Practice and Evidence of Scholarship of Teaching and Learning in Higher Education
Vol. 6, No. 2, ECE Conference 2011 - Special Issue December 2011, pp. 249-267

Positive Student Outcomes Achieved Within a Large-Cohort Health Foundation Year Course In The Face Of a Changing and Challenging Educational Environment

Ricardo Joseph Simeoni
School of Physiotherapy and Exercise Science,
Griffith University (Gold Coast Campus), Australia
r.simeoni@griffith.edu.au

Abstract

Successful outcomes (+3.7% improvement of average course grade) for large cohort physics teaching within a health foundation year were observed in conjunction with assessment modification based on reflective student feedback (resulting for example in formalized peer teaching and journal article-based laboratory report writing), and embedding student engagement and retention strategies within curriculum (such as the embedding of keys to student success and correlation data between course engagement and course success within a declaration to be signed by students). The changes were seemingly not due to random annual cohort performance variation given that the average course grade changes for all other foundation year courses, involving approximately the same cohort of students, combined was -0.22%. The physics teaching standard otherwise had remained consist prior to and during the period of comparison, as demonstrated by a consistency of teaching staff and core course material, student evaluation data, and consistently high learning outcomes for physics summer school teaching over the same comparison period. Also reinforced is that what works educationally for small groups of motivated students (i.e., within summer school teaching) will not necessarily be optimal for a large student cohort of wide ranging academic demographic.

Keywords: large cohort teaching, physics, health, assessment

Introduction

This study showcases the teaching of Biophysics and subsequent educational outcomes within a health foundation year of Griffith University's Health Faculty, known as Griffith Health. The foundation year is a common first year that accommodates students from the Schools of Dental and Oral Health, Exercise Science and Physiotherapy, Medical Science, Nutrition, and Pharmacy. Approximately 600 students from these Schools completed the Biophysics course in 2010. The Biophysics course introduces students to the fundamental physical principles that govern a wide range of phenomena, instruments and procedures relevant to the health and medical sciences, while also aiming to develop student problem solving skills. The Biophysics course convener and sole lecturer has remained constant since the inception of the foundation year in 2007, and is referred to as the lecturer throughout this paper. Also showcased for comparative purposes are the teaching and educational outcomes for a biophysics summer school delivered by the same lecturer to a smaller cohort (an enrolment of 11 for the most recent 2011 course) of typically more motivated and academically capable students. This summer school course is referred to as Biophysics SC throughout this paper.

Background

Teaching physics- and mathematics-based topics to large cohorts of first year health science students, many of whom are not mathematically orientated, presents a significant and unique teaching challenge. Indeed, at course commencement it can be said that a significant subset of the Biophysics cohort possess a fundamental dislike and trepidation towards such topics. Thus, compared to other health foundation year courses (e.g., in Anatomy, Cell Biology and Physiology) that are generally more readily received by the student cohort, teaching within Biophysics necessitates an even greater need to discard old-style "straight lecturing from the dais" approaches to teaching. An awareness of the educational importance of teaching physics within a relevant context (Lye, Fry & Hart., 2001; Whitelegg, Fry & Parry., 1999) in particular shapes the teaching of Biophysics, with this awareness leading to the inclusion of numerous application examples relevant to the health sciences. Additionally, a deliberate point is made to incorporate at least one “story” (Pickford, 2007; Whitelegg et al., 1999), in the form of an edutaining demonstration, experiment/challenge exercise (calling for volunteers), thought challenge, high-action video clip, current event discussion or use of interactive teaching software, into every Biophysics lecture to provide variety, reinforcement of concepts, and alternative modes of learning.

In addition to the inherent challenge of delivering physics to health students, the Biophysics course contains a wide-ranging student demographic in terms of university entry score. In Queensland Australia, the State location of Griffith University, the university entrance score is known as the Overall Position or OP score, which can range from 1 to 25. Students with OP scores of 1 and 2 typically compete for places in undergraduate programs of demand such as medicine and physiotherapy. In other Australian States, these topmost OP scores equate to interstate transfer indices, known as the UAI, ENTER or TER depending on the State or Territory, of 99 and 98 respectively, where for example 98 signifies a student being in the top 2% of the year 12 population. Because Biophysics enrolment includes students ranging from OP1 to approximately OP16 (e.g., exercise science students for the latter case), it is important to cater for the less mathematically-prepared students as described earlier while also challenging high achieving students by incorporating extension topics and challenge questions into course content.

