' abilities. This instructional resource can aid in fulfilling educational goals and improving students' English skills. It is also relevant to the needs of the world of work in the engineering field. Although there are several challenges, such as differences in students' English language abilities and time constraints, these teaching materials can positively contribute to skills-based learning. Improving learning outcomes in skill-based English Engineering and Communication courses by implementing teaching materials using a skill-based learning approach. Through this approach, students learn actively and are directly involved in activities that require them to apply English language skills in realistic engineering situations. The strategies used are practical and collaborative skills, active approaches, contextual learning, and competency-based assessments. This approach improved students' reading and speaking skills in engineering and increased their confidence in communicating professionally.

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