



Higher Education Research and Development Society of Australasia, Inc

The Student Experience

Proceedings of the

32nd HERDSA Annual Conference

6-9 July 2009

Darwin, Australia

Parappilly, M., Quinton, J. & Andersson, G. (2009) Enhancing the transition to university physics, in *The Student Experience, Proceedings of the 32nd HERDSA Annual Conference, Darwin, 6-9 July 2009: pp 591-596.*

Published 2009 by the
Higher Education Research and Development Society of Australasia, Inc
PO Box 27, Milperra, NSW 2214, Australia
www.herdsa.org.au

ISSN: 0155 6223
ISBN: 0 908557 78 7

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Enhancing the transition to university physics

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The main transitional challenge students experience in their first year at the University is that they have to 'step up' from being explicitly taught facts towards independent learning. In this paper we report on an activity to support 1st year student transition that took place for the first time at Flinders University at the start of the 2008 academic year. The transition sessions were aimed at creating a learning environment that exploits the student's passion for science and introduces them to their peers both socially and academically. Through these activities and strategies, the intention is to familiarise students with their teachers and peers, enjoy thinking about Physics in a positive, supportive, social setting, and thus significantly reduce their anxiety during their first week of 1st year university. Essentially, the key focus is to maximise each student's initial engagement with 1st year Physics. Through this combination of approach with clever activity design, the students develop a sense of cohort with their peers and are strongly encouraged to use their critical and independent thinking and learning skills, which will serve them throughout their university life. Here we describe our approach to this challenge and the measurable outcomes we have achieved so far.

Keywords: transition, orientation, 1st year Physics, retention

Introduction

Starting university can be quite an emotional time in a student's life. It is a new adventure, and is usually accompanied by mixed feelings of excitement, expectation and much apprehension. Students have to adjust to many changes: social, emotional, academic and environmental. Many studies about the transition issues and first year student's experiences across universities are outlined in literature, with the most prominent of these confirming the need to provide successful transition for first year university students. For example, White *et al.*, (1995, p.465) contended that the transition from school to university involves substantial change in the structure and organisation of teaching, and in the nature and purpose of learning contexts:

Australian students experience their formal education in a series of separately-organised blocks: pre-school, primary and secondary school, and university. As students move between these blocks they experience a new scale and form of organisation, new purposes and responsibilities, new power relations, and new social interactions. They are also taught, and consequently have to learn, in

different ways. Perhaps the most marked of these transitions is that from secondary school to university.

In addition, transition programs that have been developed at various Australian universities also identify the importance of the first year experience in student's satisfaction with university study. Research findings by Kantanis (2000) and Dickson et al. (2002) attest the need to support students' transition to university in a variety of ways, but have particularly highlighted a need to focus on academic integration into the university learning community.

In the case of Physics, students tend to have a perception of it before they experience it at 1st year University level. It is often considered to be one of the most difficult subjects to learn, contains 'dry' material that is mathematical in nature, and thus it is dehumanised to a large extent. In particular, students who come from a non-physics background at secondary school level often find Physics exceptionally challenging. We have noticed over several years that irrespective of their background, there are some students who noticeably struggle in their first year because they isolate themselves from the student cohort and have a distinct lack of social interaction, as opposed to lacking the ability to cope academically with their course work. Tinto's (1975) review highlighted academic and social integration as the two factors that are most likely to influence whether student's decisions will maintain their studies. Investigations by Wan et al. (1992) also iterated these aspects as important. Entwistle, McCune & Walker (2001) introduced a set of concepts that have been developed to explain these influences on the quality of learning outcomes. Specifically they state that:

... the way prior experience, the fairly stable characteristics of the individual and conceptions of learning, all seems to affect ways of studying, but we also see how specific events can interact with established ways of thinking to produce different outcomes (p. 101).

Taking these factors into account, we planned and implemented a Physics transition day at Flinders University, with a primary aim of facilitating the initial social integration of the students.