The present study, within the sections to follow, outlines newly-introduced initiatives for the teaching of Biophysics with awareness of the above challenges. The introduced initiatives are based primarily on reflective student feedback, the recognized benefits of embedding student engagement and retention strategies within curriculum (Boyde, 2006; Dearn, 2006; Kuh, 2007; Pickford, 2007), and the recognized benefit of peer-based teaching in science (Stuart, 2006) within a context of reciprocal peer learning (Boud, 2001).

Student evaluation of course administration and teaching

Official on-line student evaluation of teaching and course scores for Biophysics and Biophysics SC courses give some indication of an effective teaching approach in key areas, especially given the teaching challenge identified above. The following evaluation scores for a 5 point evaluation system with “strongly agree” as the highest positive response were achieved for the most recent running of the courses in 2010 for Biophysics and 2011 for Biophysics SC. Respective evaluation response rates of 40 and 46%, while not ideal, are accepted at Griffith University (e.g., as a basis for teaching awards) where the achievement of high on-line response rates remains a challenge. Values in parentheses are for Biophysics SC:

- 52% (100%) of responding students agreed or strongly agreed teaching was effective.
- 68% (80%) of responding students agreed or strongly agreed the course was well organised.
- 72% (80%) of responding students agreed or strongly agreed that the lecturer presented material in a clear and organized way.
- 76% (80%) of responding students agreed or strongly agreed course assessment was fair.
- 93% (100%) of responding students agreed that the lecturer had good knowledge of course material.
- 94% (100%) of responding students agreed or strongly agreed that the lecturer treated students with respect.

Despite the above evaluation results and a consistent teaching approach in place over several years, the need for Biophysics course refinement to accommodate the specific needs of academically weaker students in a large cohort setting was evident not only by consistently lower student evaluation scores for Biophysics compared to Biophysics SC, but also by consistently lower average final grades for all students (≈61.9% compared to 79.9% for Biophysics SC).

The changing educational landscape

Modern tertiary education recognizes that the transition from high school to first year university can present a broad range of challenges to an individual student, challenges which ultimately can influence student engagement, success and retention (Australian Council for Educational Research [ACER], 2008; Pan, Guo, Alikonis & Bai, 2008; Pascarella & Terenzini, 2005; Yorke & Longden, 2008). Indeed, ACER (2008) describes the challenges as forming a “complex web” and stresses the importance of not over simplifying this field of research. Kift (2008) further highlights the “substantial challenge” faced by those working to improve student engagement, success and retention by highlighting that associated improvement strategies should be applied in an integrated, institution-wide approach, which is consistent with various comprehensive retention strategy models (e.g., Beatty-Guenter, 1994; Tinto, 1975). The complexity of the situation is well summarized by Kuh et al. (2005) and Kuh (2007) in their assertion that for such a necessarily institution-wide approach, no hard and fast blueprint exists for student success: *“a unique combination of external and internal factors work together to crystallize and support an institution-wide focus on student success”* (Kuh et al., 2005: 21).

Various studies have identified the most positive factors that influence a smooth transition into first year, for example (i) the comprehensive ACER (2008) report shows strong correlations between educational outcomes and academic challenge, staff-student interactions and a supportive learning environment; (ii) the likewise comprehensive multilevel longitudinal study of Pan et al. (2008) shows that early intervention, academic-help (especially for academically underprepared students) and social interaction programs can assist retention and/or grade point average; (iii) the well known Tinto (1975, 1993) studies show that learning and persistence within an institution are aided when the student is academically and socially connected with the institution; and (iv) the study by Levitz, Noel & Richter (1999) highlights the importance of making an early connection with students to ensure students feel valued and respected on campus. Additionally, a previous study by the author (Simeoni, 2009), focusing on the health foundation year under investigation in the present study, similarly identifies the positive transition factors of quality of academic resources provided for courses, sense of community, non-academic Mentor programs, and academic staff (e.g., quality of teaching and being approachable to ask questions). In summary, programs that facilitate the above will promote for students a sense of *connectedness*, *capability and resourcefulness*, and *purpose and identity* (Lizzio, 2006), and there are increasing calls for such programs to, wherever possible, be embedded into course curriculum (Boyde, 2006; Dearn, 2006; Kuh, 2007; Pickford, 2007).

