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Enhancing Engineering Education through Research-Led Learning: Insights from a Group Design and Make Wind Turbine Project

Lin Wang

Department of Mechanical, Materials, Manufacturing Engineering, University of Nottingham, Nottingham, NG7 2RD, United Kingdom

Abstract

Research-led learning approaches in higher education have garnered significant attention for their potential to bridge the gap between theoretical knowledge and practical application. Particularly in the field of engineering, such educational methodologies are critical for developing skills that are directly relevant to industry needs. This study evaluates the effectiveness of research-led learning in engineering education through a detailed case study on the Group Design and Make (GDM) wind turbine project at the University of Nottingham. In this project, students engaged in the design and development of a novel vertical axis wind turbine equipped with a variable pitch control system, effectively applying theoretical concepts in a hands-on setting. The project extended beyond mere conceptual design to include the actual construction of the turbine and its subsequent testing in a rigorous wind tunnel environment. This approach allowed students to experience the full cycle of an engineering project—from ideation through execution. The study emphasizes the role of such research-led projects in enhancing student engagement and deepening their understanding of core engineering design principles. Moreover, it illustrates how these projects equip students with essential skills like critical thinking and collaboration, which are vital for their future careers. Through this case study, we demonstrate the substantial educational benefits of incorporating practical, real-world projects into the engineering curriculum, showing how they prepare students to meet future challenges in mechanical and renewable energy engineering with confidence and competence.

Keywords: Engineering education; engineering design; group design and make; research-led learning; wind turbine design