

# Attitudes and perceptions of first year Engineering students

Jo Devine

*University of Southern Queensland*

*Corresponding Author Email: devinej@usq.edu.au*

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## Structured abstract

### BACKGROUND

Part of the learning which occurs during the first year of a student entering higher education concerns the development of an understanding of the expectations and norms of the higher education environment (Lawrence, 2005). A student's understanding of what is required for successful academic progress can be substantially different to that of educators at the institution (Crosling et al., 2008). Issues of the number of expected study hours, prioritisation of study against other commitments and time management are often cited by academics as concerns about incoming cohorts of students. Collier and Morgan (2008) identified three key areas where students have difficulties meeting the expectations of lecturers; balancing workload and priorities, the explicitness of expectations and assignments, and issues related to communication and problem solving. Consideration of these categories of misunderstanding has been used to inform this study.

### PURPOSE

This study aims to trial the use of a scenario based survey to gather a broad snapshot of the expectations, perceptions and attitudes of a cohort of first year engineering students.

### DESIGN/METHOD

A set of scenarios has been developed based on a research question around first year student expectations of university. These scenarios were tested and refined using student focus groups to ensure authenticity, and were then administered to a class of first year students via an in-class survey early in second semester 2013. Students were asked to choose their most likely response to study related scenarios that are typically encountered by students. The anonymous data collected was analysed for indicators of student attitudes and perceptions.

### RESULTS

The use of a scenario based survey provided an efficient means of gathering broad data about student attitudes, perceptions and expectations across a cohort. The results uncover a mis-match between student expectations and the demands of higher education and some small provide insight into the extent of misalignment of student expectations and the types of mismatch which are most prevalent in this cohort. Such misalignments indicate that mid-way through their first year students' expectations are at variance with institutional expectations.

### CONCLUSIONS

The question of how institutions can assist student transition into first year engineering requires an understanding of the mis-conceptions that may exist and consideration of how the cultural context of engineering education might be broadened and explicated so that it becomes more inclusive and easily negotiated by a broader range of students.

This study is part of the first stage of an ongoing investigation into student transition to university, their development of cultural capital over the period of their studies and its effect on their subsequent academic success.

### KEYWORDS

Student expectations, First Year

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## Introduction

Universities worldwide have been under pressure, since the mid-20<sup>th</sup> century, to increase access to and participation in higher education (Trow, 2000). Higher education is no longer an elite system, available to only a small section of society, but rather is becoming available to a much wider portion of society (Trow, 1973). As a result, students from increasingly diverse social and academic backgrounds are enrolling at Australian universities (Krause, 2005a), and participation in higher education by previously under-represented groups is increasing (Crosling, Thomas, & Heagney, 2008).

As a result of this student diversification increasing numbers students from previously under-represented social groups are enrolling in engineering. Students from groups not previously well represented in higher education have various levels of academic preparation and study skills, tend to be less well informed about what to expect (James, Krause, & Jennings, 2010) and often have significant additional work and family commitments to be balanced with their studies. Many of these students report more difficulty comprehending material and adjusting to the teaching styles of university than more conventional students (James et al., 2010).

This study aims to trial the use of a scenario based survey, together with some more conventional survey questions about study plans, to gather a broad snapshot of the expectations, perceptions and attitudes of a cohort of first year engineering students which includes many students from under-represented groups.

## Background literature

There has been an increasing focus on the student experience in first year within the Australian HE sector. Student success in first year is one of three indicators which the National Teaching and Learning Performance fund uses to allocate funding to institutions. This, together with an increasing focus on student experience in a competitive HE sector, has led to an increasing focus on first year student experiences and retention (Crosling et al., 2008; Krause, 2005b).

The experience of university studies and academic culture varies greatly for students of different backgrounds (James et al., 2010; Read, Archer, & Leathwood, 2003). It is often assumed that if students have the ability, motivation and determination then they should be able to succeed at university regardless of their demographic backgrounds. However, Lawrence (2005) suggests that students must master the academic culture; the norms, discourses and tacit expectations of academia in order to succeed academically.