In the face of the above, many tertiary institutes now invest in substantial resources to enhance the first year student experience, particularly as today's students are often perceived by academics as being academically weaker compared to students of past eras (and this perception is often justified based on tertiary entrance scores, Simeoni (2009). Tinto (2009) reminds us however that the desire by academics for "better students" is not uncommon and an unavoidable consequence of the current direction of higher education, highlighting the importance of not using tertiary entrance score decline, which is outside of academic staff control, as a reason to stop trying to maximize student success. Consistent with the above, each participating School in the health foundation year has in place a formalized orientation, engagement and retention plan coordinated by each School's appointed First Year Advisor and overseen by the Dean of Learning and Teaching, Health to ensure some commonality between plans. Since approximately 2006, Griffith Health has been recognized for its leadership within Griffith University for its implementation of these plans which continue to work towards exemplars of best practice, e.g., Wilson (2007).

Challenges of the changing educational landscape

Despite the exemplary leadership of Griffith Health within Griffith University in the areas of student orientation, engagement and retention since 2006, a previous study (Simeoni, 2009) showed that on average retention within Griffith Health had increased only marginally since that time and that the increase had mirrored that of Griffith University's overall marginal increase. The study also showed that while student retention demonstrated a marked increase for some programs of study (e.g., ≈+15% increase for Physiotherapy students), student retention also displayed a marked decrease for other programs of study (e.g., ≈-10% decrease for Exercise Science students). Simeoni (2009) attributed these cohort-dependent results to differences in (i) tertiary entrance score and academic preparedness; (ii) student numbers and identity issues; and (iii) perceptions of value, respect and connectedness to one's School and intended profession. Some of these issues are expanded upon below:

With the implementation of the health foundation year in 2007, lecture group sizes for Exercise Science students increased from the order of 100 to 600. Additionally, prior to the foundation year, several first year courses for the Exercise Science students were hosted by their own School and School staff. However, after foundation year restructuring only one first year (second semester) course remained hosted by their School and School staff. Subsequently, Simeoni (2009) demonstrated that the less academically robust (i.e., with lower tertiary entrance score and being generally weaker in academic foundation skills so as to be less academically prepared) Exercise Science students, with a less well-defined career path (compared to say Physiotherapy, Dentistry or Pharmacy students), were more susceptible to identity issues associated with anonymity within large lectures and disconnection from one's school and intended profession. Programs such as physiotherapy by comparison are generally perceived as more prestigious (with strong competition for internal transfers), and have a very clear on-campus identity with a well-defined career pathway and significant professional links (e.g., student links to the Australian Physiotherapy Association) leading to a strong sense of community. Similar comments may be said of the Biophysics SC cohort who formed a close and supportive on-campus community and who have clear career pathway goals into (primarily) medicine and physiotherapy. While many dedicated staff are mindful of the importance of addressing identity, connectedness and community issues for the Exercise Science cohort, and indeed specific targeting strategies have been attempted (e.g., social events and free student membership to the Australian Association for Exercise and Sport Science, the relevant professional body), it is clear that*, a student that is more academically robust, but who experiences a difficult transition, is more likely to persist than a less academically robust student who experiences a difficult transition.*

Course changes and innovations to meet student needs

Despite the solid teaching evaluations and considerable resources invested in student engagement and retention strategies as highlighted earlier, there was an identified need to improve Biophysics given that Biophysics SC evaluations and average final grades for all students were significantly higher than that of Biophysics for largely the same lecture style and teaching personnel, course material and assessment. That is, the applied teaching method was not as successful for the large cohort situation described previously. Thus, this paper aims to highlight the course changes and innovations employed in 2010 for large cohort teaching within Biophysics and the resulting positive educational outcomes.

