Is the university system in Australia producing deep thinkers?

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Teaching and learning research since the 1980s has established a trend in students' learning approach tendencies, characterised by decreasing surface learning and increasing deep learning with increasing age. This is an important trend in higher education, especially at a time of increasing numbers of older students: are we graduating more deep learners? In revisiting these trends, our study elaborates on the past model by using the revised two-factor questionnaire (R-SPQ-2F). The current study suggests that trends in the shift between surface and deep learning approaches are more related to other factors rather than to age per se. Importantly, school leavers do not exhibit significantly weaker trends towards deep learning approaches than do mature-age students.

Keywords: surface learning, deep learning, university teaching, mature-age students

Introduction

University students, along with all members of the university community, have to respond increasingly to the changing nature of university life. Recent studies record, for example, increasing numbers of students studying full time while working part time and studying off-campus and/or on-line (Allen & Seaman, 2010; Hall, 2010). Importantly, mature-age students, that is, those over the age of 25, represent approximately a quarter of all university students in Australia (Chesters & Watson, 2013). In the new generation of universities, (such as ours and other regional universities) mature-age students account for around a half of all students. The effects of these changes on how students learn are important, and may be a significant factor when it comes to university participation by older students and the quality of graduates from universities.

Seminal studies from the mid-1980s and the 1990s (for example, the study by Biggs, 1987) demonstrated that for Australian post-secondary (university and college of advanced education) students, there was an age relationship for both a declining propensity for surface learning and an increasing propensity towards deep learning. It was argued that older students are more likely to learn concepts at university at a deeper level than their younger counterparts. Gow and Kember (1990), for example, highlighted that older students are less likely to adopt a surface approach to learning and more likely to implement a deep approach compared to younger students. Such studies thus supported the idea that age is an important factor in determining what approach a student will take towards their learning. It may be argued, therefore, that with an ageing university student population, there is a sector-wide increase in deep learning graduates.

Here we consider the implications of such a view, testing it against more recent data captured using the revised two-factor study process questionnaire, gained from a student cohort with a broader age distribution

than was available to researchers such as Biggs. As universities become increasingly required to produce work-ready graduates (Eraut, 1994; Orrell, 2004; Hughes *et al.*, 2013), it may be expected that, given the scholarly nature of university education, part of that work readiness should be the development of the ability for deep thinking. Assuming a student's preferred approach to learning is a reasonable predictor of their tendency towards deep thinking, an examination of age-learning approach relationships and the patterns of graduation by age provides valuable insight into the potential habits of university graduates in Australia.

1980s and 1990s – Biggs' Study Process Questionnaire

Here we examine the relationship between degree completions at Australian universities and data from Biggs' studies of student learning approaches using his Study Process Questionnaire (SPQ). This survey tool was validated in the 1980s and 1990s, and has become a standard for such studies. The tool is predicated on identifying the degree to which a student adopts surface, deep, or achieving learning approaches. Broadly speaking, a deep approach to learning involves the use of strategies and the adoption of motives which are common to students who strive to understand concepts at a deep level, and for a surface approach, strategies and motives that are common to students wishing to do only what is required to pass a course. An achieving approach involves a student using and adopting strategies and motives that allow the student to obtain target grades and other rewards by estimating the learning effort required to achieve a particular grade.

A question that is as relevant now as it was in the past is whether mature-age graduates have a higher likelihood of completing their degree with a deeper approach to learning than students who entered university immediately or very shortly after completing school education. This leads to another important question, that is, whether graduates are finishing university at a time when the surface approach to learning remains the dominant tendency. For universities, the answers to such questions may influence curriculum and pedagogical choices as efforts are made to improve learning outcomes for all students. In order to address such issues, it is worth returning to Biggs' original studies.

Biggs (1987) published a study based on completed SPQ returns from 2,365 students from both the (then) College of Advanced Education sectors (1,512 students) and the university sectors (853 students), focussed on students enrolled in arts, education and science courses. He reported that surface approach scores for both full-time and part-time students in both educational sectors dropped steadily from the age of eighteen to the mid-twenties, then stabilised until the age of thirty-nine years, after which the scores dropped. In contrast, deep and achieving approaches reach a minimum at age twenty-two, increasing in what Biggs calls a 'strong linear fashion' thereafter.

