University Students Expectations of NZQA Levels

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ABSTRACT

In this cross-sectional study, we compared the expectations of level 5 computing students from the university sector (n=161) with a similar cohort of students from the polytechnic sector (n=69). We elicited their expectations of the nature of the skills and knowledge, and the degree of self-management and collaboration, required for their courses. We compared their responses to the expectations set out in the NZQA qualifications framework. We found significant differences between student and framework expectations; student expectations were clearly lower than the framework in all but skills. Overall, we found no significant differences between university and polytechnic students, although polytechnic students had slightly higher expectations of knowledge and collaboration. We note that any misalignment of expectations poses a challenge for educators and suggest practical measures for aligning these expectations.

Keywords: Student expectations, accreditation expectations, university v polytechnic.

1. INTRODUCTION

This study is one of a series of studies that investigates the alignment of expectations among stakeholders in education. The premise underpinning this series is that learning happens best when there is a close alignment between the expectations of students, educators and other stakeholders.

The first study in the series (Lopez & Lopez, 2013) was a pilot study that used a convenience sample (n=89) to investigate alignment between students, lecturers and the New Zealand Qualifications Authority (NZQA). The study served, primarily, to validate the instrument. However, findings suggested there was indeed a misalignment. The second study (Lopez & Lopez, 2014) used a larger systematic sample (n=275), which was more representative of the overall student body. This confirmed the misalignment found in the pilot study. However, the sample was taken from a single institution in the polytechnic sector. This left an open question as to whether the misalignment applied only to that institution or was more general.

The present study aims to address that question by sampling another institution. To make the comparison, we used the same instrument as the earlier studies and a comparable sample from an institution in the university sector. In New Zealand, accreditation of university courses is overseen by the Academic Quality Agency (AQA). Courses from all other providers come under the auspices of the New Zealand Qualifications Authority (NZQA). It could be argued, therefore, that it is not appropriate to apply NZQA characterisations to the university sector.

Nevertheless, we believe it is appropriate for two reasons. First, it gives us a consistent basis for comparison. Second, and perhaps more important, there is a widespread perception that university bachelors students may be better prepared academically for study – either through their school performance or through innate ability (Smyth, Hyatt, Nair, & Smart, 2009). By directly investigating student expectations, we may get a sense of whether there is evidence for such a perception.

This quality assured paper appeared at ITx 2016, incorporating the 7th annual conference of Computing and Information Technology Research and Education New Zealand (CITRENZ2016) and the 29th Annual Conference of the National Advisory Committee on Computing Qualifications, Wellington, New Zealand, July 11-13, 2016. Michael Verhaart, Emre Erturk, Aaron Steele and Scott Morton (Eds).

The NZQA publishes the New Zealand Qualifications Framework (NZQF), which is a comprehensive list of all quality assured qualifications in New Zealand (New Zealand Qualifications Authority, 2011). Similar frameworks exist in Australia (Australian Qualifications Council, 2013) and the UK (The Quality Assurance Agency for Higher Education, 2008). A framework is also being considered for the EU (European Commission and Australian Department of Education, Employment and Workplace Relations, 2011).

The New Zealand framework is organized into ten levels. Broadly speaking, levels one to three map to school years. For example, New Zealand's National Certificates of Educational Achievement (NCEA) are national qualifications for senior secondary school students at levels one to three. Levels four to ten typically relate to post-secondary qualifications. Levels four to six are usually certificates and diplomas, although it is also possible to have these at all levels from one to eight. Undergraduate degrees are at level seven. Post-graduate certificates and diplomas are at level eight, a master's degree is at level nine, and a doctoral degree is at level ten.

For each of the levels, the framework sets out clear expectations of the nature of skills, knowledge, student self-management, and how a student should interact with others. Given the central role of the framework in accreditation, one might expect to find a close alignment between the expectations of NZQA, and those of educators and students. However, we had reason to believe some differences might be found. For example, Nunn and colleagues investigated student perceptions of desirable graduate characteristics (Nunn, et al., 1995) and found considerable differences from academic and employer characteristics. Consequently, it seemed reasonable to expect that we too might find some differences.

