

## BRINGING THE WORKPLACE INTO A NATIONAL CERTIFICATE IN OFFICIAL STATISTICS

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*New Zealand's National Certificate of Official Statistics was designed to raise the capability of public sector employees, in particular policy analysts giving advice to senior managers or Ministers. The competency based 40-credit certificate was first introduced in 2007. Four taught units (worth 24 credit) give students skills in basic official statistics and in critically evaluating statistical, research, policy or media publications for their quality (of data, survey design, analysis and conclusions) and appropriateness for some policy question (e.g. how to reduce problem gambling). Case studies are used to set the statistics learning into the real world context of the students. An evaluation of the first cohort of students led to a compulsory "umbrella" workplace-based statistics project worth 16 credits being introduced. Some of the challenges for students and their managers in achieving a project that is both useful to the organisation and meets the requirements of the Certificate are discussed.*

### BACKGROUND

In 2007, in response to calls for government employees to have increased statistical capability, a National Certificate in Official Statistics was developed in New Zealand. As reported earlier (Forbes, 2009, Forbes et al, 2010) the certificate was based on statistical thinking theory but focused on official statistics as well as general statistics methods. A group of academics from statistics departments in the seven main New Zealand universities were involved in its design and implementation and continue to be involved in teaching and assessment. The certificate is at level 5 (approximately equivalent to first year university) on New Zealand's vocational training framework, the New Zealand Qualifications Framework (National Qualifications Framework Project Team, 2005) and is competency based (no grades are awarded and students can re-sit questions or units until they reach the required standard). From its inception in 2007 the Certificate comprised four taught modules (called Unit Standards in the New Zealand context) as follows:

1. *Resolve ethical and legal issues in the collection and use of data in a public sector context.*
2. *Interpret statistical information to form conclusions for projects in a public sector context.*
3. *Assess a sample survey and evaluate inferences in a public sector context.*
4. *Evaluate and use statistical information to make policy recommendations in a public sector context.*

The teaching for these units is in one or two day blocks in a traditional classroom setting using small workshops. Both the learning and assessment focus on evaluating real statistical, research, policy and media publications. Two main "case study" publications (official statistics or other government agency releases, research reports or media articles) are chosen for use across all four units for teaching purposes and two different publications are chosen for assessment purposes. The four units (referred to as the taught units throughout this paper) account for 24 of the total 40 credits needed to gain the certificate. In 2007 and 2008 students could select the remaining 16 credits from a set of level four or five units registered on the framework that were deemed to be appropriate for the public sector context, such as management and communication skills or knowledge of public sector processes.

The first cohort of students participating in the certificate was surveyed together with their managers and the assessor (Forbes et al, 2010). This pilot evaluation resulted in a number of changes to the certificate, including the order that the units were taught (currently as indicated above). The final 16 credit component of the certificate was also changed to be an "umbrella" workplace-based statistics project. One reason for this was that students could then make an immediate transfer of at least some of the skills learned in the taught units to their individual workplace and demonstrate the usefulness of these skills in their day to day work. As Vaughan (2008) states "Workplace learning has

a broader project and potential to link development of the individual with development of the organisation or business, through an emphasis on sustained development and learning processes as well as learning outcomes” (p. 1).

A second evaluation of the Certificate in 2009 (Forbes et al, 2010) found that only 60% of students completed the certificate within the suggested time (one year). The time it took for a student to complete a particular unit was found to be related to the student’s motivation to do the qualification (e.g. whether they or their manager had initiated the enrolment). About half the students reported that one of the barriers to completion was balancing assessments with work and personal life commitments.

Each cohort of students is designed to be small (15-20 students). By 2013 there had been ten cohorts (nine in New Zealand and one in Tonga) with 185 students attending taught units. Students came from 37 different government and local authority agencies. However, not all were formally enrolled and some of those enrolled withdrew before attempting any assessments, leaving 144 students (excluding the Tongan students) having signed training agreements. Students are notoriously late in completing assessments with a few taking several years to gain the full qualification. Even if we consider just the 2007-2010 cohorts, the mean completion rate for the certificate is low (from 60-71%, mean = 65%).