In a later Australian study, at the same university as the current study (Southern Cross University – SCU), and also using the Biggs' SPQ, Regan (1996) confirmed Biggs' findings. She identified a relationship of age and learning approach, and highlighted the links between mature-age students and higher deep approach scores compared with younger students, and between lower surface learning approach mean scores for mature-age students and higher scores for younger students. It should be noted that, while charting the Biggs (1987) and Regan (1996) data together might allow for a comparison of the data sets from Australian Universities, Biggs (1987) does not report adequate raw data to allow for such a comparison of age profile groups.

More recently, also working with Australian higher education students and also using Biggs' SPQ, Zeegers (2001) supported the idea that the age of a student has a significant impact on scores recording their learning approaches. Zeegers reported that older students commonly achieve a higher mean score on the deep approach and a lower mean score on the surface approach than do younger students, describing this situation thus: 'The division of students based on school-leaver status and participation in all the SPQ trials showed that student age has a significant impact on SAL [student approaches to learning], with older students generally displaying a higher deep approach and achieving approach and a lower surface approach' (Zeegers, 2001, p. 126). Zeegers divided students into two age groups, recent school leavers and non-school leavers, noting that the latter cohort consistently achieved higher scores for the subscales that measure the achieving strategy, the deep strategy and the deep motivation. While Zeegers found that only one of the five trials in his study indicated a statistically significant difference in terms of surface approach between the two groups (despite mean scores being consistently higher), there was a statistically significant difference between the two groups in all but one of the five trials for both deep and achieving approaches, implying that the deep learning approach has a tendency to change with age. This pattern, Zeegers argues, indicates that 'older students are

Table 1: Australia-wide Bachelors award completions, 2012

Age group	*Number of completions*	*Age group*	*Number of completions*
18	359	26	5,284
19	7,355	27	3,888
20	25,236	28	3,125
21	36,007	29	2,449
22	29,881	30-39	11,755
23	20,288	40-49	5,343
24	11,679	50-59	1,759
25	7,448	60+	316

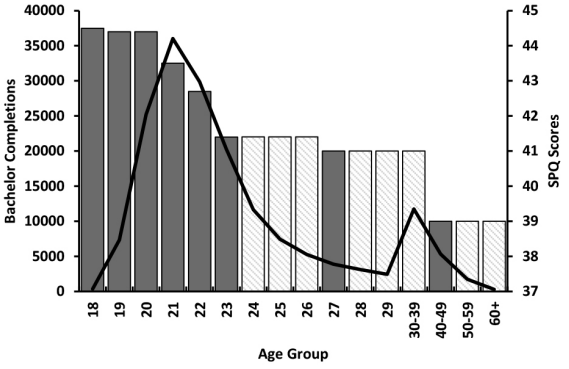
Source: ABS, 2013.

more willing or able to commit themselves to the use of learning strategies which require a greater effort on their part … [and that] older students use more elaborate study approaches and are in general more committed to their study' (pp. 126-127). The evidence for this, according to Zeegers, lies in older students scoring higher Grade Point Averages (GPA), completing more units of study, and achieving higher completion rates.

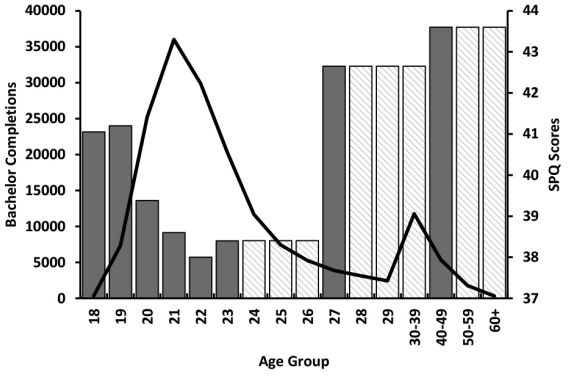
To bring these findings into a contemporary context – that is, to consider how such patterns apply to contemporary cohorts of higher education students – the most recently available Australian Bureau of Statistics university completions data (2012) provide a relevant indication of graduate completions in Australia (ABS, 2013; Table 1). Plotted against the patterns of age-related tendency towards surface or deep learning approaches are derived from Biggs' data (Figure 1), the graduate numbers provide a telling picture of the tendency of graduates in terms of their learning preferences. This is worthy of discussion for both universities and employers.

