

BETTER TEACHING THROUGH DOING:

*A MIXED-METHOD EVALUATION OF THE NZ SCIENCE,
MATHEMATICS & TECHNOLOGY TEACHER FELLOWSHIP
PROGRAMME*



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Cover image: Montage of 2002 Teacher Fellows in the field

SUMMARY

Through 2005, the Royal Society conducted a mixed-method evaluation of the NZ Science and Technology Teacher Fellowship programme. This research included a web-based survey of Teacher Fellows, and interviews with a stratified sample of host, and school, representatives from the Fellowships granted in 2001, 2002, and 2003, as well as a review of the demographics of successful, and unsuccessful, applicants to the programme for all years available.

WEB SURVEY OF TEACHER FELLOWS

Eighty six of the eligible 145 Fellows, *i.e.*, 59%, responded to the web-survey.

At the time of survey, the vast majority of Teacher Fellows (72%) were still teaching. The attrition rate observed did not appear to differ significantly from that found in the general teaching population. In addition, a sizeable minority of Teacher Fellows (16%) remained engaged in education outside the primary/secondary school systems, *e.g.*, within Universities, producing teaching resources for schools, and consulting within the education system. The survey response to the question of whether the Teacher Fellow was currently teaching also demonstrated that the Society's staff possessed an accurate knowledge of what Fellows were doing.

Overall the survey achieved a good coverage of the group by Teacher Fellowship year, and Fellow demographics; however, there appeared to be two factors affecting response: i/ response rate decreased with the time elapsed since the Teacher Fellow's award; and, ii/ a particularly poor rate of response was observed from the 2003 Teacher Fellows that were believed to have left teaching. Post-stratification was used to address both of these biases.

The findings of the survey suggest that the Teacher Fellowship is satisfying its goals, in that at least 90% of Teacher Fellows felt that their Fellowship had increased:

- the Teacher Fellows knowledge of careers in research and technology;
- subject understanding, *e.g.*, though application of current methodology and real-world research experience to the curriculum; and,
- relevant skills, *e.g.*, pedagogical and communication skills.

The majority of Teacher Fellows (91%) also reported their experience had positively impacted on their teaching practice, *e.g.*, by increasing their confidence in their subjects, and/or providing access to an increased knowledge base. These Teacher Fellows also tended to comment that the Fellowship gave them an opportunity for professional reflection away from the school system, and that they had returned to teaching, refreshed and revitalised.

In most cases, Teacher Fellows were found to have communicated their Fellowship experience to a wide range of audiences. The majority of Teacher Fellows stated that they applied the skills and/or knowledge gained through the Fellowship to their classroom programmes (88%), their schools (81%), and the wider education, and local, communities (70% and 55% respectively). An apparent source of some frustration for Teacher Fellows was where they felt that they had been unable to share their experience. The most common reasons offered were heavy workloads, and the perception of a rigid education culture resistant to innovation.

Past-Teacher Fellows were, on the whole, enthusiastic about further contributing to the Fellowship programme, with 84% of survey respondents stating that they would take part in a support network for current, and prospective, Teacher Fellows.

Survey respondents were also, largely, open to examination of the impact of their Fellowship experience: 73% nominated a host contact for interview, and 83% proposed a senior staff member at their school.

INTERVIEWS WITH HOSTS AND SCHOOLS

Almost universally, the individuals interviewed were found to have a high opinion of the scheme. Nine out of ten hosts, and school administrators, were enthusiastic in, respectively, stating that they would be willing to act as hosts, or to encourage other staff members to undertake a Fellowship, in the future. A common theme running through both interview groups was that they had been impressed by the dedication and enthusiasm of their Teacher Fellows.

In addition to gaining a willing and able colleague for the term of the Teacher Fellowship, hosts appreciated that they had gained exposure to new cultural viewpoints. In many cases, Teacher Fellows left their host organisations with new, or improved, systems and products, and a greater connection with the school system.

In the two cases where there was ambivalence about continuing participating in the scheme, circumstances outside the immediate scope of the Teacher Fellowship meant that while each stated that they had valued the Fellowship experience that was the subject of the interview, they were unsure whether it would be in the interests of their organisations to be involved in a Fellowship in the near future. One, a corporate host, had significantly expanded since the Teacher Fellowship, and there was concern over the ability to house an additional staff member, at least in the short-term. While in the case of the school interview, an unsatisfactory experience with a relief teacher for a subsequent Teacher Fellow had tempered their enthusiasm.

TEACHER FELLOWSHIP SCOPE AND SCALE

Review of the characteristics of Teacher Fellows from 1994–2006, and applicants to the Teacher Fellowship since 2003 found little of concern regarding the programme's selection process. Notably, Teacher Fellowship applications are received from all regions of the country and Teacher Fellow demographics are broadly constant with those of the general teaching population. Comparison of the success rate by the applicant's gender, ethnicity, or their school's decile and level of childhood education found no evidence of bias with all observed rates within the level of variation that could be expected to have occurred by chance. Despite this, the programme has awarded relatively few Teacher Fellowships to teachers from minorities, lower decile schools, and some districts. This feature of the NZSMT Teacher Fellowship appears to be principally a consequence of the low application rates from these groups.

RECOMMENDATIONS

This evaluation found that the Teacher Fellowship scheme appears to be satisfying its Terms of Reference, and that no structural changes appear to be needed. However, it was determined that application rates for a number of groups, *e.g.*, teachers from low decile schools, have been consistently low over the lifetime of the scheme. It is recommended that the Society seek to determine the causes for this disparity and, if possible, address them.

Introduction	1
Purpose of the evaluation	2
Methodology and survey populations	4
Web-survey Results	6
Where are ex-Fellows now?	6
What effect does the Teacher Fellowship have on its Fellows? — Teacher Fellow’s perspectives	7
Sharing knowledge of and positive attitudes to, the sciences, mathematics, and technology	12
General comments on the Teacher Fellowship scheme	14
Teacher Fellow’s openness to external review of their Fellowship	15
Interest in a support network for Teacher Fellows	16
Informant interviews of host and school representatives from 2001–2003 NZSMT Teacher Fellowships	17
Methodology and sampling procedure	18
Interviews with school representatives	19
Interviews with host representatives	24
Scope and scale of the NZSMT Teacher Fellowship scheme	28
Conclusions	34
What effect does the Teacher Fellowship have on its Fellows, and their Schools?	35
Is the Teacher Fellowship affecting the retention of its Fellows within teaching? ...	36
Issues faced by returning Teacher Fellows	38
The NZSMT Teacher Fellowship as a seed for outreach activities connecting children with active research	40
Are there gaps in the Teacher Fellowship programme?	41
Recommendations	42
Appendix I—Text of the Web-Survey questionnaire	
Appendix II—Interview structure-school	
Appendix III—Interview structure-host	
Appendix IV—Interest in a support network for Teacher Fellows	

Abbreviations used: Full Time Equivalent (FTE); Head of Department (HOD); Information Technology (IT); Learning Area Panel (LAP); Management Unit (MU); the New Zealand Science, Mathematics and Technology Teacher Fellowship (NZSMT Teacher Fellowship); the Royal Society of New Zealand (RSNZ); and, Research, Science, and Technology (RS&T).

INTRODUCTION

The New Zealand Science Mathematics and Technology Teacher Fellowship (NZSMT Teacher Fellowship) programme is a scheme that allows the release of a teacher, for up to one year, to work in a host organisation on a project of their choice involving research activity and/or technological practice. The NZSMT Teacher Fellowships were established in 1994.

Typical host organisations are Crown Research Institutes, Universities, and private sector companies engaged in research or technological development; however, many other organisations also act as hosts, when the proposed project can be shown to have a demonstrable link to the sciences (including social science), mathematics, and/or technology.

Teacher Fellowships are open to all fully registered teachers, which are currently employed by the Board of Trustees of a recognised school in New Zealand, and whose work touches on science, mathematics, technology, and/or other enterprise-related subjects in conjunction with one of the former. These criteria do not exclude those who are not currently teaching, *e.g.*, career advisors. In particular, eligible teachers can be:

- at any stage of their career (although usually with at least 5 years of service);
- teaching any age group; and,
- from any part of New Zealand.

The Teacher Fellowship programme seeks to raise the profile of the sciences, social sciences, mathematics, and technology within the wider community. It aims to achieve this by providing teachers with new experiences, and by increasing their understanding of the RS&T sector, enabling them to become more effective educators. It is funded by Government and administered by the Royal Society of New Zealand, with the bulk of its funding paying the costs for a replacement teacher while the Teacher Fellow is on leave.

As the NZSMT Teacher Fellowship scheme forms part of the Supporting Promising Individuals output class within the RS&T Vote, it is expected that it will contribute to supporting human resources in research, science and technology and to the development of people with knowledge, skills and ideas. In line with the focus of this output class on the Knowledge Goal¹, the Teacher Fellowship is intended to make its contribution in terms of the Fellows' contribution to new knowledge and innovative practice, and through their increased awareness of S&T opportunities for their pupils.

The Teacher Fellowship scheme is expected to encourage teachers to²:

- enhance their understanding of and positive attitudes towards science, mathematics, social sciences and technology, and develop both personally and professionally;
- enhance their awareness and understanding of the applications of science, mathematics, social sciences and technology in enterprise to produce valuable products and services;
- enhance their awareness and understanding of careers involving science, mathematics, social sciences and technology, and promote career options in these areas to their students; and
- share their enhanced knowledge of and positive attitudes to, science, mathematics, social sciences and technology with colleagues, students and others in the general community.

At the conclusion of their Fellowship, it is expected that teachers will return to school to put their new knowledge, and expertise, to work in the classroom.

¹ Ministry of Research Science and Technology (2004). 'The 2004/2005 Budget for Vote Research, Science and Technology.' pp12.

² Ministry of Research Science and Technology (2005). 'Terms Of Reference For The New Zealand Science, Mathematics And Technology Teacher Fellowships'.

To date, 465—including 64 for 2006—NZSMT Teacher Fellowships have been awarded.

This evaluation forms the third to review the NZSMT Teacher Fellowship programme, and follows on from previous work by the Royal Society of New Zealand in 2002³, and by Jordan and Galt in 1999⁴.

PURPOSE OF THE EVALUATION

Evaluation forms a key role in the Society's activities as a Funding and Investment Agent with responsibility for administering public funds. Programme evaluations are intended to demonstrate both the value of RSNZ administered programmes, and the extent to which they are satisfying their intent and the requirements of their Terms of Reference. This process also provides the Society with the means to identify potential problems in scope or implementation as a way to determine how our services can be improved.

This evaluation sought to determine the range of outcomes from the Teacher Fellowship, particularly those relating to teaching practice and the expectations of the Fellowship's Terms of Reference⁵. We also wished to examine the short–medium term effects of a Teacher Fellowship on the Fellow's school and their host organisation(s). The Society was also keen to follow up on the results of the previous evaluations—which had suggested that a greater number of Teacher Fellows were not returning to, or if they returned, not remaining in, the teaching workforce than might be expected.

To address these issues, a mixed-method approach was adopted:

- i/ A web-based survey of past Teacher Fellows to determine, whether the Fellow was still teaching, and to assess their perception of the Teacher Fellowship's impact. Permission was also sought for the second part of the evaluation;
- ii/ A series of semi-structured interviews with Fellow-nominated representatives from their School and their primary host institution; and,
- iii/ A review of the Society's available records of successful, and unsuccessful, applications to the Teacher Fellowship.

³ Taranchokov, A., A. Knox, et al. (2002). 'Tracking of former Teacher Fellows'. Royal Society of New Zealand. URL <http://www.rsnz.org/funding/evaluation/tftrackingreport.php>; Spratt, P. and A. Knox (2004) 'Enhancing Understanding Through Practice: the NZ Science, Mathematics, Technology, and Social Sciences Teacher Fellowship' NZJSocial Sciences 12(1):p40-45.

