

FIRST YEAR PHYSICS AT NEWCASTLE: A LONGITUDINAL STUDY

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ABSTRACT

At the University of Newcastle, we offer a pair of advanced physics courses for physics majors, science teachers and electrical engineers spanning two semesters of instruction. Student numbers (after completion) have increased from 138 in 2010 to 180 in 2015 in these courses. We commenced a longitudinal study in 2012 to measure the effect of altered teaching strategies on our first year outcomes and we report on the latest development in this study.

On-line quizzes are assigned as part of the overall student assessment and have been in place since 1998. These 11 weekly quizzes form 10% of the total course assessment. In 2014, we reported changes we had made to the learning pedagogy, where we integrated the Pearson Education or WileyPlus online systems into the courses. The online environments used quiz questions provided by the publishers, as well as offering links to video learning guides. The publisher questions involved a range of numerical answer questions, more like traditional physics homework questions, as opposed to the multiple choice style questions from the Pearson Education question pools used between 1998 and 2009. In 2015, we have reverted to the multiple choice format with quizzes accessed through Blackboard.

We find that average student attempt rate for the quizzes was 86% in 2010 and 2011 when only multiple choice quizzes were used. The average attempt rate when we changed to long answer quizzes using the Pearson system for 2012 and 2013 was 61%. The average attempt rate for students using the Wiley system in 2014 was 72%. In 2015, after reverting to purely multiple choice questions in the quizzes, the attempt rate was 79%. These data are shown graphically in Figure 1 below.

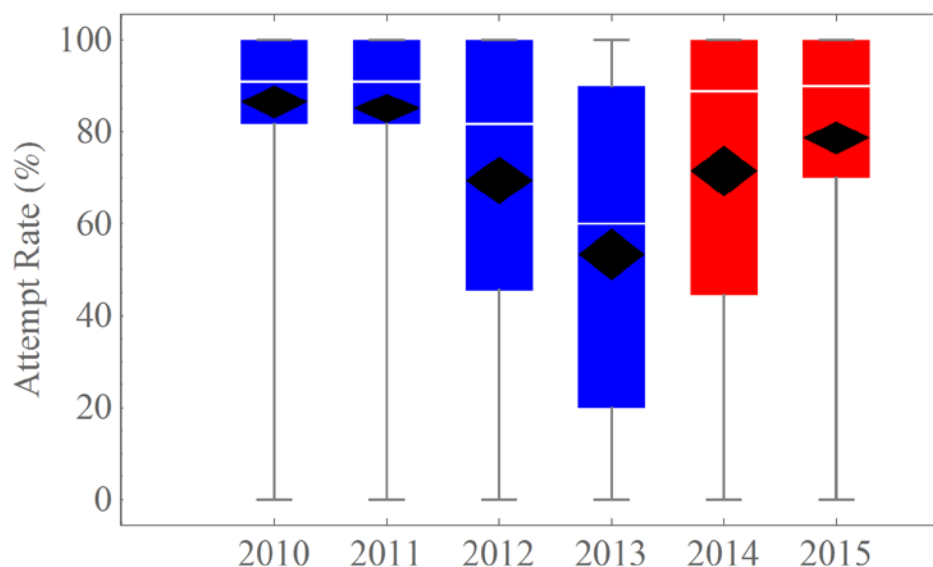


Figure 1: Whisker plot of student attempts at quizzes over eight years

We use these as an indication of student engagement with the quiz material and find that there is a student perception that it is “easier” or “more convenient” to engage with a multiple choice quiz than a set of long answer physics problems.

When using the Pearson and Wylie online systems, there was a clear improvement in overall course outcomes for the better students, as evidenced by an increase in the number of Distinctions and High Distinctions given out at the end of the year, though the poorer students did not appear to noticeably engage with the online system or approach.

We ascribe this result to an increased number of less prepared students under instruction and is an exemplar of reduced student engagement despite all efforts to the contrary, including interactive engagement within the lecture instruction.

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