Any misalignment poses a challenge for educators. With the on-going consumerisation of education, students are seen more and more as consumers of a service (Naidoo & Jamieson, 2005) – as customers. Somehow, educators need to achieve the stated educational goals while also meeting student expectations.

The remainder of this paper is organized as follows. In section two, we discuss related work in the literature. In section three, we describe our approach to the study and our methodology. We present our findings in section four. We discuss the implications of our findings for teaching in section five. Finally, we discuss the limitations of the approach and identify areas where further work is required in section six.

2. RELATED WORK

In the literature, a number of researchers have used external frameworks to analyse courses. In computing, several researchers have investigated the mapping of courses to Bloom's taxonomy (Bloom, 1956). Bloom's taxonomy is widely used in educational contexts to give an approximate indication of the cognitive depth needed for a task. Sanders and Mueller (2000) argued that courses in the early stages of a degree should be targeted at the lower Bloom's levels, whereas later courses should be targeted at the higher levels. Lister used the taxonomy to formulate course objectives for a sequence of programming courses (Lister, 2001). Howard and colleagues carried out a lesson-by-lesson analysis of depth in a CS2 course (Howard & Carver, 1996). Oliver and colleagues (2004) carried out a lecturer evaluation of the cognitive difficulty of a number of computing courses. Most of this work is grounded in the programming area and underpinning most of this work is the assumption that in teaching programming "we have traditionally focused on the higher levels of the taxonomy and ignored the lower levels" (Lister & Leaney, 2003, p. 147).

Another widely used framework is the SOLO taxonomy (Biggs & Collis, 1982). In particular, SOLO has been used to map the cognitive complexity in programming. For example, Brabrand and Dahl (2007; 2009) used SOLO to analyse over 5000 intended learning outcomes, comparing those in Computer Science to those in Mathematics and natural science. Thompson (2007) used SOLO to develop assessment criteria for programming assignments. Sheard and colleagues (2008) used SOLO to explore the programming knowledge of novices. Lister and associates (2006) used SOLO to describe differences in the way students and educators solve small code reading exercises. Whalley and colleagues (2006) used SOLO and Bloom's taxonomies to develop a question set for novice programmers. There are other less widely used taxonomies. For example, Fuller and associates carried out a literature review of the use of Bloom's and SOLO taxonomies and proposed a two-dimensional matrix taxonomy (Fuller, et al., 2007).

Both SOLO and Bloom's taxonomies have been widely used as a conceptual framework to analyse cognitive complexity in computer science. However, all of the studies cited represent an educator's perspective, rather than that of a student.

To elicit a student perspective, we have to turn to the general tertiary education literature. However, research on student expectations is still sparse within this literature.

Lowden and colleagues (2011) investigated employer perceptions of the employability of new graduates. Weligamage and Sienthai (2003) compared student and employer perceptions. Round (2005) investigated broad student expectations of University in the context of understanding and enhancing student retention.

Darlaston-Jones, et al. (2003) investigated student expectations of higher study by administering the SERVQUAL questionnaire to psychology students. Their research had been based on two factors. First that universities are becoming progressively more business enterprises and therefore are under the same pressure to increase quality and decrease costs as any other business organization. The second factor is that students now consider themselves to be customers and so demand more value for their money. Students do have expectations and perception of the universities at the beginning of their study (Coaldrake, 2001; Sander, Stevenson, King, & Coats, 2000) and if the reality is different it will result in disappointment and possible withdrawal. There are many reasons for the gap in the expectations of students and the reality of the universities. Some are that students are not well informed about the particular course and employment opportunities (Darlaston-Jones, et al., 2003; Peel, 2000) and that students are not aware of demands of the higher education study, the workload, independent learning, team work, and needed resources (Peel, 2000). The literature suggests that the person environment fit and the gap between student expectations and university experience are the main causes of attrition (Darlaston-Jones, et al., 2003). Kuh, Gonyea &Williams (2005) identified the factors influencing student expectations as expected grades, higher degree possibilities, hours expected to work and a positive attitude towards the university.

