Towards retention: the role of assessment, motivation and prior knowledge in learner completion.

Report for Ako Aoteroa.

December 2008

Sharleen Forbes, Murray Black, Karen Moses, Nathaniel Pihama, Neil Bechervaise and Kimberly Cullen.

(Statistics New Zealand, Auckland University of Technology, Learning State, Statistics New Zealand, Learning State, Statistics New Zealand))

CONTENTS

Introduction

The Education Act 1989 established the New Zealand Qualifications Authority (NZQA) to

> '*oversee the setting of standards for qualifications in secondary schools and in post-school education and training''*, section 253 (a)

and set the legislative base for the National Qualifications Framework (NQF) as one in which

> '*…All qualifications…have a purpose and a relationship to each other that students and the public can understand, and*
> *There is a flexible system for the gaining of qualifications, with recognition of competency already achieved*', section 253 (c).

Assessment in the units of learning (unit standards) registered on this framework focused on the measurement of learner performance against published standards (New Zealand Qualifications Authority, 1991 cited in National Qualifications Project Team, 2005). The first post-school qualification was registered in 1994 and secondary schools began offering unit standards in 1990 with a National Certificate of Educational Achievement (NCEA) being introduced for secondary school students in 2002 (National Qualifications Project Team, 2005). Prior to this, the traditional modes of assessment (particularly in secondary schools) were norm-referenced written examinations and, to a lesser extent, internally assessed, but externally moderated, individual project work.

A number of studies (summarized in Forbes, 2000) at the secondary school level have also shown that the form of assessment used may differentially impact on different groups of learners (such as gender and ethnic groups). Forbes (2000) found a statistically significant relationship (at the 5% level) between performance (mark or grade received) in mathematics and statistics and continuation in these subjects.

At the post-school level, Industry Training Organisations (ITOs) facilitate workplace based learning and, for increasing numbers of New Zealanders, this provides significant training and development opportunities that lead to nationally recognized qualifications on the National Qualifications Framework. According to Tertiary Education Commission statistics (Industry Training Federation, 2008) registered trainees and apprentices comprise approximately one quarter of all learners in tertiary education. The Ministry of Education (2007a) stated that:

> *"a key strength of industry training is that it allows those with few or no previous qualifications to engage in tertiary training in a workplace setting"* (Ministry of Education, p.9).

In 2007, 24% of trainees had no previous qualifications with 33% of these being Maori and 33% being Pacific trainees. 44% of the credits achieved were by trainees with no year 11 equivalent or previous education qualification. However, for all learners, continuation in learning is generally conditional on the successful completion of previous courses of study so it is important to assess whether the competency based assessment used in unit standards promotes student completion.

This study does not compare competency based assessment with other forms of

assessment or across different groups of learners but does investigate how competency based assessment can be improved to better meet the needs of learners in the workplace based *National Certificate in Public Sector Services (Official Statistics).* Hereafter in this report this certificate is referred to as the *Certificate of Official Statistics.* An investigation of the relationship between the complexity of assessment questions and the time taken to complete unit standards is also undertaken together with an analysis of other key factors related to learner completion.

Background:

1. Workplace based learning and key factors related to course completion

Many models of workplace based learning acknowledge that:

> "*Different learners, with varying capabilities, will need different amounts of time to develop occupational knowledge and diverse pathways through entry level preparation to meet both their own needs and those of industry.*" (Choy et al, 2008, p.8)

Units on the NQF are based on three key stages along the pathway of learning to meet the unit standard outcomes: training delivery; transfer of training to the workplace; and assessment of competency to the unit standard. Learners can enter at any of the three stages as prior knowledge along with current competency is recognized. Not only do learners enter at each of the three stages but some learners also exit at each stage. For some workplace learners the prior unsuccessful experience of assessment through examinations in the formal education system has created a lack of motivation to complete the assessment stage (Moses, 2008). In addition, some learners use units as refresher courses and do not complete the assessments.

Owen (2007) observed that, with the increased rate of change in today's economic environment, employees are required to obtain a broad range of skills to operate effectively in the workplace, to remain open to continuous learning and to achieve new competencies to meet changing skills needs on a continuing basis. In effect, workplace learning has become a career-long personal responsibility.

Adult learning theory suggests that such self-directed learning strategies provide motivation (Knowles, 1975; Tennant 1996). For many learners, however, the blended and unstructured nature of workplace based learning and assessment is new, unfamiliar and threatening. They need encouragement and support to acquire new skills and knowledge. In this context, prior learning, strong management support, high motivation and the mode of assessment are all likely to impact on the completion rates of learners.

Recently the focus of funding models for tertiary education has shifted both internationally and in New Zealand (Tertiary Education Strategy 2007-2012, Ministry of Education, 2007b) from engagement in tertiary education to successful completion of a tertiary education qualification and training to meet industry skill needs. The Industry Training Federation yearly report for 2007 (Industry Training Federation, 2008) indicated an 8% increase in employer participation in workplace based training with a 5% increase in industry trainees. The same report however, identified that 29,389 trainees completed national certificates, a decrease of 16% compared with 2006. Research was therefore

undertaken to explore completion issues from the business and learner perspective.

Major reports focusing on the key factors associated with successful completion of qualifications in workplace based learning in New Zealand, Australia and the United Kingdom have similar findings. In New Zealand an Industry Training Federation (Curson, 2004) report to members on completion issues for effective workplace learning identified key barriers to effective learning in the workplace as business structures and size, the nature of labour supply, having quality training models to meet skill needs, the need for employers to value the qualifications, training costs, lack of support and guidance to business and learners from ITOs. Curson reported that training of low quality and low relevance to learners' skill needs affects the learners' motivation and enthusiasm to complete through to assessment. The key influences for non-completions were trainees moving jobs to a different employer or different industry and the need for structured time and support to be allocated to undertake learning in the workplace. However, as Cudby and Moses (2004) observe, qualifications on the NQF are nationally recognized and transferable so labour movement between employers in a similar business should not be a barrier. Similar issues have been identified for the non-completion of modern apprenticeships in both New Zealand (Jeffcoat & Jeffcoat, 2006) and internationally (Gallacher et al, 2004).

Curson (2004) also argued that if employers provide an environment which fosters and facilitates effective learning, they are more likely to have learners motivated to successfully complete qualifications. This is supported by Gallacher et al (2004) who reported that one third of modern apprentices gave issues relating to the workplace context and lack of workplace support for workplace learning as reasons for non-completion. Montague and Hopkins(2002) hypothesised that:

> *"the higher quality of learning support services provided, the higher percentage of student completion rates"* (Montague and Hopkins, 2002, p.8).

When a collaborative approach to workplace learning is used, a training provider facilitates learner support from an education perspective and the workplace provides informal support from a business perspective. In her recent overview of the research literature Moses (2008) reported that motivation for learners to complete workplace based qualifications requires that:

> *'1) The employer must provide an environment that fosters effective learning …and … show value for the qualifications, learning and assessment resources used.*
>
> *2) Learners must have access to learning support systems from both educational and business perspectives which promote and support self-directed learning strategies.*
>
> *3) ITOs need to design orientation programmes for models of workplace learning and provide learner support beyond the modern apprenticeship programme.*
>
> *4) Workplace learning models must be … relevant for the business context and the learner, acknowledging prior learning and industry need.*
>
> *5) Qualifications, learning and assessment resources must meet industry quality assurance standards.*
>
> *6) Evaluation of workplace learning models and training programmes must ensure they meet the needs of industry and the learner.*
>
> *7) Training programmes must use motivational training strategies acknowledging the*

different learning styles.
8) Adequate and appropriate administration systems are required to monitor and track learners' progress and location.
9) ITO's must facilitate collaborative partnerships to ensure all providers work together on the development and delivery of workplace learning.
10) ITOs must provide support and advice on workplace learning with formal agreements on training delivery.' (Moses, 2008, pp33-34).

