

Variations in students' perceptions of stress and workload throughout a semester

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Abstract

Engineering degree programs are notorious for placing considerable demands upon their students. Balancing study and work is a challenge faced by an increasing number of undergraduate students, and this balancing act can be stressful. This paper presents data gathered from first year engineering students regarding their perceptions of their levels of stress and workload throughout a semester of study. Stress is investigated both as an absolute measure, and also as a measure relative to the students' perception of "normal".

These data show that there is considerable variation in the perceptions of the cohort. There is a proportion of the cohort that are always highly stressed; similarly there is a proportion that never find themselves stressed at all.

More importantly, the data shows that while stress and workload are linked, they are not equivalent. Relative stress does not always match absolute stress – there are students who are very stressed, but for whom this is normal; similarly there are students who are only slightly stressed, but for whom this is an increase on their usual non-stressed state. Students reported levels of workload were more variable than the measures of stress, suggesting that the relationship between stress and workload is more complex than simply "more work equals more stress".

Keywords: Student workloads, student stress, first-year experience

1. INTRODUCTION

Engineering degree programs are notorious for placing considerable demands upon their students. Balancing study and other commitments, such as paid employment, is a challenge faced by an increasing number of undergraduate students [1]. These challenges are particularly difficult for first year students who are also dealing with the transition from high school student to the university environment.

The Graduate Course Experience Questionnaire is a key indicator of the teaching performance of Australian universities, and Engineering has historically underperformed against other degree programs. Average ratings on the Good Teaching Scale are consistently 10-20% lower for Engineering programs than the overall national average [2], with excessive workload issues being a common theme in graduate responses.

There are a wide range of factors that cause stress in undergraduate students [3]. While academic-related issues certainly contribute, a significant number of non-academic-related factors also contribute heavily to the stress levels of students [4]. Academic workload is only one part of the issue; however it often misunderstood.

The concept of workload is potentially misleading as students' self-reporting of workload does not necessarily represent their ability to cope with their learning load. Jonkman et al [5] showed students' perceptions of workload not being correlated to the amount of work that they do, but instead showing some correlation to the number of assignments that they are required to complete. Other studies have shown that the extent to which the work is perceived as meaningful impacts upon the students' ratings of workload [6, 7].

There are also issues with the way in which academics view student workload. High workloads are common expectation of academics; with this comes the fear that students will rate an instructor lower on teaching evaluations as a result. The work of Dee [8] shows that the quality of instructional techniques can be more important than the level of workload in determining student satisfaction; however the challenge of balancing student workload and satisfaction remains.

This paper explores the relationship between students' perceptions of their workloads and their stress levels. The study was carried out with a large cohort enrolled in a first year Engineering Foundation Principles and Communication (EFPC) unit at (Curtin University). Students were asked to complete an online survey on a weekly basis. The students' responses regarding their workload and stress levels over a full semester are presented in this paper.

2. THE SURVEY INSTRUMENT

The students were asked a range of questions dealing with the nature of their workload: How many tasks, of what size, difficulty and relevance? How many hours did they invest in their study? In paid work? What factors have contributed to their workload this week? Which one contributed the most? What strategies worked well this week? What will you do differently next week?

The students were also asked to provide a measure of their workload, and of their stress levels. These were each implemented on a five point scale:

How does your academic workload this week compare to your typical weekly academic workload?

- A. This week requires much less work than normal
- B. This week requires a little less work than normal

- C. This week is pretty typical
- D. This week requires a little more work than normal
- E. This week requires much more work than normal

How would you characterize your current level of overall stress?

- A. Not at all stressed
- B. A little stressed
- C. Somewhat stressed
- D. Very stressed
- E. Extremely stressed

How does your current stress level compare to your typical stress level?

- A. I'm much less stressed than normal
- B. I'm a little less stressed than normal
- C. My current stress level is pretty typical
- D. I'm a little more stressed than normal
- E. I'm much more stressed than normal

These questions provided a measure of the overall cohort's perception of their workload and their stress levels. The data was gathered online, through the unit's WebCT interface. Students were given from the Thursday of the week until the Tuesday of the following week to complete the survey for that week. Completion of the survey was voluntary, but encouraged. Students were asked to complete the survey every week, including the non-teaching breaks after teaching weeks four and seven. The overall response rates varied throughout the semester, with numbers dropping off towards the end of the semester and during the examination period (Figure 1).

