MANAGING SCHOOL SCIENCE RESOURCES

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The 2017 NZ Schools Science Technician Workforce Survey

Michelle Kiernan and Ian de Stigter

Abstract

Proposed changes to tertiary training of science technicians are considered unlikely to have much consequence in the school workplace. Current and earlier workforce survey data are used to examine the school science technician group. Despite expressed forebodings about an aging population, this technician group has changed little in the last 10 years, and recent recruits are in fact a little better equipped in level of qualification and relevance of experience.

The work technicians do is examined against a basic job description, considering enhancements, extra duties, and trade/technical/craft skills used on the job. Most do the majority of the job description elements and more beside; there is no obvious difference in the level of qualification or the work complexity between those on the B and C scales.

Data show that school science technicians are playing an increasing part as hazardous substances Lab Managers; continuing the trend will be beneficial.

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Science Technicians Workforce and School Employment

In May 2017, a (NZ) Royal Society publication (1) aimed to draw some conclusions about NZ science technicians, of which the group in schools are a small part. School science technicians were well-represented on the Expert Panel, so the Royal Society report identified some distinctive features of our employment. It recognised school roles as typically part-time, usually term-time only, and with little career progression.

The Royal Society study came from a recognition of the need to better ensure an ongoing supply of suitable science technician employees. (A similar concern has sometimes been echoed in school technician workforce reports, as discussed later.)

Employers raised doubts about the suitability of current qualifications to best prepare those with a practical aptitude to step into entry-level jobs. Partly this was an over-supply of biological science graduates, but also a recognition that there were few studying the Level 6 qualifications with a high practical skills content, and that current bachelor's degrees were short on such skills.

It will be interesting to see whether students will respond suitably in taking courses now identified as more suitable for employment, and whether employers will then recognise the courses which provide their best science technicians. It may take time and substantial promotional effort to overcome long-standing prejudices.

If the changes advocated in the Royal Society report are introduced in the next few years, there will however be only small effects on school technician employment, for a number of reasons:

Firstly, newly qualified employees are generally not very suited for school work; the recognised school role is not an entry-level one, and any entry-level appointees do not do the same job. Those with new qualifications can also find school employment unattractive for several reasons: there are usually term break stand-downs, and only 40% of schools could offer as many as 30 hours/week during term-time; the correct pay scale is not generous (and as documented in this report, there can be barriers to being placed on it), and it is difficult to see the work in schools as likely to lead to advancement within the school, or as obvious preparation for a job elsewhere.

We might expect that some women entering degree and diploma courses in the next few years may later, after a length of service, choose to take some years off paid employment for family reasons. If school employment continues to be one of the most attractive options for science-trained ladies returning to the workforce, these may join a school staff in about 20 years. There will be a long delay time!

The changes proposed, to produce more of the practically-oriented Level 6 qualified technicians, and more practically-oriented papers in bachelor's degrees, have relatively little to offer schools. The positive aspect is that, if more people with strong practical aptitudes are lured into a science vocation by more practically-oriented courses, that could (eventually) be great in a school context.

In contrast, a greater emphasis on instrumental experience, to suit industry and research needs, has no use in schools. We do not have complex analytical instrumentation; it is difficult to envisage how training in the kind of equipment now found in research and routine sample analysis can be applied in a school lab. We will hope that a person used to routinely using one or a small number of technologies (say, plasma emission spectroscopy and/or GC-MS) can adapt to competently produce reference titrations with a (manual) glass burette, as required, perhaps once or twice a year, along with a full programme of other school requirements.

Purposes of the survey

We envisaged a number of uses for good data on NZ school science technicians and their work. Two in particular are topical: STANZ executive are updating the science technician job description, and this should aid the process. Progress is also being made by NZEI in school support staff gender equity study and negotiation for more equitable pay rates. (We expect NZEI achievements for State and Integrated schools to flow on into Independent schools.) We want to play our part by documenting science technician work in schools in this report. Survey respondents were also asked whether they would be prepared to provide any further information about their job if required. This provides a list of volunteers for NZEI's science technician job evaluation, when that can be scheduled.

We hoped that the comparison of our study data with earlier work would also indicate what has stayed the same, and what trends and developments in the school workplace require or deserve further consideration.

Conducting the survey

This survey of school science technicians was set up in Google Forms and carried out between 31st July and 28th August 2017. The link to the survey was promoted by STANZ via the scitech-talk email service, and we also gave individual encouragement to a number of science technicians to take part. We appreciate the contribution of all those who responded, and to the STANZ executive for their advice and support in setting up and promoting this research.

Earlier school workforce survey

In 2007, a Science Technician workforce survey (2) was carried out in NZ secondary schools, inspired by a 2001 (UK) Royal Society study (3) which expressed concern about an aging science technician workforce there. It seemed desirable to gather data on NZ school science technicians. The 2007 study provided little evidence of impending issues: technicians recruited in the previous 5 years were perhaps slightly older than those employed earlier, but were at least as well qualified for the work.

We believed that in 2017 most of the technicians originally surveyed would have retired, and wondered how this would have changed the workforce: factors such as age, qualifications, experience. Also, science teaching and assessment, the technologies and facilities used, and health and safety obligations, have all changed since 2007. It seemed likely that the services that science technicians provided in supporting teaching would have altered. We asked some of the same questions as in 2007, but dropped some of the earlier topics and introduced some new questions.