⁴ Jordan, S. and N. Galt (1999). 'The Science and Technology Teacher Fellowship Scheme: An Evaluation.', Education Department, University of Canterbury.

⁵ MoRST (2005) 'Terms Of Reference for The New Zealand Science, Mathematics and Technology Teacher Fellowships'

*FOLLOW-UP SURVEY OF TEACHER FELLOWS FROM
2001-2003*

METHODOLOGY AND SURVEY POPULATIONS

In September of 2005, the Royal Society of New Zealand conducted an online survey following recipients of the 145 NZSMT Teacher Fellowships awarded between 2001 and 2003. These Fellowships involved 123 schools and 130 hosts (see the RSNZ's annual Performance and Achievement Reports, for further characteristics of the Teacher Fellowships).

Fellows were mailed an introductory letter explaining the evaluation, and asking them to expect an emailed invitation to the survey in the following week. The letter also asked the Teacher Fellow to contact the RSNZ if our records of their Fellowship, or their contact details, were incorrect.

The survey, which was developed and run using "CollectIt" (PerfectData Corporation Ltd, Wellington), was kept open for three weeks. A reminder was sent out after two weeks to those who had, thus far, not attempted the survey. In eight cases the respondent was unable to attempt, or complete, the web-survey; all were emailed with a text version of the survey. The text of the online questionnaire is given in the Appendix II to this report.

As at the 21st of October, 86 questionnaires had been answered, *i.e.*, the overall response rate was 59%. By the survey's conclusion, nine Teacher Fellows could not be reached, *i.e.*, the non-contact rate was 6%.

Bias in two areas was observed in the character of Teacher Fellows attempting the survey. Firstly, response-rate was positively correlated with the year of their Fellowship. However, in addition, a comparison of the Teacher Fellows' self-reporting of their teaching status with the Society's records (compiled through the personal contact of the RSNZ Education team with ex-Teacher Fellows, and the NZ Teacher's Council's Online Register⁶), showed both that the Society was able to accurately track Teacher Fellows, at least over the 4-5 years covered by the survey, and also that there was particularly poor response rate from 2003 Fellows that the Society believed to have left teaching (see tables 1 and 2).

Table 1 Comparison of respondents self-report of teaching status with the RSNZ record

		RSNZ record	
		Left teaching [†]	Currently teaching
Self reported	Left teaching	20	2
	Currently teaching	3	61

[†]Left teaching refers to ex-Teacher Fellows that were not employed as teachers at the time of the survey

The corrected RSNZ record (in the five instances where it did not match with survey respondents) was used to estimate the proportion of Fellows that had not returned to teaching.

Table 2 Response by year of Teacher Fellowship and RSNZ estimate of teaching status

Fellowship Year	# Teacher Fellows	Left teaching	# Responses	Currently teaching	# Responses
2001	40	12	7	28	14
2002	48	14	10	34	18
2003	57	14	5	43	32

⁶ URL <http://register.teacherscouncil.govt.nz/applications/register/default.aspx>

Responses were treated according to a complex survey design using the “Survey V3.5” package⁷ in R 2.2.1⁸. Non-response was addressed by post-stratifying according to Fellowship year and teaching status (see table 3), resulting in a design effect⁹ of 0.97–1 depending on the question.

Table 3 Response-rate and weighting for survey strata defined by year of Teacher Fellowship and teaching status

Fellowship Year	Response rate		Weighting	
	Left teaching	Currently teaching	Left teaching	Currently teaching
2001	58%	50%	1.71	2.00
2002	71%	53%	1.40	1.89
2003	36%	74%	2.80	1.34

The number of actual responses received is noted for all questions where item response was less than the overall survey response. For individual categories, the raw unweighted number of responses is indicated. All errors are shown as +/- the standard error (S.E.M.), which has been corrected for the survey design effect, and the relevant sample size.

Unless otherwise noted, tests of independence were conducted using Pearson’s χ^2 .

Where a passage has been altered to preserve anonymity, or for sense, this is indicated through italic text enclosed in braces, e.g., “[*the Teacher Fellow*]”.

⁷ T. Lumley (2004) ‘Analysis of complex survey samples’. J. Stat. Soft. 9(8):1–19

⁸ R Development Core Team (2005) ‘R: A language and environment for statistical computing.’ R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org>

⁹ The design effect is the increase, or in the case reduction in error due to the choice of survey structure

WEB-SURVEY RESULTS

The web survey sought to fulfil four main goals: i/ a tracking function to determine what ex-Teacher Fellows were currently engaged in; ii/ to assess what self-perception Teacher Fellows had of their Fellowship experience; iii/ to determine whether the Society's administration of the scheme needed review; and, iv/ to seek key informants on the Teacher Fellowship's impacts and the Teacher Fellow's permission to contact them. As a secondary goal, respondents were asked for input into the development of a support network for those involved in, or contemplating Teacher Fellowships. Each theme is considered separately.

WHERE ARE EX-TEACHER FELLOWS NOW?

Teacher Fellows were asked whether they were currently engaged in teaching. If the response indicated that they were no longer an active school teacher, they were also asked whether they had returned to school immediately following the Teacher Fellowship, and if so, for how long had they remained at the school. All non-teaching Teacher Fellows were also asked to state what roles they were filling now.

Table 4 Are Teacher Fellows still teaching in primary/secondary schools?

Fellowship Year	No	Yes	Total	% still teaching
2001	12	28	40	70%
2002	14	34	48	71%
2003	14	43	57	75%
All Years	40	105	145	72%

Table 4 shows the combined estimates from the survey responses and the RSNZ's records. The responses to this question are covered in more detail in the survey's "Methodology and survey population" section (pp 4–5).

Of the 22 Teacher Fellows that stated they were no longer teachers, 21 responded to the question, "Did you return to teaching following the Fellowship?". Roughly two thirds of the Teacher Fellows, *i.e.*, $67\% \pm 6\%$, had returned post-Fellowship, and of those, they had remained for, on average, 13 ± 2 months before departing

The majority of respondents that had left teaching were none the less still active in the education arena (see table 5). Ex-Teacher Fellows could be found: in education/teaching roles in the University system (2); preparing teaching resources from within government agencies (2); facilitating relationships between schools and researchers (3), *e.g.*, a student outreach programme at a University; and, in monitoring or advisory roles to schools (2). In addition, two ex-Teacher Fellows were undertaking further study, both at the Masters level.

Table 5 Non-teaching Teacher Fellows current roles?

Role	Estimate [†]
Working in education-related area	$57\% \pm 6\%$
Working in science-related area	$19\% \pm 5\%$
Working, other	$18\% \pm 5\%$
Retired	$11\% \pm 3\%$
Other	$26\% \pm 3\%$

Totals sum to more than 100% as multiple options could be indicated, *e.g.* all, but one, of the ex-Teacher Fellows working in a science-related area were also involved in education.

“The Fellowship gave me the confidence and knowledge to leave teaching and move into this less stressful educating role.”

A small number of respondents indicated that they had taken retirement (3), all having taken their Teacher Fellowship prior to 2003, but even in these cases it was apparent that these ex-Teacher Fellows were still engaging with the education system, *i.e.*, part-time teaching, providing services to schools, or in one instance, actively looking for further opportunities in education.

WHAT EFFECT DOES THE TEACHER FELLOWSHIP HAVE ON ITS TEACHER FELLOWS?— FELLOW’S PERSPECTIVES

The areas on which comment was sought followed naturally from the expectations established in the Teacher Fellowship’s guidelines and application, with all applicants having to state how their Teacher Fellowship would contribute to the Scheme’s objectives. To investigate the outcome of the Teacher Fellowship in these terms, Fellows were asked, relatively blunt, questions relating to each of the four principle objectives coupled with an open-ended form to explain how they felt the objective had been met or alternatively, what barriers had been encountered.

ENHANCED UNDERSTANDING OF AND POSITIVE ATTITUDES TOWARDS THE SCIENCES, MATHEMATICS, AND TECHNOLOGY; AND BOTH PERSONAL AND PROFESSIONAL DEVELOPMENT

Three question sets were addressed to this objective. Did the Teacher Fellowship, in fact, result in an increased understanding of SMT? Evidence for the personal/professional development of the Teacher Fellows was sought through asking whether their teaching practice, or professional responsibilities, had changed post-Fellowship?

QUESTION: DID THE FELLOWSHIP ENHANCE YOUR UNDERSTANDING OF YOUR SUBJECT AND/OR CURRICULUM AREAS? (85 RESPONSES)

○ 99% ± 1% “Yes”

Further detail provided by the respondents showed that they felt that their experiences had led to the Teacher Fellow’s increased appreciation of subject-relevant skills and methodology (32), a greater understand of the curriculum though exposure to research in the area (23); and, had simply provided them with the impetus and opportunity to learn (21).

“The practical opportunities to do research gave a me a better idea of how to teach research skills in the classroom... Having the time to explore a wide range of research environments particularly in my local area means I can now use these resources better or direct other colleagues to good resources that they can use.”

“Research skills, an appreciation of all the talent in 'the real world', but I guess the main thing I learned was about myself and how many skills I had that I hadn't given myself credit for. Possibly the best of these that transcended to all work I did that year was my management skills. I was able to organise and carry out my programme efficiently, and it wasn't till it was commented on by my sponsors that I took a look at the skills we use teaching and take for granted.”

Other common themes that Teacher Fellows reflected on were: their increased pedagogical confidence; direct experience of the work environment in their field, access to knowledge and skill networks, and greater IT skills gained as a consequence of the Fellowship (all of which were reported by 10–20 respondents)

“Investigating applications of mathematics in real life situations, enabled me to learn about practical applications of statistics in enterprise. Working on the education pages of the [*host*], I became more knowledgeable about the curriculum and preparing web-based resources. I became confident with computer skills and resources, and how these could be used in teaching. Developed my interest in climate and have maintained a working relationship... to develop further resources for schools.”

Despite a positive response, one Teacher Fellow noted that a poor relationship with a host, including limited provision of resources, had interfered with what they hoped to gain. The one respondent that felt the Teacher Fellowship had not aided in understanding their subject, opined a lack of relevance in their Fellowship to their normal teaching subject:

“My task for the year was not really closely related to the curriculum area I teach.”

QUESTION: DID THE FELLOWSHIP HAVE AN IMPACT ON YOUR TEACHING PRACTICE? (83 RESPONSES)

- 91% ± 3% “Yes, positive”
- 3% ± 2% “Yes, negative”
- 6% ± 2% “No, no impact”

Again the majority of respondents indicated that the scheme had had a positive effect; however, this question provided the option for a more nuanced response. Two respondents indicated that the Teacher Fellowship had negatively impacted on their teaching in that both Teacher Fellows were no longer teaching. In one instance, the Teacher Fellow recognised that the Fellowship had provided an opportunity for reflection that had led them to realise that they no longer wanted to be a teacher. For the other, their Teacher Fellowship had coincided with senior staff changes at their school; they returned to a new principal, and what they felt to be an unsupportive environment.

For the Teacher Fellows having a more positive transition experience, changes in their teaching practice were attributed to the creation of new teaching content and resources (40), positive changes in their teaching style (22), as well as working from an increased knowledge base (17), and the coincident increase in their self confidence (14).

“I was able to reflect on the classroom teaching and learning. I was able to apply what I learnt in the classroom—students had additional strategies to solve problems. It broadened and deepened my understanding of mathematics and its relevance which in turn I think impacts on students' learning.”

“I have been stimulated to continue to carry out my own informal research to change and improve not only what I teach but how I teach—more investigative approach, more contextual design in units, more current issues.”

