First Year Biology: A Dilemma for Mature Age Students

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Abstract

Traditionally mature age students are thought to be more academically successful than other groups of university students. However, in a first year biology topic at Flinders University this trend is reversed with a higher proportion of mature age students failing the topic compared to school leavers. Lecturers had an overall impression that mature age students in general perform better than younger students due to higher motivation and increased effort placed on studying. Interestingly, a portion of these students are high achievers and are quite vocal in their interest and enthusiasm for their studies which is most likely the cause of the lecturers' opinion. Therefore, the high failure/withdrawal rate of this group has gone unobserved, with little or no effort being put into programs for academic assistance or transition. We propose some ideas that could be put in place to benefit this high risk group of students.

Introduction

The university student profile has changed significantly over the last two decades with a much larger group of non-traditional students moving on to tertiary education than ever before (Hoskins et al., 1997; Trueman & Hartley, 1996). The number of mature age students in particular has increased dramatically, a jump of 52% over the years 1990 to 2000, as reported by Adult Learning Australia (2002). Mature age students are often considered one of the most academically successful groups of students within a university environment (Bourner & Hamed, 1987; Hoskins et al., 1997; Richardson & King, 1998). A number of authors have found that mature age students consistently perform better on an academic level than school leavers (Cantwell et al., 2001; Hoskins et al., 1997; Zeegers, 2004). In the case of higher success rates in non-science degree programs, academic differences have been attributed mostly to attitudinal variation between mature age and school leaver students; whereby mature age students are thought to be more highly motivated to succeed academically due to greater maturity and better study habits (Cantwell et al., 2001; Heath, 2007; Hoskins et al., 1997; McInnes et al., 1995; Richardson & King, 1998; Trueman & Hartley, 1996; Woodley, 1984; Zeegers, 2004). The life skills that mature age students have obtained outside the university are likely to be transferable to these degree programs. In the sciences however, one study found mature age students to be less

successful (Bourner & Hamed, 1987) which may indicate that the skills obtained outside of university are not as applicable to science courses as they would be to non-science courses.

A study by Hoskins et al. (1997) suggests that mature age students tend to be concentrated in the areas of humanities and the social sciences. Bourner & Hamed (1987) support this, suggesting that mature students make up less of the total student enrollment in the sciences, including biology. It appears that little effort has been put into examining the effect of age and background on students in the sciences (Bourner & Hamed, 1987; Woodley, 1984). Historically enrollment of mature age students in the sciences at Flinders University has been low; however over the past five years the number of mature age students enrolling in sciences has increased creating a need to examine the success of these students in this field. Existing research in this area indicates that mature age students have no academic advantage over their younger peers, and in some cases perform more poorly (Richardson & Woodley, 2003; Woodley, 1984). However, Cullen et al. (1996) found within a cohort of students taking two biology topics that younger students were more likely to fail or withdraw from the topics than older students. There is clearly a need to determine the extent to which mature age students are at risk in the sciences and to identify the source(s) of the problem.

Mature age students are more likely to have developed a deeper approach to their own learning (Richardson, 1994) and therefore should develop a deeper understanding of material than students who rely on superficial methods of learning. However, although this group of students may have an increase in maturity they also have a gap in background knowledge due to a break of several years since leaving high school. Within the School of Biological Sciences at Flinders University, students without a year 12 biology background were found to consistently fail at a higher rate than students with a background (Burke da Silva and Hunter, in review). This may therefore be contributing to the lower performance of mature age students who may not have studied biology at all, or not for many years. In a field of study that is changing at an ever increasing pace even a small gap in study may put students at a disadvantage.

Mature age students are subject to a range of transition issues that differ from other groups of students; they are typically 21 years or older, have family responsibility and many have been in the work force for some time (Kantanis, 2002; Knapper & Cropley, 2000). Considering the extra commitments that mature age students often have it is surprising that they are reported to perform so well compared to school leavers. While these life experiences may give them advantages such as improved communication, inter-personal skills, and motivation to complete their course, they may impinge upon their ability to do well in science-based courses.