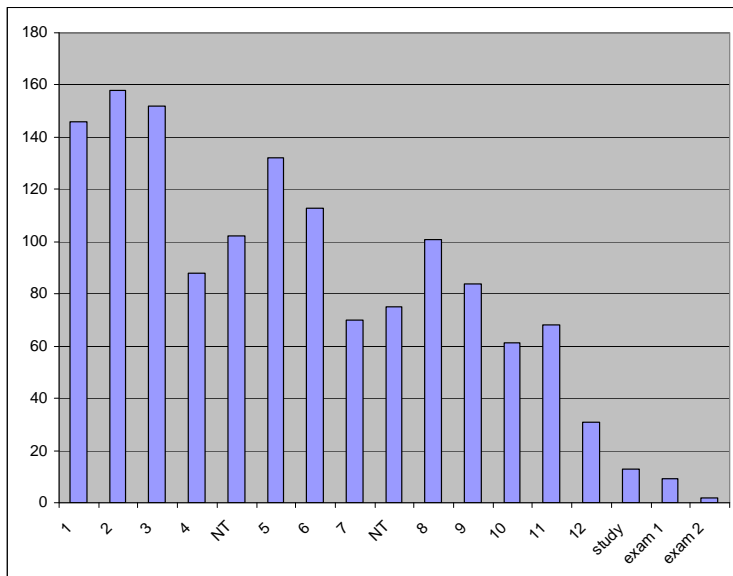


Figure 1: Response numbers by week of semester

The variations in response rate illustrated in Figure 1 are a potential concern for the validity of the data. Presumably the drop-off rate is in some way influenced by the students' workloads; however there is no data available as to why the students did or did not participate in the survey.

The choice to make the survey voluntary was a balance between two issues: the ability to generalize from volunteers to non-volunteers vs the authenticity of responses given only because responding is compulsory. The responses are only meaningful if they are authentic; the risk of introducing rubbish data – which cannot be managed by careful analysis – was deemed greater than the risk of overgeneralising – which can be managed.

The relationships between the responses for each student are less affected by the number of responses each week. The comparisons of workload and stress are made independent of week; as such it was only important to ensure that each category of responses is adequately represented.

The overall data gathered from WebCT was anonymous – no individual student is identifiable. While this prevents the ability to follow a student longitudinally throughout the semester, it does promote honest and authentic engagement on the part of the students – they know that this cannot be used as an assessment tool. Aggregation of the anonymous data does allow generalisations to be made about the overall cohort.

3. THE RESULTS – SINGLE VARIABLES

Given the drop off at the end of semester, the analysis of this data is confined to the 1,392 data points for which all three variables (relative & absolute stress, and relative workload) are represented, in the first fourteen weeks (twelve teaching and two non-instruction) of the semester.

The data does not allow for individual students to be tracked throughout the semester, and so no conclusions can be drawn regarding how workload and stress changes for an individual. It is useful, however, to consider a “representative student” based upon a percentile ranking. From week to week, different students will occupy different percentile ranks; however it is illustrative to consider the experience of a student who occupies a particular rank. In this way a representative longitudinal experience can be assumed, made up of the collective experience of the overall cohort. This representative student approach provides a useful technique to consider each of the individual variables more closely.