Literature studies emphasise that students will be more successful if they feel that they are part of their discipline. The key findings of the Krause, Hartley, James and McInnis study (2005, p. 35) on the Australian higher education system recognised:

... that the developmental nature of student identity and the associated sense of belonging, the initial orientation programs nevertheless play a key role in welcoming students into the learning community. These institution-level programs are most successful if accompanied by department or faculty-based initiatives designed to support students within their disciplinary subgroups. In addition to providing orientation programs, institutions can enhance students' engagement with learning by ensuring that they receive adequate advice about subject choices, thereby working to ensure that students find themselves in courses about which they are well informed and prepared.

Indeed, many of the reasons and benefits highlighted in this report were our motivation for undertaking a transitional activity for Physics and accordingly, the purpose of our transition day was to embed Physics concepts in simple 'ice breaking' team-based activities that were fun-focussed for the students. Through these activities, the students would familiarise

themselves with their new learning environment, as well as meet their new peers and teachers. In turn, this would lead to reduced anxiety at the first formal class, provide a positive outlook on their 1st year Physics experience and hopefully, maximise engagement with their Physics unit of study.

Methodology

In addition to the Lecturing staff, the day was organised by four honours and PhD students. The transition day was announced to all students enrolled in Physics1A through mail-out (sent with their offer of course enrolment) and was also included into the schedule for the transition program that the Faculty (of Science and Engineering) ran during the University's orientation week. The transition day was held on Friday February 29, 2008 for students enrolled in Physics 1A.

Initially, we planned to conduct three activities over the day namely, these were a Physics quiz, building a bridge from balsa (with the challenge to hold the largest mass) and building a glider from balsa (with the challenge to give the longest flight). The students were divided into groups of three, with no prior-known team mates. The students strongly engaged in the bridge construction activity by cutting balsa strips to the precise size and mitre the angles to make strong joints for the bridge. Even though we had scheduled 45 minutes for this activity, the engagement was so strong that we had to expand it to 90 minutes (and as a consequence, we postponed the glider building exercise to a second transition day). The key concept behind this contest was for the students to work on solving the problem (the precise nature of which was of secondary importance, only that it contained Physics embedded within it) as a team, which could only be achieved effectively once each person felt comfortable working in a group. Additionally, through playfully doing simple (freehand) experiments they could modify their prototype designs and 'learn through discovery.' This motivated the students to further understand the underlying physics involved and think 'like physicists do'.

Upon completing the exercise, the students were most pleased with their work. The completed bridges were tested by placing a test block on the bridge, suspending a bucket from the block and pouring water into the bucket. The ten bridges that were built by the students were very unique in their design. The design that supported the greatest mass before breaking was declared the winner and the team awarded a prize (a first year physics text for each group member generously sponsored by Unibooks). The academic staff was surprised by the ingenuity of the students and the extent of engagement. In fact, two of the bridges could withhold a weight that exceeded what we had expected to be possible. During the lunch break in the day's program, a barbeque was organised by the Flinders University Physics Student Association 'WARPED'. The commencing students had a lot of fun communicating with each other and the higher year level physics students, discussing fun times already experienced and those yet to occur.

Findings and discussion

Initial observations made in the lectures and laboratory classes indicated that the 2008 first year students engaged with each other and their teachers significantly more than students did in the previous year. We have received overwhelming positive feedback from students (surveys, emails, conversations) about how the transition day had provided them with a fun and comfortable environment, and how it made them look forward to classes. The participants agreed that the transition session was something different and it lessened their feeling of

isolation. Our Flinders online (FLO) discussion board for first year Physics topic was very active (154 messages) compared to the previous year (77 messages). They helped each other by hinting (on the discussion board) different resources available to solve assigned problems for tutorials and assignments.