2. Competency based assessment and the Certificate of Official Statistics

The *Certificate of Official Statistics* was developed by New Zealand's national statistics office, Statistics New Zealand, in collaboration with the ITO for state sector employees, Learning State (then the Public Sector Training Organisation). The certificate was registered on the NQF in July 2007 and contains four compulsory statistical unit standards and one general unit that can be selected from a number of options. The compulsory units are:

Unit Standard 23268 (US 68) *Interpret statistical information to form conclusions for projects in a public sector context*

Unit Standard 23269 (US 69) *Evaluate and use statistical information to make policy recommendations in a public sector context*

Unit Standard 23270 (US 70) *Assess a sample survey and evaluates inferences in a public sector context*

Unit Standard 23271 (US 71) *Resolve ethical and legal issues in the collection and use of data in a public sector context*

Two of the unit standards (US 68 and US 70) were at level 4 on the framework (equivalent to final year secondary school) and two (US 69 and US 71) were at level 5 (first year undergraduate degree). Overall, the certificate was assessed to be at level 4. The learning in the compulsory units was based on statistical thinking theory (Wild & Pfannkuch, 1999) but focused on official (government) statistics and their use rather than on statistics in general. Details of the learning outcomes and performance criteria for each of these four units are given in Appendix 1. This study investigates completion rates in these units only, for the first two cohorts of learners participating in the certificate.

Capper (1996) suggested that the determinants of competence used in standards based assessment on the NQF should be an amalgam of work, training and assessment making the maximum use of performance events that provide valid evidence across a number of competencies, i.e. naturally occurring evidence from the work or learning setting is supported by clear presentation and cross-referencing of ideas. Relevant application of learning is confirmed through verification by the learner's manager. In the *Certificate of Official Statistics* recognition of prior learning was aligned with this triangulation model but has not yet been used in practice. For the first cohort of students one assessment question was verified by the course provider as having been successfully completed in the learning process. Reports involving official statistics, for example, the Innovation Report, were selected beforehand and used as an exemplar for the assessments. To obtain credit for each standard, the learner was required to answer correctly all the questions pertaining to the selected report for the assessment. Students were only requested to use examples from their own workplace in one of the possible optional units. Work is

currently underway to develop an umbrella unit; a statistical research project based in the learner's own workplace to replace these optional units. Competency in the compulsory statistics unit standards in the certificate was measured on learners' responses to a set of standard assessment questions.

Each of the four compulsory units was delivered in Wellington with, for the second cohort, videoconference links to Auckland and Christchurch as required. Each was also delivered by a different provider (US 68 by Auckland University, US 69 by Victoria University of Wellington, US 70 by Auckland University of Technology and US 71 by Statistics New Zealand) but all four units were assessed by the same assessor (from Auckland University of Technology). Learners were required to demonstrate to the assessor that they could satisfactorily perform the key tasks given in the assessment either in writing or orally. Their answers were to be given in the context of two published reports that were common to all four unit standards and supplied to the learners. Other reports were to be provided on a minimal basis to cover assessed components not in these reports. The assessment questions used for the first cohort of learners are given in Appendix 2. Answers to the assessment questions were completed in the learner's own time (supposedly over a three week period) then submitted to the assessor. Learners were able to resit parts of questions until they reached a satisfactory level of performance. It was anticipated that having the ability to resit would encourage learners to complete units but may affect the total time taken for completion.

Methodology

The first cohort of learners in this certificate enrolled on the basis that, although the certificate had been formally moderated and registered on the NQF, to some extent both the course content and the assessment questions were being piloted. All but one of these candidates were from Statistics New Zealand. Some modifications to the assessment questions, as detailed in the results section below, were made for the second cohort of learners. Of the original 16 candidates in this cohort, seven came from Statistics New Zealand and the other nine from four different government agencies. One of these candidates withdrew before attempting any assessments as a result of changing roles twice within the same government agency and competing priorities. This does not support the view of Cudby & Moses (2004) that labour movement within a business should not be a barrier to completion.

Two learners from the first cohort of students used the unit standards in the *Certificate of Official Statistics* to refresh or enhance their existing statistical knowledge and did not request or submit any assessments. For those students in each of the first two cohorts who had completed at least one unit standard at the date (31 November 2008) of the study (13 of the original 15 candidates in the first cohort and 6 of the original 16 candidates in the second cohort) the relationship between the level of complexity of the assessment question and the time (in days) taken to completion was investigated quantitatively. The level of complexity of questions was determined using a mapping of Bloom's (1956, 1984) taxonomy of six levels for learning into the five instructional domains defined by Delmas (2002) and then into the five levels of statistical reasoning proposed by Garfield (2002) as shown in Table 1 below.

Table 1: Levels of complexity (reasoning)

	Bloom's Taxonomy	Instructional Domains	Reasoning Framework
Level	**Objective**	**Teaching**	**Assessment**
1	**Knowledge** Recall	**Literacy** Identify	**Idiosyncratic** Knows
2	**Comprehension** Meaning	**Literacy** Describes	**Verbal** Defines
3	**Application** Context	**Reasoning** Why?	**Transitional** Partial Understanding
4	**Analysis** Distinguishes	**Reasoning** How?	**Procedure** Application
5	**Synthesis** Contextual Links	**Thinking** Apply	**Integrated Process** Complete Understanding

These five levels can be illustrated using a learner's ability to differentiate between the mean and standard deviation as follows:

1. **Idiosyncratic:** The learner knows that the mean and standard deviation are used in statistics but isn't able to fully appreciate their meanings.
2. **Verbal:** The learner is able to define both the mean and standard deviation but with no context.
3. **Transitional:** The learner can define both the mean and standard deviation correctly in the context of the given report.
4. **Procedural:** The learner is able to explain how both the mean and standard deviation relate to the objective of the report but not to interpret their use in all parts of the report (for example, in confidence intervals and margins of error)
5. **Integrated Process:** The learner can integrate the meanings and uses of the mean and standard deviation into all relevant parts of the report.

For learners and their managers in the first cohort, structured questionnaires (Appendix 3a and 3b) were used. One interviewer delivered the learner questionnaire to all the 13 candidates and a second delivered the manager questionnaire. Open ended responses were recorded, entered into a spreadsheet and analysed by the rate of occurrence of common phrases to determine the learners' views of the unit standard (content, assessment and barriers to completion) and the managers' expectation and level of support. Analysis of learners' reasons for enrolling in the certificate was used to determine their level of motivation (high or low). The managers' perception of the statistical skills (basic or none) of learners prior to enrolling in the certificate was used as a proxy for their prior statistical knowledge. Although there was only a relatively small number in the first cohort (13 students) the relationship between the two levels of

motivation and the time to completion and between the learner's prior knowledge and the time to completion was also investigated.

Feed back was also sought from the assessor on his views on the influence of the form or content of the assessment questions on completion.

In general, because of the small numbers of learners (13 and 6 in each cohort respectively) who had completed at least one unit formal statistical tests were not done and the results should be viewed as indicative only.

Results

1. Levels of complexity of assessment questions

The key purpose of the questions used to assess learning in the units within the certificate was to put the learners in the position of having to read and interpret public sector reports over a range of statistical concepts, bearing in mind the overall objective of the report and how the statistics within the report informed answers to various policy questions.

Appendix 4 categorizes each of the questions used in the first (pilot) cohort using a scale of 1 to 5 (corresponding to the increasing levels of complexity). These can be considered as increasing levels of complexity. Reasoning in the range 3 to 5 indicates that the question requires some linkage of the statistical analysis to the context of the report. Table 2 below shows the number of questions occurring at each level of complexity within each unit standard.

