

# DEVELOPING REPRESENTATIONAL SKILLS THROUGH WEEKLY ONLINE LEARNING MODULES FOR FIRST-YEAR UNDERGRADUATE PHYSICS STUDENTS

Matthew Hill, Manjula D. Sharma, Helen Johnston

Presenting Author: Matthew Hill ([matt.j.hill@hotmail.com](mailto:matt.j.hill@hotmail.com))

School of Physics, The University of Sydney, Camperdown NSW 2006, Australia

**KEYWORDS:** multiple representations, communication, flip-lectures, online learning, physics education, first-year

## ABSTRACT

Investigations at The University of Sydney over the last two years have revealed a potential gap between the representational ability (the ability to use graphs, words and equations to communicate and solve problems) of some of the first year physics students (a poster detailing this was presented at ACSME 2011). For semester 1, 2013, 11 sets of research-based, online modules were created to specifically target the use of multiple graphical representations when considering questions in physics. These pre-instruction modules, completed by half of the students randomly assigned, were designed to be relevant to the upcoming material to be covered in that week's lectures. Pre-exposure to relevant material has been shown to be an effective way of introducing material to students (Seery & Donnelly, 2012). Parallel to the online modules were another set of modules targeting the conceptual knowledge required in first-year university physics. The large-scale study (n>500) involved the measurement of learning gains for conceptual and representational diagnostic tests over the semester including a longitudinal comparison with the representational ability of first-year students in previous years.

## REFERENCES

Seery, M. K., & Donnelly, R. (2012). The implementation of pre-lecture resources to reduce in-class cognitive load: A case study for higher education chemistry. *British Journal of Educational Technology*, 43(4), 11.

Proceedings of the Australian Conference on Science and Mathematics Education, Australian National University, Sept 19<sup>th</sup> to Sept 21<sup>st</sup>, 2013, page 33, ISBN Number 978-0-9871834-2-2.