RESEARCH-BASED INSTRUCTIONAL STRATEGIES IN SECOND-YEAR PHYSICS: A CASE STUDY

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Research-Based Instructional Strategies (RBIS) have proven advantageous in improving students' learning in physics (Hake, 1998) and in STEM more generally (Freeman et al., 2014) in higher education, with most work having focused on the first-year university level. Despite the advantages of RBIS over traditional teaching methods, the uptake in higher education has been slow (Henderson et al., 2012). Factors found to impact the uptake of RBIS include time (Dancy & Henderson, 2010) and faculty workload and incentives (Walczyk et al., 2007). Therefore, further study is called for to figure out how these factors interact with educational culture and structure affecting the effort to increase the uptake of RBIS in higher-year physics courses.

CONTEXT AND AIMS

In 2021, RBIS was implemented in half of the second-year Quantum Physics course at University of New South Wales (UNSW), while the other half retained the use of traditional teaching methods. This occurred due to a co-teaching format used in higher-year physics courses where each lecturer independently chooses their preferred teaching method. Several extensive changes since 2019 impacted lecturers' decisions on course design and teaching methods: a shift from semesters to terms (UNSW 3+), online emergency mode during COVID-19, and hybrid mode in returning to normalcy. I will present a case study on how different factors such as external events, time, workload, and incentives, along with a unique education system, affect the choice and employment of RBIS and the perception of both lecturers and students in the Quantum Physics course. The study explores (i) how and why the course structure changed in the period 2019–2023, with particular emphasis on the shift to using RBIS, (ii) how students perceive the teaching methods used in the course, and (iii) how lecturers navigate their workload, time and incentives to teaching the course and what impact this has on the sustainability of using RBIS.

METHODS & RESULTS

Data were collected through the Quantum Physics course evaluation surveys from 2019–2023, a questionnaire exploring students' perception of teaching methods employed in the Quantum Physics course in 2023, and interviews with course lecturers in 2023. Thematic analysis and descriptive statistics were used to analyze the qualitative and quantitative data respectively. Preliminary results reveal that several RBIS were incorporated by the lecturers, including flipped classrooms, Just-In-Time Teaching, and peer discussion. Student perception scores of the course structure from the course evaluation surveys show a steady increase each year from 4.4 in 2019 to 4.9 in 2023. Lecturers discussed a variety of benefits and challenges of using RBIS, which implicated a range of other factors such as established working patterns and available support. RBIS exhibited a promising quality improvement of instruction in higher-year courses but is unlikely to be sustained unless the complex nature of higher education is taken into consideration.

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