Richardson (1994) indicates that mature age students have more appropriate approaches to studying, potentially due to intrinsic desires to develop on a personal level rather than purely for the gain of a qualification (Newstead et al., 1996). This perceived increase in academic success could potentially lead to a decrease in help provided to mature age students. Hoskins et al. (1997) specifically indicate that "*it is questionable whether they should be specifically targeted as in need of training in study skills*" (p 325). Whilst in some instances help may not be required in the sciences mature age students would likely benefit greatly from some form of guidance in the area of study skills. Being older with different lifestyles and experiences could actually serve to exclude mature-aged students from both social and academic interactions with the younger groups of students in a university setting therefore preventing them from acquiring skills from

student-to-student interactions with their peers, shown to be an extremely effective form of learning (Biggs, 2003; Topping, 1996). Specific transition programs directed at the needs of mature age students within the sciences should be considered.

Results

What do the Lecturers think?

We interviewed lecturers (n=10) within the School of Biological Sciences at Flinders University to determine their opinion of the academic ability of mature age students compared to school leavers. Their impression was that mature age students do either as well or better in biology topics compared to school leavers. Of those interviewed, 90% of lecturers commented that mature age students appear more highly motivated and showed greater effort and enthusiasm for their studies than did their younger peers.

How do Students Perform in First Year Biology?

A two-tailed t-test of students' grades in the first year biology topic BIOL1102 – Molecular Basis of Life, indicates that mature age students fail and withdraw at more than twice the rate as school leavers, 26.7% compared to 11.2% respectively (Figure 1). Student data from 2000 and 2006 (n=3298) showed a significant difference in failure/withdrawal rate between students beginning an undergraduate first year biology topic 0-1 years after completing high school compared to those who begin university 2 or more years after completing high school ($t=2.44$, $P<0.001$) (Figure 1). However, when final grades were compared between the two groups we found that a greater proportion of mature age students received a grade of High Distinction compared to school leavers, with a mean of 10.3% compared to 6.6% over the years 2006-2007 (Figure 2). Whilst these percentages are not significantly different ($t=2.19$, $P>0.05$) they may play a role in influencing lecturers opinions of mature age students, such that a group of mature age students appears to perform very well in first year biology and they are likely to be noticed and provide the influence on lecturer opinion represented in the interview results above.

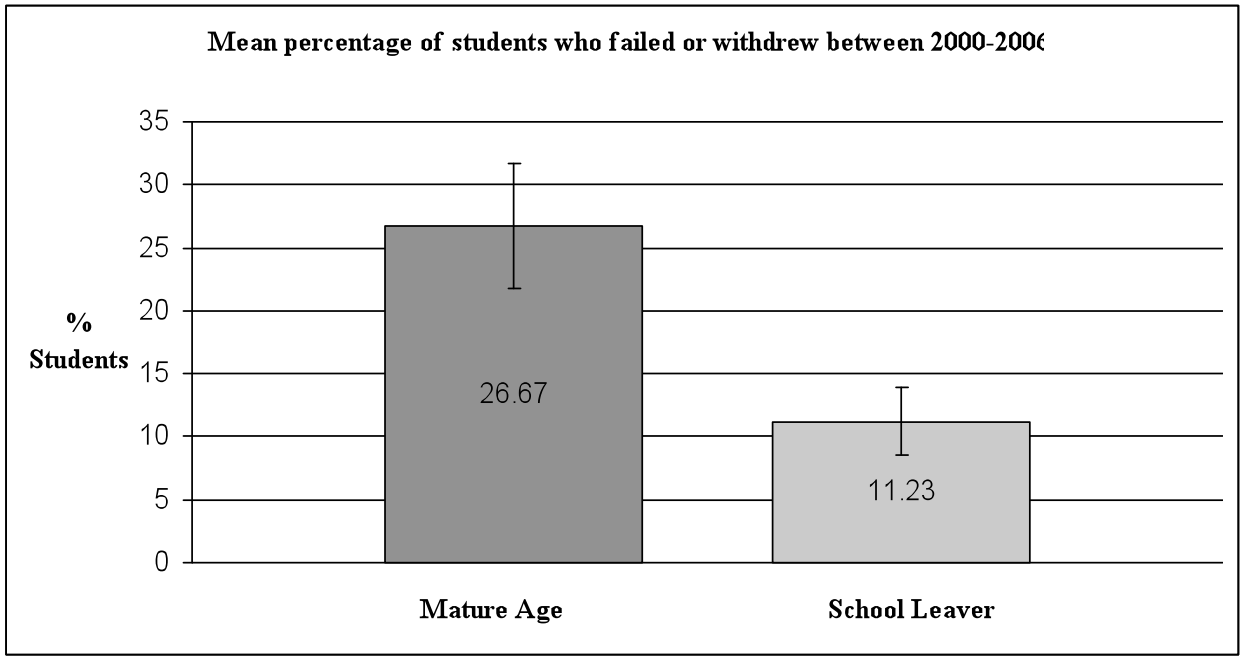

Figure 1: Mean failure and withdrawal rates of students enrolled in BIOL 1102 at Flinders University between 2000 and 2006, showing a significant difference ($t=2.44$, $P<0.001$). (School leavers = 0-1 yr gap, n=202. Mature age students = 2+ yrs gap, n=213).