Part of the learning which occurs during the first year of a student entering higher education concerns the development of an understanding of the expectations and norms of the higher education environment (Lawrence, 2005). A student's understanding of what is required for successful academic progress can be substantially different to that of educators at the institution (Crosling et al., 2008). Issues of the number of expected study hours, prioritisation of study against other commitments and time management are often cited by academics as concerns about incoming cohorts of students.

One indicator of students who do not come from a traditional university participant background is that of 'first in family' or 'first generation' students; these are students whose parents have not completed a university degree (Collier & Morgan, 2008). Such students can arrive at university with a 'cumulative disadvantage' (Collier & Morgan, 2008), in that they may not have access to the particular "types of knowledge, ways of speaking, styles, meanings, dispositions and world views" (Margolis, 2001) that are available to students from more conventional backgrounds. Collier and Morgan (2008) argue that such variations in cultural capital, based on parents' educational experiences, correspond to important differences in students' abilities to respond to faculty expectations.

When there is such a disconnect between a student's educational expectations and those of their institution it can be alienating for the student (Crosling et al., 2008, p2), which can impact on their engagement, academic performance and ultimately their retention in the higher education. Engagement and productive learning are seen as a vital factor in students' continuation at university (Scott, 2005, xii). Academic engagement is reflected by students' attending classes, their active involvement with staff and fellow students and with learning resources (Nelson, Clarke, & Kift, 2012; Scott, 2005; Tinto, 1975).

Collier and Morgan (2008) identified three key areas where first in family students had difficulties meeting the expectations of lecturers; (1) balancing workload and priorities, (2) the explicitness of expectations and assignments, and (3) issues related to communication and problem solving. Consideration of these categories of misunderstanding has been used to inform this study.

Effective time management is significant in facilitating a smooth adjustment to university life and a positive experience of first year (Krause, 2005b). Van der Meer et al (2010) found that although first year students are often realistic about the time they will need to spend on their studies, many found it difficult to organise their study time and keep up with their work. First generation students in particular have a tendency for over-commitment and time management issues (Collier & Morgan, 2008).

Interpretation of course descriptions and assessment instructions is an area of difficulty for many students (Collier & Morgan, 2008; Lawrence, 2005; Read et al., 2003). First generation students look for more detail on the mechanics of completing assignments but also take many of their cues about what is acceptable from observation of the way that the lecturer speaks about assessment (Collier & Morgan, 2008). Lecturers, on the other hand, tend to believe that students should master the course material and then 'only have to follow the instructions' in order to complete assessments (Collier & Morgan, 2008).

The language used in teaching at university can be foreign and hard to understand for many students (Lawrence, 2005); the use of technical 'jargon', vocabulary and structure of the discourse can be confusing and generate levels of fear and uncertainty in students (Collier & Morgan, 2008). While course staff see their role as 'here to help with course content', students can feel unsure of the correct mode of contacting staff and the extent of the assistance they should be seeking (Collier & Morgan, 2008).

## **Methodology**

"First generation" was chosen as the indicator of a non-traditional student for the purpose of this study. In order to investigate how our cohort of first year students was expecting to engage with their studies a set of scenario based questions was developed based around indicators of engagement and common misconceptions of first generation students, as identified by Collier and Morgan (2008). Specifically, the three areas to be explored in this study are;

- Time management and prioritisation of study and other commitments
- Problem solving – the way that students choose to solve difficulties with course material; the strategies they adopt for seeking assistance.
- Language difficulties – how do students overcome difficulties with the language used by lecturers in their formal classes

Based on these categories and the work that Collier and Morgan (2008) reported on exploring these areas of tension, a set of scenario ideas was developed. The object of each scenario was to describe a dilemma where students' responses could vary in a number of ways reflecting the issues explored by these researchers.

### **Development of scenario questions**

Scenario based survey questions were chosen as a more authentic means of gathering student perceptions than "belief" surveys (Brush, Wang, & Watson, 2008). In a scenario

based survey participants are asked to choose a behavioural response to a situation rather than choosing an articulated belief or attitude.