Survey responses and schools represented

The 2007 NZ workforce survey was able to obtain only 143 technician responses, but in 2017, greater access to computers, and improved computing technology and communications, have aided the process. We obtained 255 responses from school science technicians representing 235 schools, as shown in Table 1.

Table 1. Survey responses

School type	Roll size	Response numbers	Schools represented
Independent	1-800	12	12
	801-1500	9	6
	1500+	3	3
Integrated	1-800	34	34
	801-1500	18	18
State	1-800	70	70
	801-1500	64	61
	1500+	45	31
All	**Total**	**255**	**235**

The 255 responses represent a population of more than 300 school science technicians. It is hoped that this voluntary sample fairly represents that total population. The smaller number of responses in 2007 means that survey may have been less representative, so there is a need for caution in assigning trends from data differences in the 2 studies.

Age data

Age data is often used as an indicator of concern about retirement and replacement; and/or to question whether pay levels and recruitment practices pass muster. Table 2 summarises the survey age data.

Table 2. NZ School Science Technician Ages

	Female	Male	All Technicians
Upper quartile	59	69	59
Median	52 *[2007:51]*	60.5 *[2007: 59]*	53
Lower quartile	45	50	45
Average	51.5	57.8	52.1
<40 years	10%	17%	11%
41-50	32%	8%	30%
51-60	36%	25%	35%
61-70	20%	25%	21%
71+	-	25%	2%

Age concerns

The Preproom 2016 UK Technician Survey (4) considered:

*“The age of technicians should be of concern to school leaders as it seems the majority of science technicians are rapidly heading for retirement. **36%** of technicians are in the 51-60 age bracket* [**35%** in NZ], *meaning they will likely retire and leave the profession within the next decade.”*

*“**29%** are in the 41-50 age bracket* [**30%** in NZ*]. The vast majority – **72%** of technicians – are over 40 years of age* [NZ: **93%** in 2007; **89%** in 2017]. *Just **28%** of technicians are under the age of 40* [NZ: **7%** in 2007; **11%** in 2017], *with only **1%** under the age of 21* [none in NZ].”

“As the majority of technicians leave the profession over the next 20 years, it will be interesting to see if the role attracts a younger cohort. We feel this will be unlikely if there continues to be little career progression available to technicians.”

This UK figure for school science technicians over the age of 40 has in fact proved to be remarkably stable. The 2001 Royal Society study (3) showed similar alarm at exactly the same figure; **72%** then were also over the age of 40! There had in fact been no change over 15 years, and no evidence presented of unfilled vacancies, despite the expressions of alarm from the age statistics.

Hackling (5) led a 2009 study of Australian school science technicians, including training and support, and the roles they fulfilled. **78%** of the Australian technicians were over 40, and **60%** were over 50, so technician ages there were intermediate between those in NZ and the UK. Hackling reported “Concern was expressed by a number of interviewees about the aging technician population and the imminent retirement of a number of experienced technicians in the next few years.”

The understandable concerns that Hackling notes, of individual interviewees (one supposes, school Heads of Science) about the need to replace long-serving staff, tell us nothing about how readily other suitable candidates can take their place.

The reported 2001 and 2016 UK concerns, on the other hand, implied that the whole school technician workforce was in crisis. Since there had been no change in 15 years, clearly this was not the case. It seems that some academics, used to studying teacher population statistics to determine training needs, had taken school science technician statistics and applied the same kind of analysis to that data – without recognising the differences in the populations.

An example of teacher data and its (appropriate) analysis:

Collins (6) noted as a concern that NZ teachers are in 2017 the third-oldest in the OECD with ***36%*** aged 50 or over, compared with the OECD average of ***30%***.

This suggests there aren’t enough young teachers starting in the profession to replace those retiring. We already know that there is currently a teacher shortage in NZ, from the evidence of persistent vacancies, and the comment on the statistics seems to fit well with that knowledge.

Of science technicians in this current survey, ***64%*** are aged over 50. Should this much higher level of older people disturb us? We may feel that it should.

But from Table 2, we find that the science technician median age is 53, and it hasn’t changed significantly in 10 years. Furthermore, we don’t see that schools are having difficulty replacing technicians when they leave, as unfilled positions would show.

The UK-expressed concerns are not justified if there is a stable workforce (as our survey indicates we also have in NZ) and it appears the report-writers have misunderstood the essential characteristics of this group of employees.

Who then are school science technicians?

In NZ, school support staff are 92% female, and the majority are ladies who have returned to the workforce when their children are of school-age, when they are generally seeking family-friendly working hours and holidays. (As their children further develop, those preferences may change.) Science-trained mothers, who form the majority of the school science technician workforce, bring to their jobs mature capabilities which younger recruits are challenged to match. The men taking on science technician roles are generally somewhat older and with still greater employment experience.

School science technicians might be better (and sometimes are) termed “science resource managers” – they generally need to pick up some poorly-defined requirements, work alone in a semi-autonomous manner, establish suitable procedures, operate and develop systems, and work effectively and efficiently with staff and students. They need strong technical aptitudes, but the technical skills they use need to be applied to the relatively basic equipment found in schools.

We need to reiterate that the school science technician is generally seen as a semi-autonomous role: schools rarely provide the technician (at appointment or later) with significant direction in that role.

Schools need to hire mature, experienced staff. Their experiences and life skills (less often found in younger recruits) are of great value in fulfilling school requirements.