> Universities need to take a more strategic approach to the management of student expectations. This management might take the form of spelling out more clearly to students what they will experience and in addition be prepared to change student expectations. (Tricker, 2003, p. 4)

Despite these few examples, we found that, overall, student and lecturer expectations of course levels remain underexplored in the tertiary education literature. Despite the stated aim that "This assists learners when making decisions on which qualifications to undertake, and when, and where" (New Zealand Qualifications Authority, 2011, p. 3), the framework descriptors seem to be used more for communication between providers and the accreditation authority than for communication with students. Indeed Kemmis and associates note:

> Student expectations and the broader set of expectations that flavour VET and HE are often quite different and are often implicitly embedded in subjects and courses. The process of making these differences explicit is left to the student making the transition. (Kemmis, et al., 2010, p. 30)

We believe that it is important that expectations are shared between students and educators, and not just left to the student. Our study aims to identify the extent to which student expectations are aligned to the level descriptors.

3. PROCEDURE

In this cross sectional study, we surveyed students with the same anonymous questionnaire used in the previous studies. We extracted the polytechnic cohort from the previous study.

Participants for the university cohort were recruited immediately before a scheduled lecture in introductory programming. The students were supplied with participant information sheets and paper questionnaires. Participation was voluntary. The questionnaires were anonymous and without any demographic information.

3.1 Instrument

We used the same custom questionnaire for the survey that we used in the previous study (Lopez & Lopez, 2013; Lopez & Lopez, 2014). The instrument description is repeated here for convenience.

The questionnaire used four questions to investigate characteristics of the levels relating to self-management, working in groups, skills and knowledge. We took the wording for the questions from the level descriptors in the NZQA accreditation document (New Zealand Qualifications Authority, 2011). To align our questions with the wording used in the NZQA document, we prefaced each student question with the stem: *In this course, it is reasonable to expect that a student will …*

We then presented the participant with a list of the exact wording used in the NZQA document to characterise the levels and asked the participants to indicate which of the options they felt was closest to their expectation.

As an example, Question2 in the student questionnaire is shown in **Error! Reference source not found.**.

For this course, it is reasonable to expect that a student will:

- Not interact with others – students should work independently.
- Interact with others
- Collaborate with others
- Contribute to group performance and adapt own behaviour when interacting with others
- … and so on

Figure 1: Sample question

Note that, for completeness, we added the first of these options (not interact with others) to the framework. The framework itself starts with level 1 (interact with others).

3.2 Sample

The polytechnic sample was taken from the previous study. The university sample was sourced for this study; the sample characteristics are summarised in Table 1.

Table 1: Sample characteristics

Cohort	N	Response rate
University	161	63%
Polytechnic	63	61%
All students	224	62%

Note: The university response rate was estimated by comparing the number of responses to a count of the number of students present in the lecture theatre at the time the questionnaire was administered.

3.3 Analysis Approach

For descriptive statistics, we use the mode and mean. For statistical inference, we were interested in the question: *how likely are these data if we are sampling randomly from a population with a mean of the expected NZQF level?* Thus, our data are slightly unusual inasmuch as the population mean is known a-priori. However, the variance is still estimated from the sample. To accommodate this, when comparing to the framework levels, we base inference on the standard error of the mean (SEM) and use a z-test for inference rather than the usual t-test. On the other hand, we used t-tests to compare university and polytechnic student populations since the means of both of these were estimated from the sample.

4. RESULTS

We begin this section with an overview of student expectations. Table 2 shows the proportion of students who chose the expected level according to the framework.

Table 2: Proportion choosing the expected level

Question	University	Polytechnic	Combined
Q1	16%	8%	**14%**
Q2	5%	10%	**6%**
Q3	11%	13%	**12%**
Q4	17%	22%	**19%**
Overall	12%	13%	**13%**

Note: Each cell shows the percentage of students who chose the expected level as defined by the NZQA framework.

As can be seen, overall only 13% of the student choices were at the expected level, and a strong preference for the expected level is not visible among either cohort of students. This poses a major challenge for educators. A course taught at the expected framework level will fail to meet the expectations of the majority, on average about 87%, of the students.

However, another strategy is available to an educator. If most students share an expectation, even if it is lower than the framework, a course could be taught initially at the level students expect, or just above. The educator could then work progressively to raise expectations to the framework level. However, this would still fail to meet the expectations of the cohorts of students we studied. Table 3 shows the modal levels expectations chosen by students in each cohort, together with the proportion who made that choice.