Authenticity of the survey instrument was ensured by trialling the scenario ideas and developing both the scenario and possible responses using two focus groups of students (who were not subsequently part of the cohort surveyed). Using the discussions in these focus groups the scenarios and their wording were refined. The factors which would affect a student's choice of response were identified and subsequently clarified in the scenario description.

Possible responses to the scenarios were developed with the focus group students. The students in the focus groups were second and third years, who verified that they had indeed faced similar situations during their studies. They were asked to identify a range of responses they had either used or considered in similar situations.

As the focus groups comprised students who were relatively advanced in their studies it was unsurprising that they initially articulated responses that corresponded closely to approaches that would have been recommended by instructors. The fact that they had succeeded thus far in their studies indicated that they had developed an understanding of the expectations and norms of their educational environment and this was demonstrated by their eagerness to give the 'correct' response to scenarios. They measured correctness by their perception of the acceptability to institutional staff of a particular approach. It was only when pushed that they agreed that there were other, less acceptable, approaches that they had observed 'other students' attempting or that they may have considered when they were new to engineering studies.

The wording of the scenarios and possible responses was refined on the basis of the focus groups. Language and terminology was made less 'academic' and based on the language used by the focus group students in their responses. The aim of this adjustment was to increase the accessibility of the scenarios presented to the students in the survey so that they would relate more closely to the possible responses.

### **The survey instrument**

The final set of survey questions essentially comprised 3 parts; some basic background information, direct time management and planning questions and two scenarios.

Background information questions:

- Which program of study are you undertaking?
- How many years have you been studying your current degree?
- How many times have you enrolled in this course (engineering statics)?
- What was your parents'/ caregivers' highest educational level attained?

It was decided to address the issue of time management directly rather than using a scenario as no good, generalisable scenario on this topic emerged from the focus groups. In addition, a mix of scenarios and direct questions was more appropriate for the in-class nature of the survey administration. These questions comprised:

- How many courses are you enrolled in this semester?
- On average, how many hours do you work during semester?
- How many hours per course are you planning on studying (including class attendance)?

Two scenarios were chosen for use in the survey which addressed the way in which students managed the issue of language difficulty in class and their approach to basic problem solving, which incorporated elements of communication and perceptions of support available. These scenarios and the possible responses are shown in Table 1 below.

**Table 1: Scenario based questions used in the survey**

<b>Scenario 1:</b>	You are studying one of the first topics in this course (Engineering statics). You have been to the lecture and have read the text and course material
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	<p>relating to that topic.  When you try to do some of the recommended problems you can do the first couple (they are similar to the worked examples) but don't know how to even start any of the next three problems.  You notice that there are no questions like the ones in this topic on the course assignment.  What do you do?...</p>
Possible responses	<ol style="list-style-type: none"> <li>1. Ask course staff to explain how to tackle to the problems</li> <li>2. Look for relevant resources or information on course / university websites</li> <li>3. Ask your class-mates if they know how to do these problems</li> <li>4. Ask a work colleague or other contact outside the university for help</li> <li>5. Do a Google search of the internet for similar examples</li> <li>6. Move on to the next topic, which relates to an assignment question</li> <li>7. Review the course materials and textbook again – try to relate them to the questions</li> </ol>
<b>Scenario 2:</b>	<p>You have been attending lectures for Engineering Statics but you find it difficult to follow what the lecturer is saying.  You find that your mind tends to 'wander' during these lectures. This is a difficult subject and not following the lectures is making it even harder for you to understand the work.  You are worried about how you will go in this course.  What do you do?...</p>
Possible responses	<ol style="list-style-type: none"> <li>1. Do some extra preparation/study before the lectures so that you know a little about the topic ahead of time in the hope that this will make it easier to follow</li> <li>2. Start to put your hand up in class to ask for clarification when you find you are not following</li> <li>3. Begin taking more notes in class in an effort to keep yourself focussed on what is being said</li> <li>4. Complain to the Faculty about the lecturer's teaching</li> <li>5. Skip the lectures so that you can spend the time studying the material by yourself or in a study group</li> </ol>

### Administering the survey

The survey participants comprised 45 students from a cohort of, mainly civil and mechanical, first year engineering students, 58% of whom identified themselves as the first in their family to attend university via the background question shown above.

