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EVALUATION OF THE TEACHING-LEARNING PROCESS OF GAS TURBINE ENGINE FUNDAMENTAL USING GENERIC FEATURES OF GOOD TEACHING

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Abstract: Understanding gas turbine engines as aircraft propulsion engines is essential in aircraft maintenance. It was found that the learning outcomes for basic turbine motor courses (gas turbine engine fundamentals) were not optimal. This research aims to learn and teach basic motorbike courses that focus on finding out learning activities based on the general features of good teaching Gall et al. (2007) in the basic course on turbine motors at the TPU D.IV Study Program. This research was conducted in June-July 2022 and used qualitative methods with semi-structured interviews, observations, and theoretical studies to collect qualitative data. Six findings, namely lack of student involvement; activity plans inside and outside lectures are inadequate; need to maintain and plan better practical activities; no program for implementing understanding in the classroom; and emphasis on activities in pairs or groups. The limitation of this research is that it only examines teaching and learning activities. There may be other parameters that can influence academic achievements such as student characteristics, availability of learning materials, facilities, etc., or developing learning with a structured active learning approach to maintain student involvement and understanding of the content that needs to be carried out in further research.

Keywords: gas turbine engine fundamental, generic features of good teaching, qualitative approach, teaching and learning evaluation, vocational higher education

Introduction

A holder of a basic aircraft maintenance certificate must demonstrate competencies outlined in Advisory Circular (AC) 147-02 Basic Certificate Curriculum and Syllabus Development, Amendment: 0 (2017). Diploma IV Program Studi Teknik Pesawat Udara (Prodi D.IV TPU) is a program offered at the Politeknik Penerbangan Indonesia-Curug (PPI-Curug), which is authorized as an Aircraft Maintenance Training Organization (AMTO). One of the key subjects in the Prodi D.IV TPU curriculum is the gas turbine engine fundamental course. It is crucial to comprehend gas turbine engines as aircraft engines for aircraft maintenance purposes. According to Yildirim & Kurt (2018), airplane engines generate the necessary power for airplanes, making them crucial for flight safety. In many high-risk of aviation fields, aircraft maintenance has been identified as a major point of concern (Insley & Turkoglu, 2020). It directly impacts flight safety (Khan et al., 2020) and is essential for safe and efficient aircraft operations (Lee & Mitici, 2020). Aircraft maintenance is very important because it accounts for 21% of the latent conditions contributing to aircraft accidents (International Air Transport Association, 2021).

In the period from 2016 to 2019, one student from the 2017 class failed the gas turbine engine fundamental course at Prodi D.IV TPU, even after a score correction process. Initially, 58% of the total students across all four batches passed the course, while 29% had to retake the

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first re-exam and 13% had to retake the second re-exam to pass. These results indicate that the learning outcomes for the gas turbine engine fundamental course at Prodi D.IV TPU have been suboptimal, suggesting a need for an evaluation of the learning activities in this course.

Hassan (2011) conducted an attitude-based evaluation of the teaching and learning process to measure the plan's effectiveness. Djunaidi et al. (2006) assessed the quality of the teaching and learning process performance using the focus quality method to identify areas for improvement and understand students' preferences. Angga & Kardiyanto (2022) conducted a thorough evaluation of the teaching and learning process to gather information on specific subjects. This research aims to evaluate teaching and learning process in gas turbine engine fundamental course, focusing on teaching and learning activities, as described by generic features of good teaching Gall et al. (2007).

Method

This research was conducted in June-July 2022 using qualitative methods, including semi-structured interviews, observations, and theoretical studies, to collect data. Qualitative research aims to gather various expressions and interpretations of perceptions (Nergård, 2014; Nergard et al., 2011). Semi-structured interviews are designed to capture participants' perspectives (Kioulepoglou & Makris, 2023). The interview guide for semi-structured interviews was developed based on the general features of good teaching (Gall et al., 2007). There are 12 generic features of good teaching, namely: (1) supportive classroom; (2) opportunity to learn; (3) curricular alignment; (4) establishing learning orientations; (5) coherent content; (6) thoughtful discourse; (7) practice and application activities; (8) scaffolding student’s task engagement; (9) strategy teaching; (10) cooperative learning; (11) goal-oriented assessment dan (12) achievement expectation.

To ensure representation from the entire student population, we selected resource persons from both the high-scoring and low-scoring groups in the gas turbine engine fundamental course. A total of six students participated in virtual interviews, with each interview lasting 30-35 minutes. One student from the high-scoring group of the batches of 2017, 2018, and 2019, and one student from the low-scoring group of the batches of 2016, 2018, and 2019, participated in the interview. Additionally, a lecturer who taught the gas turbine engine fundamental course also took part in the interview.

To ensure the accuracy of the qualitative data, triangulation was performed. Triangulation was carried out to increase the validity of qualitative data (Gall et al., 2007). This involved cross-referencing the interview results from high-scoring students, low-scoring students, and a lecturer, a method known as source triangulation. The first triangulation involves combining the results of the interviews. The second triangulation, known as method triangulation, involves concluding data collected through interviews (results of the first triangulation), field observations, and the generic features of good teaching theory as outlined by Gall et al. (2007).

Result

Through the qualitative data collection process and triangulation of sources and methods, it was concluded that the learning of gas turbine engine fundamental course in the prodi D.IV TPU is as follows:

1. Supportive classroom
   Involvement and concern in learning between students included discussions, reminding each other, completing understanding, and picket schedules. The students initiate themselves to do these. Students interact more effectively during practice sessions. The lecturer's support for

students' learning involved extra lecture hours, reminders, guidance, learning materials provision, and visits to real gas turbine engine training aids.

