University of Tabuk

Faculty of Engineering

Mechanical Engineering Department

“Bachelor of Science in Mechanical Engineering Program”

Teaching Strategies in MEP

2021-2023

Implemented Teaching Strategies in MEP:

The Mechanical Engineering Program (MEP) at University of Tabuk employs a diverse range of teaching strategies to ensure an enriching educational experience for its students. This report provides a detailed analysis of four key teaching strategies utilized in MEP: Lecture, Problem Solving-based Learning, Project-based Learning, and Experimental-based Learning.

Lecture:

Description:

- Lectures in MEP serve as a fundamental method for delivering foundational knowledge in Mechanical Engineering and Science.
- Traditional lecture formats are utilized, where instructors present key concepts, theories, and principles to students.

Effectiveness:

- Lectures are effective for conveying theoretical concepts, providing a structured learning environment, and facilitating the understanding of fundamental principles.

Applicability:

- Well-suited for delivering essential content in a didactic manner.
- Provides a platform for instructors to present complex theoretical information.

Problem Solving-based Learning:

Description:

- MEP employs Problem Solving-based Learning to enhance students' abilities to identify, formulate, and solve complex engineering problems.
- Students engage in activities that require critical thinking and application of engineering principles to practical scenarios.

Effectiveness:

- Encourages active participation and engagement.
- Develops analytical and problem-solving skills essential for engineering practice.

Applicability:

- Well-suited for courses focused on applying theoretical knowledge to real-world engineering challenges.
- Enhances students' ability to think critically and solve problems independently.

Project-based Learning:

Description:

- Project-based Learning is integrated into MEP to provide students with hands-on experiences in engineering design and problem-solving.
- Students work on projects that mimic real-world scenarios, considering factors such as public health, safety, welfare, and global, cultural, social, environmental, and economic aspects.

Effectiveness:

- Fosters teamwork, collaboration, and leadership skills.
- Enhances creativity and innovation.
- Bridges the gap between theoretical knowledge and practical application.

Applicability:

- Well-suited for courses where practical application and design considerations are crucial.
- Prepares students for real-world engineering challenges.

Experimental-based Learning:

Description:

- Experimental-based Learning is integrated into MEP to develop students' skills in conducting appropriate experiments, analyzing data, and using engineering judgment.
- Laboratory sessions and experiments complement theoretical learning.

Effectiveness:

- Provides a hands-on understanding of engineering principles.
- Enhances critical thinking through data analysis and interpretation.

Applicability:

- Well-suited for courses with a focus on experimental and hands-on learning.
- Strengthens the link between theory and application.

MEP's utilization of a combination of teaching strategies, including lectures, problem-solving, project-based, and experimental learning, reflects its commitment to delivering a well-rounded and practical education. These strategies collectively contribute to the holistic development of students, preparing them for the dynamic and challenging field of Mechanical Engineering.

Teaching Strategies Alignment with MEP Mission

The Department of Mechanical Engineering at Tabuk University is dedicated to delivering high-quality education aligned with its mission and that of the Faculty of Engineering. This report provides an in-depth analysis of how specific teaching strategies, namely Lecture, Problem-solving based learning, Project-based learning, and Experimental-based learning, are meticulously aligned with the overarching mission of MEP.

Teaching Strategy Alignment:

1. **Lecture:**
    - *Mission Alignment:* Lectures serve as a cornerstone teaching strategy, aligning seamlessly with the mission's commitment to providing high-quality education. They are designed to impart foundational knowledge essential for students to become proficient engineers in various specialized fields.
    - *Mission Components Addressed:* The structured delivery of theoretical content in lectures ensures that students gain essential knowledge in Energy and Thermo-Fluid Engineering, Mechanical Systems and Design, Engineering Materials and Manufacturing, and Mechatronics and Controls.
2. **Problem Solving-Based Learning:**
    - *Mission Alignment:* Problem-solving based learning is a strategic alignment with the mission's goal of producing professionally equipped engineers. This teaching approach emphasizes the application of theoretical knowledge to solve complex engineering problems.
    - *Mission Components Addressed:* By fostering problem-solving skills, this strategy contributes to excellence in various engineering domains while promoting ethical decision-making and societal welfare.
3. **Project-Based Learning:**
    - *Mission Alignment:* Project-based learning is intricately linked with the mission's objective of promoting excellence, ethics, and societal welfare. Through projects, students delve deep into engineering concepts, fostering innovation and practical application.
    - *Mission Components Addressed:* The emphasis on excellence is realized as students engage in projects that challenge them to apply their knowledge creatively, fostering ethical considerations and societal impact.
4. **Experimental-Based Learning:**
    - *Mission Alignment:* Experimental-based learning aligns with the mission's aspiration to provide high-quality education by offering students hands-on experiences in engineering experimentation.