There are also a number of students (about 10%) who complete all the four taught units but not the final 16 credit research component. As this research is based in the workplace the level of statistics it contains is highly variable. But at a minimum, the project should contain graphs and at least one appropriate statistical analysis such as: relationships between pairs of numeric or categorical variables, confidence intervals for means or proportions, interpretation of hypothesis tests (*p*-values) or investigation of time series. Examples of successfully completed projects are:

- Factors affecting participation in a government funded children’s internet survey
- Differences between Egyptian and New Zealand societies
- Comparing religious affiliation in New Zealand and Tongan Censuses
- Analysis of travel by preschool children - New Zealand Household Travel Survey data
- Comparison of local and international prices in Tonga
- Survey of SAS ECO users in Statistics New Zealand
- Survey of transport issues for residents in a new subdivision
- Differences between the CPI and Statistics New Zealand’s Household Consumption Expenditure Implicit Price Deflator.

One way of increasing completion rates could be to assist these students to finish their research projects. To determine the students’ perceptions of barriers to completing the project a survey of the New Zealand students that started the certificate after the research project was made a compulsory part of the Certificate (2009-2012 cohorts) was undertaken. This paper reports on the results of this survey and consequent new initiatives developed to increase completion rates.

## SURVEY METHOD

Email addresses from training agreements were used to send a link to an online questionnaire (available from the authors). Any alternative addresses given in automated responses were also used but only cursory internet searches were made to find other new email addresses. The first email invitation only yielded a response rate of 10%. Two further reminder emails increased this to 30% (20 students). A further eight people answered about half the questions in the survey. There were respondents from every cohort, although the response rates were related to the time delay between the cohort and survey (2009 = 13%, 2010 = 14%, 2011 = 38% and 2012 = 43.5%). The low response rate and out of date sample frame and low response rate mean there are a number of potential sources of bias. These might include: learners with stronger opinions, those with time available to answer the survey, or less representation of earlier cohorts. The results should therefore be viewed as indicative only. Given the potential biases results have been reported for the responding students only. If these were to be treated as a random sample of the entire student population in the given years, the margins

of error would be substantial. For example, for a proportion of 20 students it is roughly (with finite population correction) plus or minus 18 percentage points.

## RESULTS

Responding students came into the Certificate with highly variable backgrounds in statistics, 21% having never studied statistics, 54% either in the senior secondary school or introductory university courses and 15% in advanced tertiary level or as professional development for their job. However, for a number, their prior learning had taken place more than 4 years ago. Multiple responses were possible to the question on why students had enrolled in the course. Of the 29 students responding to this question, 45% did so because they wanted to be more confident using official statistics and 41% because they wanted to learn about official statistics. Only 14% of the responding students enrolled in the Certificate because their manager told them to (Figure 1).

As with the taught units in the 2009 evaluation, completion of the project was related to its perceived priority. Of the 20 students responding to this section, almost half (9/20) did not start working on the project until after finishing the four taught units. A quarter had not yet started doing the project. However, of the 12 that had not yet started or completed the project, 75% still intended to complete it.