“My ability to teach science improved greatly by having an in-depth understanding of some of the big ideas about the natural world. This enabled me to assess what the students were thinking and how I could develop learning programmes to encourage the students to challenge their current views.”

Another common theme was revitalisation. The Teacher Fellowship was seen by many ex-Fellows as a much needed break from the school system, and for fourteen respondents provided them with an opportunity for professional reflection.

“My Fellowship provided time to reflect on my teaching practice and gave insights into different aspects of mathematics, science and technology. I was able to return to teaching with renewed

vigour and a greater understanding of how mathematics is used in the workplace. I also gained contacts for class trips, resources etc. to enhance my teaching and make mathematics more interesting for my students.”

“During my Fellowship, I was able to read current research on effective pedagogy, especially in relation to Mori and Pasifika students. This has enabled me to understand more the factors that contribute to quality teaching for all students.”

Seven of the Teacher Fellows also noted that, as a consequence of their research experience they had assumed leadership roles within their schools and, in some cases, the region.

“I use some of the data collected in classes. I was invigorated by the experience and am now Head of Faculty which would not have been the case without the Fellowship.”

“It gave me a great personal resource that I use every year when teaching my Year 13 Bio class the topic, and I have delivered it to several other schools and classes as well.”

Of the Teacher Fellows that felt the scheme had not affected their teaching practice, two stated that this was because they had left teaching.

QUESTION: IF YOU ARE STILL A TEACHER, HAVE YOUR RESPONSIBILITIES CHANGED AS A CONSEQUENCE OF THE FELLOWSHIP? (61 RESPONSES FROM 64 ELIGIBLE)

- Yes 38% ± 4%

The majority of teaching ex-Fellows (38) stated that either their role was unchanged, or change was not related to their award; however, a sizable minority of Teacher Fellows (16) reported that they had gained responsibilities (both Management Unit, and non-MU) and/or promotion post-Fellowship, which they attributed to the Scheme.

“Now Head of Department. Being re-energised I applied for the position—something I would not have done without the Fellowship.”

“I am now in charge of the Science curriculum in my school.”

For two Teacher Fellows, new roles and responsibilities were associated with their relocating to another school.

“Changed schools, now teaching computing and as Assistant Principal I am heavily involved in training teachers in computer use and managing the ICT infrastructure.”

Conversely, three respondents had reduced their responsibilities post-Fellowship.

“Resigned from being an over stressed HOD Science to being an Agricultural/Horticultural teacher at a smaller school.”

“I have purposefully gone part time so as to give me 4 more hours to prepare demonstrations and organise more activities more my students.”

“I resigned as [*Teacher in Charge*] of Jr Science to return to more classroom teaching”

ENHANCED AWARENESS AND UNDERSTANDING OF THE APPLICATIONS OF THE SCIENCES, MATHEMATICS AND TECHNOLOGY

QUESTION: DID THE FELLOWSHIP ENABLE YOU TO LEARN OR ENHANCE SKILLS RELEVANT TO YOUR CURRENT EMPLOYMENT? (85 RESPONSES)

- 94% ± 2% “Yes”

Increased competence in the IT area was the most commonly noted outcome (29). Respondents also noted that the Teacher Fellowship had equipped them with relevant research (14), pedagogical (13) and/or communication skills (10), *e.g.*, a typical comment was:

“Specific content knowledge was absorbed but also general awareness of numerous contexts and ideas for the enhancement of my courses. Ideas have come directly via the work I undertook, indirectly from an increased attendance at professional conferences etc. and from the time I had to reflect, to read about Science research and pedagogical strategies.”

In addition a number of Teacher Fellows noted that they had adapted skills and experiences from their research programme into their teaching (12). Teacher Fellows were also likely to comment on the overlap between their research discipline and their current employment, usually as a teacher of that discipline: *e.g.*, mathematics (7); a relevant science (6); technology (5); electronics (2); and the environment (1).

“Research skills have been very valuable in assisting students particularly with Achievement Standards investigations.”

“I am able to use skills I developed during my Fellowship year ... and it is great to be able to conduct these lessons with more understanding and in a more scientific manner.”

“I am helping the Technology Dept [*to*] develop courses in Electronics.”

Five ex-Teacher Fellows noted that they had changed jobs post-Fellowship, although the effect of this on their perception of the schemes value was balanced. Another three had changed to careers more closely aligned with their research, while in contrast, two of the respondents that stated that their experience did not lead to career-relevant skills, it was because they had moved in a direction away from their research project:

“After spending the year with Physics people, I decided that a subject change would be good for my career. Hence, I moved school and am now in my fourth year of teaching senior Physics.”

“I am now a music teacher. Music and Science were my greatest loves while I was a classroom teacher, but opportunities have opened in music, and I am teaching classroom music in 3 schools.”

Skill development through the Teacher Fellowship also brought unexpected benefits for some ex-Fellows:

“I am currently employed as [*a senior advisor to schools*] and I believe that this position was gained as a direct result of the new learning and skills acquired during my time on Fellowship.”

ENHANCED AWARENESS AND UNDERSTANDING OF CAREERS INVOLVING THE SCIENCES, MATHEMATICS AND TECHNOLOGY

DID THE FELLOWSHIP INCREASE YOUR KNOWLEDGE OF CAREER OPTIONS AVAILABLE TO STUDENTS? (83 RESPONSES)

- 90% ± 2% “Yes”

The most common set of responses given related to the Teacher Fellowship having given: i/ a better understanding of what a research career entailed (29); ii/ an increase exposure to the research/working environment (16); or, both (9).

Following in frequency, Teacher Fellows also reported that their experience had led to their discovery of new career paths and/or areas (12), and that it had emphasised the relevance of their subject area (10).

“[T]his was like a revolving door of different career options and examples of technological practice.”

“Helped to broaden my understanding of how important and applicable are the skills and concepts taught in the context of biology.”

Teacher Fellows that had been hosted at Universities were also likely to comment that they had gained insight into the career structure within the tertiary education system.

“I worked with young scientists regularly and as it was 30 years since I had graduated, this provided an insight into how things are now. I met people at conferences who also enlarged my experience of what careers were possible.”

Where the programme was viewed as having made no contribution to the Teacher Fellow’s careers knowledge, it was typically explained that the Fellow believed they had been fully aware of the relevant career options and conditions prior to the Teacher Fellowship (6).

SHARING KNOWLEDGE OF AND POSITIVE ATTITUDES TO, THE SCIENCES, MATHEMATICS, AND TECHNOLOGY

QUESTION: HAVE YOU APPLIED SKILLS OR KNOWLEDGE GAINED AS A CONSEQUENCE OF THE FELLOWSHIP TO ANY OF THE FOLLOWING AREAS: CLASSROOM; SCHOOL; EDUCATION COMMUNITY; LOCAL COMMUNITY; OTHER?

In responding to this question, Teacher Fellows were asked to indicate the communities to which they had communicated their Fellowship (see table 6), what communication had taken place, and conversely, if they had experienced barriers to applying skills or knowledge learnt, to describe what they were.

Table 6 Teacher Fellows are active communicators to a large range of audiences

Audience	%Yes [†]
A classroom programme	88% ± 2%
Your school	81% ± 3%
The extended education community	70% ± 3%
Your local community	55% ± 3%
Other	23% ± 3%

[†]Non-response taken as “No”

It is apparent that ex-Fellows feel that that they have much to share with a wide range of audiences, with the typical Teacher Fellow noting that they had reached all four audiences, *e.g.*,

“Because the Fellowship was grounded in technological practice the experience has been relevant at all levels of my teaching. I now have a rich store of technological experiences to share with my students. I have developed resources which have been useful as examples or templates for them to use. I have also found that parents have been interested in the experience, I have had a number of occasions where I have been able to describe a ‘case Study’ from real life to illustrate the relevance of a particular topic or course requirement. Parents can then see the relevance of the subject and their student's learning.”

“Aside from school, where I have mentored teachers in biotech, I have involved myself in a community group, where I shared some of my background, and also spoke at 2 conferences and at several schools.”

Contribution to classroom programmes occurred primarily through the creation of teaching resources (32 responses) and, as noted previously, incorporating their research into their class material (34). In addition, a large number of Teacher Fellows used their Fellowship to seed ongoing out-reach activities, *e.g.*,

“Continued working with the local district council sampling freshwater lakes for nutrient loadings. Classes are involved.”

Of particular note, in at least some cases, outreach activities were promoted even where the Teacher Fellow had not returned to teaching, *e.g.*,

“Although I did not go back into the class room, I worked with the science staff at [*the*] College setting up mentoring between staff and [*University*] staff and also school students and university students. The standard of teachers' understanding science concepts increased hugely and more

students did science and went on to tertiary training. Of course there needs to be a greater time frame to be sure of a continuing beneficial effect of the science department and the students.”

Within the school and extended education communities, a large number of Teacher Fellows (38) indicated that they had either set-up or had participated in working groups to share teaching experience, with many respondents referring to mentoring and/or professional development roles.

“I have acted as liaison between school and University and conducted [*Professional Development*] sessions with the Maths department and also teachers in other departments to aid students' learning in mathematics in their respective subjects.”

“I have been actively involved in mentoring some of my colleagues from the school at which I taught, and I have both initiated and assisted in programmes here at the university that have resulted in better networking and support for biology teachers ... and their students.”

In addition to the four outlined areas, ex-Fellows indicated that they had made use their Fellowship experience in corresponding with central and local government, *iwi* authorities, and in some cases, their host's customers.

A number of Teacher Fellows had also been productive as researchers, with many noting conference and workshop presentations (14), and six recording that their work had resulted in peer-reviewed publications.

“There is some use here, and I suspect, overseas, of the method I developed ... from correspondence following the delivery of my paper. This has even resulted in an invitation to join an overseas University faculty as a visiting scientist for 6 months

The vast majority of survey respondents were either silent on the question of barriers to communication (49), or explicitly stated that they had not experienced any (6). However, a number of respondents noted concerns of which the most common related to the heavy workload and time constraints associated with being a teacher (15), followed by problems with the school's organisation/culture (11), or a combination of the two:

“It takes time to turn the knowledge you gain into teachable resources. When you are suddenly confronted with the demands of teaching then it is difficult to find the time.”

“Reluctance of school administration to try new approaches or curriculum content.”

“There are always time constraints for teachers in terms of release time etc and the costs of release. Teachers still feel that the paper work required to get students off site makes it something they are less inclined to do so there are some entrenched institutional and procedural issues.”

To a lesser extent, some Teacher Fellows (5) commented on a general lack of resources to effect change, *e.g.*,

“Some of the trade skills and practice I observed and would like to implement require considerable financial outlay in purchasing plant and equipment. My school has made significant contribution in this regard but the cost is ongoing. Local industry has shown some interest in assisting financially and this is being developed.”

While apparently uncommon, these barriers could be extremely demoralising for ex-Fellows when encountered:

“Refreshed and ready to enjoy my return to teacher I found many barriers. A new principal in my absence felt I had had a 'holiday' and made life very difficult... We had been warned of the possibility but I didn't see how it could happen, how wrong I was. After trying for nine months to live with and try to solve the attitude problem, the bad classes and scheduling that went with it I felt I could take it no longer... .”

On a more positive note, one Fellow, despite finding that their school had an encouraging environment, wanted a greater challenge and more opportunities to share their experience:

“I was able to bring my teaching to life by looking at ways the local community and its cultural and historical markers could be used as props for my teaching and student’s learning. If anything however it highlighted a frustration of preaching to the converted and this was partly why I left. I wanted to take what I was doing at [*the school*] and offer it to other teachers.”