- *Mission Components Addressed:* Fields such as Energy and Thermo-Fluid Engineering and Mechatronics and Controls benefit from experimental learning, enhancing students' understanding of theoretical concepts through practical application.

Effectiveness and Continuous Improvement:

1. **Assessment Alignment:**
    - Assessment methods, including classwork, exams, and project evaluations, are meticulously aligned with each teaching strategy. This ensures that students' understanding and application of knowledge are consistently evaluated.
2. **Feedback Mechanism:**
    - A robust feedback mechanism, including student surveys, assessments, and faculty evaluations, contributes to the continuous improvement of teaching strategies.
3. **Mission Reinforcement:**
    - Teaching strategies undergo periodic reviews to ensure ongoing alignment with the mission. Any adjustments made are intended to reinforce the mission's goals and objectives.

The alignment of teaching strategies with the MEP mission underscores the commitment to providing a holistic education that not only imparts knowledge but also cultivates the skills and values essential for success in the field of mechanical engineering. By consistently reviewing and adapting teaching methods, MEP ensures its steadfast commitment to excellence, ethics, and societal welfare. This alignment contributes to the development of professionally equipped engineers who can make meaningful contributions to society.

Teaching Strategies Alignment with PLOs:

The Mechanical Engineering Program (MEP) has carefully designed its teaching strategies to align with the Program Learning Outcomes (PLOs). This report provides an in-depth analysis of the alignment between MEP PLOs and the teaching strategies employed in various courses.

Table 1 Proposed teaching strategies used with PLOs

PLO code	Knowledge and understanding	Teaching Strategies
K1	An ability to demonstrate knowledge of concepts of Mechanical engineering and science	Lecture
	Skills	
S1	An ability to identify, formulate, and solve complex engineering problems by applying principles of Mechanical engineering, science, and mathematics	Problem solving based learning
S2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Problem solving based learning Project based learning
S3	An ability to develop and conduct appropriate experimentation, analyze, and interpret data, and use engineering judgement to draw conclusions	Experimental based learning
S4	An ability to communicate effectively with a range of audiences.	Project based learning
	Values, Autonomy and Responsibility	
V1	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Project based learning
V2	An ability to function effectively on a team, whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	Project based learning
V3	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Project based learning

Lecture for Knowledge and Understanding:

Alignment:

- MEP recognizes that the PLO K1, focusing on the demonstration of knowledge in Mechanical Engineering and Science, is effectively addressed through traditional lectures.
- Lectures provide a structured format for delivering essential theoretical concepts, fostering a solid understanding of foundational knowledge.

Effectiveness:

- Lectures effectively transmit key concepts and theoretical foundations to students, aligning with the knowledge and understanding aspects of PLOs.

Problem Solving-based Learning and Project-based Learning for Skills:

Alignment:

- PLOs S1 and S2 emphasize the development of problem-solving skills and the application of engineering design principles. MEP employs Problem Solving-based Learning and Project-based Learning to address these skills.
- Problem-solving activities and projects immerse students in real-world engineering challenges, aligning with the intended skills outcomes.

Effectiveness:

- These strategies contribute significantly to enhancing students' abilities to identify, formulate, and solve complex problems while applying engineering principles.

Experimental-based Learning for Skill S3:

Alignment:

- PLO S3 focuses on the ability to develop and conduct appropriate experimentation. Experimental-based Learning is integrated into MEP through laboratory sessions and experiments.
- These sessions provide hands-on experiences in conducting experiments, analyzing data, and using engineering judgment, aligning with the targeted skill outcome.

Effectiveness:

- Experimental-based Learning is effective in bridging the gap between theoretical knowledge and practical application, aligning with the desired skill development.

Project-based Learning for Skills V1, V2, and V3:

Alignment:

- PLOs V1, V2, and V3 emphasize ethical and professional responsibilities, teamwork, and continuous learning. Project-based Learning is strategically employed to address these values and skills.
- Collaborative projects encourage students to recognize ethical responsibilities, function effectively in teams, and acquire and apply new knowledge.

Effectiveness:

- Project-based Learning fosters a holistic development of values, autonomy, and responsibility, aligning with the targeted outcomes.

MEP's intentional alignment of teaching strategies with PLOs demonstrates a commitment to delivering a curriculum that not only imparts knowledge but also cultivates the skills, values, and autonomy necessary for successful mechanical engineers. This alignment enhances the overall educational experience, preparing students for the challenges of the engineering profession.