Table 2: Number of questions by level of complexity

Level	US 68	US 69	US 70	US 71
1	4	2	2	0
2	5	0	9	3
3	6	6	6	9
4	3	5	1	2
5	0	5	1	2
Total	**18**	**18**	**19**	**16**

A chi-square test at the 5% level of significance using the data displayed in figure 4 (collapsed to three levels of complexity; **1+2**, **3** and **4+5**) confirmed that that level of complexity of questions and unit standard were significantly related (χ^2 = 17.7 with 6 degrees of freedom). As expected, the two level 4 standards, US 68 and US 70 have considerably more questions at the lowest two levels of statistical reasoning than the two level 5 standards, US 69 and US 71. US 69 has over half its questions requiring statistical reasoning to levels 4 and 5 whereas US 71 has over half in the middle category which represents the lowest level of contextual links at the lowest level. This could be due to some of its questions revisiting basic concepts as part of scaffolding into questions involving reasoning to a higher level throughout the assessment in this unit. US 71 was different to the other three units as it was concerned with ethical and legal issues related

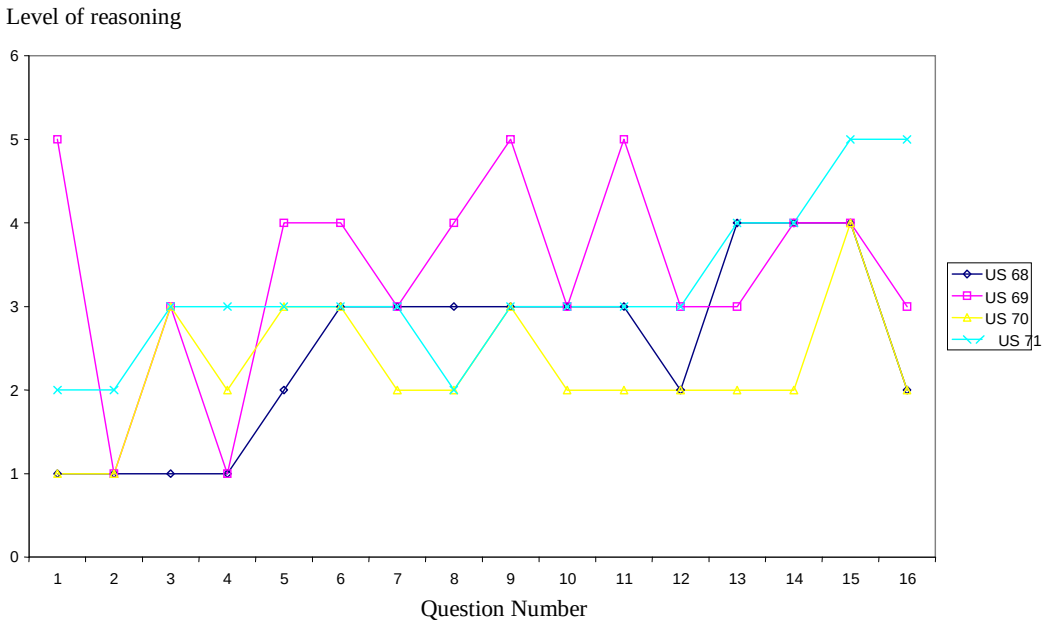
to the collection and use of official statistics whereas the other units were concerned with statistical methods and their interpretations.

The average (mean) complexity levels of questions in each unit were:

US 68	Mean = 2.3
US 69	Mean = 3.6
US 70	Mean = 2.5
US 71	Mean = 3.2.

Figure 1 gives the level of statistical reasoning (complexity) for each question in each of the compulsory unit standards. This shows an upward trend in statistical reasoning levels across questions 1 -15 in US 68 but US 69 does not follow a similar trend. US 70 and US 71 also follow an upward trend in the main (except for the last two questions in US 70 and the drop between questions 7 and 8 in US 71). The difference in US 69 may be because these questions were designed to sit separately under each of the four learning elements in the unit.

Figure 1: Level of reasoning for individual assessment questions.



2. Analysis of resits

There was a small group of candidates that managed to complete each unit standard in the time given. However, most asked for, and were given, extensions from the three weeks. Out of those learners who requested the assessment, table 3 shows the percentages of candidates in each unit that passed their first assessment (as at 12th September 2008).

Table 3:Percentage (number) of candidates who passed their first assessment (by 12/09/08)

US 68	23% (3)
US 69	31% (4)
US 70	50% (6)
US 71	40% (4)

That is, half or more (77%, 67%, 50% and 60% respectively) of learners in each unit standard were required to resit at least one question. The mean number of questions requiring resits per learner in each unit standard were:

US 68 Mean = 2.4
US 69 Mean = 2.5
US 70 Mean = 4.2
US 71 Mean = 1.5

Specific questions requiring resits are given in Appendix 5. The assessor identified and classified issues that may have influenced these candidates into requiring a re-sit on at least one question as teaching, assessment design or candidate related. The teaching issues identified were lack of coverage of some concepts and more difficulty with quantitative than quality assessments. Assessment design issues included learners being unable to find examples of required content in the given reports so that answers could be given in context, difficulties explaining concepts not covered in the reports and questions not being clear enough about what was required in the answer. Candidate issues included questions not being answered completely or answers too brief and not enough detail given. Table 4 summarises the nature of the unsatisfactory responses requiring re-sits.

Table 4: Number of resits by reason for requiring resit.

Error Classification	**US 68**	**US 69**	**US 70**	**US 71**
Wrong	9	2	7	2
No Context Provided in Answer	0	2	8	2
Question Not Answered Fully	15	16	10	5

A higher proportion of re-sits in the level 4 than level 5 units occurred because learners were incorrectly explaining statistical concepts but the major source of resit requirements, over all the units, was that questions were not answered fully enough. Part of the reason for this was that the questions themselves didn't make it clear enough what was required for a full answer.

As a result of this analysis changes were made to the assessment questions for the second cohort of students. Assessment questions in unit standards US 69, US 70 and US 71 were modified to address the order of difficulty of questions, to reduce the number of questions and to establish closer alignment with the five stages of statistical reasoning and the question order. Overlaps in questions requiring similar answers between unit standard

assessments were removed and linkage provided across units in assessing components of two common reports to all four units. Fine tuning of exemplars and/or worked examples as part of the presentation was done to indicate what was required to complete different types of questions satisfactorily. The order of delivery of the unit standards was changed so that learners were more clearly focused on legal and ethical constraints (US 71) within the overall objectives of a report along before the various statistical concepts required (US 68, US 70 and US 69). Backup and mentoring systems for learners were also extended.

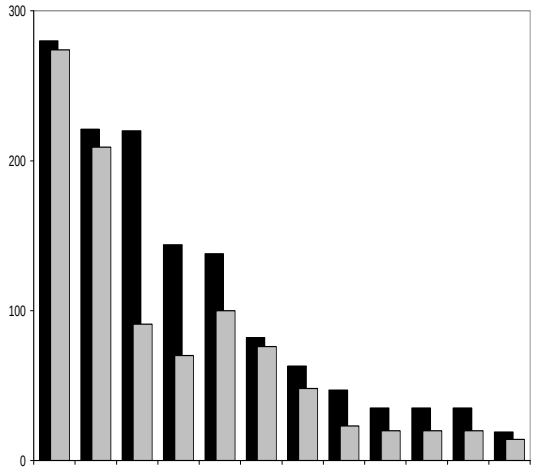
3. Time to completion

(a) Cohort One

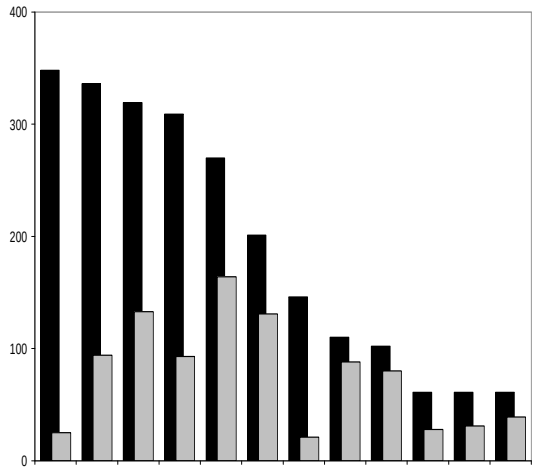
The order of presentation of the unit standards to the first cohort of learners was US 70, US 68, US 69 and US 71.The following graphs (figures 2a, 2b, 2c, and 2d) give the time taken (in days) to completion for each learner in each unit standard in the first cohort from both the date of delivery of the course seminar (black bars) and the date of receipt of the assessment questions (grey bars). The times to completion are ordered from the highest to the lowest from the seminar date for each unit standard.