GENERAL COMMENTS ON THE TEACHER FELLOWSHIP SCHEME

In an effort to determine whether the Society’s administration of the scheme needed review, ex-Fellows were asked to comment on the NZSMT Teacher Fellowship’s application and reporting processes, and for their reflection on the scheme as a whole; *i.e.*,

- Are there ways which you feel the Fellowship’s application process could be improved?
- Are there ways which you feel the Fellowship’s reporting process could be improved?
- Do you have any other comments relating to the Fellowship scheme?

The most common responses to the call for comment on the schemes application, and reporting, processes, were statements that there weren’t any problems (26 and 36 respectively), followed by no response (18 and 34 respectively).

For the remainder, the bulk of concern focussed on the application process, with the most frequent comments requesting additional roles from the Society, *i.e.*, that it: establish mentors to guide applicants through the process (12); hold workshops to encourage teacher participation (5); and, run a service to put prospective Teacher Fellows in contact with suitable hosts (4). The only other common concern was that the current application process was too long (8) and repetitious (2). Although there were no common issues relating to the Teacher Fellowships reporting process, a theme for a number of responses was that they expressed either confusion or a query about the required report. Although this may be a consequence of the years that had elapsed since these Teacher Fellows wrote their last report, it may be that the guidelines should be reviewed with an eye to simplification.

Where a general comment was offered, they were almost universally positive (58 positive, 19 non-responses), *e.g.*:

“The best opportunity ever invented...hugely beneficial from all perspectives.”

“It was one the most valuable experiences of my teaching career. It enabled me to experience life outside the classroom, experience the 'real' world. All teachers, especially those who haven't worked outside the classroom, would benefit from participating in similar programmes.”

“This is a GREAT scheme. I can't speak highly enough of it. The society is to be congratulated on it's professionalism and the opportunities it offers teachers.”

“It was a fantastic experience and I gained a lot from it. I was able to work with lots of ex students, parents of students, people I had played rugby with and coached to achieve a common

goal reflected in my research topic. It was also a heap of fun. I also got my evenings back and was able to complete my PhD during this time which was obviously not an objective of the programme but was able to happen which was great.”

“My [*Fellowship*] year was the best thing that had happened to me during my 20 years of teaching. I had really had enough of teaching and that year "saved" me. It was incredibly refreshing. I returned to teaching ready to do a few more years!!!! I am still implementing things that I started during that year.”

The only major concerns expressed related to the transition of the Teacher Fellow back in to teaching (7 responses). These ranged from changes in the school while the Teacher Fellow was away, through to a need to prepare for the return to workplace that will be dull by comparison. For some, the Fellowship’s outcome was obviously bitter-sweet:

“I found the Fellowship a very worthwhile experience. In some ways the opportunity may have come too late. The rate of change in assessment plus the large number of other functions I was fulfilling in education had me trapped. The year of the Fellowship gave me a fresh look at what I could achieve with my skills. While I believe I was a good classroom teacher, I felt that I was in danger of becoming stale and cynical. The Fellowship certainly gave me new knowledge and experiences, but on my return to teaching I found that my job was more about discipline (mostly schoolwide, not in my classroom) than teaching. The need to put a disproportionate amount of energy into areas other than my own teaching made me feel that it was unlikely I would remain fresh and innovative and be able to continue teaching through to retirement. I therefore choose to take a new path in my life and am enjoying new challenges.”

TEACHER FELLOW’S OPENNESS TO EXTERNAL REVIEW OF THEIR FELLOWSHIP

The Royal Society wished to interview the Teacher Fellowship’s stakeholders to triangulate responses regarding the schemes impact. As the Fellowship’s guidelines do not explicitly address evaluation goals, ex-Teacher Fellows were asked for their consent to contact representatives from their school (as at the time of their Fellowship), and what they felt to be their primary host (see table 7). In both instances respondents were asked to nominate a suitable individual.

Table 7 Teacher Fellow views on Host and school administrator contact

Object to HOD contact?	Object to host contact?		Total
	Yes or no response	No	
Yes or no response	10	13	23
No	4	59	63
Total	14	72	86

A conservative approach was adopted where lack of response was interpreted as an objection. The majority of survey respondents (84%) were happy to have either their host or school interviewed, with slightly more than two thirds of respondents (*i.e.*, 68%) comfortable that the Society make contact with both their host and school. With the exception of Teacher Fellows who had left teaching who were twice as likely to object, or not respond, to nomination of a school representative ($p>0.03$), there were no other detectable sources of bias. This section of the survey also highlighted the degree of mobility in the teaching system, with the most common comment associated with objection/non-response to the HOD contact, being that no senior staff remained from the time that the Teacher Fellow had been employed at the school. For further details on the interview selection process, see the “Methodology and sampling procedure” section of Part II, Informant Interviews.

INTEREST IN A SUPPORT NETWORK FOR TEACHER FELLOWS

The Royal Society is investigating the need for a support network of Teacher Fellows to enable communication between past, present, and prospective fellows. As a supplementary role of the survey, ex-Fellows were asked what value they would see in such a network and, if it was established would they be willing to take part (see table 8). The response pattern to this request also provides an independent proxy of the value that ex-Teacher Fellows continue to place on the Scheme.

Table 8 Perceived value and willingness to participate in a Teacher Fellow support network

Is a network of value?	Willing to take part in network?			Total
	Yes	No	No response	
Yes	60	0	0	60
No	11	6	0	17
No response	1	1	7	9
Total	72	7	7	86

Even taking non-response to indicate a lack of interest, 84% of survey respondents indicated that they would be willing to take part in such a network. Of particular interest are the 11 respondents that opined that such an initiative would not be of value, but despite this they would still take part. For the full results from this question see Appendix IV.

*INFORMANT INTERVIEWS OF HOST AND SCHOOL
REPRESENTATIVES FROM 2001-2003 NZSMT TEACHER
FELLOWSHIPS*

METHODOLOGY AND SAMPLING PROCEDURE

In order to gain additional insight into the short–medium term impacts of the Teacher Fellowship, the Society sought to conduct interviews with what we regarded to be key stakeholders in the scheme: host representatives, and Principals or HODs from schools that had been awarded Teacher Fellowships. The selection process was structured to provide a balanced mix of interview subjects by Fellowship year, further stratified by, in the case of the school interviews, both decile and school institution type (*i.e.*, primary vs. non-primary), and for the host interviews, organisation type, *i.e.*, CRI, government, private business, TEO, and other.

For school-based interviews, one name was selected for each decile including N/A (typically private schools), the remaining characteristics were selected as shown in table 9.

Table 9 School interview characteristics

School type	Fellowship year			Total
	2001	2002	2003	
Primary		1	2	3
Secondary	3	2	3	8

For host-based interviews, two names were selected for each organisation type, with the year of Teacher Fellowship distributed as shown in table 10.

Table 10 Host interview characteristics

	Fellowship year			Total
	2001	2002	2003	
No. interviews	3	2	5	10

Individuals nominated by respondents to the web-survey (see ‘Teacher Fellow’s openness to external review of their Fellowship’) were divided into categories of interest, numbered, and randomly reordered using Research Randomizer¹⁰. The lowest numbered name in each category was sent an invitation requesting their participation in the interview process. As ex-Teacher Fellows who had left teaching were less likely to nominate school contacts, the selection was inspected to ensure that representatives from this group would be interviewed. In this sample, two of the school representatives, in both cases the school’s Principal, came from schools whose Teacher Fellow had left teaching at the time of the survey.

Only one interview subject declined: a host from the 2001 round who felt that too much time had elapsed since the Teacher Fellowship for them to make reasonable decisions regarding attribution. In this instance, the next subject in this category was successfully invited.

Interviews followed a semi-structured format (see Appendix XX for templates). All were conducted by phone over two weeks from the 14th of November 2005, and interviews were recorded with the subject’s explicit consent. The recordings were transcribed, and the transcripts subjected to thematic analysis. Where necessary for the sense of a quote, interviewer voice is indicated by being enclosed within angle brackets, *i.e.*, “<” and “>”.

Although the resulting sample sizes, being from 1–8 for each subcategory, were too small to allow statistically significant sub-group comparisons by themselves, they were expected to provide additional insight into the Fellowship’s outcomes. This approach was also chosen as it would provide the Society with an estimate of the variability in opinion among stakeholders, and data to generate hypotheses for subsequent research.

¹⁰ URL <http://www.randomizer.org>

RESULTS

INTERVIEWS WITH SCHOOL REPRESENTATIVES

The goal of these interviews was to determine what had been the effects of the Fellowship on Teacher Fellows as perceived by a, largely, independent observer, *i.e.*, the senior staff and administration of the Teacher Fellow's school. As a secondary goal, the subjects were asked for evidence of potential mid-long term effects on their school arising from the Teacher Fellowship. Finally, as a proxy measure of the informant's continued enthusiasm for the scheme, they were asked whether they would encourage their colleagues to participate in a Teacher Fellowship.

Of the representatives that were interviewed: six were their Principals, three were Deputy Principals, and the remaining two were Heads of Department. All, but one, of the eleven representatives had known the Teacher Fellow before their Fellowship. The one exception had only known the Teacher Fellow from their return to the school. Despite this, they were still happy to comment on their perceptions of the individual's professional stature, and their transition, although they were only able to indirectly assess change as result of the scheme.

ARE TEACHER FELLOWSHIPS AFFECTING CLASSROOM PRACTICE?

Eight of the eleven interview subjects (72%) were of the opinion that the Fellowship had positively affected the Teacher Fellow's classroom practice. Examples arising from the scheme included: returning with greater enthusiasm (7); a wider vision of their subject (6); the establishment of linkages between the classroom and the wider community (6); with five of the interviews mirroring comments from the survey that the Teacher Fellow had returned refreshed and revitalised, *e.g.*:

<Do you believe that the Fellowship affected their classroom practice?> "I think it did. I think it did in a whole series of things. Firstly, it actually did, personally, because it invigorated her. Because she'd got to that stage, where a lot of teachers do, where you're looking for another challenge, or another step, or just something else to, I guess, inspire you. I think, research is quite well documented, with teachers at a certain stage we start to plateau. She had had a, done a post-graduate diploma, which had been really good. But this one, I think, really turned her around. She came back, and has remained, I think, much more inspired, invigorated, willing to try new things. Yeah, all of those things." <What changes have been in the classroom?> "The classroom, I've been talking to her about that. You can't actually specific it, because it's crossed over everything she does. ... It comes into absolutely everything she teaches. And so she's just continued to draw on all of the work she did. The other thing was that it gave her fantastic contracts, which she's also continued to use to help her with her lessons, and to be able to offer interesting programmes, and interesting insights for the girls."

"Enhanced it really, made her just more aware and a wider vision."

"For me, the change that I've seen is her awareness of research protocol, and the whole enquiry-based learning concept."

"With the time off he had, he was able to establish more links with what he does in the classroom with what's happening outside the school. The study he did was on water quality down at the lake here, and he, to do that he had develop a relationship with the trustees of the lake So he had to establish those links with the tribal authority ... and that's been maintained since. Students in his Year 12 classes, and his Year 10 classes, have been out and involved in projects in the lake."

“It has made a dramatic change in one particular area, the year 13 course... The way that that is done is quite, quite, different now. Now the processes she was following there were quite rigorous, scientifically rigorous, and she is now applying that kind of rigour, and what-have-you to those investigations that those students do. So they are... . As a result, the investigations they are producing are of much higher quality, and have been winning the regional science fair prizes. So that’s a very obvious benefit.”

In two, of the three, cases where classroom practise had not been affected, the introduction of NCEA was mentioned as having potentially interfered with the ex-Fellow’s development, while the last noted that the Teacher Fellow’s subject of research had been too divorced from their teaching subject to be transferred.

DO TEACHER FELLOWS CHANGE ROLES POST-FELLOWSHIP?