3.1 Absolute Stress vs Week

The absolute stress follows the overall pattern of increasing from the first week until the second break, then peaking again at week 10 and decreasing towards the exams

(Figure 2, normalized to show proportions of respondents in each week who fit in each category):

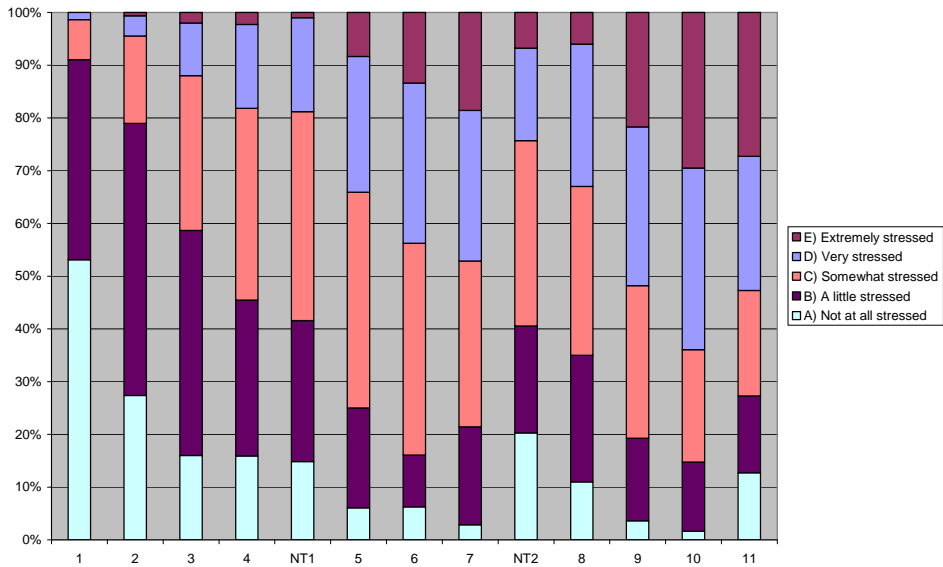


Figure 2: Absolute Stress vs Week

It is significant to note that there is a proportion of the cohort who are not at all stressed at any point throughout the semester, and that all throughout the semester there are students who are extremely stressed. For most of the semester, the median reported absolute stress is “Somewhat stressed”. It is only in three of the weeks – 9, 10 and 11 – that the median response is “very stressed” or higher.

It is also significant to note the small variations in the reported level of absolute stress. There is no point in the semester in which a representative student will be two responses different in consecutive weeks; for instance, if the student at the 65th stress percentile reports C, “somewhat stressed” in one week, then the student at the 65th stress percentile in the next week will report in the range B-D. Indeed, there are very few instances in which a two-step change is made inside two weeks, and these mostly deal with the wind-down in stress at the end of the semester.

Again, because no student can be tracked longitudinally, this does not mean that no individual student experiences these fluctuations. What it means is that the cohort overall makes a relatively gradual transition from relaxed to stressed. This data suggests that for the overall cohort, there is a fairly appropriate balance of stress. Whether this stress matches their expectations, however, is better considered with the Relative Stress variable.

3.2 Relative Stress vs Week

The relative workload built up over semester, peaking at teaching week 10 then dropping off towards exams (Figure 3):

