Overcoming Obstacles in the Implementation of Active Learning

Theo HUGHES

School of Physics and Astronomy, Monash University, Melbourne, Victoria 3800, Australia

Abstract. Transforming pedagogy from the "traditional lecture" approach to "active learning" can be challenging. A variety of factors (e.g. money, physical space and timetabling) can present obstacles both to the initial implementation and the sustainability of such changes. The experience of a successful transition at Monash University offers insights into overcoming obstacles in the initial phase, and removing obstacles in the way of sustainable change.

1 Introduction

There have been various studies of the obstacles facing a transformation to active learning pedagogies in physics. For example, some that focus on specific pedagogies [1, 2, 3] and others that look at transformation in a broader context [4, 5].

The ongoing transformation in the School of Physics and Astronomy at Monash University provides practical examples across the range of principles raised in these discussions – particularly as it was a case study in one of them [4].

2 Implementing Change

PACE (Physics & Astronomy Collaborative-learning Environment) is a teaching space in the School of Physics and Astronomy at Monash University, completed in 2014. It was constructed to support a move from "traditional lectures" to "active learning" and it was particularly aimed at large first year cohorts. The classrooms, and the importance of the surrounding spaces, were discussed in detail at a presentation at last year's conference [6].

This presentation will discuss how PACE has been a significant component of driving change. However, a physical space alone, cannot drive a transition or lead to sustainable change. So here, as at Monash, the moniker "PACE" is used to refer not only to the physical space, but also to the associated administrative and pedagogical transitions. So the word "Environment", in the acronym PACE, is taken to have a much broader meaning than just the physical space. In that sense the PACE example illustrates a range of enabling strategies.

3 Sustainable Change

An active learning approach for physics is often referred to as "Studio Physics" which derives from a program of pedagogical transformation at the Rensselaer Polytechnic Institute [7]. The first Studio Physics program in Australia was implemented at Curtin University of Technology [8]. Personal communication from those involved indicates that when the instigators of this effort moved on, teaching reverted to traditional lectures. While the Curtin case is an example of a "successful implementation" it highlights that sustaining such a transformation is as much of a challenge as the initial transition.

PACE has been designed around sustaining change as much as initiating change so this talk will also present aspects of PACE that are aimed at sustainability.

4 Conclusion

It has been highlighted [5] that "Informal social interactions provide a significant communication channel in the dissemination process, in contrast to the formal avenues of workshops, papers, websites, etc., often promoted by change agents". Similarly there is evidence [1, 3, 5] that successful, sustainable transformation has more to do with practical obstacles surmounted by good leadership and management than a particular pedagogical approach. The ongoing transformations at Monash, in relation to implementation and sustainability, provide clear examples of these ideas – with the change at Monash also stimulating change at other institutions in Australia through formal and informal means [9].

So while academic study and output provides a directional guiding light suitable, for example, for the evaluation and determination of best practice pedagogies such as "active learning", this talk will highlight the need to ensure the use of a broader range of skills in overcoming the obstacles on any journey in the direction of that light.

References

[1] P.J. Enderle, S.A. Sutherland, J. A. Grooms, *Exploring the context of change: Understanding the kinetics of a studio physics implementation effort* Physical Review Phys. Educ. Res. **9**, 010114 (2013).

[2] M. Dancy, C. Henderson and C. Turpen, *How Faculty Learn About and Implement Research-Based Instructional Strategies: The Case of Peer Instruction*, Physical Review Phys. Educ. Res. **12**, 010110 (2016).

[3] K. Foote, A. Knaub, C. Henderson, M. Dancy and R.J. Beichner, *Enabling and Challenging Factors in Institutional Reform: The Case of SCALE-UP*, Physical Review Phys. Educ. Res. **12**, 010103 (2016).

[4] M.D. Sharma, *SoTL Leaders and Communities of Practice Driving Change in Teaching and Learning*, http://issotl.com/issotl15/sites/default/files/ISSOTL%202015%20Program%20Book%20WEB.PDF (2015).

[5] R. Khatri, C. Henderson, R. Cole, J.E. Froyd, D. Friedrichsen and C. Stanford, *Designing for Sustained Adoption: A Model of Developing Educational Innovations for Successful Propagation*, Physical Review Phys. Educ. Res. 12, 010112 (2016).

[6] T. Hughes, *PACE: Not "Just" an Innovative Classroom*, presentation at GIREP-ICPE-EPEC, Dublin City University, Dublin, Ireland (2017).

[7] J. M. Wilson, *The CUPLE physics studio*, Phys. Teach. 32 (12), 518–523 (1994).

[8] S. R. Yeo, *Evaluation of a University Physics Studio Learning Environment: The Interrelationships of Students' Perceptions, Epistemological Beliefs and Cognitive Outcomes* (Doctoral dissertation, School of Applied Sciences, Curtin University of Technology). Retrieved from https://espace.curtin.edu.au/handle/20.500.11937/1982 (2012).

[9] P. Francis, *Teaching large classes without lectures*, 22nd Australian Conference on Science and Mathematics Education, Monash University, Melbourne [Proceedings still to be published: www.acds-tlcc.edu.au/events/acsme/previous-conference-publications] (2017).