The majority (7) of the Teacher Fellows that were the subjects of these interviews were in different roles to those they had been in before their Fellowship. In accord with the Teacher Fellows’ self-reporting in the web-survey: three had gained Head of Department positions and two had assumed greater administrative duties. The remaining two had left their secondary/primary school teaching for, in one case a role in coordinating outreach activities between schools and a University, while the other was a national curriculum advisor. Only in two instances was an increased school responsibility attributed to an effect of the Teacher Fellowship, although interestingly, both of school representatives for the Teacher Fellows that had left teaching felt that this change in their career path was, at least partly, due to their Fellowship experience.

“We’ve lost four staff. Yeah, but none of them were because of the Fellowship, so that’s probably just ... unfortunate. But that’s happened, and possibly these were just people who were looking outwards.”

WHAT EFFECT DOES A TEACHER FELLOWSHIP HAVE ON THE EX-FELLOW’S PROFESSIONAL REPUTATION?

Seven, *i.e.*, 63%, of the school representatives stated that, in their opinion, the Teacher Fellow’s reputation had been enhanced as a consequence of the scheme. The reason given most often was that the Teacher Fellowship had resulted in increased recognition and prestige (6).

“I’m sure it enhanced it. The fact she was awarded it in the first place, and secondly that what she did, probably She was able to go out into the community and get worthy recognition from that point of view.”

This was followed by the Teacher Fellow’s increased responsibilities post-Fellowship (3), and their colleagues appreciation of their increased confidence (3).

For one of the four interviews that did not note an effect on the Teacher Fellow’s reputation, the reason given was:

“No, I’m not sure that it did.” <Why do you think that might be?> “Well possibly, its because I think we’ve had four Teacher Fellows here.”

However, another common comment—including from an individual who saw no effect on professional reputation—was that the Teacher Fellows had been highly respected to start with.

“It will have done, because people do acknowledge it’s a good thing to get and expands your range of experiences but, I think she was well respected as a biology teacher anyway.”

WHAT IS THE EFFECT OF A TEACHER FELLOWSHIP ON THE FELLOW'S SCHOOL?

The majority (7) of those interviewed about the effect of a Teacher Fellowship on a school stated that their experience of the outcomes from the scheme had been positive. Interestingly, this included both representatives nominated by the Teacher Fellows that had left teaching, although one HOD did comment on the effect of losing a valued staff member.

“You don't want to lose your top teachers, but in saying that education is wider than that, and we've all got to have that perspective.”

The effects for schools were far from uniform, with the most common explanations, at three each, being i/the creation of new teaching resources by the Teacher Fellow, and ii/ the opportunity granted by the Fellowship to trial a relieving teacher that had become a permanent member of staff. Also given as reasons, by two subjects each, were: increased community involvement fostered by the Teacher Fellow; the ex-Fellow's contribution to an improved working environment; increase environmental awareness at the school; and Teacher Fellowship which had led to new courses being offered.

“It's sort of encouraging, it might seem odd, but it's encouraging for other teachers when one of their colleagues has some time off, y'know to get some refreshment leave and look at what others are doing I suppose it gives them hope too.”

“I think it's given us a much more positive and dynamic teacher. I think it's given us someone who is able to assist girls, much more meaningfully, into geography and into science than she might have been able to before.”

“In our curriculum area we never had environmental education, or environmental studies, at any level previous to [*the*] Fellowship. So that is our major winner, and she pushed for that, and she was convincing enough for it to happen.”

Of note, nine of the eleven interviewees commented on ongoing outreach activities, and three referred to increased prestige for the school due to public recognition of the calibre of its teachers.

DO TEACHER FELLOWS HAVE ANY EFFECT ON THEIR LOCAL COMMUNITY?

All but one of the interview subjects felt that the Teacher Fellowship had led to positive changes in their community. These were primarily described as being a consequence of the public's awareness of the Teacher Fellowship and increased recognition for the school(8), but also because of the school's ongoing relationships with the Teacher Fellow's host (7), and increased engagement with community groups (4).

“People in the community and the local community, and the local schools, and the local high school are aware of that. Obviously they know about the [*Teacher Fellowship*].”

“I think it is very beneficial, in a two-way process, for people in the community to see people of the calibre of [*our Teacher Fellow*] and how they work, and that teachers are well organised, good communicators, and that sort of business.”

ARE TEACHER FELLOWSHIPS ASSOCIATED WITH DIFFICULTIES FOR SCHOOLS?

School representatives were asked whether they had experienced, or were aware of, any problems as a result of the Teacher Fellowship. For the majority of interviews (9 in total) the answer was either a clear “No”, or a comment to the effect that there had been no major problems. Despite this, finding a replacement for a valued staff member was commented on by five subjects, including both who felt that there had been a significant problem.

“Oh, the main issue we have is, of course, having staff out.”

“There’s always that initial headache, in staffing the gap. But, y’know it’s worth the hassle really; you wouldn’t like to turn down the chance for someone to do that.”

In addition, two interviews noted that parents did not appreciate the need for professional development when it negatively affected the short-term teaching of their children, and another two subjects noted concerns about other NZSMT Teacher Fellowships that they had been involved with rather than the one that was the subject of their interview.

“The only problem that I know of is people leaving instead of coming back to being a teacher. But, my knowledge of them is that there are a few of those, and a lot more benefit from the ones who are coming back.”

GENERAL COMMENTS FROM SCHOOL REPRESENTATIVES.

Interview subjects were also asked for any comments or perceptions they had regarding the Teacher Fellowship.

The most commonly held sentiment was a positive view of the programme (5), *e.g.*:

“Yeah, well I think the Scheme is fantastic. I’m a very strong supporter of it. I think there’s a lot to gain for all the people involved; the person doing it, the school, the people they work with, and the wider community. And obviously, the kids when you come back.”

“It’s a really valuable opportunity for staff, and the more of them the better.”

“I think it’s a great idea. All in favour of it.”

For some their views were more nuanced:

“I think for the individual teacher concerned, they’re great. I’ll be honest, we’ve had several staff on different ones and, I guess, the board have expressed concern about the apparent disruption in here. But that’s just taken from a bigger picture... the first question the board said was “Well, what’s that going to do to that subject area”, but I guess that’s from the Board’s perspective, I’d see it more from the teacher’s perspective. Y’know teaching’s not an easy job, and if teachers can take a year out and get some training, and get a different perspective on life, that’s great.”

School representatives noted that the Teacher Fellowships had led to multiple benefits for all involved, with two stating that the Teacher Fellowship represented a valuable opportunity, and another pair commenting that given the chance they would do one themselves.

However, some significant concerns were expressed. Three staff members raised concerns over their perception of Teacher Fellow’s leaving teaching, including one who was also worried about

awards to teachers close to retirement. Two Principals commented on the isolation of the Teacher Fellows from the school environment, and that there should be greater contact with the school while on the programme, while a Deputy Principal felt that the Society should undertake a renewed effort to market the NZSMT Teacher Fellowship programme to schools.

Finally, school representatives were asked whether for their overall impression of the Teacher Fellowship, and whether they would encourage their colleagues to undertake one. Subjects were unanimous in stating their positive view of the programme, and all but one stated they had, or would be happy, to promote the Teacher Fellowship.

In the one instance where ambivalence to the NZSMT Teacher Fellowship was noted, the interview subject, a Deputy Principal, expressed concerns about a relief teacher for a subsequent Teacher Fellow. This individual had caused the school sufficient problems that their enthusiasm for the Fellowship was dampened, at least temporarily.

INTERVIEWS WITH HOST REPRESENTATIVES

The goal for this series of interviews was to explore hosts' perceptions of potential benefits expected from the Teacher Fellowship, and to determine whether the programme had resulted in persistent effects on their host institutions. In a similar fashion to the method used for school representatives, hosts were asked whether they were willing to participate in a future Teacher Fellowship as a proxy of their continued enthusiasm for the scheme.

WHAT RELATIONSHIPS DO HOSTS HAVE WITH TEACHER FELLOWS?

Of the host representatives that Teacher Fellows had nominated: two each were randomly selected from Universities, CRI, Governmental agencies, private businesses, and all other institution types. The only interview subject that did not wish to participate came from a private business; they gave the length of time elapsed since the Teacher Fellowship as their reason for withdrawing from the evaluation. In this instance, another private organisation nominee was selected and successfully enrolled.

DO TEACHER FELLOWS HAVE EFFECTS ON THEIR HOSTS?

All ten interviewees felt that the Teacher Fellow had made a positive contribution to their workplace. In the vast majority of cases (nine of the ten), Teacher Fellows were said to have had lasting effects on their hosts, with the same number stating that they continued to have contact with the Fellow.

“*The Fellows*’s bringing [*school groups*] through each year, and it’s good to see, And, y’know, he can do those tours himself as well; he knows the whole place, and what’s dangerous, and that sort of thing. So he just runs his own tours through the winery, and possibly just gets one of the [*staff*] to talk about the career side of it.”

“Long-term effects in the sense, I think, that it has enhanced that link with a particular school.”

Teacher Fellows had contributed to their hosts by producing resources (7) and encouraging the formation of outreach activities and networks with schools (5). Six of the host interviewees were also quick to note that they had been inspired by the Teacher Fellows enthusiasm and dedication, with three of these referring to the Teacher Fellow having exposed them, and their organisation to new ideas. In addition, one Fellowship had acted as the successful pilot for a new position which has now been established, and another, who had been hosted at a University, was said to have made a positive, lasting, impact on student colleagues.

“He definitely, once he had learned the programming language required to work on this job, he did a lot for us just in terms of further developing things that we had already done, adding new features, adding things we had always wanted but hadn’t had time to do ourselves.”

“*The Fellow brought* an educational perspective to it, and we were also at that time trying to establish a relationship with the [*local tertiary education institute*]. So that was quite critical, and those links were built and strengthened, and they’re continuing now.”

< What contributions did *the Fellow* make to your team? > “Oh, quite a lot, I’d have to say. In terms of the actual experiments we set up, those are the things that a small to medium size [*business*], like we are, just wouldn’t have the time to follow through in a scientific way... What we could do was actually look at a few experiments in [*the industry*] and say, ‘lets actually test what our assumptions are in a more rigorous way’. It was sort of a luxury to be able to do that.”

And also useful, because there was a surprising result. Things ... assumptions around things that we were doing, that perhaps we didn't need to do any more, and that's been a cost saving. But also clarifying some of the things that we were doing, or could do, are useful to do, and improve production... . So certainly, [*the Fellowship's*] results have helped us in a commercial way. So it was a two way, and that's, I believe, the whole basis of the programme."

"I had wanted to apply for an LEOTC programme. One had been applied for here, previously. And so we worked collaboratively on that; [*the Fellow*], me, and the marketing manager, and were successful in gaining that for two areas of the country. We applied for a whole nation-wide thing. So that was a really neat outcome that helped push the boundaries of the whole way that it affected the Trust, and she ... and I know that their job was not to write up resources for your organisation, but she did. In fact, she wrote a wonderful one for the organisation itself, y'know, what we're about; how to relate that to children."

"I would say that his influence was not just felt by the staff, but by the cohort of students. So, when he went on fieldwork, and we'd be taking along a heap of graduate students, he'd be interacting with our graduate students. And he was pretty good with them."

Both university-based hosts also commented on the benefit of their exposure to colleagues with current childhood education experience:

"I think the real value of the Fellowships from our point of view ... I think it's very important for us, because it reinforces to me and my colleagues what the other side of the fence is like. You get the opportunity to learn about where our students are coming from. Y'know, if you want to sit down with the fellows and talk about what goes on in the classroom, there's a really great opportunity to talk about curriculum. From our point of view, I'd like to think it was a positive spin-off in that these guys go back to their classrooms and say 'I had this really wonderful experience at [*the host*], and I met these really cool people, and, y'know, I'd recommend [*them*]' . So I see it as being a win-win. They benefit enormously, and so do we."