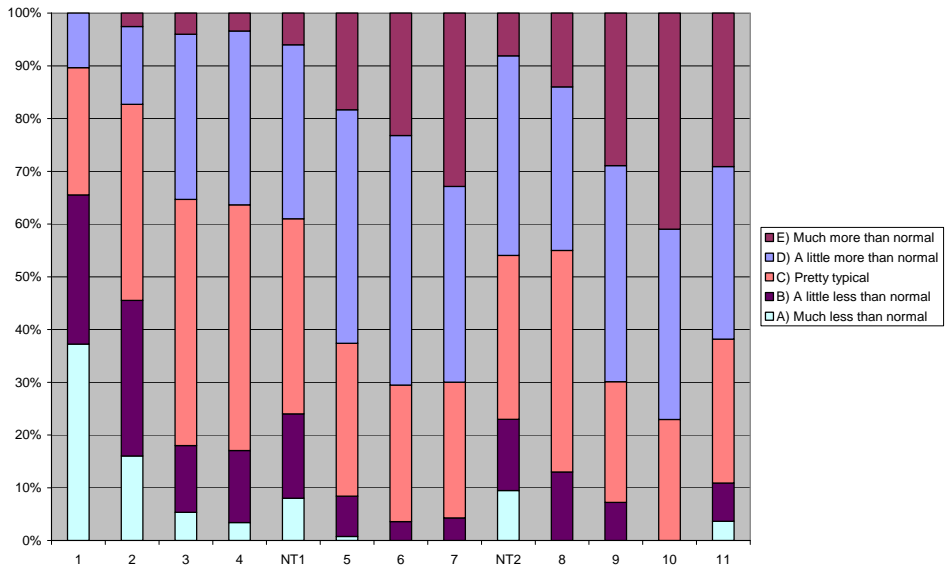


Figure 3: Relative Stress vs Week

The relative stress variable is more volatile than the absolute stress variable, with more frequent changes in the median percentile response throughout the semester. There are also more instances of greater changes in response (i.e. two steps) between weeks at a given percentile rank, although these are primarily linked to the non-teaching breaks. This decrease in stress at breaks contradicts Ross et al's [4] findings that breaks were a source of stress; however it could be that workload in the lead up to breaks is stressful, but the breaks themselves are not. There is a significant decrease in relative stress at the end of the semester, with some representative students experiencing two-response changes from C to A in both the final weeks.

It is significant to note that in all but the first week there are students that report that they are much more stressed than normal, and that for nine of the fourteen weeks there are students that report they are much less stressed than normal. This suggests that there are some substantial differences in the students' perception of what constitutes 'normal' – a phenomenon that is also observed in the data regarding their relative workload.

3.3 Relative Workload vs Week

The relative stress builds up over semester, peaking at teaching week 10 then dropping off towards exams (Figure 4):

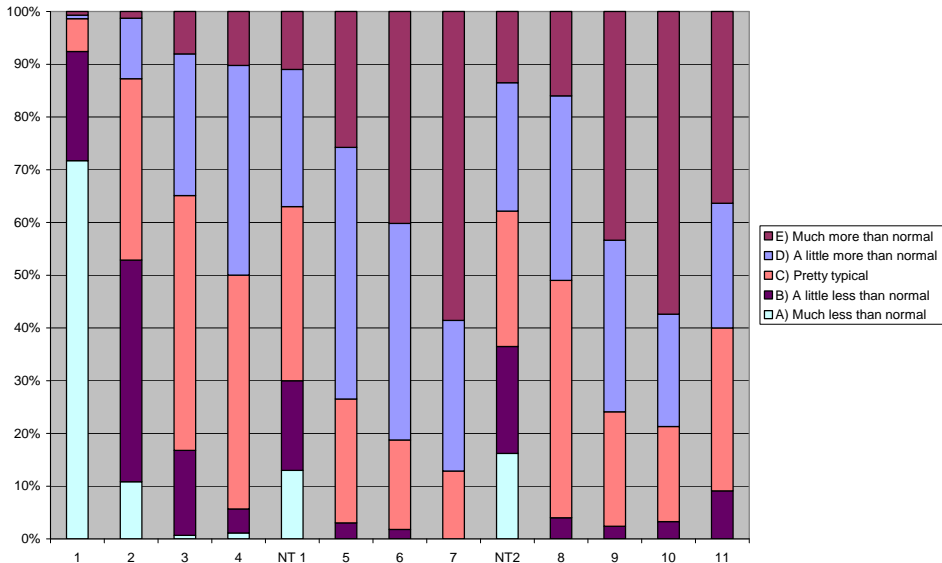


Figure 4: Relative Workload vs Week

The relative workload variable displays significant variability in the weeks adjacent to a non-teaching break. There is a huge decrease in the reported workload in the second non-teaching week, with the lowest 60 percentiles showing a 2-category decrease in reported workload. There is also a much greater variability in the median response, which varies through all of the weeks throughout the semester, and which remains constant for at most two consecutive weeks.

The biggest changes are located near the breaks, which show that the students clearly perceive that time off from classes provides a decrease in their workload. It is uncertain whether this is because they have fewer in-class commitments, and as such have less work; or it could be an artefact of staff using the Friday before the break as a deadline; or it could simply be a recalibration of what constitutes “normal” for the semester.

Again it is significant to note that for every single week of semester there is at least one student who considers the workload to be much more than normal, and that in seven of these fourteen weeks there is also at least one student who considers the workload to be much less than normal.