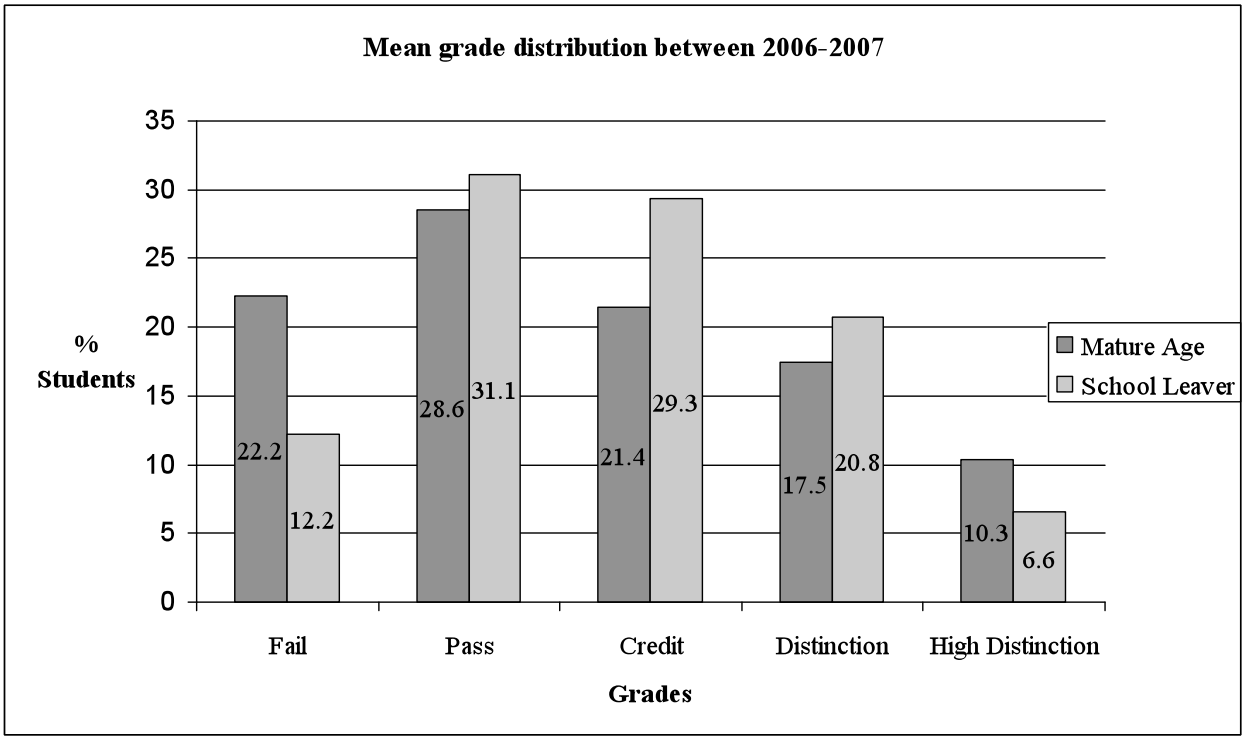

Figure 2: Mean grade distribution for mature age students and school leavers for 2006 and 2007. School leavers (0-1 year gap) n=665, Mature age students (2+ years gap) n=126. The subset of 2006 and 2007 were used as complete grade data was available for these years alone. We have considered the results from 2006 and 2007 as representative data due to the similarity in trends to the 2000-2006 data.

Improving Performance

In order to significantly affect the performance of mature age students in a first year biology topics, programs which target both transition and academic performance should be considered. Programs such as peer assisted study and bridging courses may be specifically tailored to a mature age cohort in several ways. It is especially important to consider the difficulties faced by mature age students compared to school leavers in designing various academic or transitional programs. Considerations should include timing; to enable students with children to attend later sessions, class size; to enable more direct communication with academics, and content modification; providing more or fewer remedial tasks depending on the experience of the cohort.