The prior 2009 assessment strategy for Biophysics was relatively uncomplicated, as displayed by the middle column of Table 1, but nonetheless adopted a philosophy of constructive alignment between course objectives, learning outcomes and assessment (Biggs, 2003). Multiple choice examination questions were utilized (necessitated by the volume of students, short marking time systematically imposed, and limited staffing resources) but were designed as a mixture of simple completion (type A), multiple completion (type K) and relationship analysis (type E) questions, as defined within Case and Swanson (2001). Question construction techniques were adopted so as to optimise the relevancy and focus of questions, and to avoid common technical flaws (Case & Swanson, 2001; Collins, 2006). Although a significant number of the concept- and calculation-type multiple choice questions were "fundamental", in that they were deliberately designed to test basic knowledge and skills (aimed at students from weak physics and mathematics backgrounds who had made an effort), the ideal of assessing the application, rather than the recall, of knowledge (Alexander & Krause, 2008) was also incorporated (e.g., by incorporating questions with links to high interest theory application lecture discussion topics).

A primary course change in 2010 was in the area of assessment. The adopted 2010 assessment strategy was based on the findings of a reflective survey of past Biophysics students (Simeoni, 2008) which highlighted a student desire for less emphasis on the end-of-semester examination, a finding attributable to assessment expectation uncertainty known to be a key concern among first year students (Griffith University, 2006; Pickford, 2007; York, 2006). That survey also highlighted a desire for assessment to include an assignment option, oral presentation, increased laboratory report weighting and an element of peer teaching. The desire for an assessable assignment component is supported by general Griffith Health graduate student survey results (Alexander & Krause, 2008) which have recorded the following student sentiments re perceived positive aspects of their study experiences: *"Being able to choose areas that interest us individually and incorporate these into assessment items, i.e., flexibility on topics of assessment to research."; "Some assignment work was highly relevant, most was interesting."; "Workload was reasonable, assignments mostly* *interesting.".* Given that a communications course was controversially omitted from the health foundation year program of study when introduced in 2007, with the subsequent recognition of an even greater need to embed scientific literacy skills into each foundation year course, an appreciably weighted and well designed assignment task would thus serve both student wants and the educational objective of developing scientific literacy. The finding by Simeoni (2008) regarding students' desire for increased Biophysics laboratory report weighting is also supported by the above graduate student survey of Alexander and Krause (2008) which noted *"Laboratories, hands on experience, feedback on my progress"* as other experiences associated with positive student sentiment. The student call for some degree of assessable Biophysics peer teaching is in line with the knowledge that peer teaching is known to be the most effective facilitator of student learning in science, technology and engineering (Stuart, 2006).

The ideal Biophysics assessment structure identified above in some regards is not surprising but logistically difficult to implement for student cohorts of 600 with limited resources available for staff marking, thus some compromises were made when designing the revamped 2010 Biophysics assessment structure. For example, rather than a stand-alone assignment, within each of the 5 laboratories a new journal article write-up component was included whereby the students were required to locate, identify (using full APA referencing style), and briefly summarize a recent scientific journal article of relevance to the laboratory (increasing the overall laboratory assessment weighting to 15%). Also, rather than separate peer teaching and oral presentation tasks, for 2010 these desired assessment components were introduced in a combined manner, whereby in a tutorial or lecture theatre venue students could individually or in pairs deliver a 5% weighted presentation (typically at least 10 min in duration and marked by peer ballot) to (i) help explain a difficult-to-understand lecture topic from a student's perspective or (ii) present an exposé of an interesting and relevant application of a learnt theory topic. The latter would often involve, for example, the use of modern technology such as a captivating/entertaining u-tube video clip; innovative home-designed student experiment (e.g., experimenting the physics of parachuting with a home-made mini-parachute as showcased in the Appendix); captivating demonstrations (e.g., demonstration of ultrasound wave propagation and wavelength in water via a borrowed physiotherapy ultrasound machine); areas of application of high interest to the presenting student (e.g., how a rotary engine works); and more generally elements of student creativity and humor. The 2010 revised Biophysics assessment structure, with end-of-semester examination weighting proportionally reduced in accordance with the above, is summarized by column 3 of Table 1.