In NZ, as we shall see from the data that follows, we have a stable, replenishing group of school technicians, with generally good science qualifications and practical science-related experience. NZ schools have generally not found it difficult to attract the mature experienced staff they require to replace technicians who leave – in fact they are doing better at it than schools in Australia and the UK.

It may be significant that the (NZ) Royal Society paper on the Science Technicians Workforce - which reflects the ideas and attitudes of employers – has nothing to say about attempting to lure experienced staff back to work in their specialty areas. If other employers saw this as a useful option, and put efforts into head-hunting experienced specialist staff who have had a break for family reasons, schools may need to value their science technicians more to retain them.

This report looks further into technician recruitment age and service in schools, qualifications and backgrounds, and details of the role they fulfil. The evidence suggests more recent arrivals in schools at least match the qualifications and previous experience of those recruited earlier.

Science Technician Recruitment Age

Survey data for those who were recruited in the last 5 years was compared with data for all survey respondents. Over the 5 years there appears to be a small increase in age at induction for the ladies, but more of the men being employed in recent years are relatively younger – so that although the average age of men employed recently is still higher than the average for women, the male and female medians match.

Table 3. Technician Age When Recruited

	All Females	**All Males**	**Last 5yr Females**	**Last 5yr Males**
Count	228	24	75	9
Upper quartile	45.3	58	47.5	56.3
Median	40.3	51.8	43.5	43
Lower quartile	36	38.5	36	30
Mean	40.9	51.0	42.2	43.5

Length of School Service

School service statistics are complicated by the fact that there is some movement of technicians between schools. (Some technicians also work in 2 or more schools at the same time, but we have not detailed the extent of that, or its implications.) Data for sequential science technician service in any school, and in the current school, given by survey respondents, are shown in Table 4.

Table 4. Technician School Service

	Any School		**Same school**	
	Female	Male	Female	Male
Upper quartile	16.3 yrs	14.6 yrs	15 yrs	13.3 yrs
Median	10 yrs	9.5 yrs	7.7 yrs	6.5 yrs
Lower quartile	3.7 yrs	2.6 yrs	2.4 yrs	0.8 yrs
Mean	10.9 yrs	8.9 yrs	9.4 yrs	7.3 yrs

It can be seen that the female staff have longer median or average service than males, in both Same School and Any School evaluations.

Qualifications

Unlike some other employers taking on numbers of technicians, and able to carry out significant training on the job, schools are largely dependent on the qualifications and experience that recruits bring to the school role.

In Hackling's study of Australian technicians, about **60%** of these had qualifications at or above Level 6 on the NZ Qualifications Framework. This compared to **40%** in the UK in the 2001 study. In NZ, it will be seen from Table 5 that school technicians are better-qualified; the 2007 study indicated **74%** at Level 6 or above, and in 2017, **77%** were so qualified. NZ science technicians have greater need to be well-qualified and experienced, as they are more often sole technicians, needing greater resourcefulness and self-reliance.

Table 5. Technician Qualifications

NZQF level	**none**	**1-3**	**4-5**	**6**	**7**	**8-10**
All schools	1%	13%	8%	31%	31%	15%
State - last 5yr	-	5%	3%	19%	44%	24%
State - all	2%	15%	8%	30%	29%	16%
Integ – all	-	13%	12%	27%	33%	15%
Indep - all	-	-	4%	46%	42%	8%
[2007 all schools]	*[1%]*	*[15%]*	*[10%]*	*[34%]*	*[29%]*	*[11%]*

In table 5, it is apparent that Independent schools are more likely to have employed technicians with no less than Level 6 qualifications – and also less likely to have employed those qualified above Level 7. The same observations were made in 2007.

Technician experience before school employment

The survey-recorded range of experiences before starting technician work in a school are difficult to categorise. Some staff have had a succession of differing roles, and others spent an extended period in just one position.

Of those employed in a school for more than 5 years, 68% had science-related previous work, while 86% of those hired in the last 5 years had a previous science-related job. Some also had experience in education (including teaching) while many had administrative, leadership, and business backgrounds. A listing of these prior employment roles is given in Appendix 1.

The value of older workers is too often under-rated in retention and hiring policies. According to Bev Cassidy-Mackenzie (7) of Diversity Works (formerly the Equal Employment Opportunities Trust) “It’s short-sighted given they offer skills, expertise, knowledge built up over a lifetime of working.” The school science technician role is one where maturity can be a strong factor in enabling role fulfilment.

Most of our science technicians have further developed their life skills and usefulness for this resource management role, in ways that never show in a CV, and may be overlooked in skill assessments. They have successfully raised families and managed households, and are ready to cope with the demands and needs of the science family.

Together with a science training and an extended period of involvement in science practice, this has produced excellent team players for the science resourcing role.

Science Technician Job Description

Technician roles in schools vary: for historical reasons, different relative strengths of technicians and other school staff, time allocated to the work, and different expectations of what a technician can and should do. We have through our survey applied a critique to a basic “technician job description” (which is a revised version of the one used in the 2007 workforce survey, sourced from NZEI), by asking how many technicians do each of the things on the 24-point list.

An abbreviated text of the 24 items included in the survey questionnaire is given in Table 6, so that we can consider the responses. Only 2 of 24 items were accepted by all respondents as included in their job. Most of the other elements received greater than 90% acceptance, but 2 described duties were performed by fewer than 50%, and a further 3 by fewer than 80%.