The survey was administered during an introductory 'Engineering Statics' class. Data was collected anonymously with the use of in-class 'clicker' technology. This technology allows students to choose a response to a question posed by the lecturer via an individual hand held 'clicker' device. Responses are collated electronically and aggregated responses are available instantly on an overhead screen. The question results were then discussed with students, within the context of the course, as part of their introductory class.

The responses given by each respondent to the questions were collated by clicker identification number, although participant anonymity was preserved as the clickers were distributed randomly and there was no class attendance recorded. This technology enabled correlation of responses to different questions via clicker number.

### Survey Results

It must be recognised that what a person says they will do and what they actually do could differ widely for a number of reasons. It is not suggested within this paper that the surveys

are indicative of what students actually did during the semester. Rather, the responses are used as a reflection of the expectations that students, who are typically mid-way through their first year of engineering studies, have with regard to their studies.

### How students planned to spend their time

Despite 93% of the class being enrolled in a full time course load (the remaining 7% had a three quarter load), 37% of the class were spending more than 15 hours per week in paid employment (Figure 1).

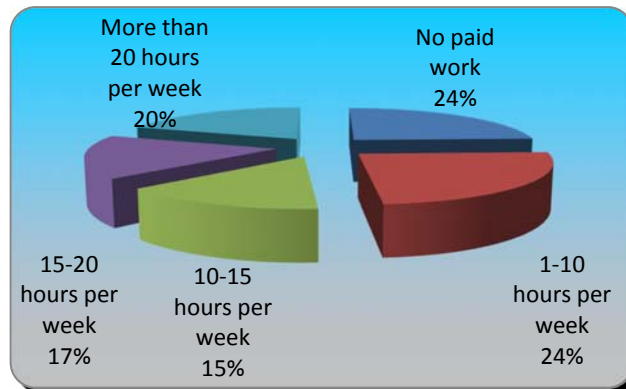


Figure 1: Hours per week spent in paid employment during semester

After discussion about expectations of time spent studying students were asked to spend a few minutes calculating how long they planned to spend per week on each course.

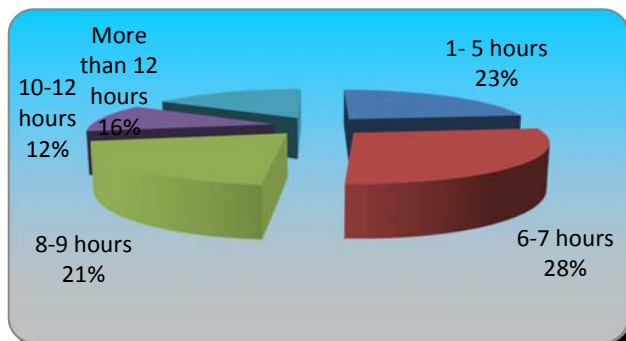


Figure 2: Hours per week planned studying

Responses showed that 51% of the class planned on spending seven hours or less per week on each course, including the scheduled four hours of lecture and tutorial time (Figure 2). This is well below the institutionally recommended level of 10-12 hours per week per course. It is particularly interesting as these figures were given by students only minutes after a discussion of the demanding nature of the Engineering Statics course and the recommended study hours. Of the students planning on spending less than 7 hours per week studying, 54% did not work or worked less than 10 hours per week. First generation students tended to give a lower estimate of hours than students with university educated parents. Students who had been studying for more than a year tended to report a plan for higher weekly hours of study.

### Scenario responses

The responses to Scenario 1, concerning a student experiencing difficulty with the prescribed formative problems, are shown in Table 2.

Table 2: Aggregated responses to scenario 1, concerning response to study difficulties

Scenario 1: Problem solving	Responses
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<b>Can't complete formative problems</b>	Count	Weighted percentage
Do a Google search	38	23.8%
Ask your class-mates	34	22.7%
Review the course materials and textbook	31	16.5%
Ask course staff to explain	20	11.6%
Move on to the next topic	20	8.4%
Look for relevant institutional resources	17	10.5%
Ask a work colleague or other contact	15	6.3%
<b>Totals</b>	<b>175</b>	<b>100%</b>

Students were asked to select as many out of the seven possible actions as they would try, and to rank them in the order that they would try them. Some students nominated all seven strategies and others chose only one. The weighted percentage shown in Table 2 incorporates the ranking order as well as the number of students saying they would use a particular strategy.