"Well, I think [*the Fellow*] was a breath of fresh air... . Here's someone coming in with a whole lot of specialised information about how things work in the schools; that we're not really familiar with, because the people who enrol the students aren't actually in the departments. I mean someone in the University probably knows all this stuff, but we don't, in the disciplines at the coalface. So it was a learning experience for us too."

DO TEACHER FELLOWSHIPS HAVE ANY EFFECT ON THEIR LOCAL COMMUNITY?

Again, the majority of interviewees felt that the Teacher Fellowship had resulted in benefits for the community (eight of ten, with two unsure). This benefit was primarily being a positive effect on the relationships between the host and the community. Seven of the Teacher Fellowships had seeded ongoing outreach activities, and five had led to improvement in the educational content provided by the host, either through creation of resources, evaluation of current education practice, or instruction of pedagogical principles suited to use by the organisation. Five of the hosts also noted that the Fellowship had increased the public profile of their research programmes, with two of these attributing the opportunity provided by the media attention surrounding the Teacher Fellowship.

"[*T*]he awareness raising, with [*the Fellow*] being a champion for the environment, and getting out there in the public and the media, and asking the questions."

ARE TEACHER FELLOWSHIPS ASSOCIATED WITH DIFFICULTIES FOR HOSTS?

“I wouldn’t say there were any problems, but I’d say there were some unknowns. The unknowns were ‘what’s he going to do when he gets here?’ And I think, actually, that’s a strength, because if we’d had that all circumscribed in advance we’d have lost a lot of flexibility.”

Fortunately for the scheme, with the exception of one respondent, hosts were clear that the Teacher Fellowship had proceeded without incident. The one problem mentioned revolved around the issue of finding resources, *i.e.*, space and computer usage, for what was essentially a new member of staff.

GENERAL COMMENTS FROM HOST REPRESENTATIVES.

The single most common thread running through the interviews were expressions of support and enthusiasm for the programme:

“My colleagues, who have worked with all our fellows have always been very positive as well. They’ve seen it as being a really good thing, and not just because it’s someone coming in and collecting data. It’s more that they’ve had an opportunity to work with a teacher and find out what life’s like for them.”

I think it’s an excellent idea. Not just because we gained so much from having [*the Fellow*] here, but I think there’s a huge Well, I could probably give you an hour answer to that, but I see there’s an increasing disconnect between primary and secondary school education in New Zealand, and in fact not just New Zealand, but globally, and the real research world, to the extent that people grow up no appreciation for how science works. And how can they when they’re being taught by teachers who were trained in teachers training colleges, and themselves never worked in a research environment?”

With three host representatives noting that they had developed a rapport which they had appreciated with their particular Teacher Fellow.

“I think with us, we were just very lucky that [*the Fellow*] and I clicked straight away, and have still got that connection. I still go to talk in her class at school a couple of times every year.”

A surprising number of interview subjects had had teaching experience, and they tended to make comments relating to the Teacher Fellowship being an, essential, year for refreshment, and the benefits of taking practical experience back into the classroom.

“Oh, I’m just very positive about them [*the Fellowship*]. I’ve been a classroom teacher myself, and I wish they’d been around when I was one. Because the benefits to the teacher, and the teachers school, are just so immense . . . and to us.”

Finally, host representatives were asked for their overall impression of the NZSMT Teacher Fellowship, and whether they would encourage their colleagues to undertake one. Mirroring the result of the school interviews, all subjects agreed that the programme had been a positive experience for their organisation overall, and all but one stated they would be happy to act as a host in the future. However, some hosts appeared to still be partly bemused by their experiences with their Teacher Fellows, and wanted some reassurance that they would be getting a Fellow as “good as the last one”.

“For me, for me, it’s always a little worry, because up-front you don’t know how capable the person is going to be. I probably invested a hundred, or a hundred and fifty, hours of my time in

[*the Fellow*] during the year. You always have to wonder, could I have got more done myself, if I had spent that hundred and fifty hours, myself, doing that job. And in [*this*] case, the answer is certainly no. There's no way I could have got as much done. So for me it was a good return on investment. Yes. I invested 150 hours and probably got out 400 hours, of what I could have accomplished in 400 hours."

The one exception, a private industry representative, noted recent growth in their company, and their team, and expressed concerns about being able to manage an additional staff member in the short term.

*SCOPE AND SCALE OF THE NZSMT TEACHER
FELLOWSHIP SCHEME*

The NZSMT Teacher Fellowships are allocated on a competitive basis, with the number awarded dictated by the level of government funding. Since 2000, the scheme has seen significant increases in support which have been directly translated into more Teacher Fellowships being offered. Commensurate with increased funding, the programme continues to attract a high level of demand with success rates for any particular round since 2001 varying between 40% and 55% (see figure 1).

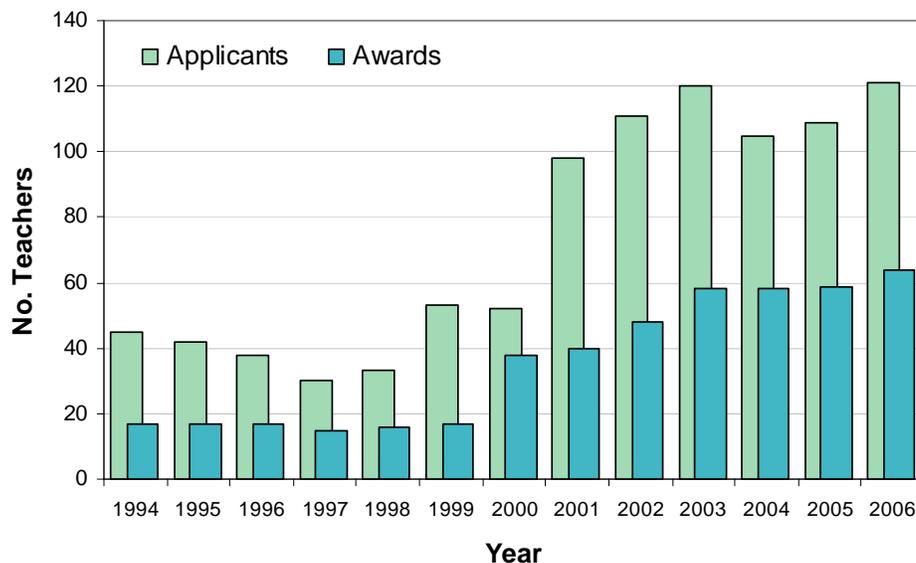


Figure 1: Number of applications and awards of NZ Science Mathematics and Technology Teacher Fellowships

The Teacher Fellowship is open to all fully registered teachers that are currently in the employ of a Board of Trustees at a recognised New Zealand school, who can demonstrate that their work touches on the sciences (including the social sciences), mathematics, and/or technology. Prospective Fellows can be at any stage of their career, although there is the expectation of at least five years teaching experience.

Applicants to the NZSMT Teacher Fellowship must propose a specific project with one or more host organisations that have agreed to act in that capacity, they must also have the permission of their Board of Trustees for the period of absence should they be successful.

Each application is considered by a Learning Area Panel (LAP) (Science, Mathematics, Social Science, and Technology) and their recommendations are then, in turn, considered by a Final Panel comprised of the chair person of each LAP. The decisions of the Final Panel must be ratified by the Council of the Royal Society of New Zealand. While the Society does aim to balance the number of Fellows by gender, subject speciality, and school character, selection is principally based on the calibre of an application in comparison to others in the round and as funding permits.

In order to investigate whether selection for a Teacher Fellowship was influenced by any overt bias, the characteristics of Teacher Fellows from 1994–2006, and unsuccessful applicants to the programme from 2004–2006, *i.e.*, all years for which data was available, were analysed.

The number of Teacher Fellows was found to strongly correlate with the decile of the school from which they came. Over the course of the Fellowship, each decile had, on average, 4.8 more Fellows than the decile before ($R^2 \sim 0.82$, see figure 2).

NZSMT Teacher Fellowship awards by decile

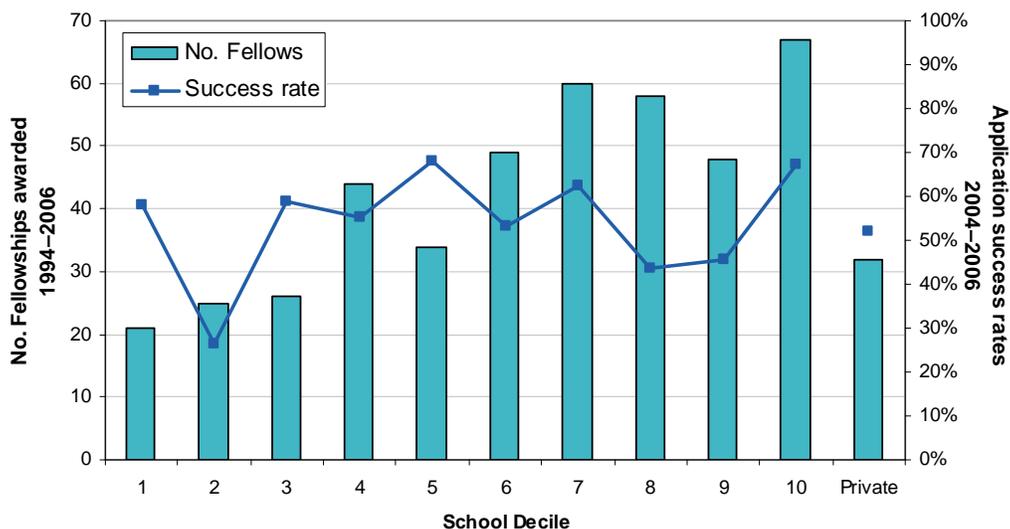


Figure 2: Decile of Teacher Fellows from 1994–2006, absolute number and success rate for applications from 2004–2006.

School decile is expected to have an influence on the number of Teacher Fellows. This is not because the Society feels that the calibre of teachers is correlated with school decile, *i.e.*, “While great teachers are often found at high decile schools, we believe that there are many great teachers at low decile schools”¹¹. Instead, recent research suggests that lower decile schools will find obtaining a replacement science/technology teacher more difficult¹², and are thus less likely to put existing teachers forward for a Fellowship. This seems to be borne out; for the years that data was available, success rates were independent of school decile ($R^2 < 0.05$). Thus, the applications from all deciles appear to be being treated fairly, but there is simply a lack of applications from teachers from lower decile schools.

Early in the Fellowship’s history, the number of male Fellows outnumbered their female colleagues by, in some years, more than 2:1 (see figure 3). Since 2001, the balance has shifted more towards female Fellows in keeping with the higher proportion of female teachers in the New Zealand system¹³. From 2004–2005, female applicants had slightly higher success rates at the Fellowship than males (59% cf. 50%); however, this difference did not reach statistical significance ($p > 0.1$).

¹¹ 2005 Performance and Achievement Report of the Royal Society of New Zealand, pg 47.

¹² Staying in Science

¹³ Ministry of Education (2005) ‘Teacher Stats 2004’.