We conclude that particularly demonstrating experiments, and looking after computers/digital devices are less frequently seen as science technician functions. Also, other activities included in job expectations in most schools are not in some.

Table 6. Science Technician Job Description

#	Element abbreviated description	Inclusion
1	Advise staff about practical work and resources	91.8%
2	Prepare solutions and materials for practical work	100.0%
3	Prepare materials and equipment for prac tests, assessments	100.0%
4	Deliver orders to teaching spaces	91.0%
5	Recover orders from teaching spaces	90.6%
6	Assist teachers, students with set-up, equipment use	95.3%
7	Demonstrate experiments when required	39.2%
8	Assist students with equipment for individual projects	77.6%
9	Set up, operate, run checks, on departmental equipment	94.9%
10	Make simple equipment, carry out simple repairs	97.3%
11	Arrange for repairs and maintenance	96.1%
12	Review equipment and maintenance needs in Science	94.9%
13	Work with LM, in accord with COP and H&S requirements	87.8%
14	Ensure all haz subst storage, labelling, use, disposal complies	98.8%
15	Maintain Safety Data Sheet records for hazardous substances	95.3%
16	Assist the LM where relevant in advising staff on safety issues	77.3%
17	Operate effective system to stack, store, transport, return, gear	99.2%
18	Stocktake of equipment, books, paper res, chemicals, & maintain	98.4%
19	In cooperation with Head of Science provide budget input	92.5%
20	Obtain and care for living specimens and plants	76.5%
21	Obtain/collect non-living specimens for dissection & experiments	92.9%
22	Clean specialty equipment/glassware needing special treatment	99.2%
23	Assist with security of science laboratories and equipment	89.0%
24	Assist with use, maintenance of computer, dig devices & assoc.	47.8%

Job Description extensions

Now that we have looked at compliance with this generalised job description, let us consider how job descriptions have been extended for some. There were two sets of questions asked in both the 2007 survey and this 2017 survey, which consider these enlargements to the job: *Role Enhancements*, and *Extra Technician duties.*

Role Enhancements

The 2007 and 2017 surveys asked technicians whether they had a development role, or took departmental initiatives - with a number of possible areas suggested. These elements were considered to require added skill and/or responsibility beyond the elements of the basic job description. With some items, that may be less obvious, but if, for example, technicians are given budget management responsibility, or if their titration results are used as the reference or "expected values" in senior chemistry practical exams, these clearly require specific competence. Table 7 gives a summary of these role enhancements, with the percentages of surveyed technicians to whom they apply.

Table 7. Technician Role Enhancements

	Activity description	**2007**	**2017**
1	Budget management	60%	54%
2	Chemical database	93%	87%
3	Chemical hazard management	88%	79%
4	Consumables budget preparation	71%	58%
5	Capital equipment quotes/orders	NA	75%
6	Equipment database	85%	70%
7	Microbial cultures	43%	51%
8	Pipette & burette accuracy verification	25%	29%
8	Rock and mineral sets	25%	44%
10	Storage system development	78%	77%
11	Store/prep room design	59%	58%
12	Titrant standardisation for assessments	42%	49%

Question 5, about capital equipment items, was not asked in 2007. Some of the percentages have changed over 10 years, but the data indicate that a high level of technician competence continues.

Extra Technician duties

Many science technicians carry out paid functions for the department or school which are not on the standard technician duty list; some of these may not obviously fit the technician role, but someone has to do them! In the 2007 survey, we asked technicians what extra things they did, and checked to see how many do these things in 2017. (Exam supervision has been added to the 2017 survey list.)

Table 8. Extra Technician duties

	Activity description	2007	2017
1	Exam supervision	NA	14%
2	Field trips	55%	55%
3	First aid	35%	39%
4	Health & safety committee	33%	32%
5	In-class support	59%	42%
6	Parent/open evenings	17%	13%
7	Prizegivings	9%	4%
8	Science/school camps	8%	7%
9	Science fairs	43%	32%
10	Teaching	8%	6%
11	Tutoring	7%	3%

The technician workforce includes a number who have teaching experience at primary, secondary, and tertiary levels. Many of those reporting “teaching” as part of their duties may be well-qualified to do so.

Trade, technical and craft skills

The basic science technician job description list given in Table 6 includes, as item 10, “Make simple equipment, carry out simple repairs”. This requires the application of strong practical abilities, and science technicians describe a range of these. The 2007 survey found nine claimed areas of skill. In 2017, we checked on these ones again, but also added a tenth skill suggested by 2017 respondents under “other”: sewing, which has been used to advantage in science labs (as in making safety glasses holders). These skill areas which technicians use in making and repairing equipment are shown in Table 9.

Table 9. Trade, technical and craft skills

	Area of skill used	2007	2017
1	Electrical checks	22%	21%
2	Electrical repairs	20%	16%
3	Electronic circuit assembly and repair	20%	20%
4	Glassblowing	20%	12%
5	Metalworking	6%	5%
6	Painting	16%	25%
7	Plastics fabrication	3%	3%
8	Soldering	41%	47%
9	Woodworking	14%	20%
10	Sewing	NA	2%

Instrumental Work

Science technicians are usually involved with using, calibrating and maintaining scientific instruments. Many school technicians have had solid experience in these areas, in prior roles, but there is less of this equipment in schools, and usually less need for precision. This 2017 survey asked what equipment school technicians calibrated or maintained. The answers in Table 10 show little involvement by most school science technicians, apart from with microscopes and pH meters.

