

Symposium on Innovative Pedagogy in University Physics

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Abstract. We present a symposium of four invited talks which address various issues related to implementation of innovative pedagogical approaches, classroom spaces for active learning, sustainability of such reforms, and possible barriers and constraints that may impede such implementations. The speakers cover a wide range, including faculty, staff, and administrators, and they represent these concerns in four different countries (Belgium, Germany, Australia and Canada). We hope to engage a broad audience who is currently (or will soon become) passionate and committed to disseminating these pedagogical reforms at the university level.

1 Background

Studies of undergraduate STEM education have shown that students need to be actively engaged in the learning process in order for it to be effective. A passive lecture environment (“teaching by telling”) has been shown to be largely ineffective in developing students’ skills in critical thinking and problem solving [1]. Many articles have been written on the inadequacies of the conventional lecture format, including several by two prominent educational pioneers, Eric Mazur [2-3] and Carl Wieman [4-5]. In addition, a recent “meta-analysis” of 225 compiled studies comparing traditional lecture versus active learning also demonstrated the pedagogical merits of an active engagement approach [6]. Yet despite the abundant data indicating the shortcomings of the conventional lecture format, this continues to be the instructional mode that is prevalent in most institutions.

Many instructors are aware of these findings, but there are persistent obstacles that hinder the extensive use of more innovative methods of pedagogy [7-11]. Some of these issues include personal time commitment for implementation, lack of specific knowledge of effective methods, inadequate learning spaces for implementation, and institutional or departmental resistance to reformed course structure. By offering this symposium, we hope to begin addressing these issues by promoting active learning as a preferred method of instruction for physics at the university level and by exploring the various dimensions of implementing and sustaining such a pedagogical approach.

2 Objectives

In this symposium, we present exemplary cases from Belgium, Germany, Australia and Canada which touch on all of the issues outlined above. These cases include administrative directives which have guided departmental activities, infrastructure and classroom modifications which have provided unique learning spaces for students, and actual hands-on implementations of active learning in specific university courses. The speakers cover a wide range, from faculty and departmental staff members to high-level university administrators. From this group of selected talks, we plan to address a broad spectrum of concerns about the effectiveness of these innovative techniques and the practical constraints related to their implementation.

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