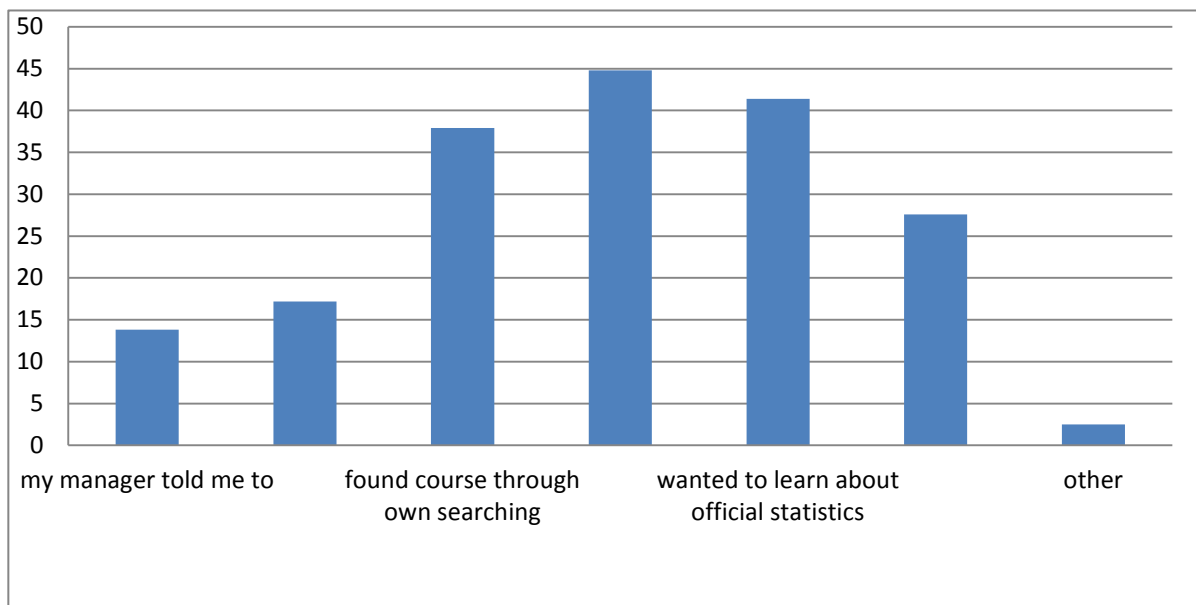


Figure 1: Reasons for enrolling in the Certificate of Official Statistics

As shown in Figure 2, over half of the learners agreed or strongly agreed that they didn't have enough time in their day to work on their project. Students who disagreed with the statement that the project was a low priority (that is, saw the project as high priority) were about five times more likely to complete than those who agreed (42% of respondents). 44% of respondents also thought that their manager saw the research project as a low priority. However, there was no evidence of any significant relationship between the students' perception of their own priority and their perception of their manager's priority for the project (Chi-squared test  $p$ -value = 0.431, Fisher exact test  $p$  value = 0.4528). Only a small proportion (3 or fewer) of the students identified too hard content, picking a topic, finding data, or low support from their manager or the tutor as barriers to completion (Figure 2). A quarter (of the 16 respondents) indicated that they had changed role or job since beginning the Certificate. It is possible that this may have a bearing on completion of the research project but was not investigated further.

The importance of following up students who had not submitted was emphasized by one student who stated that *"After the final workshop - my original topic choice fell through and it was only after follow-ups ... that we retro-fitted some work I had done (using the disciplines taught) and I put together a Research Project."*

All of the respondents (100%) felt that they were well informed and 85% considered that their managers were well informed. Most of them had discussed the research topic (80%) and getting data (80%) with their manager but only half (50%) discussed choosing methods, creating statistical outputs, their first draft, or submission of the assignment with their manager. Some learners also disagreed that their discussions with their manager were productive (40%).