Table 3: Modal expectation levels chosen by students

Question	University	Polytechnic	Combined
Q1	4 (40%)	4 (38%)	**4 (35%)**
Q2	2 (35%)	3 (37%)	**2 (34%)**
Q3	1 (41%)	3 (29%)	**1 (35%)**
Q4	6 (23%)	4 (25%)	**6 (21%)**
Overall	3 (20%)	3 (27%)	**3 (22%)**

Note: Each cell shows the most popular response followed by the percentage of students who chose that response.

It can be seen that none of the percentages is above 50%; there is no single level expectation that could be chosen which would satisfy the majority of the class. For example, if one teaches a level five course with the modal level 2 or 3 expectation of collaboration (Q2), this will still fail to satisfy the expectations of the majority (two thirds) of the class. Finally, it can be noted that, overall, the modal expectation of both cohorts is at level three, well below the framework expectation of 5. To explore this further, Table 3 shows the mean expectation for both cohorts.

Table 4: Mean overall levels chosen

Statistic	University	Polytechnic	Combined
Mean level	3.47	3.74	3.55
Standard error	0.08	0.11	0.06
z-sig	< .001	< .001	<.001
t-sig	n/a	n/a	n.s.

Note: z-sig is the probability of observing a mean this low in a random sample drawn from a population with the expected mean; t-sig is the probability that the two samples are drawn from the same population.

Overall, there is no significant difference between the two cohorts (t-test), but both cohorts are significantly ($p<.001$) below the framework expectations. The following sections show the student expectations for each of the individual questions.

4.1 Question One: Self-Management

This question asked about the degree of self-management that a student could be expected to show. **Error! Reference source not found.** shows the mean level expectation of students by cohort.

Table 5: Expectations of self-management

Statistic	University	Polytechnic	Combined
Mean level	3.85	3.59	3.78
Standard error	0.09	0.15	0.08
z-sig	< .001	< .001	< .001
t-sig	n/a	n/a	n.s.

Note: z-sig is the probability of observing a mean this low in a random sample drawn from a population with the expected mean; t-sig is the probability that the two samples are drawn from the same population.

As can be seen, the mean expectation is significantly (p<.001) below those of the framework for both cohorts. There is no significant difference between the two cohorts. Overall, the mean student expectation of self-management can be characterised as between level three ("requiring major responsibility for own learning and performance") and level four ("self-management of learning and performance under broad guidance").

4.2 Question Two: Collaboration

This question related to the degree to which a student could be expected to collaborate with others. Table 6**Error! Reference source not found.** shows the mean level of student expectation by cohort.

Table 6: Expectations of collaboration

Statistic	University	Polytechnic	Combined
Mean level	2.31	2.86	2.46
Standard error	0.09	0.17	0.08
z-sig	< .001	< .001	< .001
t-sig	n/a	n/a	.005

Note: z-sig is the probability of observing a mean this low in a random sample drawn from a population with the expected mean; t-sig is the probability that the two samples are drawn from the same population.

A t-test suggests (p=.005) that the expectation of collaboration is significantly lower in the university cohort than in the polytechnic cohort. However, both cohorts have significantly (p<.001) lower expectations of collaboration than required by the framework and this shortfall is much larger than the minor difference between the cohorts. Overall, the mean student expectation of collaboration can be characterised as between level two ("collaborate with others") and level three ("contribute to group performance and adapt own behaviour when interacting with others").

4.3 Question Three: Knowledge

Question three asked about the nature of knowledge. Table 7 shows the mean expectations of students by level.

Table 7: Expectations of knowledge

Statistic	University	Polytechnic	Combined
Mean level	2.78	3.40	2.96
Standard error	0.16	0.26	0.14
z-sig	< .001	< .001	< .001
t-sig	n/a	n/a	.044

Note: z-sig is the probability of observing a mean this low in a random sample drawn from a population with the expected mean; t-sig is the probability that the two samples are drawn from the same population.

As with collaboration, a t-test suggests (p=.044) that the expectation of the nature of knowledge is significantly lower in the university cohort than in the polytechnic cohort. Both cohorts have significantly (p<.001) lower expectations of knowledge than required by the framework and this shortfall is much larger than the minor difference between the cohorts, which if only marginally significant at p=.044.