It is clear from the analysis of individual variables that there is a variation in perceptions between students. What is more meaningful is to determine whether there is a variation in perceptions within the students; that is to say whether or not their view of workload corresponds to their view of their stress levels. This comparison appears in the next section.

4. THE RESULTS - COMPARING STRESS TO WORKLOAD

Each of the three individual variables shows distinct trends throughout the semester, and there is some consistency between these trends. It is also informative to look at pairs of variables together, to determine the extent of the coupling between workload and stress.

4.1 Relative stress vs Relative workload

One of the key goals of this work is to determine whether stress actually correlates with workload – is it workload that causes stress, or is it other factors that have a greater impact. To do this, it is useful to compare the students' reported levels of relative stress to those of relative workload (Figure 5).

Figure 5 shows that there is a good degree of overall correlation between the perceptions of workload and stress, but that there are outliers. There are responses for which students responded that their workload was much higher than normal, but their stress levels much lower than normal, and vice versa. The responses are cross-tabulated in Table 1.

Overall, 52% of the recorded responses have a matching value for relative stress and relative workload, which are highlighted in green in Table 1. 37% of responses have a one-step difference (highlighted in yellow) and 11% of responses (highlighted in red) have a two-or-more category difference Relative Workload and Relative Stress.

The mismatch is relatively evenly spread between students who rate stress higher and those who rate workload higher. 27% of responses rate their relative workload greater than their relative stress, of which 4.9% rate the difference at two steps or greater (a-c, b-d, c-e etc). 21% rate their stress greater than their workload, of which 6.0% rate the difference at greater than one step.

This data shows that while Relative stress may correlate well with Relative Workload, the students' responses matched for just over half of their responses, suggesting that other factors influence the students' perceptions of workload and stress.