Table 10. Instrumental Maintenance and Calibration

	Instrument	**2017**
1	Balances	10%
2	Colorimeters	6%
3	Conductivity meters	0.4%
4	Data loggers and sensors	2%
5	Electrical meters (ammeters/voltmeters)	2%
6	Microscopes	80%
7	Multimeters	2%
8	pH meters	62%
9	UV/Vis spectrophotometers	4%

Technician Computer Use

Computer technology is vital for school science technicians in giving access to all the information they need to do their work. They use the computer for research, for producing print resources, communicating on and off-site, and in managing staff orders, chemical stocks, equipment and materials, hazards, and finances.

Suitable access to a computer to enable technicians to do their work effectively cannot be assumed. Nor can it be assumed that their computer skills are adequate. Table 11 shows 2017 responses about computer access. Table 12 shows responses to questions about computing capabilities.

Table 11. Technician Computer Access

Option	Option detail	No.	%
A	Ready access in my work area at all times	232	91%
B	Can access, but not in my work area	20	8%
C	No work access. Use home computer accessing school system	2	0.8%
D	No work access. Use home computer not accessing school system	1	0.4%
E	No computer at home or work except by special arrangement	0	

Better provision of computer access for some would allow greater effectiveness.

Table 12. Technician Computing capabilities

The survey asked technicians whether they used 4 types of software in their work. The responses were:

	Yes, & competent	Yes, but not confident	No
Database responses	161	60	34
%	63%	24%	13%
Email responses	249	5	1
%	98%	2%	0.4%
Spreadsheet responses	181	67	7
%	71%	26%	3%
Word process responses	226	27	2
%	89%	11%	1%

Technicians also had a great variety of other computer competencies more difficult to tabulate. Most of the items on the list were applications, but others included:

Administer on-line booking system for Science
Computer hardware resource person
Computing resource person
Website design and maintenance

The full list is given in Appendix 2.

Science Technician Grading

Science technician grading has always been a matter of contention. NZEI have stated an expectation that science technicians filling out the standard job description should be on NZEI's Support Staff Collective Agreement C grade. (We asked those in Independent Schools if they were on an equivalent rate.) There have been some successful compliance actions based on this premise, for technicians paid on the B scale – or even the A scale - but for many, the pay differences remain.

Table 13. Science Technician Grading

School type	Year	B scale
State 1-800	2007	41%
	2017	40%
State 801-1500	2007	24%
	2017	25%
State 1500+	2007	27%
	2017	11%
Integrated	2007	40%
	2017	21%
Independent	2007	6%
	2017	7%

Moreover, recent (more vague) grading descriptors in the collective agreement have made the outcomes of such compliance actions less certain. Table 13 shows the 2017 responses on grades, compared with those from the 2007 survey.

There have been improvements in grading compliance in the Integrated schools, and in the larger State schools, but no improvement in the medium-size State schools, or in the least compliant category, the small State schools.

If there is a pay problem in some Independent schools, it does not seem to be widespread. In 2017 (as in 2007) only one claimed to be paid at a rate equivalent to the B scale; 13 were paid at a rate equal to or above the C scale, and 10 either ignored the question or claimed not to know. (Responses from technicians who did not indicate a grade have been ignored in calculating percentages.)

Grading and Job Description Correlation

If there is any merit in some science technicians being graded on the B scale rather than the C scale, it should be clearly identifiable through a lesser job description. We might expect also: lower qualifications and skills brought to the job.

We therefore separately collated B and C graded technicians in all the schools where the NZEI agreement is directly relevant: Integrated schools, and State schools in different roll size categories. We then examined the 24 element job description data (shown in Table 6) for those graded B.

There were just 3 technicians on the B scale who appeared to be doing lesser jobs; one each from an Integrated school (12/24 elements), a State 801-1500 roll school (10/24 elements), and one from a State 1500+ student school (13/24 elements).

Apart from these three, the other B graded science technicians seemed to be doing essentially the same job as those on C scale. Table 14 compares data for the remaining B scale technicians, using the data categories from Tables 5-9 (Qualifications, numbers of: job elements, enhancements, extra duties, and trade-technical-craft skills) with those for C scale technicians.

The data means for each data type show that those here graded on the B scale and the C scale bring similar contributions to their work, and have very similar jobs. Given the range of values for each data group, it would be hard to argue that the B scale technicians are distinctly less able, or less is demanded of them.

It would be helpful if the SSCA grade descriptors could be made less open to varying interpretations. This would help get more consistent initial grading decisions, and any necessary later compliance actions would then be more assured of success.

Table 14. Scales B and C technician work compared

		Integrated	**State 1-800**	**State 801-1500**	**State 1500+**
NZQF qual	B mean	6.1	5.7	5.7	5.3
	B range	4-8	1-8	2-10	1-6
NZQF qual	C mean	5.9	5.6	5.8	6.4
	C range	1-8	0-8	1-10	2-8
Job elements	B mean	20.9	21.6	21.0	23.0
	B range	16-24	18-24	16-24	21-24
Job elements	C mean	21.3	22.0	21.8	21.3
	C range	14-24	15-24	16-24	15-24
Enhancement	B mean	6.9	5.8	6.1	6.0
	B range	0-9	1-12	1-11	3-10
Enhancement	C mean	8.1	6.9	8.2	7.7
	C range	0-11	0-12	0-12	0-12
Extra duties	B mean	2.1	2.1	1.9	2.3
	B range	0-5	0-8	0-6	1-4
Extra duties	C mean	2.2	2.8	2.7	1.9
	C range	0-6	0-7	0-6	0-7
Craft skills	B mean	1.1	1.1	2.3	2.3
	B range	0-7	0-4	0-8	0-6
Craft skills	C mean	1.5	1.3	1.8	1.7
	C range	0-7	0-7	0-7	0-6
Technicians	B number	10	28	15	3
	C number	41	42	46	35