Table 1. Biophysics 2009 and 2010 Assessment

Assessment Mode	2009 Weighting	2010 Weighting
End-of-semester exam	60	50
Mid-semester exam	30	30
Laboratory report	10	15*
Peer teaching oral presentation	0	5#

*Incorporated new journal article identification and summary task. #Marking by peer ballot.

Other initiatives introduced to the Biophysics course for 2010 include:

- A ten-point keys to first year student success page inserted at the front of printed lecture notes which gives some insight into the directive advice (e.g. towards the university's learning services unit) that a First Year Advisor may give to a student in need of support (the Biophysics lecturer also has responsibility for the First Year Advisor role within the School of Exercise Science and Physiotherapy).
- Key statistical information, again inserted at the front of printed lecture notes, from the 2009 course in terms of the high correlation between lecture attendance and results achieve in the course. (The course outline states that printed lecture notes present the main theoretical points of lecture content and are complemented by further lecture discussion and examples. That is, lectures are not presented in a flexible delivery mode and lecture attendance is expected.)
- Student declaration for signing stating that the student has read the above keys to first year success and correlation information, and is aware that the keys to success are examinable (via a relatively easy examination question to encourage students to read the critical information). Thus, this inclusion is a further example of embedding engagement and retention strategies within curriculum.

- The inclusion of multiple tear-out ballot forms within printed lecture notes for peer teaching assessment within tutorials or lectures as described earlier (ballot papers were collected for an arbitrary subset of students within lecture theatre presentations). As indicated by the ballot paper (see appendix), part marks were not awarded for presentations. That is, if both the majority of the class and class tutor/lecturer deemed the presentation helpful to student learning, interesting, and well explained and presented, then 5% was awarded. If unsuccessful, a student had the option of repeating the presentation after feedback from the class tutor/lecturer. Additionally, those students who opted not to partake in peer teaching simply had 5% added to the weighting of their overall examination mark. This uncomplicated approach allowed for marking constancy among the large number of weekly tutorial classes (15) and students expressed appreciation of the low pressure environment which in-turn encouraged creative expression and a collegial sentiment among students. A rationale for this initiative was previously outlined however it is acknowledged that its flexibility may result in the achievement of slightly different learning outcomes amongst students.
- Pages for completion during lectures within printed lecture notes.
- Brain teasers (with a humorous element) to challenge logic skills.

Though not new to 2010, it is also noteworthy that Biophysics timetabling includes on a weekly basis two 1 hour “Drop-in” sessions (effectively course-based common-time sessions) designed in part to facilitate informal peer-assisted learning. Within these sessions students developed personalized concept maps (Brown, 2002; Novak 1990) – see appendix for example – and shared mistakes in problem solving steps subsequently leading to positive peer-led discussion (e.g., *“I find it easy this way”*). An email support group established specifically for Biophysics within these drop-in sessions has also proved useful towards fostering independent learning, as demonstrated by the following student email comment sent to all students in a support group: *“…everyone can pitch in and see if we can find the answer”*. In addition, drop-in sessions involve a “tell me your concerns” component; presenting concepts and problems more slowly; extended use of interactive learning software; and facilitation of student introductions to reduce student isolation.

Results and discussion

Figure 1a displays the percentage change in the average course grade between 2009 and 2010 for Biophysics and for all other health foundation year courses (with approximately the same enrolment cohort) combined. These other six courses include: Anatomy and Physiology I&II; Cell Biology; Cells, Tissues and Regulation; and Chemistry in Biological Systems I&II).