Patterns of learning approach, student age and graduation age

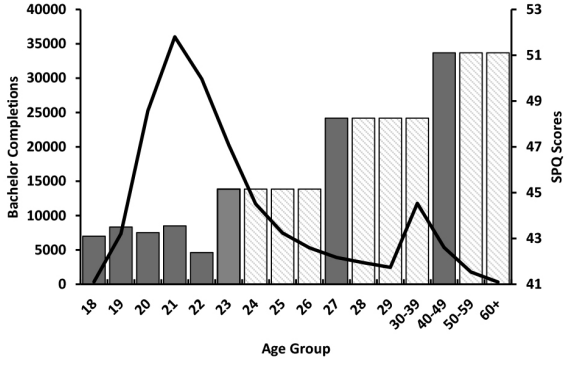
In learning terms, Biggs' data show a reasonably notable drop-off in surface learning scores after the age of 20, a trend that is paralleled with a drop-off of achieving approach scores. The rise in deep learning scores with age is less evident. While this evidence implies an early persistence of achieving and surface approaches, the uptake of deeper learning approaches is slower. Importantly, even at present, with the growing proportion of mature-age students attending higher education, the peak of graduations occurs around the age of around 21-22. This is an age that corresponds with Biggs' patterns of the onset of declining



Biggs Surface Approach



Biggs Achieving Approach



Biggs Deep Approach

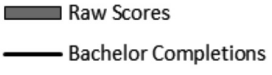


Figure 1. Measures of learning approach scores from Biggs (1987) (columns against SPQ scale) by age, against annual award completions (full line) derived from ABS data. The age groups used replicate the groups used in the ABS data, and thus the Biggs data for >23 year old were averaged for the age ranges 23-26, 27-39 and 40-60+.

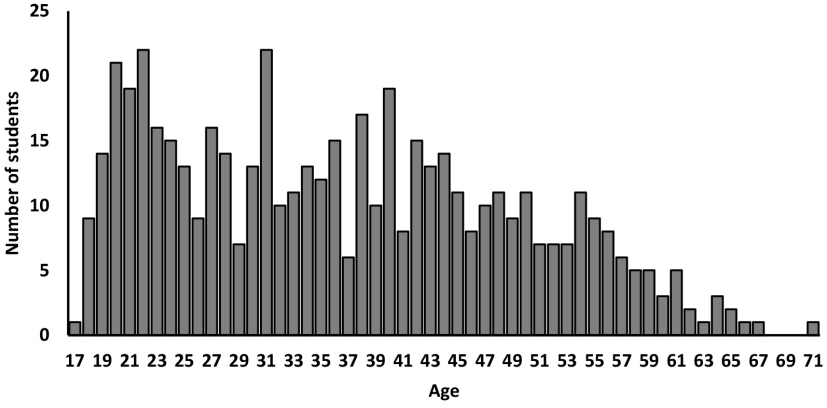


Figure 2. Age-frequency distribution of respondents to the 2013 Study Process Questionnaire survey

surface and achieving approaches, and the start of a slight rise in deep learning approach. On the face of it, Biggs' data also imply that the greatest number of graduate degree completions occurs at an age where deep approach is on average lower than in older age groups where fewer degree completions occur. Similarly the greatest number of degree completions also occurs when surface approach is higher compared to older age groups.

Does this mean that Australian universities are graduating a cohort of surface learners? Before accepting such a conclusion, it should be noted that Biggs' student cohort was dominated strongly by school leavers, i.e. the 18-year-olds to those in their early 20s, and that the patterns identified in that work are largely only relevant to this younger student cohort. Although we do not have the exact numbers of students from each age group, Biggs (1987, p. 93) does state that, 'age effects are difficult to assess in view of the fact that samples of older students are increasingly selective'. Biggs' data do not have much to say about the behaviour of mature-age students. The research was conducted before the time of growth in mature-age enrolment in Australian higher education. Furthermore, Biggs' conclusions arose out of an approximately two to one response rate from university and college of advanced education students. The degree to which Biggs' data can now be applied to the contemporary Australian university system needs to be tested.