Figures 2: Cohort One: Time taken to complete unit standard (in days)

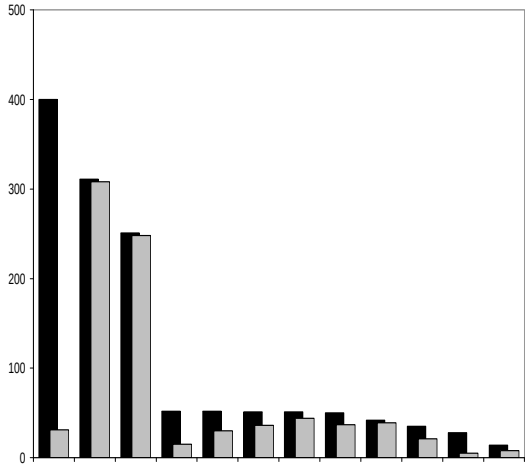
2a: US 68



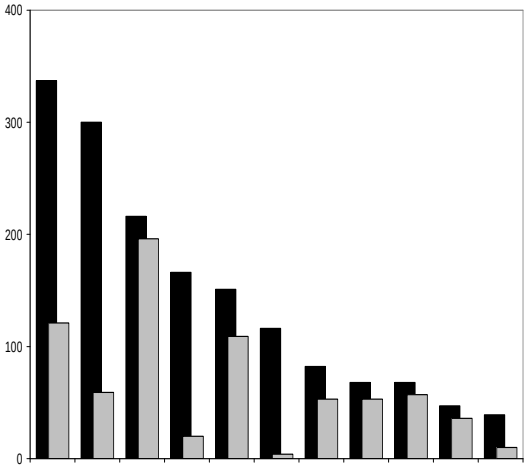
2b: US 69



2c: US 70



2d: US 71



There were also some long periods between the initial submissions and re-sits but some of these were accounted for by the availability of the assessor to supervise the resit.

Table 5 below gives the number of candidates in Cohort One requesting assessment questions, the number requiring resits (in one or more questions), the number who passed and the pass rate.

Table 5: Assessment Summary for Cohort One candidates

Unit Standard	**Number**			**% Pass Rate**
	Sent Out	**Re-sits**	**Passes**	
US 68	13	10	13	100
US 69	13	8	12	92
US 70	12	6	12	100
US 71	12	6	11	92

The median completion time (84 days) was greater for the statistical level 5 unit standard (US 69) than the two statistical level 4 units (median completion times of 48 and 33.5 days for US 68 and US70 respectively). There was a lot of variation in the time taken to completion in each unit as is shown by the ranges:

US 68	7 to 174 days
US 69	8 to 150 days
US 70	5 to 240 days
US 71	4 to 167 days

The variability, as measured by the standard deviation, for US 70 was substantially higher at 64.5 days than for the other three unit standards. This was probably because of the outlier at 240 days.

Barriers to completion identified by the assessor were timing (allocated time of three weeks to complete each assessment too short, not enough time between the course deliveries for each unit standard), assessment design (absence of a clear example of the

concept), teaching (concepts not covered in enough depth, not enough support for weaker learners, effect of instruction diminished over time) and learner specific (reluctance to request assistance, the order of doing assessments (for example, skipping an earlier quantitative unit then coming back later) time management and work commitment conflicts).

For 8 of the 13 candidates in Cohort One their level of motivation could be constructed from interview data from with these candidates. Candidates that expected the certificate to increase their statistical skill and knowledge or assist with career advancement were classed as having high motivation. Candidates who indicated that they took part in the certificate as either a refresher or to contribute to the pilot process were classed as having low motivation. As table 6 shows the median time (in days) from receiving the assessment to completing the assessment was substantially longer for candidates with low motivation than for those with high motivation. However, this analysis is indicative only as there were only a small number (8) of learners specifying their reasons for doing the certificate.

Table 6: Median time taken (in days) from receiving the assessment to completion of each unit standard by level of motivation (as specified by candidate)

Candidates			**Median Completion Time**				
Motivation	**Number**	**Percentage**	**US 68**	**US 69**	**US 70**	**US 71**	**Total**
High	6	46%	21.5	63.5	22.5	28.0	29
Low	2	15%	154.5	132.0	53.0	109.0	109
Not specified	5	39%					
High - Low			133.0	68.5	12.5	81.0	80
ALL	13	100%	48.0	84.0	33.5	53.0	44

NOTE: One candidate had only completed 3 units and another only one unit at the time of analysis.

Candidate's managers gave their perception of the candidate's statistical knowledge at the time of enrolling. Responses from managers that indicated that candidates had no, some or little prior statistical knowledge were classified as 'low' prior knowledge. Responses of basic or average were classified as 'basic' prior knowledge. As table 7 indicates there was no obvious relationship between the level of motivation and the level of prior statistics knowledge for the 8 candidates for whom both items of information were available. That is, the low motivation candidates were not those with low prior background.

Table 7: Prior knowledge of candidates by level of motivation

Prior Knowledge				
Motivation	**Basic**	**Low**	**Not specified**	**Total**
High	4	2		6
Low	1	1		2
Not specified	1	2	2	5
Total	6	5	2	13

Information on the prior level of statistics was obtained from the managers of 11 of the 13 candidates. As Table 8 shows, there was no consistent pattern across all the unit standards and the differences between candidates that had a low prior level of statistics compared with candidates with a basic prior level of statistics was smaller than those seen between candidates with high and low motivation.

Table 8: Median time taken (days) from receiving the assessment to completion for each unit standard by prior knowledge (as specified by manager)

Candidates			**Unit Standard**				
Level of Statistics	**Number**	**Percentage**	**US 68**	**US 69**	**US 70**	**US 71**	**Total**
Basic	6	46%	35.5	90.5	18.0	53.0	48
Low	5	39%	73.0	66.5	33.5	72.5	38
Not specified	2	15%					
Basic - Low			37.5	-24.0	15.5	19.5	-10
ALL	13	100%	48.0	84.0	33.5	53.0	44

NOTE: One candidate had only completed 3 units and another only one unit at the time of analysis.

If the mean number of days (from the time the assessment was sent) to completion is used instead of the median, as shown in table 9, the pattern across unit standards is less consistent. As there are a few learners that take a long time to complete (outliers) these impact on the mean but not the median so the median is a better measure to use here.

Table 9: Difference in mean completion times by candidate's level of motivation and by prior statistics knowledge.

Candidates	**Unit Standard**				**Total**
Motivation:	**US 68**	**US 69**	**US 70**	**US 71**	
Low – High (8)	114.8	59.8	-22.2	67.7	54.8
Prior Knowledge:					
Low – Basic (11)	-7.7	-25.6	-22.5	36.8	-3.8

NOTE: One candidate had only completed 3 units and another only one unit at the time of analysis.