Figure 1a. Percentage change in average course grade between 2009 and 2010 for Biophysics and other six heath foundation year courses combine

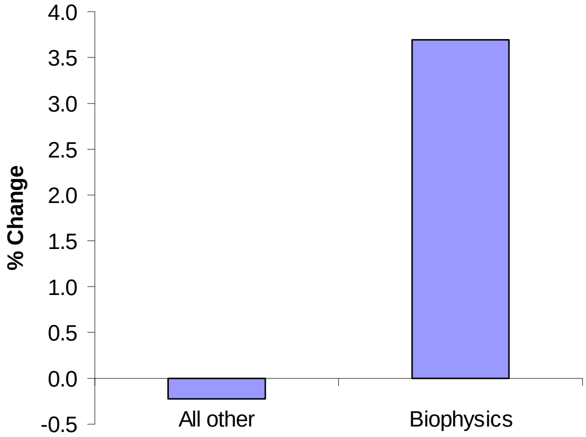
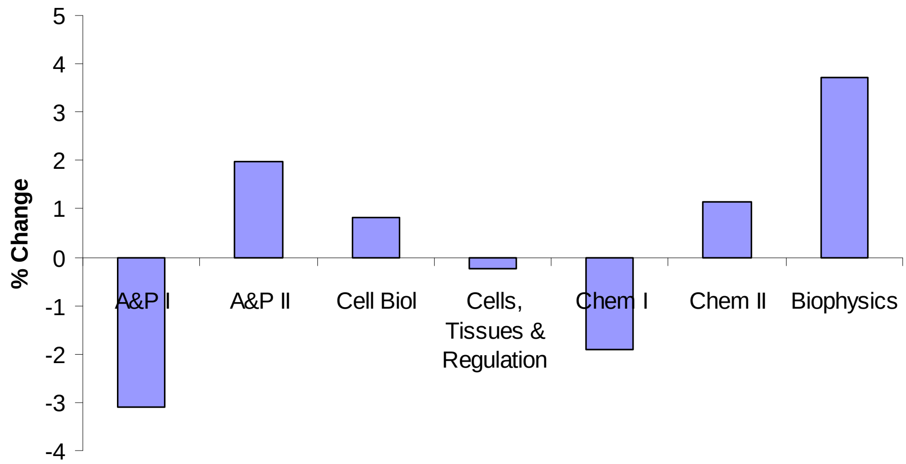


Figure 1b. The individual variations of the other six courses



The overall grade increase for Biophysics of +3.7%, observed in conjunction with the 2010 course changes and initiatives based partly on reflective student feedback as identified in section 2, is higher than any other individual course change within the health foundation year courses for which the average change was -0.22% (changes ranged from -3.1 to 2.0% for other courses). *t*-test analysis indicates that the +3.7% increase between the 2009 and 2010 average grades is significant (t=3.66, $df \approx 1000$, $p<0.001$), while the average decline of -0.22% for other courses supports that the increase for Biophysics may not simply be due to annual variation of cohort ability, since in that case one would expect similar increases for most courses (although an assessment of subsequent years is required to verify this latter assertion). For Biophysics SC which first commenced in 2009, average grades for 2009, 2010 and 2011 have remained remarkably constant and high (80.5, 80.1 and 79.9% respectively). Hence, the presented results indicate the benefits of continually looking at ways of refining one's educational approach, especially in a changing educational landscape of: increased student numbers; increased proportion of academically weaker students; increased demands on students' time management (e.g., work commitments); and accepted benefits of embedding engagement and retention strategies into curriculum. The results also enforce that what clearly works for small groups of motivated students (i.e., Biophysics SC) will not necessarily be optimal for 600 students of a wide ranging demographic (in terms of academic ability as indicated by tertiary entrance score), many of whom feel trepidation towards course topics.

The increase in average course grade for Biophysics in 2010 also aligns with a 16% increase in perceived effectiveness, fairness and clarity of course assessment compared to 2009 student evaluation results, with course satisfaction indicators remaining steady or increasing modestly in other key areas. It should be noted however that since this case study is based on a single pilot of a changed course (follow-up will be undertaken after completion of the current running of the course), the possibility of contributing factors such as an unconscious increase in teaching team enthusiasm when delivering a new teaching approach should not be excluded. However, further preliminary support for the pilot findings are provided by a similar educational approach introduced in Semester 1, 2011 to a second year course (Bioinstrumentation) within Griffith Health's Bachelor of Exercise Science and Physiotherapy Programs. This 150 student cohort course, convened and delivered by the same lecturer with in-common teaching support staff, faces some of the teaching challenges of Biophysics as it teaches the underlying physical principles of instruments utilized in exercise science and physiotherapy, as well as electronics and computer programming and interfacing skills. The 2011 course changes implemented within Bioinstrumentation resulted in an overall course satisfaction increase of 37% for a response rate of 39% (again based on official on-line student evaluation of teaching and course scores). Additionally, 95% of responding students agreed or strongly agreed course assessment was clear and fair; 87% of responding students agreed or strongly agreed the course was well organized; and 76% of responding students agreed or strongly agreed the course was effective in helping students to learn. It is also noteworthy that 2011 Bioinstrumentation student evaluation scores exceeded or matched those of other second year courses (e.g., Musuloskeletal Anatomy and Sports Coaching) within the same School and which generally are more readily received by the same student cohort.