Revisiting the model of age-related student learning approach

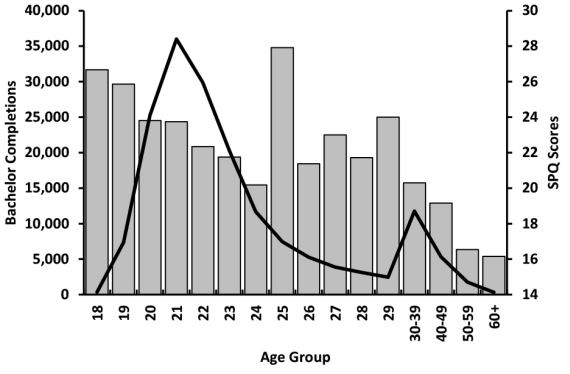
More recently (2013), we revisited this issue of age relationship to learning approach using a revised version of Biggs' original (1987) Study Process Questionnaire (i.e. Biggs *et al.*, 2001).

The older version of the SPQ tool uses three main subscales (Deep, Surface, and Achieving), whereas the new SPQ (2F-R-SPQ) has only two main scales (Deep and Surface). This is why the data sets arising from Biggs', Regan's, and our studies are not directly comparable, despite the comparability of the patterns identified in each study. Biggs *et al.* (2001), in his revision of the SPQ tool, states that 'using confirmatory factor analysis, the SPQ can most conveniently be described in terms of two factors: deep and surface, with achieving motive and strategy subscales aligning themselves on both factors'.

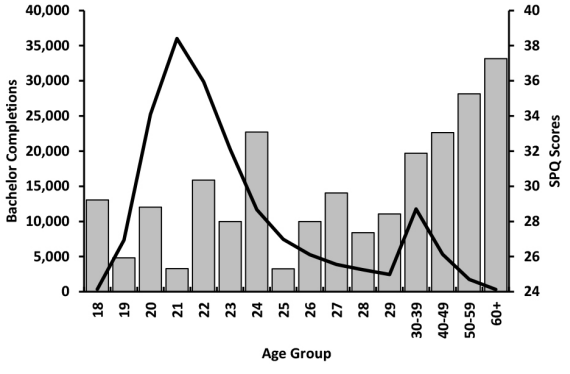
Our focus was to reinvestigate the link between age and the type of learning approach taken in light of the changes in student composition of universities since interest in learning approaches was at its peak in the 1980s-1990s. This new work contributes to the earlier studies in which older students were suggested to be more likely to take a deep approach to learning. The relevance of this study stems from the fact that our university is typical of the newer generation of Australian universities, in that it has a higher than average proportion of mature-age students (approximately a half of all students) compared to the many other major universities in Australia; the national average is now around a quarter of enrolments. Our study was undertaken at Southern Cross University, and involved a self-selecting group of students across the university who completed an anonymous online survey, distributed to all students at the university, on the Qualtrics platform. Students responded from across the disciplines, and included students from the Schools of Education, of Law & Justice, of Health & Human Science, of Business, of Arts & Social Science, of Tourism & Hospitality, and of Environment, Science & Engineering. The survey comprised 20 study process questions, based on Biggs' original survey, plus additional questions regarding age, gender and current GPA. The return of 560 students represents around five per cent of the targeted population, and compares favourably with Biggs' 853-strong university student return. Importantly, the age-frequency values are more evenly distributed across the range from school leavers to mature-age students (see Figure 2).

Our data are presented in Figure 3 as SPQ scores versus age group, plotted with the 2012 ABS graduate age data. The pattern of values by age appears to represent two

distinct cohorts of students, separated around the age of 25. The younger (18 to 25 years old) and older (over 25 years old) groups exhibit similar patterns in the change in learning approach, namely that the surface learning approach score declines through time, and that the deep learning approach score increases through time. These are not necessarily unambiguous declines and rises. In an echo of Biggs' data, the patterns suggest that it may be easier for students to gain and/or teachers to support a reduction of a surface learning approach, than it is for the adoption of a deeper learning approach. Furthermore, it appears that while the overall patterns are similar for the 25 and under and over 25 year old cohorts, the older groups appear to start with a greater propensity towards surface learning and less propensity towards deep learning than the younger group.