(Hazardous substances) Lab Managers

In our 2015 report (8) based on a school science technician survey, we found that many schools had yet to appoint a LM and take basic steps to meet safety requirements. Fitzsimons (9) also gathered data on LMs in 2008. The data for LM appointments, and the numbers of science technicians involved, from these earlier surveys and the current study, are shown below.

Table 15. Science Technicians as Lab Managers

Year	Schools surveyed	All LMs	Technician LMs
2008	82	46	6
		56% of schools	13% of LMs
2015	177	133	23
		75% of schools	17% of LMs
2017	235	169	34
		72% of schools	20% of LMs

Table 15 shows that a persistently large group of schools has yet to be persuaded to appoint a Lab Manager. However, the proportion of all LM positions held by science technicians seems to be growing.

The current survey had some follow-up questions to ascertain how science technicians could be further involved as Lab Managers. In schools with no Lab Manager, technicians were asked if they could step up to the role, with suitable support. In schools where there was a non-technician Lab Manager, the technician was asked, if the situation changed in the future, whether they would then be interested in stepping up to the role. The responses are shown in Table 16 below.

Table 16. Potential Science Technician Lab Managers

	Non-technician	Technician	No LM
Is there a LM?	135	34	66
Could you step up, with support?	NA	NA	[T43]
If there's change, would you be interested?	[T27]	NA	NA
Potential future numbers		104 (44%)	

The answers to these questions suggest considerable potential for further school Lab Manager positions to be filled by technicians – in 43 of the 66 schools without LMs, and a further 27 in schools with LMs – the technicians see themselves as future candidates if there is an opening. Moving to a Lab Manager role could fill an important gap in the school's safety management, and be a useful career progression for a valued staff member.

Schools which have yet to appoint a Lab Manager should note both obligations and penalties in the Health and Safety at Work (Hazardous Substances) Regulations 2017 which take effect on 1st December 2017. If serious harm occurs, reckless disregard for basic requirements of the Regulations (such as failing to appoint a Laboratory Manager) can incur substantial personal and organisational penalties.

Conclusions from the survey

NZ school science technicians are better-qualified and more experienced for their work than are the similar groups in the UK and Australia. Expressed concerns about succession in those countries appear to have little merit, and our data confirm the minor changes over time in this NZ school professional group are positive.

Science technicians have faced a persistent refusal over many years to correctly grade about 30% of their workforce – who carry out work of the same complexity - with smaller State schools being particularly at fault in this unfairness. The tradition of wrongly grading these technicians is now so deeply-established, that it may take extraordinary measures to obtain change through compliance efforts, and the current untested grade descriptors are unhelpful.

NZ school science technicians can be viewed as part of the female-dominant school support staff group, which is overdue for gender equity review to establish the true value of the work they carry out in schools. We anticipate that the equity review will finally achieve a pay grade consistency which compliance efforts have not obtained, but interim measures to address the grading issue should also be considered.

Science Technicians have been under-utilised in handling the (hazardous substances) Laboratory Manager responsibility for schools, but some progress has been made in this area. If schools are to fulfil regulatory responsibilities for chemical safety, they will be advised to continue that trend; to place more of that hazardous substance care responsibility into science technician hands, and in doing so increase possibilities for technician advancement.

Future proposals discussion

After his presentation of the Royal Society's Science Technician Workforce paper (1) at ConSTANZ on 11th October, Andrew Cleland suggested that STANZ could have the science technician job sized "by a specialist and independent agency specialising in this work such as Strategic Pay or Hays", and so obtain one view on equitable pay for the work. Dr Cleland's standing in the science community means his recommendation has received serious attention.

The Hay Group is the best-known agency involved in the sizing of jobs, and works with government departments and local bodies and many companies.

The Hay Group job evaluation process (10) is a factor-based system, based on the job description, an interview with the job holder, and sometimes the manager of the job holder. The particular factors the Hay evaluation uses to judge the person's work are: required know-how, problem-solving involvement, and accountability.

K**now-how** is the combination of knowledge skills and experience required for fully acceptable job performance: practical and technical know-how, planning, organising and managerial knowledge, and communicating and influencing skills.

Problem-solving is defined as the use of know-how. An assessment is made of the span, complexity and level of evaluative and innovative thought required by the job environment and its challenges.

"**Accountability**" is considered to be the scope given to the job holder to direct resources of all kinds and to influence or determine the course of events, and their answerability for the consequences of their decisions and actions on the organisation. Accountability is thought of as: freedom to act, scope and significance of those actions, and overall significance of the job.

Hay sizing for a position can provide an independent assessment of job content, readily tied to a salary. Concern has however been raised about ensuring that job evaluation is carried out in a gender-neutral manner; much of the gender pay gap exists because skills in predominantly female roles may be unfairly assessed. The factors chosen in the Hay sizing are said (11) to produce inherent bias:

"The Hay system consistently values male-dominated management functions over non-management functions more likely to be performed by women."