In summary, the median completion times from the date the assessment questions were sent out to completion of the unit ranged between 4 and 240 days and, even though there was only a small number of candidates, the time taken to completion seemed to be related to the individual candidates level of motivation. Of the 13 learners who requested assessments in the first cohort 10 (77%) completed the whole certificate in the 18 month timeframe, and 11 (85%) completed all four of the core unit standards. At present the duration of the Training Agreement for the certificate is 12 months but Learning State allowed the pilot candidates two three month extensions. At least one of these extensions was required for operational reasons but the time taken to total completion of the certificate will require further monitoring before we can be sure that a 12 month timeframe is feasible for learners.

(b) Cohort Two

As at the time of writing only three of the four compulsory unit standards had been delivered to the 16 candidates in the second cohort. Following the analysis of performance of Cohort One learners, the order of presentation of the unit standards to Cohort Two learners was changed to US 71, US 68, US 70 then US 69. The time taken (days) to complete the assessment both from the date of delivery of the course seminar (black bars) and the date of receipt of the assessment questions (grey bars) for the 10 learners who had completed at least one unit in Cohort Two is given in figure 3. The times to completion are ordered from the highest to the lowest from the seminar date for each unit standard.

Figure 3: Cohort Two: Time taken to complete unit standard from receiving the assessment (in days)

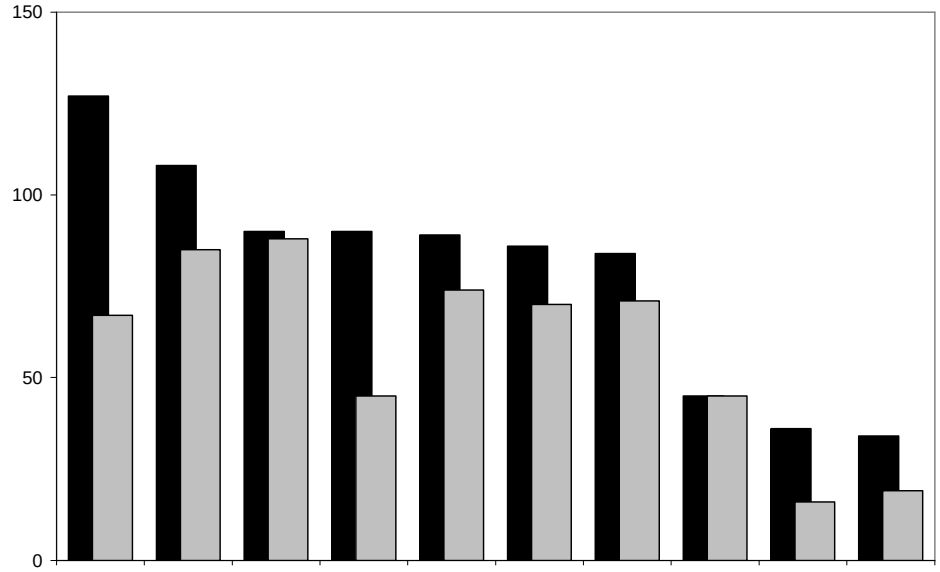


Table 10 shows the percentage of the 16 candidates who have completed each of the four compulsory units.

Table 10: Cohort Two: Percentage of assessments requested or submitted by unit standard

	Assessment		
Unit Standard	**Number submitted**	**Completed**	**Not Completed**
US 68	12	33%	67%
US 69	1	0%	100 %
US 70	9	11 %	89%
US 71	14	36%	64%
Total	36	28%	72%

As more than half of the learners in each unit standard have not yet completed their units no further meaningful analysis of this group could be done.

4. Views of learners and their managers

The most common reasons given by learners in Cohort One for enrolling in the certificate were to improve their statistical knowledge and promotion prospects, or as a refresher course.

When asked for their views on how the content related to their prior knowledge, learners with little or no prior knowledge of statistics found the statistical content difficult compared to those with prior knowledge or training in statistics who found it relatively straight forward. A number of learners stated that they initially found the assessment questions difficult as they were not sure what they were expected to include in their answers. Learners used other candidates, tutorials and assessor feedback to clarify any issues that arose.

All learners reported a tension between the completion of assessment and work and personal life and many reported that the certificate had a relatively low priority compared with other commitments. Learners generally found time to complete the assessment when there were no other commitments and some worked on several units at the same time. Some learners mentioned that fixed deadlines would have given them a greater drive to complete sooner.

In general, learners in Cohort One seemed to have been given very little support from their managers. As one manager stated "*I relied on the Certificate process to help her (tutoring, study groups, etc)*". Managers seemed to have a 'wait and see' attitude to the impact of the certificate on learners and most indicated that it was too soon to determine if participation in the certificate had met their performance expectations. However, the managers of six candidates reported that there had been a noticeable increase in the candidates' level of confidence in the workplace.

5. Feedback from the assessor

As stated earlier, the assessor listed possible reasons that resits were needed as the lack of an example in the given report; lack of teaching coverage of some concepts; or learners' answers to questions not giving what was required (not providing appropriate context, not enough detail given or only part of a question answered). He also made suggestions for improvements to the assessments including: having fewer questions; linking assessment components across unit standards; assessing more components as part of the teaching process; producing exemplars; using workplace evidence with workplace verification where possible; having performance criteria that start with the objective of answering a policy question: introducing a component in the assessment to see if learning is maintained over time: using questions that are applicable to the assessment report rather than having have 100% coverage of content and choosing reports so coverage of content isn't always the same thus removing the need for candidates to invent answers; and exploring the use of group assessments.

Changes to assessment following the pilot cohort (One).
Following the feedback from the assessor, and in consultation with the providers of each unit changes were made to the assessment between the first (pilot) and second cohorts of learners as follows:

- order of presentation of the unit standards was changed from US 70, US 68, US 69 then US 71sequence to US 71, US 68. US 70 and US 69 so learners focused on legal and ethical constraints and report objectives before learning the various statistical concepts required;
- questions in US 69, US 70 and US 71 were modified to give fewer questions and closer alignment with the five stages of statistical reasoning in question sequence; remove overlaps in questions between units; and provide some choice when explaining concepts (for example, explain in context a confidence interval for a mean or a proportion);
- fine tuning of exemplars and/or worked examples within courses to show what was required for a pass;
- use of a gaps analysis to ascertain entry knowledge of learners, provide pre-courses in relevant material and extend backup and mentoring systems.

Overall conclusions and recommendations
Two learners from the first cohort of students used the unit standards in the *Certificate of Official Statistics* to refresh or enhance their existing statistical knowledge and did not request or submit any assessments. Of the 13 learners who did 10 of 13 (77%) have completed the whole certificate including the final elective unit in the 18 month timeframe. However, 11 of 13 (85%) completed all four of the compulsory statistical unit standards within this timeframe. At present the duration of the Training Agreement with Learning State for the certificate is 12 months but two extensions to this were needed so further monitoring of the actual time taken by learners is required before we can be sure that a 12 month timeframe is feasible for learners.

One learner in the first cohort managed to complete even though he changed workplaces. In the second cohort however a learner who changed roles twice within the same government agency withdrew from the certificate because of competing priorities {in keeping with the reasons for withdrawal found by Curson (2004)}.

Learners seemed to have been given very little support from their managers and it is recommended that, in qualifications such as this, where the material is directly related to the workplace activities of learners, managers be informed of the amount of support learners require (both in terms of time and encouragement). When manager surveys are undertaken these should be at a sufficient distance from the completion of courses so that the effect in the workplace of the learning can be fully evaluated.