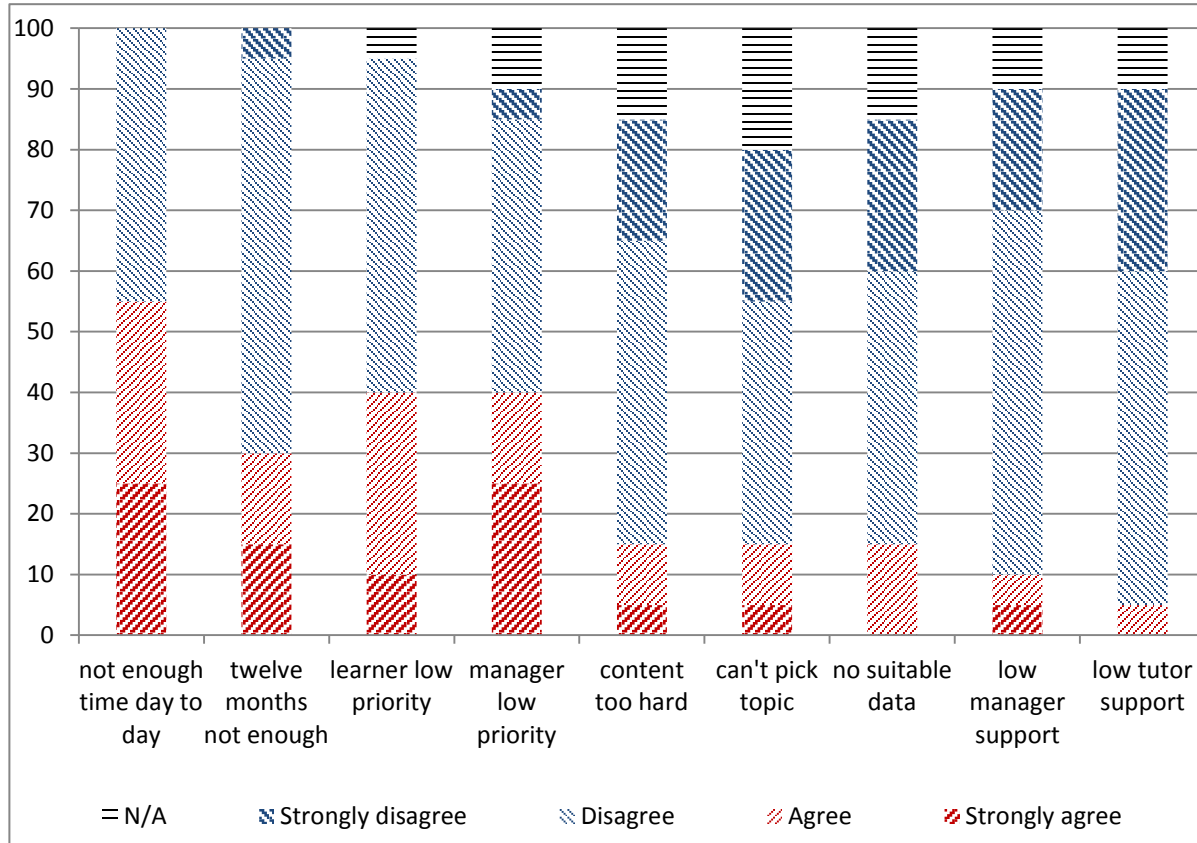


Figure 2: Students' perceptions of barriers to completion of the research project

A high proportion of the students were positive about the relevance of the *taught units* to the research project with over 90% (20 or 21 of the 22 respondents) either agreeing or strongly agreeing that each unit was relevant to the project (Table 1). However, as one student stated “*I'm trying to incorporate all the topics from the course into my research project in some aspect. In that case, all topics are relevant to my research project*”.

Table 1: Relevance of taught units to the research project

To what extent do you agree that the following units were relevant to your research project?						
	Strongly agree	Agree	Disagree	Strongly disagree	N/A	Total (n)
Legal and ethical issues	9	11	1	0	1	22
Interpreting descriptive official statistics	12	9	0	0	1	22
Making inferences with official statistics	11	10	0	0	1	22
Making recommendations with official statistics	13	7	1	0	1	22

Of the 15 students that had started the project, 4 (27%) have already applied the skills and knowledge gained in the research a moderate extent. Students' comments about how they have applied these skills in the workplace included:

- *Applied sampling theory from the course in scoping an observational cell phone use survey.*
- *By developing collection reports with some analysis and recommendations from survey metadata.*
- *Interpreting and explaining margins of errors, odds ratios etc. for research papers*
- *To harp on to others about data matching and information privacy*
- *I am now able to analyse data to a deeper extent and have more of an understanding of the information that I send to others. It has given me more confidence in what I do and I can inform others with confidence.*
- *I started a mini-project (currently on hold) as suggested by my new manager to check if a certain source of administrative data is good enough to be used as quality check for current data.*

#### RESPONSE TO STUDENT FEEDBACK

As a result of the positive feedback from the surveyed students, no major adjustments were made to the content of any of the taught units.

However, a number of steps were taken in 2013 to increase the students' perception of the importance of the research project and to address their expressed lack of time to work on the project:

1. A half-day workshop on the project was held immediately prior to the first of the taught units (in the past workshops were held at the completion of the taught units).
2. A tiered approach to the project was introduced with students being asked to submit research plans, structured report outlines, etc. as they developed their research project.
3. Although there had previously been no formal due dates for assessments for the taught courses students were now asked to submit each assignment before the date of the next course. It was felt that early completion of the taught units would free up more time for work on the project.
4. As with previous cohorts, the students' managers were also invited to attend a short workshop on the research project (with the aim of increasing the manager's priority for the project).

The original 2013 cohort of 18 students began the Certificate in July 2013. There has since been one withdrawal. There has been an immediate response to the above initiatives from the remaining 17 students with 14 (82%) of students submitting assessments for the first taught unit on the due date and 13 (76%) passing the unit. In addition, 10 (59%) of students had submitted research plans and/or entered into discussions about their project with the course coordinator prior to the third taught course (at the end of October 2013).

#### CONCLUDING COMMENTS

In its current form, the New Zealand Certificate of Official Statistics is a mix of externally taught and assessed units and a workplace based but externally assessed project. However, as Vaughan (2008) states, "*Workplace learning is not just a one-way process then. It is an interaction between workplace, learning, and the learner*" (p19). That is, students need to interact with their managers in the choice of the project and throughout its development. Possible reasons for the perceived managers' low priority for the project could be they see it as additional to their negotiated annual work plans, or they feel that they have contracted out the students' learning in the Certificate through payment of their enrolment fees. An ongoing issue for the Certificate administrators is getting managers to accept that "*Workplace learning projects require substantial investments of resources, commitment and energy from both employers and employees.*" (Alcántara, 2006, p1). Managers need to be reminded to allocate sufficient work time for both themselves and their student in order to gain maximum return from their investment in this training.

Early indications are that the initiatives developed in response to the survey of students' perceived barriers are already having a positive impact, and the results of these improvements will continue to be monitored.

What has not yet been measured is whether or not participation in the national certificate has a positive effect on organizational performance, decision-making processes or statistical outputs.

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