This does not suggest that STANZ investment in Hay sizing would be profitable, since it does not provide opportunity to address the identified gender issues.

The Pay & Employment Equity Unit set up in the former Department of Labour, developed in 2009 (12) an Equitable Job Evaluation System (EJE) intended to overcome biases which perpetuate unfair assessment of predominantly female roles.

The Spotlight Skills Identification Tool used in this evaluation system was put to use by Celia Briar in a 2010 report (13) commissioned by NZEI, which served as a pilot for support staff gender equity studies now being progressed.

The gender-neutral evaluation process recognises that leadership can be provided through *influencing* relationships as well as *reporting* relationships. "Accountability" assessments may rely too heavily on formal statements of responsibility, and overlook the important influencing and determining relationships through which the information, essential services, and safety requirements are established and provided, and plans produced for financial transactions and resources.

NZEI are interested in using the EJE/Spotlight tools to value the skills provided by teacher aides and other support staff, but negotiations to establish comparator groups for teacher aide job evaluation have faced opposition. Decisions on the evaluation tool and comparators for teacher aides will be made next year.

The contributions made by science technicians need also to be fairly evaluated, and NZEI efforts for a gender equity claim - based on current undervaluing of the skills of our members - needs solid support from STANZ. It is probable that obtaining agreement on suitable comparator groups will be as difficult as for teacher aides.

In the interim we should ask for urgent grading clarification to right one glaring and long-standing inequity that our professional group suffers: the wrongful assignment of about 30% of technicians, who should be recognised on the C grade, to a B grading.

In the past, we have been considered alongside school librarians in grading. We have a lot in common with those in libraries: both groups have assistant, professional, and manager positions; and similar level professional qualification requirements. It should therefore be helpful for NZEI to conduct gender equity claims for both professional groups jointly. We look to the STANZ executive to work closely with NZEI to see what can be achieved!

Michelle Kiernan & Ian de Stigter 31 October 2017

REFERENCES

1 Royal Society Te Aparangi (2017) “Science Technicians Workforce”.May 2017, p30. http://uat-royalsociety.samdog.co.nz/news/training-science-technicians-that-are-ready-for-the-future/
2 de Stigter, Ian (2007). ”NZ School Science Technicians Workforce Survey”. https://stanz.nzase.org.nz/app/uploads/2015/05/Workforce-Survey.pdf
3 The Royal Society (2001) “Survey of Science Technicians in Schools and Colleges“, p15. https://royalsociety.org/~/media/Royal_Society_Content/policy/publications/2001/9998.pdf
4 Preproom (2016). “UK School Science Technician Survey 2016”, p8. www.preproom.org/downloads/preproom-UK-technician-survey-2016.pdf
5 Hackling, Mark (2009) ”The Status of School Science Laboratory Technicians in Australian Secondary Schools”, May 2009, P26. http://moodle.asta.edu.au/pluginfile.php/1641/mod_resource/content/2/National_survey_results_09.pdf
6 Collins, Simon (2017) “Student fees 7th-highest in OECD”. http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=11921463
7 Cassidy-Mackenzie, Bev.(2017) “Older workers face too much discrimination – economist”. http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=11905931
8 Kiernan, Michelle and de Stigter, Ian (2015) “Reason and Practicability”. https://stanz.nzase.org.nz/app/uploads/2015/10/Reason-and-Practicability-002.pdf
9 Fitzsimons, Sheryl (2008), Nelson College for Girls. Personal communication.
10 Remuneration Authority. http://remauthority.govt.nz/remuneration-process/setting-remuneration/remuneration process » setting remuneration
11 Hay Guide Chart. https://en.wikipedia.org/wiki/Hay_Guide_Chart
12 Equitable Job Evaluation System. https://www.employment.govt.nz/hours-and-wages/pay/pay-equity/equitable-job-evaluation/
13 Briar Associates. “Valuing the work of support staff in schools”. https://www.nzei.org.nz/documents/MYNZEI/Resources/SS-Reports/SS-Job-Evaluation-Final-Report.pdf

Appendix 1.A Science Experience - employed in last 5 years

Total with "science" experience = 72/84 (86%)

Lab and Science practical experience

Analytical chemist x 2
Animal health technician x 2
Assistant research fellow x 2
Biochemist
Biomedical researcher
Cancer research
Chemical engineer
Chemistry technician x 5
Civil engineering lab technician
Dairy lab science technician x 5
Drug safety specialist
Environmental chemist
Environmental monitoring
Food lab quality control x 4
Food lab science technician x 2
Food microbiology technician x 2
Food research technician x 2
Food technologist
Food technologist, QC and product devt
Forensic scientist
Lab technician x 5
Masters degree 1 year lab work
Med lab assistant
Med lab microbiologist
Med lab scientist x 5
Med lab senior scientist
Med lab technician x 2
Med lab technologist
Medical research
Microbiology consultant
Molecular biology research
Oil industry lab technician
Pathology lab technician
Pharmaceutical lab technician x 2
Pharmaceutical product development
Pharmacy technician
Physiotherapist
Plant scientist
Process engineer
Quality assurance officer
Quality control technician
R & D scientist
Senior lab technician
Senior microbiology technician
Soil analyst
Test engineer
University lab demonstrator x 2
University research lab assistant
University research technician
University researcher

Appendix 1.B Science Experience - employed more than 5 years

Total with "science" experience = 116/171 (68%)