The time taken by learners in this certificate to complete units (from the date the assessment questions were sent out) was highly variable both for individuals (ranging from 4 to 240 days), as found previously by Choy et al (2008), and across the four units (median tiimes ranging from 33.5 to 84 days). The sample size is very small so

conclusions remain highly tentative but the time taken to completion does seem to be related to the candidates level of motivation.

The value of piloting or evaluating qualifications after being run one or two times is clearly demonstrated in this study. Not only was the order of the unit standards changed to meet learners needs but also the assessment questions themselves. In addition gaps analyses were introduced for new learners and pre-courses or learning support for those that required it. Further work is being done to introduce a new umbrella unit standard that will be truly workplace based, using a research or statistical report done by the learner within their organisation.

References

Bloom, B.S. (1956), 'Taxonomy of Educational Objectives: The Classification of Educational Goals', *Handbook I; Cognitive Domain*, New York, USA: Longmans, Green and Co.

Bloom, B. S. (1984) Taxonomy of Educational Objectives. Boston, MA: Allyn and Bacon

Capper, P. (1996). *Workplace skills assessment project final report.* Wellington, Centre for Research on Work, Education and Business.

Choy, S., Bowman, K., Billett, S.,Wignall, L., & Haukka, S. (2008). Effective models of employment-based training, National Council for Vocational Education Research, Adelaide SA.

Cudby, J., & Moses, K. (2004). *Standards based workplace training and assessment in the New Zealand public sector*. Paper presented at the International Cooperative Learning Conference, Auckland. Wellington: Public Sector Training Organisation.

Curson, R. (2004). *Completion Issues in Industry Training*, Industry Training Federation. Wellington.

Gallacher, J., Whittaker, S., Crosson, B., & Mills, V. (2004). *Modern Apprenticeships: Improving completions.* Scottish Executive Social Research. Edinburgh.

DelMas, R.C. (2002), 'Statistical Literacy, Reasoning and Learning: A Commentary', *Statistical Education*, 10(3).Industry Training Federation. (2008). Industry Training. Retrieved on 10 July 2008, from, http://www.itf.org.nz/iot.htm.

Education Act 1989, Public Act 1989 No. 80, New Zealand Government.

Forbes, S.D. (2000) *Measuring students' education outcomes: Sex and ethnic difference in mathematics,* (Doctoral dissertation), Curtin University of Technology, Perth, Australia

Garfield, J. (2002), 'The Challenge of Developing Statistical Reasoning', *Journal of Statistics Education*, 10(3).

Industry Training Federation. (2008). *Learners: perceptions of industry*, Industry Training Federation, Wellington, NZ.

Jeffcoat, G., & Jeffcoat, S. (2006). *Evaluation of the modern apprenticeship programme,* Tertiary Education Commission, Wellington.

Knowles, M. S. (1975) Self-Directed Learning. A guide for learners and teachers, Englewood Cliffs: Prentice Hall/Cambridge

Ministry of Education, (1999). *Achievement 2001 - National Certificate Of Educational Achievement.* Wellington, New Zealand: Ministry of Education.

Ministry of Education. (2007a). *Industry training 2007.* Wellington, New Zealand: Ministry of Education.

Ministry of Education. (2007b). *Tertiary education strategy 2007-12 incorporating statement of tertiary education priorities* 2008-10. Wellington, New Zealand: Ministry of Education.

Montague, L., & Hopkins, L. (2002). *Supporting learners in training*, National Council for Vocational Educational Research, Adelaide, SA.

Moses, K (2008). What are the key factors affecting learner motivation to complete qualifications through workplace learning?, Victoria University research project

National Qualifications Framework Project Team. (2005). *The New Zealand National Qualifications Framework, Revised paper*, New Zealand Qualifications Authority, Wellington.

Owen, H. (2007) *Workplace productivity-making skills count*. Paper presented at the ITF annual conference 27 July 2007 Leading & Learning Hotel Intercontinental Wellington.

Tennant, M. (1988, 1996) Psychology and Adult Learning, London:Routledge.

Tertiary Education Commission. (2008). Retrieved August 15, 2008, from http://www.tec.govt.nz

Wild, C., & Pfannkuch, M. (1999). Statistical thinking in empirical enquiry [with discussion]. *International Statistical Review*, *67*(3), 223−265.

Appendix 1: Learning outcomes for unit standards in the *Certificate of Official Statistics*

US23268 - Interpret statistical information to form conclusions for projects in a state sector context

Level **4**

Credits **8**

Purpose This unit standard is designed for people employed in the State Sector in positions where they are required to interpret statistical data to make and/or report decisions. People credited with this unit standard are able to: describe the process for obtaining statistical information for a project; interpret results from categorical and numerical variables for a project; interpret results from time series variables for a project; and interpret results from demographic information for a project in a state sector context.

Elements and performance criteria

Element 1

Describe the process for obtaining statistical information for a project in a state sector context.

Performance criteria

1.1 The requirements for statistical information are identified and described in terms of the project.

1.2 Requirements for statistical information are identified and described in terms of the type of data collection, variables, application to the project questions and the context.

Element 2

Interpret results from categorical and numerical variables for a project in a state sector context.

Performance criteria

2.1 Tables of counts, percentages and proportions with their row and column marginal totals are interpreted to form responses to the project requirements.

2.2 Graphs, numerical summaries and descriptions of distributions of numerical variables are interpreted to give responses to the project requirements.

2.3 Scatterplots, regression models and residual plots of relationships between numerical variables are interpreted to give responses to the project requirements.

2.4 Tables of magnitudes of categorical variables and numerical variables are interpreted to give responses to the project requirements.

2.5 Graphs are interpreted and formed to support responses to the project requirements.

2.6 Conclusions are drawn from the analysis of the categorical and numerical variables and recorded in accordance with organisational requirements.

Element 3

Interpret results from time series variables for a project in a state sector context.

Performance criteria

3.1 Analysis of time series variables is interpreted to give responses to the project questions.

Range time series variables may include but are not limited to – actual, seasonally adjusted, deflated, percentage change;

Components may include but are not limited to – trend, seasonal, irregular.

3.2 Indexes are used to give responses to project questions.

3.3 Performance indicators are interpreted to give responses to project questions.

3.4 Conclusions are drawn about the original variables and their components and recorded in accordance with organisational requirements.
Components may include but are not limited to – trend, seasonal, irregular.

Element 4

Interpret results from demographic information for a project in a state sector context.

Performance criteria

4.1 Standardised rates and/or odds ratios are calculated and interpreted to form responses to the project questions.

4.2 Conclusions are drawn from the demographic information and recorded in accordance with organisational requirements.

US23269 - Evaluate and use statistical information to make policy recommendations in a state sector context

Level **5**

Credits **8**

Purpose This unit standard is designed for people employed in the State Sector in positions where they are required to interpret statistical data to make and/or report decisions. People credited with this unit standard are able to: assess and select relevant data sources; develop a brief for statistical information collection; evaluate reports based on statistical information; and use reports based on statistical information to make policy recommendations in a state sector context.

Elements and performance criteria

Element 1

Assess relevant data sources to make policy recommendations in a state sector context.

Performance criteria

1.1 Sources of data are identified and assessed to determine their applicability to the policy recommendations.
Range: sources of data may include but are not limited to – existing collections, administrative datasets, new surveys, censuses, experiments, results of data integration projects; properties of data may include but are not limited to – origins, quality, contents, strengths and limitations (implications of classifications, data incompleteness, etc.).

Element 2

Identify and select relevant data sources to make policy recommendations in a state sector context.

2.1 Relevant data sources are chosen and data sets are selected to meet the requirements of the policy recommendations.

Element 3

Develop a brief for a statistical information collection to make policy recommendations in a state sector context.

Performance criteria

3.1 Requirements are identified and described in terms of their inclusion in the brief.
Range requirements include but are not limited to – timeframes, costs, target audience, purpose, type of decisions required, scope, use of information, frequency of use, level of information detail, classification systems, non-response, editing and imputation, data quality.