2. Opportunity to learn
   A small number of students are actively engaged in learning during class. Active student involvement is demonstrated through asking questions. Unavailable specific activities that are designed to help students build understanding on their outside of regular lectures.
3. Curricular alignment
   At the start of the semester, the lecturer provides students with verbal information about the instructional goals and objectives. This means that students unpredict in advance what their learning outcomes will be. Additionally, the learning activities conform to the lesson plan outlined by the faculty.
4. Establishing learning orientations
   Information regarding lesson plans is not shared to students by lecturers, including both in-class lesson plans and learning activities outside the lecture schedule.
5. Coherent content
   Teaching methods include lectures, discussions, and individual or group assignments. The order of topics discussed is random. Lecturers provide English textbooks, presentation materials, and virtual video recordings for independent study. Challenging topics include calculations and materials for gas turbine engine components.
6. Thoughtful discourse
   Lecturers ask questions in class verbally and spontaneously to regain students' attention and against boredom. Additionally, students are occasionally given impromptu questions or assignments to be completed outside the scheduled lecture time by the lecturer.
7. Practice and application activities
   To apply their understanding, students engage in practical activities, which involve introducing, identifying, explaining, and disassembling and reassembling components of a gas turbine engine. The lecturer provides oral feedback to students, including reminders, explanations, and instructions.
8. Scaffolding student’s task engagement
   Lecturers make efforts to ensure that students remain active in learning by asking questions verbally, requesting students to come to the front of the class, and giving individual assignments for discussion between students. However, the lecturers do not prepare activities that students must do outside the lecture schedule to encourage ongoing learning.
9. Teaching strategy
   Teaching methods currently used are traditional, such as lectures, discussions, assignments, and video recordings. There are no scheduled activities for students outside of class. Any activities outside of lecture times are mostly organized by students themselves, rather than being part of the planned learning activities by the lecturers.
10. Cooperative learning
    In-class learning and learning activities outside the lecture schedule in pairs or small groups are rarely carried out. Learning activities in small groups are carried out during practice.
11. Goal-oriented assessment
    Various forms of assessment used to evaluate students include quizzes, midterm and final exams, and assessment assignments. Quizzes are used to track progress in understanding. When creating questions, refer to existing questions related to the topic of discussion. Types of tests used include multiple-choice questions, essays, and performance tests.

12. Achievement expectation

    Lecturer verbally provides information about the expected learning outcomes in the basic turbine engine course, but the students are unaware of it. Lecturers adhere to the lesson plan provided by the faculty.

Discussion

This research aims to evaluate the teaching and learning process in gas turbine engine fundamental course, focusing on teaching and learning activities, as described by generic features of good teaching Gall et al. (2007). Based on the results of the qualitative data collection process and the triangulation of sources and methods, the following findings were obtained:

First, the level of student engagement in lectures is low because the learning activities are still focused on individual work and are led by the lecturer. Additionally, students lack information about the course orientation and learning objectives. In higher education, student involvement is seen as a key factor in assessing the success and quality of both students and institutions (Groccia, 2018). There is a strong relationship between student engagement and achievement, persistence, and college satisfaction (Friedlander & Macdougall, 1992). According to Zhang and Hyland (2018), student engagement plays a crucial role in the success of formative assessment. Additionally, Ayouni et al. (2021) assert that student involvement is the primary factor influencing student experiences, which in turn impacts student performance.

Second, the planned learning activities outside the lecture schedule are inadequate. Neither the faculty documents nor the lecturers prepare special activity plans so that students can build understanding independently or together with fellow students outside of the lecture schedule. When developing learning strategies Dick et al. (2015) suggest follow-through to ensure retention.

Third, the class activities have been unplanned. This is evident from the verbal and spontaneous nature of the questions asked during lectures, which are used to recapture students' attention when it begins to wane, without requiring them to fully engage in the learning process. According to Gall et al. (2007), questions should be carefully planned to actively engage students in the ongoing lecture, based on strong ideas.

Fourth, during practice, students apply their understanding by introducing, identifying, explaining, removing, and reassembling gas turbine engine components. This is in line with Pappalepore & Farrell (2017), who found that students prefer active learning styles and methods that challenge them intellectually. Active learning is a student-centered pedagogical approach (Guarascio et al., 2017). Michael & Modell (2003) included cooperative learning; collaborative learning; problem-based learning; and peer tutoring as a new approach to promoting active learning.

Fifth, learning activities in class are primarily face-to-face instruction and lecture-centered, limiting opportunities for students to apply their understanding. Gall et al. (2007) stated that students require ample opportunities to practice, apply their learning, and receive feedback on improvement.

Sixth, learning in class and activities outside the lecture schedule is rarely done in pairs or small groups. However, learning activities in small groups do take place during practice. Learning with peers benefits student learning (Tweddell et al., 2016). In line with Lockspeiser et al. (2008), students who learn from both peers and lecturers can identify advantages for their learning. Learning with peers has various positive results, especially for those involved in the learning (McKenna & Williams, 2017).

Conclusion

This research aims to evaluate teaching and learning process in gas turbine engine fundamental course, focusing on teaching and learning activities, as described by generic features of good teaching Gall et al. (2007). This study identified six key findings: lack of student involvement, insufficient activity plans both inside and outside of lectures, the requirement for better activity planning and maintenance, the absence of a program to implement understanding in the classroom, and a focus on activities in pairs or groups. It's important to note that the research only analyzed teaching and learning activities. Other factors that could affect academic performance, such as student characteristics, the availability of learning materials, and facilities, are disregarded.

There is an opportunity for further research to investigate additional factors that could influence academic achievement. This research could focus on active learning approaches, both within and outside the classroom, to maintain student engagement and support them in enhancing their academic performance.

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