URL www.minedu.govt.nz/web/downloadable/dl7091_v1/7091-staff04.xls

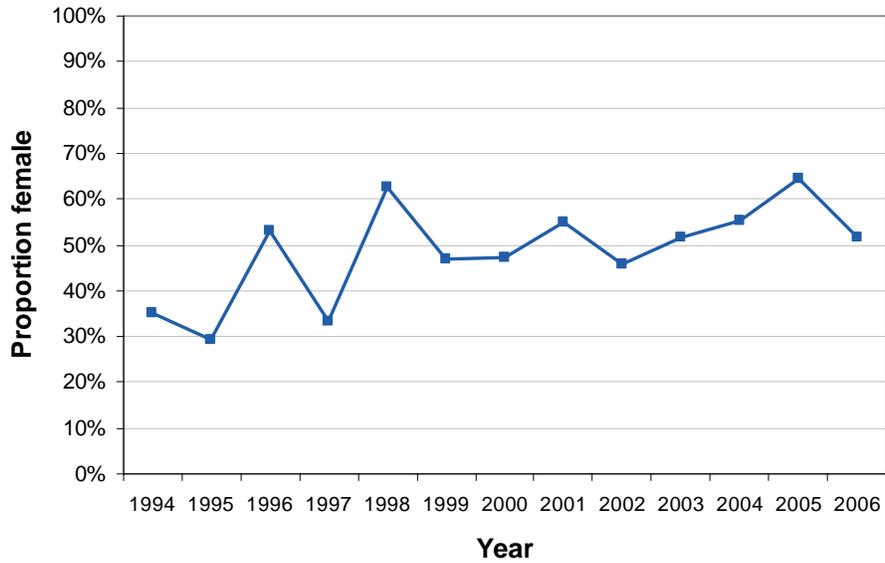


Figure 3: Gender distribution of NZSMT Teacher Fellows 1994–2006

In a similar fashion to the effect of decile on Teacher Fellowship numbers, there is an apparent lack of Teacher Fellows from the primary schooling system (see figure 4) where they make up roughly half of all teacher FTE. As the success rates for applications from different institution types did not differ significantly (Primary 50% cf. Composite 59% cf. Secondary 56%, $p > 0.5$).

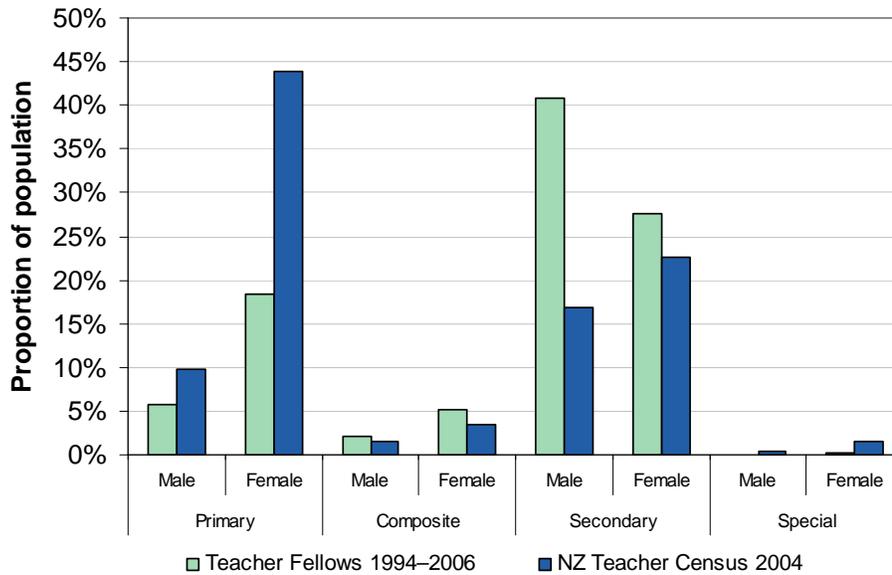


Figure 4: Gender of teachers and Teacher Fellows by school type

Success rates for European/Pakeha teachers were higher than their non-European colleagues, *i.e.*, 56% cf. 36%; however the low number of minority applicants to the Fellowship rendered this difference statistically insignificant ($p \sim 0.08$). While it is apparent that ethnic minorities are not represented in the Fellowship to the extent that they are in the teaching system as a whole (see figure 5), once again, this appears to be a consequence of low application rates from non-European/Pakeha teachers.

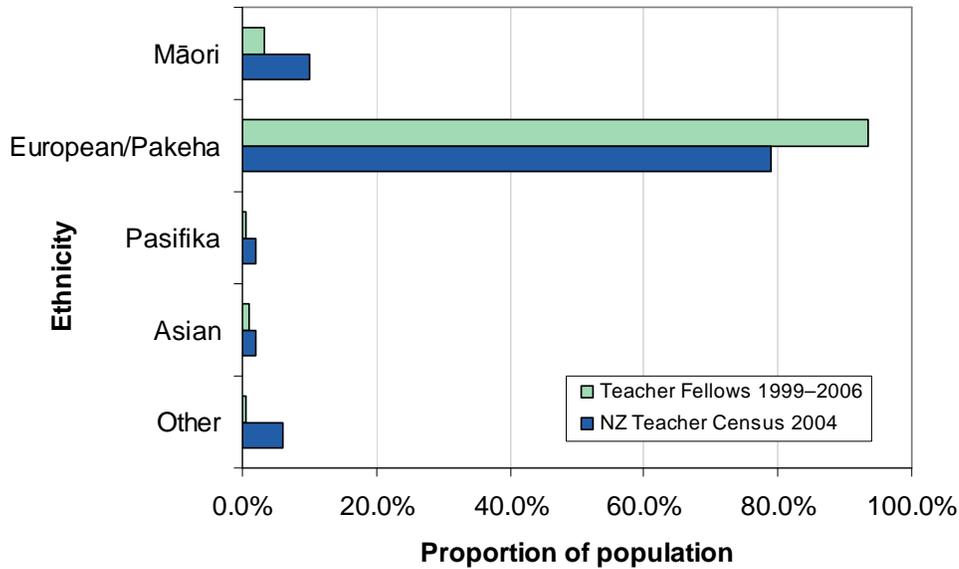


Figure 5: Self-reported ethnicity of teachers and Teacher Fellows

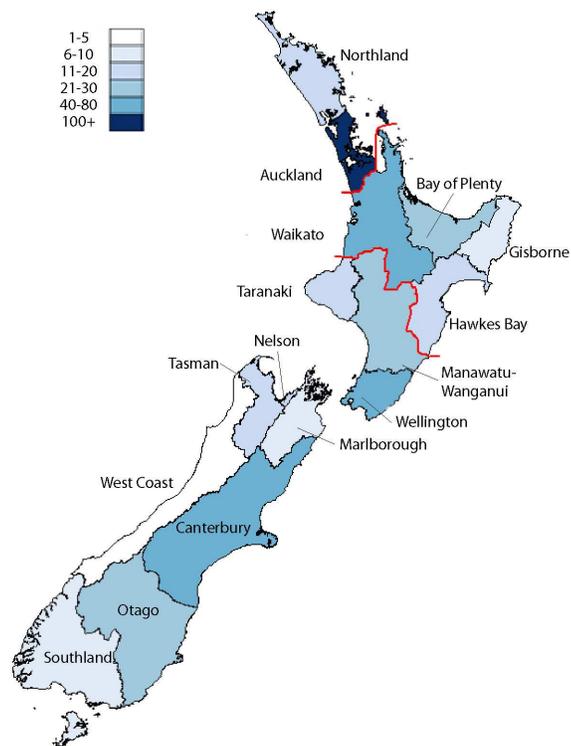


Figure 6: Distribution of Teacher Fellows from 1994-2005, by district of origin.

A map of the regional distribution of Fellow’s school of origin also confirmed that the scheme has been particularly strong in the Auckland district, with other regions having a number of Fellows roughly in proportion to their relative populations. In contrast, over the course of the Fellowship there have been relatively few Teacher Fellows from Gisbourne, Marlborough, or Southland, and only a handful from the West Coast (see figure 6).

In keeping with the support for the programme exhibited in the interview sections, a large proportion of schools, and hosts, have elected to become participated in more than one Teacher Fellowship. Both distributions follow power relationships, *i.e.*, of the 305 schools that have been involved with the Fellowship from 1994–2006, almost a third (94) have had two or more (see table 11), while of the 295 host organisations, almost a quarter have hosted more than one Fellow (see table 12)

Table 11 Distribution of number of Fellowships in a school from 1994–2006

No. Fellowships	1	2	3	4	5	6	7	8
No. Schools	211	61	16	11	2	1	1	2

Table 12 Distribution of number of Fellows hosted by an organisation from 1994–2006

No. Fellowships	1	2	3	4	5	6–10	11–20	21+
No. Schools	227	37	10	4	1	5	8	3

CONCLUSIONS

The results of the web-survey found that the Teacher Fellowship programme appears to be satisfying the goals of its Terms of Reference. At least 90% of Teacher Fellows felt that their Fellowship had increased:

- relevant skills, *i.e.*, primarily pedagogical and communication skills but also through aiding curriculum design;
- subject understanding, *e.g.*, through application of current methodology and real-world research experience to the curriculum; and,
- the Teacher Fellows knowledge of suitable careers.

The majority of Teacher Fellows (91%) also reported their experience had positively impacted on their teaching practice, *e.g.*, by increasing their confidence in their subjects, and providing access to an increased knowledge base. These Teacher Fellows also tended to comment that the Fellowship gave them an opportunity for professional reflection away from the school system, and that they had returned to teaching, refreshed and revitalised.

These self-assessments were supported by the results of interviews with key informants from the Teacher Fellows' schools, and representatives from the organisations that had acted as their hosts.

In most cases, Teacher Fellows reported that they had communicated their Fellowship experience to a wide range of audiences. The majority of Fellows stated that they applied the skills and/or knowledge gained through the Teacher Fellowship to their classroom programmes (88%), their schools (81%), and the wider education, and local, communities (70% and 55% respectively).

One of the most encouraging findings was the extent to which survey respondents were open to independent commentary on the impact of their Fellowship experience: *i.e.*, 73% nominated a host contact for interview, while 83% proposed a senior staff member at their school. Even taking the conservative view that non-response indicated an objection, only 11% of those participating in the survey declined this scrutiny.

Almost universally, the individuals interviewed were found to have a high opinion of the scheme. As a proxy for their level of support for the programme, nine out of ten hosts, and school administrators, were enthusiastic in, respectively, stating that they would be willing to act as hosts, or to encourage other staff members to undertake a Fellowship, in the future. In a few cases, interviewees noted that they had sent put forward staff for NZSMT Teacher Fellowships, or had attempted to engage a Teacher Fellow, subsequent to the Fellowship that was the subject of the interview.

Hosts indicated that they felt they had gained a willing and competent worker in their Teacher Fellow, and many hosts appreciated that they had gained exposure to new cultural viewpoints as a consequence of the Fellowship. In most cases (*i.e.*, 90%) host representatives felt that their Teacher Fellow had made a lasting positive contributions to their organisation, with Teacher Fellows having left behind new, or improved, systems and products, and a greater connection with the primary and secondary school systems. School representatives on the other hand, felt that a revitalised, and more capable, teacher had returned post-Fellowship. Even in the cases where ex-Teacher Fellows had left teaching, the representatives retained a positive view of the programme.

There were two instances where uncertainty was expressed about continuing participating in the scheme; one of ten host interviews, and one of eleven school interviews. In both cases, circumstances outside the immediate scope of the Teacher Fellowship were given as reasons. One, a corporate host, had significantly expanded their operation since the Fellowship, and they

were concerned about their ability to house and manage an additional staff member, at least in the short-term. In the other case, a school principal, an unsatisfactory experience with the relief teacher for a subsequent Teacher Fellowship had tempered their enthusiasm for the programme.

WHAT EFFECT DOES THE NZSMT TEACHER FELLOWSHIP HAVE ON ITS FELLOWS, AND THEIR SCHOOLS?