3.2 Brief is developed in accordance with organisational requirements.

Element 4
Evaluate reports based on statistical information to make policy recommendations in a state sector context.
Performance criteria
4.1 Reports based on statistical information are evaluated in terms of the fitness for purpose of the source data for the policy recommendation.
4.2 Reports are evaluated in terms of the fitness for purpose of the analysis, the reliability and validity of the conclusions and the clarity of the content for the policy recommendation.
Element 5
Use reports based on statistical information to make policy recommendations in a state sector context.
Performance criteria
5.1 Reports are analysed to form a response to the policy recommendation.
5.2 Decisions and/or recommendations based on the analysis are made and recorded in accordance with organisational requirements.
5.3 Limitations or modifications of relevant data sets are discussed with respect to a specific policy question.

US23270 - Assess a sample survey and evaluate inferences in a state sector context
Level **4**
Credits **4**
Purpose This unit standard is designed for people employed in the State Sector in positions where they are required to interpret statistical data to make and/or report decisions. People credited with this unit standard are able to assess a sample survey, and evaluate inferences and draw conclusions from sample surveys in a state sector context.

Elements and performance criteria
Element 1
Assess a sample survey for use in a state sector context.
Performance criteria
1.1 Resources are identified in terms of specialist advice on survey structure and analysis.
1.2 Features of a survey are assessed in terms of their impacts on the results from the survey.
Range: survey features may include but are not limited to – purpose, population, frame, data collection instrument, sampling plan, data collection method, data recording process, analysis methods, reporting methods, stratification, clustering, weights, longitudinal features, editing and imputation, classification systems, non-response.
Element 2
Evaluate inferences and draw conclusions from sample surveys in a state sector context.
Performance criteria
2.1 Inferences are evaluated in terms of confidence intervals for the estimates, and the contexts.
Range: inferences may include but are not limited to – estimates of population mean, population proportion, difference between means of two populations.
2.2 Conclusions are recorded in accordance with organisational requirements.

US23271 - Describe ethical and legal issues in the collection and use of data in a public sector context

Level **5**

Credits **4**

Purpose This unit standard is designed for people employed in the State Sector in positions where they are required to interpret statistical data to make and/or report decisions. People credited with this unit standard are able to: describe and understand legal and ethical issues (including privacy, security and confidentiality) relating to the collection and use of data in a public sector context; assess the adequacy of processes and policies addressing these issues; identify and describe how these issues impact on respondents to data collections; and make policy recommendations for processes or protocols that can help reduce these impacts.

Elements and performance criteria

Element 1

Describe and understand legal and ethical issues (including privacy, security and confidentiality) relating to the collection and use of data in a public sector context and assess the adequacy of processes and policies addressing these issues.

Performance criteria

1.1 Overview of privacy, security and confidentiality principles is described.

Range: Including but not restricted to legislative (e.g. Privacy, Statistics and Tax Administration Acts) and administrative constraints.

1.2 The collection and use of data in a public sector context is described and assessed in terms of privacy principles (with reference to at least **two** of the twelve principles listed in the Privacy Act).

1.3 The collection and use of data in a public sector context is described and assessed in terms of the security requirements of the government ministry, department or agency using the data (with reference to at least **two** examples).

1.4 The collection and use of data in a public sector context is described and assessed in terms of confidentiality requirements (with reference to at least **two** examples).

1.5 At least **one** other ethical or legal constraint on the collection and use of data in a public sector context is described and assessed.

Range: Including but not restricted to legislative (e.g. Human Rights Act) or administrative constraints (Public Sector Code of Conduct, Health and Research Ethics)

1.6 Processes and/or procedures for resolving privacy, security or confidentiality issues relating to the collection and use of data in the public sector are described in accordance with organisational requirements.

Range: Including but not limited to informed respondents, purpose for collection, physical and electronic barriers, office practices, data matching and data sharing protocols, statistical disclosure control.

Element 2

Describe issues relating to the impact on respondents of the collection and use of data in a public sector context, and assess the impact of these.

Performance criteria

2.1 **Two** potential impacts on respondents of legislative and ethical issues in the collection and use of data are identified and described.

Range: impacts may include but are not limited to – respondent burden, use for statistical versus operational purposes.

Processes and/or procedures for resolving privacy, security or confidentiality issues relating to the collection and use of data in the public sector is described in accordance with organisational requirements (with reference to at least **two** examples).

Range: Including but not limited to purpose for collection, use for statistical versus

operational purposes, physical and electronic barriers, office practices, data matching, data sharing, confidentiality protection.

2.2 The processes and/or procedures described in 2.2 are assessed in terms of their potential impact on respondents.

Range: Including but not limited to participation, respondent burden, data quality, trust.

Element 3

Make policy recommendations that could help resolve impact on respondents of privacy, security, confidentiality and ethical issues

Performance criteria

3.1 Recommendations for at least **two** processes and/or procedures for helping resolve the impacts on respondents of the collection and use of data procedures, in accordance with legislative and organisational requirements, are clearly described.

Range: Including but not limited to prior communication, feedback to respondents, length of questionnaires, unambiguous and unobtrusive questions.

3.2 The potential impact of these recommendations on respondents is assessed and described.

Range: May include but not limited to transparency, burden, participation, data quality, trust.

Appendix 2: Assessment questions used for Cohort One (pilot cohort)

Unit Standard 68

1. Reference the report(s).

2. What are the main objective(s) of the survey?

3. Name a likely non-sampling error resulting from this survey.

4. Identify all the variables used in this survey

5. Classify all the variables identified as continuous, categorical or neither.

6. What statistical procedure(s) have been used and why is it appropriate in this report(s)?

7. Choose a table of counts (frequency tables) and from that table identify and interpret in context three (row, column and total) percentages and/or proportions.

8. Choose a graph or graphs and at least one other type of numerical summary to draw conclusions appropriate to the context of the survey report(s).

9. Choose a statistical measure(s) and/or distribution from the demographic data to draw conclusions appropriate to the context of the survey report(s).

10. Choose a bi-variate analysis and make three interpretations from plot(s), model and/or correlation measure.

11. Give an example of a performance indicator in the context of the survey report.

12. State what a residual is in linear regression.

13. In the context of the survey report, explain what is meant by cyclical variation in a Time Series?

14. In the context of the survey report what could be conclude from the trend in a Tim Series?

15. In the context of the survey report, explain what is meant by the random component in a Time Series?

16. How do we interpret a seasonally adjusted time series?

17. Calculate and explain an odds ratio.

18. Calculate and explain an index number.

Unit Standard 69

Element 1: Assess data collections relevant to a policy questions

1. How well do the objectives of the data collection fit the policy question(s)?

2. What is the population that data is required for?

3. If a sampling procedure has been used, describe its main features.

4. What information is being collected?

5. What topics (objectives) do the questions relate to?

6. What aspects of the data collection or analysis affect its use?

7. What is one main result from this study (answer in the form of a possible headline for an article)?

Element 2 Identify and select relevant data collections to make policy recommendations

8. What data collections have you identified that could be used to answer this question?

9. How can these data collections be used to answer the policy question?

Element 3 Describe a statistical information collection that can be used to answer a specific policy question

10. Give the key elements of a data collection that could be used to answer the given policy question?

11. Describe one possible main result (as EITHER a potential press release OR a newspaper article).

12. Describe what sort of graph(s) you could include in your article (in question 11).

Element 4 Evaluate reports based on statistical information to make policy recommendations

13. What constraints are there on the stated conclusions in the supplied articles(s) or report(s)?

14. Do the supplied report(s) or analyses use data that is appropriate to answer the policy question given in element 2? Write your answer so that it could be understood by someone with less statistics knowledge than you.