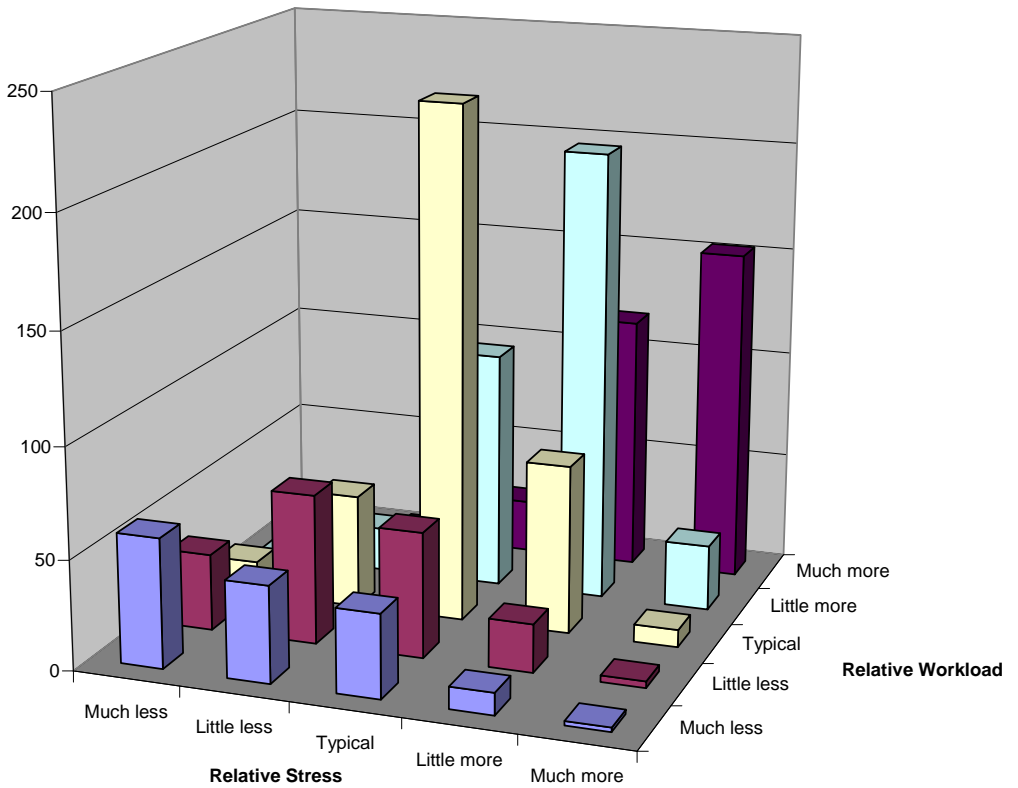


Figure 5: Relative Stress vs Relative Workload

Table 1: Relative Stress vs Relative Workload

| | | Relative Stress | | | | | Total |
|-------------------|-------------|-----------------|-------------|---------|-------------|-----------|-------|
| | | Much less | Little less | Typical | Little more | Much more | |
| Relative workload | Much less | 59 | 44 | 38 | 10 | 2 | 153 |
| | Little less | 35 | 68 | 57 | 22 | 3 | 185 |
| | Typical | 15 | 52 | 234 | 77 | 8 | 386 |
| | Little more | 3 | 20 | 109 | 206 | 30 | 368 |
| | Much more | 2 | 4 | 24 | 117 | 153 | 300 |
| | Total | 114 | 188 | 462 | 432 | 196 | 1392 |

4.2 Absolute stress vs Relative stress

One key distinction made in this work is the difference between absolute stress and relative stress – whether the student is negatively impacted by their stress is different to whether their stress levels are higher or lower than usual. In order to explore this distinction, it is useful to compare the students’ reported levels of relative stress to those of relative workload (Figure 6):

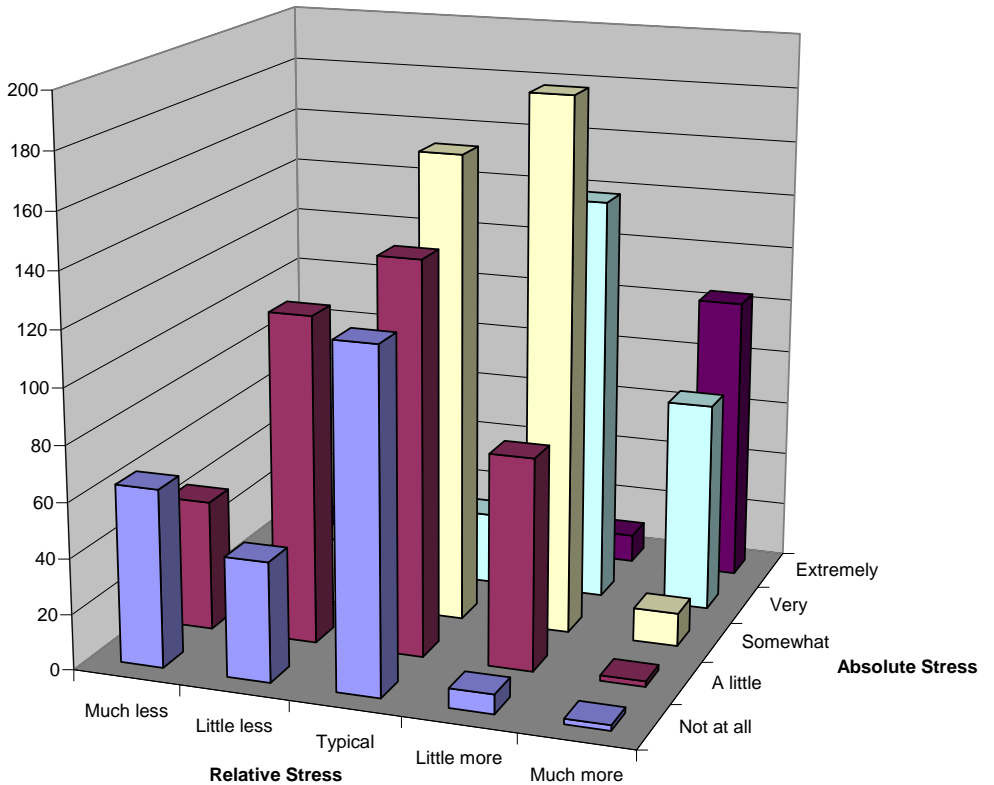


Figure 6: Absolute Stress vs Relative Stress

Figure 6 shows that there are responses representing almost all pairwise combinations of absolute and relative stress values, with some combinations being much more common than others. The responses are cross-tabulated in Table 2:

Table 2: Relative Stress vs Absolute Stress

| | | Relative Stress | | | | | Total |
|-----------------|------------|-----------------|-------------|---------|-------------|-----------|-------|
| | | Much less | Little less | Typical | Little more | Much more | |
| Absolute Stress | Not at all | 64 | 43 | 122 | 7 | 2 | 238 |
| | A little | 47 | 118 | 141 | 76 | 2 | 384 |
| | Somewhat | 1 | 24 | 169 | 192 | 12 | 398 |
| | Very | 0 | 2 | 26 | 147 | 76 | 251 |
| | Extremely | 2 | 1 | 4 | 10 | 104 | 121 |
| | Total | 114 | 188 | 462 | 432 | 196 | 1392 |

In Table 2 three clusters of responses are highlighted, each representing a theme in the responses – essentially the aggregated version of the representative student model used earlier.

The first cluster, highlighted in red, represents students who consider “Not at all stressed” to be their “Typical” level of relative stress. For these students, “a little stressed” is “a little more than usual”, and “somewhat stressed” is “much more than usual”. These responses represent students for whom any stress is unusual – perhaps unchallenged at high school, they are not used to stress in any form. A total of 210 responses fit into this category, 15% of the overall dataset.

The second cluster, highlighted in yellow, represents students who represent “A little stressed” to be their “Typical” level of stress. For these students, “Not at all stressed” represents less than normal, while “somewhat” and “very” constitute more than normal. A total of 516 responses fit into this cluster, 37% of the overall dataset.

Taken together, these two clusters represent more than half of the responses – responses for whom the typical level of stress is “Not at all stressed” or “A little bit stressed”. The perception of what is normal plays a big part in students’ responses to stress and workload, and this data suggests that the majority of students perceive normal to be a predominantly relaxed state.

Conversely, of the 372 responses indicating that the student is either “very stressed” or “extremely stressed”, the third cluster (highlighted in green) of 35 responses reported that this was “typical” or “less than normal”. For these students (2.5% of the overall cohort, or 9.4% of those who were highly stressed) it is clear that stress is a common part of their student experience, and their definition of normal is diametrically opposed to that of the first two clusters.

This difference in opinion is clearly representative of the well-documented diversity of engineering student cohorts; however it also raises definite challenges for the teaching of these students. For half of the students any notable level of stress will be

more than they are used to; for a minority of students highly stressed is their normal way of life.

5. CONCLUSION

The underlying motivation for this work was to ease concerns about student workloads; however there is an argument to be made that the workload is only a problem if it is stressful. It is clear from the aggregated data that perception of workload varies more than perception of stress, and that perception of relative stress varies more than perception of absolute stress. The general trends in the variables are similar; however there are differences when it comes to the students' perception of "normal".

Almost every week of the survey has both "much more" and "much less" responses for both relative stress and relative workload. There is a percentage of the cohort who are never stressed; there is similarly a percentage that are always stressed. Why these students are robust to changes in the workload throughout the semester warrants investigation – are they unstressed because they are coping well, or are they unstressed because they haven't realised how much work they have to do?

More importantly, there is a significant proportion of the cohort who view any stress as more than usual. These students need to learn how to manage their stress levels; it is incumbent on academics to provide them with opportunities to develop these skills.

The majority of the cohort does undergo changes in stress and workload levels throughout the semester, with a definite link between the week of semester and their reported levels of workload and stress. The non-teaching weeks have a clear impact upon both of these variables, with both workload and stress decreasing in the weeks in which no classes are held. Clustering of assessments prior to a break can contribute to the pre-break peaks; the distribution of workload throughout the semester should be considered to ensure that these peaks do not climb too high.

Overall, it appears that while there is a link between workload and stress levels for the overall cohort, the relationship is not as simple as "more work equals more stress". Some students are always stressed; some are never stressed. More study is required to truly identify what factors lead to students' perceptions of their workloads.

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