Conclusion

Successful outcomes (+3.7% improvement of average course grade) for large cohort physics teaching within a health foundation year were observed in conjunction with assessment modification based on reflective student feedback (resulting for example in formalized peer teaching and journal article-based laboratory report writing), and embedding engagement and retention strategies within curriculum. The changes were seemingly not simply due to annual cohort variations given that the average variation was -0.22% for all other foundation year courses, involving approximately the same cohort of students. The physics teaching standard otherwise had remained consistently solid prior to and during the period of comparison, as demonstrated by a consistency of teaching staff and core course material, student evaluation data, and consistently high summer school teaching outcomes. While findings of the present pilot study are preliminary and the possibility of contributing factors such as unconscious renewed enthusiasm of the teaching team should not be excluded, the findings encourage the pursuit and follow-up of the applied approach for teaching physics-based topics to large cohorts of health students.

References

Alexander, H. & Krause, K. (2008). *Getting Assessment Right – How to Plan and Develop Effective Assessment*, Griffith University Workshop, December.

Australian Council for Educational Research (2008) 'Attracting, engaging and retaining: New conversations about learning', Australasian student engagement report: Australasian Survey of Student Engagement. Australian Council for Educational Research: Victoria, available: Retrieved 5 Feb 2009 from :http://www.acer.edu.au/documents/AUSSE_2007Report.pdf

Beatty-Guenter, P. (1994) 'Sorting, supporting, connecting and transforming: Retention strategies at community colleges', *Community College Journal of Research, 18*(2), 113-129.

Biggs, J. (2003). *Teaching for Quality at University.* Second edition. Buckingham, U.K.: Open University Press.

Boud, D. (2001). *Introduction: Making the Move to Peer Learning.* In Boud, D., Cohen, Ruth & Sampson, Jane (Ed.). Peer Learning in Higher Education: Learning from and with each other. London: Kogan Page, 1–17.

Boyde, J. (2006), 'From "LOST" to engagement in uni life: how a pilot student mentoring program is assisting first year students', *9th Pacific Rim Conference on First Year in Higher Education: Engaging Students*,. Griffith University Gold Coast,12-14 July.

Brown, D.A. (2002) 'Creative Concept Mapping', *The Science Teacher*, 69 (3): 58-61.

Case, S.N. & Swanson. (2001). *Constructing Written Test Questions for the Basic and Clinical Sciences.* Third edition. Philadelphia: National Board of Medical Examiners.

Collins, J. (2006) 'Education techniques for lifelong learning', *Radiographics*. 26: 543-551.

Dearn J. (2006). Pedagogies of engagement workshop. *9th Pacific Rim Conference on First Year in Higher Education: Engaging Students*. Griffith University Gold Coast,12-14 July.

Griffith University Student Orientation and Engagement Committee (2006). Faculty of Health Student Orientation Survey: Developing more effective orientation and transition strategies for commencing students, Griffith University Gold Coast.

Kift, S. (2008), 'The next great first year challenge: Sustaining, coordinating and embedding coherent institution-wide approaches to enact the FYE as "everybody's business"', Keynote address. *12th Pacific Rim First Year in Higher Education Conference: An Apple for the Learner: Celebrating the First Year Experience*, Hobart.

Kuh, G. D. (2007, July), 'What maters to student success in the first year of university', Keynote Address. *10th Pacific Rim First Year in Higher Education Conference: Regenerate, Engage, Experiment*, QUT, Brisbane.