The students also exhibited independent group-level thinking. For instance, without prompting they created study groups to prepare for their final examinations. The impact of their active engagement may be further illustrated by the distribution of the exam results. Comparison of the Physics 1A exam results in years 2007 and 2008 are shown in (Figure 1). Although it is not preferable to adjust marks at the final exam, occasionally an adjustment of mark (~ a few percent) can significantly affect the pass rate due to the number of students who are at or just below the pass level. In 2007 (and has often been the case in prior years) the data had to be scaled by an offset of five marks in order to obtain a reasonable distribution and pass rate. However, in 2008, which did not need any scaling, we observe a clear increase in the success rate of the students. There is a relative increase in the percentage of students for the distinction and high distinction grades, and in essence, some of the students who achieved pass and credit levels have been pushed into the higher grade levels. The standard deviation has increased and the distribution has been broadened over the higher grades.

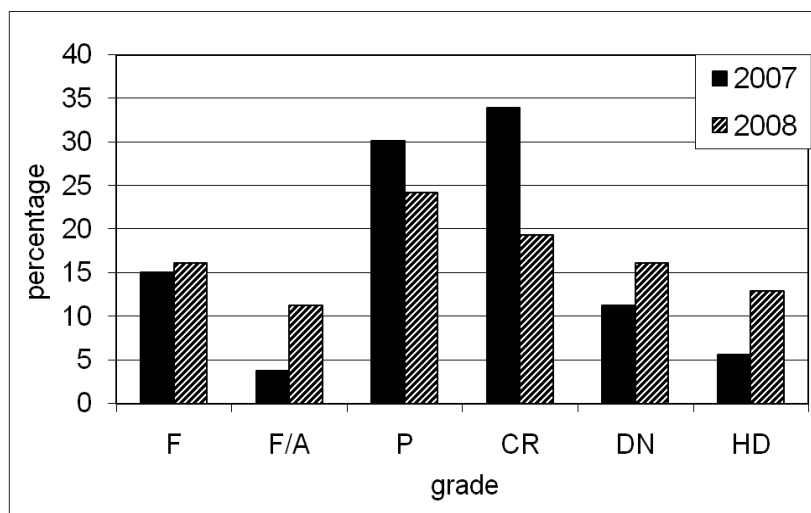


Figure 1: Physics 1A Exam result for year 2007 and 2008 with student number 53 for 2007 and 62 for 2008.

As noted earlier, we organised a second transition day on April 14, 2008 (during the mid semester break). However, the student turnout for this event was quite poor. There may be several possible reasons for this. For example, the students may be focused on assessment tasks, or other work commitments. They may travel home for the break, or perhaps they are so well transitioned into their University life that they see little value in a second activity! Of course, students are not likely to volunteer to turn up on campus when on a designated break, and this is probably the most likely reason for poor attendance.

In addition to our internal measures of the impact of the transition activity, the Physics 1A topic was ranked in the top three of all Physics units surveyed in a national ALTC Physics project (in which students expectations and experiences in first year physics units of various kinds were measured and compared), and was ranked best among mainstream Physics 1 units (refer <http://www.physics.usyd.edu.au/super/ALTC/service-pre-post-surveys/subjects.html>).

For more details about the ALTC Physics project and survey please see <http://www.physics.usyd.edu.au/super/ALTC/service-pre-post-surveys/>

Overall, our work supports the concept of ‘establishing prior experience’ noted by Entwistle, McCune and Walker (2001). We believe that the transition program, which provided a prior experience before engaging with the students in a formal classroom setting, played an important role in terms of successful engagement, progression, achievement and an overall positive first year experience. Notably our retention rate into second year physics increased by 25% in 2009, which may be due to a number of specific influences across the entire year, but could, at least in part, be due to successful, targeted, transition activities.

Conclusions

The transition day was successful for providing an effective initial first year Physics student experience. It allowed an opportunity for all involved to network, socialise and learn. As a result, the extent of student engagement and formation of study groups has increased compared to prior years. The 2008 exam results also support the perception that the transition day activity provided strong benefits to the overall student experience, as it demonstrated an improvement in performance. We have no doubt that activities aimed at enhancing the transition of commencing first year students are highly beneficial.

Acknowledgements

This project was supported by the Flinders University transition grant 380 0601. We thank the School of Chemistry, Physics and Earth Sciences for providing additional funding to maintain this initiative for 2009.

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