Element 5 Use reports based on statistical information to make policy recommendations

15. What results or statements made in the supplied report(s) are relevant to the policy question given in element 2?

16. How does the supplied data collection(s) differ from the one you proposed in question 10?

17. How could the data collection(s) have been used to answer this question? OR, How could the data collection be changed so that it could be used to answer this question?

18. Use the result(s) of the analyses described in question 17 to make a policy recommendation or recommendations for your manager to consider.

Unit Standard 70

1. What are the main objective(s) of the survey?

2. List the sources of data used in this survey and if applicable any surveys that this survey provides data for.

3. How would you classify this type of survey? Choose from one-off, time series or longitudinal. Justify both the type chosen and those not chosen.

4. Explain the difference between a sample and the population from which the sample is selected?

5. What sampling procedure has been used and why was that procedure used?

6. How has the sampling been carried out?

7. Explain the difference between sampling and non-sampling errors.

8. How can a set of observations be weighted?

9. Give an example of each of the four different measuring scales where applicable.

10. Explain the difference between the mean and the median.

11. Explain the difference between the standard deviation and the range.

12. What does the margin of error represent?

13. Explain the meaning of the 95% (99%) confidence interval for the mean and a total

OR
Explain the meaning of the 95% (99%) confidence interval for a proportion.

14. Explain the meaning of the 95% (99%) confidence interval for the difference between two means (or proportions).

15. Explain how non-responses and missing data have been allowed for by imputation and describe the possible impact of this treatment.

16. Explain how a confidence interval can be used to test an inference.

17. Explain the difference between stratification and clustering and describe the impact of these on reporting the results of your survey

18. Explain how confidence intervals can be used to draw overall conclusions.

19. Explain how statistical measures can be used to draw overall conclusions.

Unit Standard 71
Element 1 Identify, describe and assess legal and ethical constraints on the collection and use of data in a state sector context

1. In your own words give a general overview of the twelve principles stated in the Privacy Act.

2. What are the ethics of using an observational study to collect data from people who are not aware that they are being observed?

3. How are respondents to these data collection(s)] made aware of the purpose of supplying information and/or of the use that will be made of their data?

4. Give your interpretation of how two of the above Privacy principles apply to the collection and use of data in the public sector.

5. Are respondents [to these data collection(s)] made aware of the measures that will be used to ensure their data is secure? If not, suggest how this could have been done.

6. Explain to someone with less statistics knowledge than yourself two security requirements for public sector data collections.

7. Discuss the adequacy of the privacy and security measures applied to the supplied data collection(s) OR, If these are not described discuss what measures do you consider should be applied.

8. How does confidentiality differ from privacy and what is the overall purpose of confidentialising data?

9. Explain to someone who has less statistics knowledge than you, two methods for confidentialising data.

10. How has the data been protected from accidental disclosure of personal information in the published result(s) OR, If it has not been protected, suggest how this data could be protected?

11. Who can access either the original data set or more detailed result? OR, if this has not been identified, suggest who should be allowed access to each level of data (detailed aggregates, original data set, etc.).

12. In your opinion, is the confidentiality protection applied to this data collection(s) adequate? Write this as a briefing note for your manager to consider.

13. What other ethical considerations have been
OR could/ should have been considered with respect to the collection and use of data [in these data collection(s)]?

Element 2 Assess the impact on respondents of legal and ethical issues

14. What measures of response are reported on OR could have been reported on [in these data collection(s)]?

15. Explain to someone with less statistics knowledge than yourself how the quality of the results produced from the data collection(s) supplied could be affected by ethical and legal issues? Discuss at least two potential impacts on respondents.

Element 3 Make and communicate policy recommendations that could help resolve the impact on respondents of privacy, security, confidentiality and ethical issues

16. What changes to the processes related to ethical and legal issues [used in the data collection(s)] could result in reducing the impact of these issues on respondents? Communicate your answer as a recommendation for senior managers to consider.

Appendices 3

3a: Interview Questions for Candidates

1. When you signed on for this programme, what did you want to get out of the certificate?
   - work goals
   - personal goals
   - other

2. What parts of the content required in the certificate were too easy/challenging/too hard /not relevant for your organisation?
3. What parts of the assessment required in the certificate were too easy/challenging/too hard /not relevant for your organisation?
4. How well did the assessment cover the content you learnt?
5. How has the certificate helped you?
   - in your work
   - personally
   - other

Candidates who have completed

5a. How long did it take to complete the compulsory components? (or individual unit standards?)
6a. What helped you to complete? (Consider people, work structures, content presentation, assessment tasks)
6b. What parts of the assessment helped you complete the unit standards? How great a role did they play in completion?
7a. Identify any parts of the assessment that hindered you from completing any particular unit standards in a timely manner.
7b. How great a role did these barriers play in completion? Please be frank and detailed in responses.
8a. Evaluating the usefulness of the Certificate, what would you recommend to someone interested in enrolling ?

Candidates who have not completed

9 . When do you intend to finish?
10. What is helping you stay with the programme?
11. Identify any parts of the assessment that are helping you complete the unit standards? How great a role are they playing in completion?
12 . Identify any barriers to completion that you have discovered. These may be work-related or they may relate to the course and how it is being assessed - or both
13. Identify any parts of the assessment that are hindering you from completing the unit standards? How great a role are they playing in slowing your progress?
14 . Evaluating the usefulness of the unit standards you have completed so far, what would you recommend to someone interested in enrolling?

3b: Interview Questions for Managers

1. What were the base levels of staff you have involved in the Certificate programme?

1b. What level do you expect your staff to reach as a result of completing the Certificate?

2. Briefly outline your own level of involvement in your staff' members' working through the Certificate?

2. What are your expectations of the Certificate for your staff?

3. Is the Certificate helping them to meet those expectations?

4. How has working on the Certificate affected the work of your staff in terms of their:
- ability to do their work? (Increased productivity?)
- confidence with statistics? (Less supervision time?)

5. If you have provided support for your staff in completing any of the assessment tasks, briefly comment on the relevance and level of these tasks in terms of the core demands of your organisation.

6. Evaluating the usefulness of the Certificate as you have seen it so far, what would you recommend to future staff interested in enrolling?

Appendix 4: Level of reasoning (complexity) of assessment questions

US 68	Level of Complexity	US 69	Level of Complexity
1	1	1	5
2	1	2	1
3	1	3	3
4	1	4	1
5	2	5	4
6	3	6	4
7	3	7	3
8	3	8	4
9	3	9	5
10	3	10	3
11	3	11	5
12	2	12	3
13	4	13	3
14	4	14	4
15	4	15	4
16	2	16	3
17	2	17	5
18	2	18	5

US 70	Level of Complexity	US 71	Level of Complexity
1	1	1	2
2	1	2	2
3	3	3	3
4	2	4	3
5	3	5	3
6	3	6	3
7	2	7	3
8	2	8	2
9	3	9	3
10	2	10	3
11	2	11	3
12	2	12	3
13	2	13	4
14	2	14	4
15	4	15	5
16	2	16	5
17	5		
18	3		
19	3		

Appendix 5: Number of candidates requiring a resit by specific question within each unit standard

Question Number	US 68	US 69	US 70	US 71
1	0	2	0	3
2	0	0	0	0
3	1	1	1	0
4	0	0	0	0
5	1	1	1	0
6	2	0	2	0
7	1	1	1	1
8	1	1	4	0
9	0	0	0	0
10	4	4	2	0
11	0	1	2	2
12	1	0	0	0
13	5	2	1	0
14	0	1	1	0
15	3	0	1	0
16	2	2	2	3
17	1	4	4	
18	2	V	0	
19			3	

Note: V = verification by the course presenter that all learners passed this question