Lake & Boyd Surface Approach



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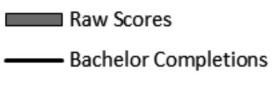

Figure 3. Measures of learning approach scores from the 2013 SPQ survey (columns against SPQ scale) by age, against award completions, derived from ABS data.

There are many variables potentially affecting students' engagement with learning. It has been suggested, for example, that students' secondary education has an impact on their approaches to learning (Harper & Kember, 1986). The reasonable similarity between the under 25 year old and over 25 year old groups suggests that the changes are related to progress through the three or four years of a degree course. The trends are likely to be weakened by having students enrolling at all ages, and many enrolling part-time (60 per cent at our university), and therefore taking longer to complete their degrees. This would provide a running averaging of scores. Further issues may be related to the specific demographics of our cohort, perhaps more typical of the new generation and regional universities, issues such as the low SES enrolment (26 per cent at SCU) and first in family enrolment (just under 70 per cent at SCU). Overall, however, while the study has followed previous research in its assumption that the key patterns are age-related to some extent, it appears that the changing tendencies may be better explained as being stage related.

Discussion

Although a student's first year at university has been shown to provide a solid basis for academic success (Burton *et al.*, 2009), many first year students attending Australian universities – whether coming directly from secondary school or entering as mature-age students – are considered ill-prepared for tertiary education; many students are '… uncertain of what was expected of them' (Krause *et al.*, 2005, p. 66). Conventionally, this has been couched in terms of contrast between school leaver and mature-age entrants. It is claimed that uncertainty exhibits itself amongst first year students as low motivation towards their studies (McInnes *et al.*, 2000). On the other hand, as Zeegers (2001) claims, the older a student, the more willing or able he or she is to commit to the use of elaborate but effective learning strategies that, by their very nature, require greater effort. Furthermore, older students have a greater ability to commit to their studies, and are more successful in completing their degrees (Zeegers, 2001). Such learning characteristics of older students may be attributed to three factors: motivational factors; the impact of secondary education; and the role of life experiences (Harper & Kember, 1986; Zeegers, 2001).

Such arguments reinforce the notion that age plays a significant role in a student's tendency towards approaches to learning (i.e. Biggs, 1987; Regan 1996). Nevertheless, there are many other factors that influence

a student's approach to tertiary studies. Zeegers (2001) argues that both age and their tertiary experience are likely to have an impact on a student's learning. Richardson (1995) determined that the mode of university entry has a major impact on the students' approach to learning, although he argued that a school leaver entering directly into university seems to be less motivated towards a meaningful or achieving approach compared to students who take a break between high school and university, even a break of just one or two years. Supporting this idea, Martin (2010) more recently suggested that participation in a gap year allows for resolution of motivational deficits between high school and university.

From our studies, rather than reflecting the importance of age per se, this suggestion would allow a student to enter the same cohort at a stage when the change in balance between surface and deep learning approaches has commenced, perhaps resulting in better degree performance. If stage rather than age is the important variable, it is relevant to note the apparent difference between the magnitudes and rates of change of scores between the mature-age and usual age groups. Consideration of such patterns, plus issues of life stage as it relates to a student's approach to university studies, suggests that further research would usefully build on the assumption of stage rather than age as the critical variable influencing the adoption of surface or deep learning approaches.

Conclusion

Our revisiting of the issue of learning approach reinforces the trend towards decreasing surface learning and increasing deep learning that Biggs identified in the 1980s and others since have supported. This is, of course, an important conclusion for an educational institute, especially one based on learning as scholarship rather than technical competence. However, our study elaborates on this model, and suggests that the trend is more related to other factors rather than to age per se. Importantly, the school leaver cohort (under 25-year-olds) does not exhibit a significantly weaker trend towards deep learning approaches than the mature-age cohort. Indeed both cohorts appear to behave in similar ways, despite their likely difference prior educational history, life experience and expectations of higher education.

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