Overall, the mean expectation can be characterised as being between level 2 ("basic factual and/or operational knowledge of a field of work or study") and level 3 ("some operational and theoretical knowledge in a field of work or study").

4.4 Question Four: Skills

The fourth question was about the nature of skills. Table 8 shows the student expectations by level.

Table 8: Expectations of skills

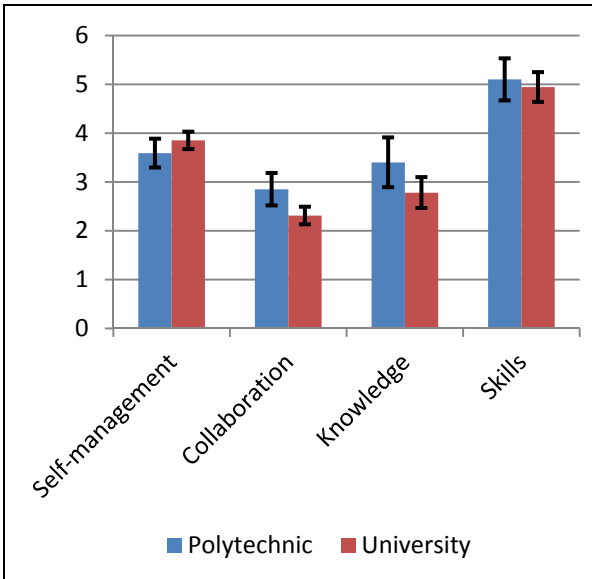
Statistic	University	Polytechnic	Combined
Mean level	4.94	5.10	4.99
Standard error	0.16	0.22	0.13
z-sig	n.s.	n.s.	n.s.
t-sig	n/a	n/a	n.s.

Note: z-sig is the probability of observing a mean this low in a random sample drawn from a population with the expected mean; t-sig is the probability that the two samples are drawn from the same population.

In contrast to the three preceding questions, the mean expectation of both cohorts was consistent with the framework expectations and there was no significant difference between the cohorts. The framework expectation is "select and apply solutions to familiar and sometimes unfamiliar problems".

4.5 Overall Findings

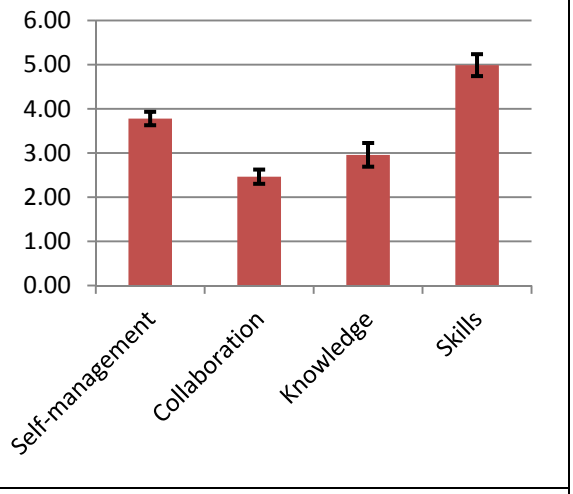
The mean responses to each of the questions are summarised in Figure 2.



Note: The error bars show a 95% confidence interval.

Figure 2: Overall level expectations

From this figure, it can be seen that both cohorts show a similar overall profile. Expectations of skills are very close to framework expectations, whereas expectations of self-management, collaboration and knowledge are significantly below the framework expectations for level five. Indeed, they are also below level four. Expectations of the polytechnic students are significantly higher that the university students for collaboration and knowledge, but not significantly different with regards to self-management and skills. Taken overall, there is no significant difference between the university and polytechnic students. Moreover, the differences in collaboration and knowledge, although statistically significant are probably not meaningful; both cohorts are significantly below the framework expectations. Thus, it makes sense to combine the two cohorts as shown in figure 3.



Note: The error bars show a 95% confidence interval.

Figure 3: combined level expectations

Overall expectations of both cohorts can be summarised as correctly aligned with the framework for skills, at just below level four for self-management, at about level three for knowledge, and between level two and level three for collaboration.