Students showed a clear preference for 'googling' as a primary means of finding assistance, followed fairly closely by asking their peers. Interestingly, asking course staff for assistance was nominated as a first option by seven students, all of whom had been studying for more than a year prior to joining this course. The only other participant who had been studying for more than a year nominated seeking help from course staff as their second option.

Responses to the scenario regarding difficulties following the lecture, summarised in Table 3, show that most students seem willing to take responsibility for their learning through additional preparation and note-taking. If the language used in the lecture (for example jargon or unknown technical terms) was the problem, as implied by the discussion surrounding the presentation of the scenario, then these measures could provide some, although laborious, means of identifying and following up unfamiliar terms.

**Table 3: Aggregated responses to scenario 2, concerning response to language difficulties**

<b>Scenario 2: Language and Problem solving</b>	<b>Responses</b>	
<b>Not understanding the lecture</b>	Count	Weighted percentage
Undertake some extra preparation/study	35	36.2%
Begin taking more notes in class	29	28.9%
Skip the lectures	15	14.3%
Start to put your hand up in class	15	12.4%
Complain to the Faculty about the lecturer	9	8.2%
<b>Totals</b>	<b>103</b>	<b>100%</b>

In contrast, of the nine students who said that they would complain about the teaching, five nominated this as their first or second option, followed by skipping the lectures. All of these students were first years and reported a trade certificate or high school as the highest level of parental education.

## Discussion and conclusion

Students from this cohort who are the first in their family to attend university seem to have differing expectations of their time commitment to study than their institution. This variance in expectation also applies to students from university educated families, although they tended to have a slightly higher expectation of the hours that would be required. Whether the student or institutional expectation of the time required to learn, and to demonstrate, mastery of the course material is more realistic is not evident from this study but it is clear that expectations differ. These findings reflect those of Collier and Morgan (2008) who found that while

institutional staff expected students to prioritise study and that study time would be determined by the mastery of course material, students tended to base study effort on the time available to them.

Although students are willing to discuss their studies with fellow students they show a reluctance to interact with course staff in order to resolve their difficulties. This reluctance appears to be mitigated in students who have been enrolled for longer periods, possibly indicating that an adaptation to institutional culture has occurred, or is in place, such that students are comfortable enough to approach staff and consider them a learning resource. The possibility of an adoption of institutional norms over time is also indicated by the tendency of students who had been studying for more than a year to plan for longer hours of study per week, although this could also be an indication that these are students who have been struggling with their studies in the past. This phenomenon indicates a possibly rich area for deeper investigation to establish whether in fact inculcation has occurred for these, and other, students and under what circumstances such a relaxing into and adaptation to the higher educational culture and environment could be expedited for more students.

The results of this small study add to the growing body of data that suggests that non-traditional students have expectations of higher education studies which are at variance with those of academia. However, this study is limited to a very rudimentary snapshot of student expectations; questions around the reasoning behind these choices, whether they reflect subsequent actual behaviour and whether such behaviour assists successful progression through university requires much deeper investigation. Student interviews would provide richer data on these topics and the importance of cultural capital for engineering students. This study has also not directly addressed the specific expectations of staff but relied on the literature for this perspective.

Further questions around how institutions can assist student transition into first year engineering require a greater understanding of the mis-conceptions that may exist and consideration of how the cultural context of engineering education might be broadened and explicated so that it becomes more inclusive and easily negotiated by a broader range of students. Devlin (2011) suggests a 'joint-venture' approach to bridging the socio cultural divide, in that both students and institutions will need to adjust their approaches in order to ensure the success of a broader range of students. She suggests that initiatives such as a shift in conceptions of teaching, towards one of supporting participation in an unfamiliar knowledge community, together with greater higher education partnerships with schools as having the potential to bridge the divide for many students.

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