A trial of a mature age peer assisted study program has been implemented in 2008 at Flinders University incorporating the factors mentioned above. Sessions are held later in the day enabling students to collect children from school if required. Those students are then able to bring their children to classes with them if they so chose. Class sizes are smaller ranging from 10-16 students rather than the larger sizes for school leaver students of approximately 25 students per class. The content of these sessions is often modified slightly to allow the opportunity for students to attempt individual questions that they are finding difficult in the presence of a facilitator and classmates. To date feedback from mature age students regarding the implementation of this program has been overwhelmingly positive, however we are yet to collect data to determine whether there is a significant improvement in student performance.

Conclusion

While many reports in the literature have found that mature age students do better at the tertiary level than their younger peers (Cantwell et al., 2001; Heath, 2007; Hoskins et al., 1997; Richardson & King, 1998; Zeegers, 2004), it appears that this trend is not always followed in the sciences (Woodley, 1984). Reasons for increased grades amongst mature age students have been attributed to an increase in maturity, greater commitment to their studies, and a greater understanding of the importance of tertiary education (Cantwell et al., 2001; Heath, 2007; Hoskins et al., 1997; McInnes et al., 1995; Richardson & King, 1998; Zeegers, 2004). However, academic success in first year science subjects often relies heavily on previous understanding of the topic material (Burke da Silva & Hunter, in review). This understanding is most likely gained through high school study, rather than work in unrelated fields. Progression through the topic without a deep understanding of the key concepts will be severely limited due to the nature of biology where understanding relies on building on past knowledge. Such key understandings or threshold concepts (Meyer & Land, 2003) may be even more difficult for mature age students to grasp having typically not recently studied biology. Many mature age students have never studied biology at all, and this lack of background understanding in the topic places them at a great disadvantage compared to those students that have.

Our findings differ from the majority of published studies which show that mature age students are likely to outperform school leavers. It would be predicted that mature age students perform better in all degree programs than school leavers because they have stronger motivational skills (McInnes et al., 1995); approach learning in a more productive manner (Murray-Harvey, 1993); have stronger learning goals (Eppler & Harju, 1997); and generally take a deeper approach to

learning (Richardson, 1994; Zeegers, 2004). However these skills do not appear to help a large proportion of mature age students within biology specifically.

Our findings are also in opposition to the expectation of biology lecturers, who have the opinion that mature age students are more academically successful in general than other groups of students. This assumption appears to be due to a proportion of mature age students who are able to deeply understand the subject and perhaps perform better than most school leavers. In addition, mature age high achieving students are generally more confident in their knowledge and are more likely to approach academic staff to discuss topic details. Students who are confident enough to ask questions are typically also reasonably confident with their knowledge of the topic (pers obs.) while those who tend not to ask questions openly may have less understanding of the topic and consequently may fall under the radar of lecturers, especially in large intake topics. Therefore the students who are interacting with the lecturers directly are responsible for creating the false impression that mature age students, as a whole, are achieving higher academic success in biology than their class-mates, which may have resulted in no programs to specifically address this issue.

Science topics are especially rich in content and contact hours are often much higher than in non-science topics. This extra expectation may impinge more heavily on mature age students who have greater commitments in other aspects of their lives. Consequently, in order to reduce the discrepancy in academic success between mature age students and school leavers we must consider alternative ways of providing opportunities to succeed. In a brief search we found that several universities offer web-based information and small orientation programs specifically designed for mature age students (The University of Western Australia, 2008; Macquarie University, 2006; University of Edinburgh, 2008; Monash University, 2007) however programs embedded within topics that have a high failure/attrition rate may have greater success at retaining the mature demographic. The introduction of programs (transition and/or academic) to specifically target mature age students should be considered. The design of such programs must take into account the range of different issues that mature age students must manage. Programs with proven success in both transition and academic performance in traditional student cohorts, such as peer assisted study and bridging courses, if targeted specifically at mature age students may result in the improved performance and retention of this group.

As studies have found that mature age students are succeeding at high rates in non-science courses and as such are clearly able to perform well (Cantwell et al., 2001; Heath, 2007; Hoskins et al., 1997; McInnes et al., 1995; Richardson & King, 1998; Trueman & Hartley, 1996; Woodley, 1984; Zeegers, 2004), we must look for ways to overcome whatever barriers are preventing them from succeeding in the sciences. As the demand for well trained scientists increases and in view that mature age students are enrolling in science courses it is essential that we implement either proven aids or look towards developing new and innovative methods to retain this highly motivated and capable group.

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