5. DISCUSSION

The central goal of this study was to investigate whether the differences we found earlier between student expectations and the NZQA framework were artefacts of a single institution or whether they were symptomatic of a more general pattern. Our findings demonstrate that the differences are not limited to a single institution and suggest that the pattern may be more widespread, at least among computing students. We were also surprised to find so little difference between university and polytechnic cohorts. In this section, we discuss the implications of our findings for teaching.

First, as shown in Table 2, we note that very few students chose the expected category. Moreover, in no case did the modal category represent the majority of students (Table 3). This poses a challenge for lecturers because there is no simple solution to the problem of what level to target for student activities. There is no easy solution to this challenge other than to work on changing student expectations.

Second, government expects students to demonstrate self-management skills. Indeed, the Ministry of Education states:

> Given the significant investment the Government makes in students both through tuition subsidies and student support, students are expected to take responsibility for their own performance. [24, p. 3.2]

Changing student expectations of self-management is likely to require the whole teaching team to take a consistent approach and actively promote expectations of self-management, and the associated benefits to students. Some practical measures could be wider use of self and peer assessment and involving students in setting appropriate framework-related learning activities and assessment criteria.

Third, even more than with self-management, students' expectations of collaboration are low at below level 3 three ("contribute to group performance and adapt own behaviour when interacting with others"). It is interesting to note the objective at level four of: "demonstrate some responsibility for the performance of others". This may well act as a barrier for some students. From our own teaching experience, it seems likely that some students reject the validity of this, even though employers place a high value on working effectively in a team. This suggests that one way of modifying these expectations would be to expose students more to the values articulated by employers. Nevertheless, despite such an employer perspective and the explicit expectations of NZQA, some students (and perhaps some faculty?) may still feel that it is not right or fair for their performance to be dependent on others. Changing this expectation is also likely to require a "whole of team" approach. Moreover, it is likely to require a sustained effort over a substantial time period to help students progressively see the ability to foster collaboration as strength and the inability to collaborate as a weakness.

Fourth, students' expectations of the nature of knowledge are low at about level three (some operational and theoretical knowledge in a field of work or study). At level five, the framework expectation is: "broad operational or technical and theoretical knowledge within a specific field of work or study". The clear difference here is breadth. Students are not expected to know a topic in depth, but should have a clear overview of the breadth of a field, the elements in the field and how they interrelate. From our own experience, we believe that students are too ready to carry out an internet search and copy and paste findings, considering this acceptable as knowledge. Activities that may be useful to effect change include requiring paraphrasing and summarising of material found, essay-type activities with compare and contrast, and embedding taxonomies such as SOLO (Biggs & Collis, 1982) into assessment rubrics. However, changing students' expectations of the nature of knowledge will also require a substantial "whole of team" approach.

Fifth, in contrast to the foregoing areas, students' expectations of skills demonstrated appropriate expectations. In our previous studies, we found that the polytechnic students seemed to hit a ceiling at level 5. In this study, we have only looked at level 5 university students and so cannot comment on any changes there may be beyond level five.

Overall, we believe that a concerted "whole of team" approach should be taken to align student expectations, and thus indirectly lecturer expectations, with those articulated in the framework. One way of achieving this would be to include a perspective of framework levels into regular course reviews. Learning activities, and especially assessed activities, should be mapped to framework levels to ensure alignment. It will be important to carry this out progressively, starting from lower levels, so that a student is presented with a coherent evolution of expectations as they progress with their study through the levels.

Since our first study was published, we have adopted a number of measures to increase student awareness of level expectations. How effective these are remains to be seen.

6. CONCLUSION

In this study, we investigated the expectations of students in the university sector of the academic values articulated in the NZQA framework. We found a remarkably similar pattern to that we had previously found in the polytechnic sector.

The central goal of this study was to investigate whether the differences we found earlier between student expectations and the NZQA framework were artefacts of a single institution or whether they were symptomatic of a more general pattern. Our findings demonstrate that the differences are not limited to a single institution and suggest that the pattern may be more widespread, at least among computing students. Future work could investigate whether a similar pattern is found in other disciplines.

6.1 Acknowledgements

We would like to thank Professor Tanja Mitrovic and Professor Andy Cockburn from Computer Science and Software Engineering, University of Canterbury for their help with this study.

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