Kuh, G., Kinzie, J., Schuh, J., Whitt, E. & Associates (2005). *Student success in college: Creating conditions that matter.* San Francisco: Jossey-Bass. p.21.

Levitz, R. R., Noel, L. & Richter, B. J. (1999). Strategic moves for retention success. *New Directions For Higher Education,* Winter, 31–49.

Lizzio, A. (2006). *Designing an orientation and transition strategy for commencing students*, Griffith University First Year Experience Project.

Lye, H., Fry, M. & Hart, C. (2001) 'What does it mean to teach physics "in context"? A first case study', *Australian Science Teachers Journal.* 48:16-22.

Novak, J.D. (1990) 'Concept Mapping: A Useful Tool for Science Education', *Journal of Research in Sc*

Pan, W., Guo, S., Alikonis, C. & Bai, H. (2008) 'Do intervention programs assist students to succeed in college? A multilevel longitudinal study', *College Student Journal, 42*(1), 90-98.

Pascarella, E. & Terenzini, P. (2005). *How college affects students (Vol 2): A third decade of research*. San Francisco: Jossey-Bass.

Pickford, R. (2007). *Fe Fi Fo Fun, Do I smell success at the end of year one? … A very English perspective on the first year experience*, Griffith University Celebrating Teaching Seminar Series, 29 June.

Simeoni, R.J. (2008), 'Student reflection on physics assessment within an inaugural health foundation year', Full Refereed Conference Paper. *11th Pacific Rim First Year in Higher Education Conference: An Apple for the Learner, Celebrating the First Year Experience*, Hobart, 30 June-2 July.

Simeoni, R.J. (2009), 'Student retention trends within a health foundation year and implications for orientation, engagement and retention strategies', Full Refereed Conference Paper. *12th Pacific Rim First Year in Higher Education Conference: Preparing for Tomorrow Today – the First Year Experience as Foundation*. Townsville 29 June-1 July.

Stuart, M. (2006). *STEM – engaging students in Science, Technology, Engineering*, Griffith University Ce

Tinto, V. (1975) 'Dropout from higher education: A theoretical synthesis of recent research', *Review of Educational Research, 45*, 89-125.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd Ed.). Chicago, IL: University of Chicago Press.

Tinto, V. (2009). Taking student retention seriously: Rethinking the first year of university. Keynote address. *First Year Experience Curriculum Design Symposium*, QUT, Kelvin Grove, 5 -6 February.

Whitelegg, E., Fry, M. & Parry, M. (1999) 'Real-life contexts for learning physics: meanings, issues and practice', *Physics Education.* 34:68-72.

Wilson, K. (2007, April). *Enhancing the first year - strategies for success*, Griffith University Celebrating Teaching Seminar Series.

Yorke, M. (2006). Student engagement: deep, surface or strategic. *9th Pacific Rim Conference on First Year in Higher Education: Engaging Students.* Griffith University Gold Coast,12-14 July.

Yorke, M. & Longden, B. (2008) 'The first-year experience of higher education in the UK: Final Report', UK: HEA, Retrieved 5 Feb 2009 from : http://www.heacademy.ac.uk/assets/York/documents/resources/publications/FYEFinalReport.pdf

Appendix 1 A student ballot paper for the peer teaching assessment task

Peer Teaching Ballot

Choose one of the following as applicable:

I found the presentation helpful to my learning or understanding of a course topic	No/Yes
I was already confident in the topic presented but thought the topic was well explained and presented	No/Yes
The extension topic presented was most informative, well explained and presented	No/Yes

Peer Teaching Ballot

Choose one of the following as applicable:

I found the presentation helpful to my learning or understanding of a course topic	No/Yes
I was already confident in the topic presented but thought the topic was well explained and presented	No/Yes
The extension topic presented was most informative, well explained and presented	No/Yes

Appendix 2. A photograph from a student home experiment involving a home-made parachute for peer teaching the physics of parachuting

Appendix 3. An example student-developed concept map shared with a drop-in tutorial class, with the student going on to become a course tutor