Lab and Science practical experience

Academic labs
Agriculture research technician
Aluminium manufacture R&D
Animal health product QC
Animal health technician x 2
Biochem research technician
Biochem technician
Biochemistry/Haematology technician
Biotech industry

Botanical research lab
Brewery lab technician
Broadcast technician
Chem manufacture analytical chemist
Chem manufacture industrial chemist
Chem manufacture QC x 3
Chemical engineer x 2
Chemical engineering technician
Chemistry lab technician x 3
Communicable diseases
Company chemist
Cosmetics QC
Crop/Food
Dairy industry chemistry technician x 3
Dairy industry lab manager
Dairy industry micro technician x 3
Dairy industry microbiologist x 2
Dairy industry QC supervisor
Dairy industry QC technician x 4
Dairy industry research technician x 2
Embalming
Environmental agency technician x 2
Environmental agency water testing
Estuarine research technician
Fisheries research
Food industry chemical analyst x 2
Food industry microbiologist

Food industry QC manager
Food industry QC technician x 4
Food microbiology technician x 2
Food R&D
Forestry research technician
Gas industry R&D chemist
Genetic research technician
Horticulture research technician x 2
Hospital lab technician x 2
Immunology/biochemistry research technician
Industrial lab technician
Industrial microbiologist
Lab supplies QC
Laboratory technician x 10
Leather research technician
Liggins Institute
MAF science technician x 2
Meat industry QC supervisor
Medical histologist
Medical lab biochemistry technician x 3
Medical lab haematology technician
Medical lab micro technician
Medical lab scientist x 6
Medical lab technician x 12
Medical lab technologist x 3
Medical research associate
Medical research technician x 4
Metallurgy instrumental analysis
Micro lab technician x 5
Microbiologist technical officer
Nuclear chemistry technician
Oil/gas industry chemist x 3
Pathology lab technician x 3
Perfume lab
Pesticides technician
Pharmaceutical analyst

Pharmaceutical QC x 2
Pharmacy School technician
Pharmacy technician x 3
Plant analysis technician
Plant diseases technician

Tertiary institute lab technician x 2
Tobacco analysis
Toxicology lab science technician x 2
TV, audio, security technician

Plant virus technician
Post Office technician
Protein separation
Psychology research technician
Pulp/paper research technician
Pulp/paper technologist
QC analyst
QC chemist
Regional council lab technician
Research institute technician
Research scientist x 2
Research technician
Respiratory & cardiac technician
Seed analyst
Senior animal health technician
Senior Scientist analytical chemistry
Soil research technician
University biology technician x 2
University chemistry technician
University dental school science technician
University lab technician x 4
University medical researcher
University microbiology technician
University PE technician
University research technician x 3
Veterinarian
Veterinary nurse/receptionist
Veterinary pathology technician
Veterinary research: doctoral;post-doctoral; commercial
Veterinary surgeon
Water chemical analysis
Water lab QC x 2
Wine lab manager
Wood products lab technician

Appendix 1.C Other roles – in education

Employed in last 5 years

Assisting disabled university students
Learning Assistant
Playgroup coordinator
Teacher aide x 2
Teacher: Chemistry and Science
Teacher: Physics and Science
Teaching
Teaching and Learning Support

Employed more than 5 years

Admin assistant
ECE qualified, leadership.
English teacher
Food & textiles technician
Food, soft, hard technician
Librarian
Library Assistant
Primary school teacher
Relief teacher
School dental nurse
Science teacher x 8
Teacher
Teacher aide x 3
Tertiary lecturer, reliever
University science tutor

Appendix 1.D Other roles – Admin & business

Employed in last 5 years

Accounts, Admin, and PR
Compliance Systems Auditor
Dairy farming
Electronics manufacturing
Engineering manager
Food safety management
Health & Safety coordinator
Healthcare coordinator
Lab Manager
Lab Team Leader x 2
Neighbourhood Support Area Manager
Part-time admin
Product Development Manager
Quality Systems management
Retail business
Retail pharmacist x 2
Technical manager

Employed more than 5 years

Administrator
Building business admin
Careers consultant
Caregiver
Customer services
Defence Scientific Officer
Designer & builder
Drafting cadet
Enrolled nurse
First aid instructor
Flight attendant
Law clerk
Nurse
NZ Customs
Orthotics technician
Personnel officer
Refinery Planner
Registered dietitian
Retail
Tally clerk
Telecom manager

Appendix 2. Other computer competence mentioned

3D printer set-up/use x 2
Administer on-line booking system for science equipment
Animation
Audio editing/sound production
AV editing/archiving software
Cloud share and store photos
Computer hardware resource person x 2
Computing resource person
Datalogging software x 3
Desktop publishing x 6
DVD copying
Electrical test/repair archive software
Google Apps x 2
Google Classroom
Google Docs x 11
Google Forms x 3
Google Sheets x 2
Graphics drawing program
Image processing x 5
Internet searches x 11
Kamar x 15; Edge x 1
Labelling program x 8
Maintaining/arranging IPAD apps
Microscope camera software
Microsoft Forms
OCR
On-line ordering of equipment/chemicals x 4
PASCO software x 2
Powerpoint x 4
Risk Assess x 7
scanning internet resources for teachers
Schoolbox (parent portal)
Science ordering system on intranet x 2
scitech-talk x 2
SDS printing x 2
Textbook loan software x 2
Video editing and conversion x 2
Weatherlink
Website design and maintenance