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Enhancing Core Competencies of Engineering Cost Students Through Subject Competitions

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Abstract: This study examines the impact of subject competitions on the core competencies of engineering cost students. Traditional education often fails to develop a broad range of skills required for today's engineers. By incorporating subject competitions, this research highlights their effectiveness in enhancing technical skills, creativity, ethical awareness, and teamwork. Through a mixed-methods approach, including case studies and interviews, the study demonstrates that these competitions significantly contribute to student development, preparing them for real-world challenges in engineering. The findings offer valuable insights for educational institutions aiming to improve their curricula.

Keywords: Core Competencies; Engineering Education; Subject Competitions

1. Introduction

There is an increasing demand for engineering professionals who are not only technically proficient but also possess a diverse range of competencies such as innovation, ethical decision-making, and social responsibility. Traditional educational approaches have largely concentrated on technical skills, often neglecting these broader competencies. Subject competitions provide a practical platform to address this gap by fostering essential qualities among engineering cost students. This study evaluates the current state of these competencies and proposes a model that utilizes subject competitions to enhance overall student development in engineering cost education.

2. Literature Review

2.1 Competency-Based Education in Engineering

Competency-based education has evolved significantly in engineering to meet the demands for well-rounded professionals capable of adapting to various challenges. Historically, the focus was on developing technical skills, but there has been a growing recognition of the need for a more holistic approach that includes problem-solving, ethics, and teamwork. Subject competitions have emerged as an effective means to achieve this, providing a dynamic setting where students can apply their knowledge in practical scenarios.

2.2 Benefits of Subject Competitions in Skill Development

Research shows that subject competitions are effective in enhancing both technical and non-technical skills. These events challenge students to work under pressure, utilize theoretical knowledge, and create innovative solutions to complex problems. Participation in these competitions has been shown to improve critical thinking, collaboration, and leadership skills, which are essential for professional success in engineering. the hands-on experience gained complements traditional learning methods, fostering a well-rounded skill set.

2.3 Applying Competency Development Models in Education

The use of competency development models through subject competitions has proven to be advantageous in various educational settings. These competitions allow students to demonstrate their abilities, receive feedback, and learn from peers. In the context of engineering cost education, subject competitions provide realistic scenarios for managing projects and estimating costs, which enhances students' ability to manage resources, maintain budgets, and make informed decisions under pressure.

3. Research Objectives and Methodology

3.1 Research Objectives

The main aim of this study is to evaluate the impact of subject competitions on the development of core competencies among engineering cost students. the focus is on assessing improvements in technical skills, creativity, ethical awareness, and responsibility. By exploring these areas, the study seeks to provide insights for refining educational practices that support comprehensive student growth.

3.2 Methodology

A mixed-methods approach was adopted, integrating both qualitative and quantitative data collection to analyze the influence of subject competitions on student competencies. the research is based on case studies from engineering cost competitions at the Mayuan and Guangwu Institutes, supplemented by interviews with educators, participants, and industry professionals. Quantitative data were analyzed statistically to measure the effectiveness of these competitions in enhancing various competencies. A comparative analysis was also conducted to highlight differences between traditional teaching methods and those incorporating subject competitions.

4. Findings and Discussion

4.1 Development of Core Competencies

Participation in subject competitions has significantly boosted the core competencies of engineering cost students. These competitions provide a setting for applying theoretical knowledge in practical situations, allowing students to develop both technical and soft skills. For instance, students learn to analyze complex project requirements, optimize resource allocation, and manage time effectively, which are critical in cost engineering. Moreover, the competitive environment encourages innovation, pushing students to think creatively and devise unique solutions to challenges.

4.2 Enhanced Educational Outcomes

Integrating subject competitions into the curriculum has led to improved educational outcomes by fostering a collaborative and interactive learning environment. These competitions enable students to work together and learn from each other, enhancing teamwork and communication skills. Additionally, the practical experience gained from these competitions improves problem-solving abilities and prepares students for real-world engineering challenges. This approach also promotes ethical decision-making and accountability, as students are often required to justify their choices and consider the broader impact of their actions.

4.3 Challenges and Opportunities

While subject competitions offer many benefits, they also present certain challenges. Implementing these competitions requires a departure from traditional teaching methods and necessitates additional resources, including time, funding, and training for educators. the effectiveness of these competitions depends on the willingness of both students and faculty to embrace this experiential learning approach. However, these challenges provide opportunities for innovation in education. By creating a more holistic learning environment, educational institutions can better equip students for the complexities of the modern engineering workforce.

4.4 Overcoming Barriers to Implementation

To successfully integrate subject competitions into the curriculum, educational institutions must address several obstacles. There must be a commitment to providing adequate resources, ensuring competitions are well-supported by faculty and funded appropriately. Institutions should also cultivate a culture that values experiential learning, encouraging both students and educators to fully engage in these activities. Finally, the curriculum should align the goals of competitions with learning outcomes, ensuring that the skills developed are directly applicable to professional practice.

5. Conclusion

Subject competitions serve as an effective tool for developing core competencies among engineering cost students. By blending technical skill development with practical, real-world applications, these competitions help students build a comprehensive skill set that prepares them for both professional and

ethical challenges in the engineering field. Future research should examine the long-term effects of subject competitions on career success and explore ways to further integrate these competitions into engineering education to maximize their benefits.

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