“And he actually came in, and did much more for us than we actually planned, and I think it was because of his enthusiasm for the project... And I think he was enthusiastic because it was directly relevant for school kids and for educational purposes. Y’know, it was a research project, but with, very much, a focus on secondary school education. ... [F]or teachers in New Zealand to come into a research organisation and see how things are done, I think it does two things. First of all it gives them real world experience in the scientific process. And secondly, I think it gives them a feeling for what kids need to learn at school if they want a career in science.” – CRI host

“He was very much aware of trying to make [*education*] dynamic for kids at school. So he was putting the programme together, which I think he still uses, on how [*our product*] is made, and so obviously got a few pointers from us, and not just the scientific side, but the careers side as well.” – Private industry host

“I think to give teachers a year’s break, a year’s refreshment, doing something completely different, where they can look at the world from a different perspective. It’s gotta be beneficial for them as a break, and it’s got to be beneficial for them for going back with fresh eyes and fresh ways of looking at things when they’re teaching their kids, what ever their programme is.” – NGO host

The rationale for professional development programmes must be that they will deliver better outcomes for students. It is therefore of concern that recent research, albeit in the area of child literacy, suggests that many professional development schemes only result in short-term changes in teaching practice, and thus can only have limited effects on student achievement¹⁴. While it was beyond the scope of this evaluation to attempt to measure the effects on students of the NZSMT Teacher Fellows, it is important to note that many of the mechanisms suggested as being indirect measures of the effectiveness of professional development can be found in the Fellowship’s outcomes. The majority of Fellows appear to be strongly involved in the learning community of their schools, and in many cases Fellows are reported as acting as regional leaders. As shown by the responses to the survey, and subject interviews, Teacher Fellows appear to have subsumed many of the concepts of the “New Professionalism” in their enthusiasm to communicate their experiences to their teaching community¹⁵. In fact, one of the major causes of frustration reported by Teacher Fellows throughout this evaluation was where they felt that they had been prevented, either by heavy workloads or their perception of resistance to change within their school, from making this contribution.

Some other jurisdictions have advantages over New Zealand in their ability to assess the efficacy of programmes similar to the NZSMT Teacher Fellowships: namely, the expectation/acceptance of relatively invasive monitoring of individual student’s academic progress; and, in some instances, the practise where a teacher will stay with students through two–three years of

¹⁴ Research commissioned by the Ministry of Education and led by Dr Helen Timperley, University of Auckland. (2003) ‘Shifting the Focus: Achievement Information for Professional Learning: A Summary of the Sustainability of Professional Development in Literacy - Parts 1 and 2’
URL www.minedu.govt.nz/goto/pdinliteracy

¹⁵ Mockler, N. and L. Normanhurst (2004). ‘Transforming Teachers: New Professional Learning and Transformative Teacher Professionalism’. Paper presented to the Australian Association for Educational Research Annual Conference. URL <http://www.aare.edu.au/04pap/moc04272.pdf>

schooling at a time. These features have been used to good advantage to conduct a large multi-programme evaluation of US-based Science Work Experience Programmes for Teachers (SWEPTS)¹⁶. Of note, experience of Teachers in a SWEPT programme were found to significantly enhance the academic ability their students in biology and chemistry, while SWEPT-veteran math teachers were also able to reduce the decline in student attitudes to the subject compared to the students of matched teachers that had not undergone the programmes. In findings mirrored by the current evaluation, SWEPTS were also demonstrated to have encouraged positive developments in teaching practice, *e.g.*, increasing use of inquiry-based activities compared with control teachers, which are anticipated to be of benefit to their students. Although SWEPTS differ from the NZSMT Teacher Fellowship programme, in that they tend to be over the summer period for 8–12 weeks, and in the archetypal programme, the Columbia University Summer Research Program for Secondary School Science Teachers, the fellowship is repeated with the same host after one year, the fact that these findings are common to a variety of different designs of research experience for teachers programmes encourages the belief that similar impacts can be expected for the NZSMT Teacher Fellowship.

In a similar vein, it is also expected that the large number of Fellowships that lead to ongoing outreach activity will mean that the scheme will have wide-ranging, positive, effects on students beyond those that could be hoped for typical professional development programmes.

IS THE NZSMT TEACHER FELLOWSHIP AFFECTING THE RETENTION OF ITS FELLOWS WITHIN TEACHING?

“The only risk I guess, is that they do see that there’s life outside.” – Principal for 2001 Fellow

“She made the comment to me, and she said that ‘if I hadn’t had that year out, I wouldn’t be teaching now.’” – Host for 2003 Fellow

A previous evaluation was undertaken in 2002 to determine the effect of the NZSMT Teacher Fellowship on the loss of its Fellows from teaching¹⁷. This research found that while there no significant differences in Fellow attrition compared with that expected for the national teaching population, there was a suggestion of increased loss early post-Fellowship, which bordered on statistical significance. This result came as something of a surprise as evaluation of a, broadly, similar programme had found positive effects on teacher retention. This programme, the IISME Summer Fellowships, which is based in California, USA, was credited with an overall reduction of annual teacher loss in its Fellows to 4% compared with a, contemporaneous, state average of ~8%¹⁸. The current evaluation was undertaken, in part, in an effort to resolve this issue.

As noted previously, the results from the web-survey confirmed that the RSNZ staff kept accurate records of the current status for ex-Fellows. Using this database, it was estimated that of the 401 Teacher Fellows from 1994 to 2005, approximately 307, or 77% are still teaching in the NZ primary and secondary school systems, see table 11. Models of the attrition rate for Fellows were constructed, and compared with the expected loss rate for the general teaching population as predicted from the Ministry of Education’s Teaching Staff Tables¹⁹.

¹⁶ Silverstein, SC, Dubner, J, *et al.* (2004) ‘The Effects of Teacher Participation in a Scientific Work Experience Program on Student Attitudes and Achievement: A Collaborative Multi-site Study’. Report to the NSF for Award # 9812142.

URL <http://www.sweptstudy.org/NSF%20SWEPT%20Final%20Report.html>

¹⁷ Taranchokov, A., A. Knox, *et al.* (2002). ‘Tracking of former Teacher Fellows’. Royal Society of New Zealand.

¹⁸ Weisbaum, K.S. and, D. Huang (2001). ‘IISME Teacher Retention and Program Impact Evaluation 1985-2000’. Cupertino, CA: Industry Initiatives for Science and Math Education. URL <http://iisme.org>

¹⁹ Ministry of Education (2005) ‘Teacher Stats 2004’. URL www.minedu.govt.nz/web/downloadable/dl7091_v1/7091-staff04.xls

Loss rates for all teachers over the period 1994–2004 were reported as being between 8.9% and 10.8% annually. Against this measure, the Teacher Fellowship would be said to have a strong positive effect on teacher retention, however the loss rates are a relatively crude measure which are calculated on the basis of changes to payroll information from the beginning and end of the relevant year, and do not capture the high rate of return that occurs in the teaching profession. The Ministry of Education does not regularly report this information, and the most recent estimates available at the time of this report come from 2001 when it was found that roughly 35% of those counted as lost by the Teaching Staff Table will have returned to teaching after one year, and a further 8%, and 5%, by two and three years, respectively²⁰. The decreased loss rate that this level of return would indicate is shown as ‘Expected Incl. Return’ (see table 13 and figure 7).

Table 13

	Fellowship year												Total
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
No. Fellows	17	19	19	15	16	18	36	40	48	56	58	59	401
No. Believed to be teaching	12	13	11	10	8	14	24	27	34	43	52	59	307
% Still teachers	71	68	58	67	50	78	67	68	71	77	90	100	77
Expected	32	35	39	43	47	52	58	64	72	80	90	100	70
Incl. Return	49	52	56	59	62	66	69	74	78	83	90	100	77

Comparison of the expected loss rate including subsequent return against the model of best fit on Teacher Fellowship loss rate (a quadratic, adjusted R-square 0.71) found no significant difference; suggesting that the NZSMT Teacher Fellowship experience is not having a negative effect on teacher retention, but equally, that there is not strong evidence for a positive effect either. However, it should also be remembered that of those that indicated they had left primary/secondary education, roughly, three-fifths were still engaged with the education community in some other capacity (see table 5, page 6).

²⁰ Ministry of Education. ‘Teacher Mobility Statistics 1997/1998: Losses, Movements, and intakes of Regular Teachers in New Zealand State Schools.’ Accessed on 10 Oct 2005.
URL <http://www.minedu.govt.nz/index.cfm?layout=document&documentid=3493>

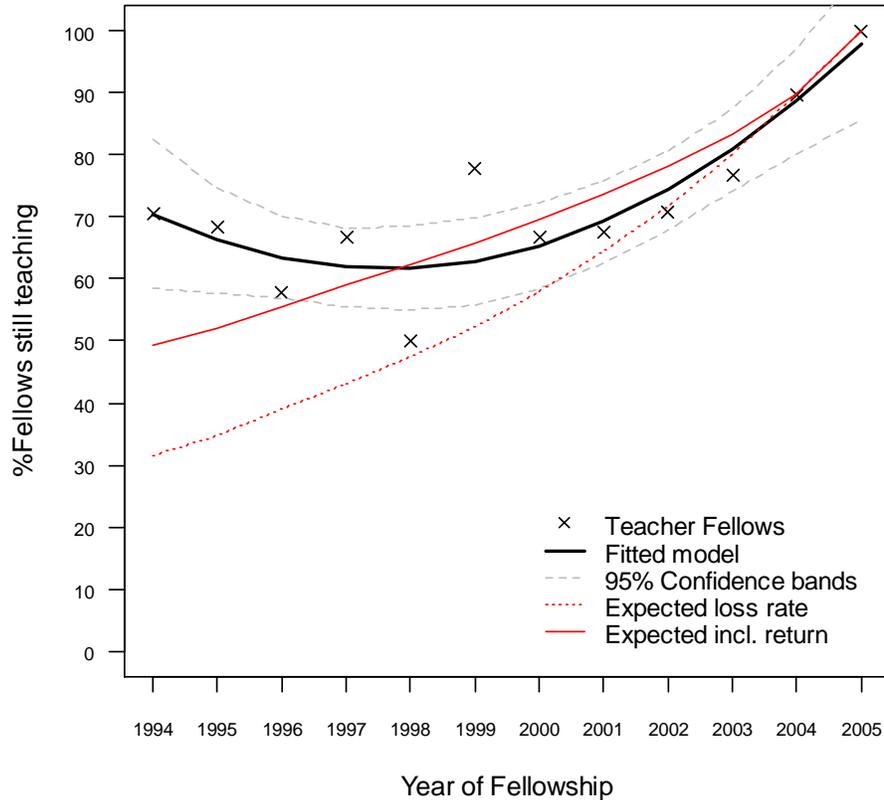


Figure 7: Modelled attrition rates for Teacher Fellows as at the end of 2005, compared with the expected attrition for the general teaching population.

An interesting feature of the Teacher Fellowship’s attrition curves is that the rate of loss appears greatest in the first one–two years post-Fellowship. That this maximal loss rate immediately post-Fellowship was also observed in the 2002 tracking survey of the NZSMT Teacher Fellows, as well as being recognised in the “IISME Teacher Retention and Program Impact Evaluation 1985-2000”, suggests this is a common phenomenon for this type of programme. However, after this volatile period, the loss rate appears to stabilise, and at the earliest time points for which we have information, *i.e.* 1994 and 1995 Teacher Fellows, the rate at which ex-Fellows are returning to teaching is presumably exceeding the rate of loss.

Unfortunately, without a more complete description of the factors affecting loss, and return, in the general teaching population, the question of the effect of the NZSMT Teacher Fellowship on teacher retention cannot be satisfactorily resolved.

ISSUES FACED BY RETURNING TEACHER FELLOWS

Through anecdotal comments, the RSNZ’s education unit is aware that returning from the Fellowship experience back into the classroom can be difficult; a belief which appears to be borne out by the attrition data. Despite this, relatively few of the surveyed Teacher Fellows, or their colleagues, dwelt on the matter of transition. In the handful of cases where concerns were raised, they either, tended to be in areas that were not amenable to change from within the Society, or, had already been recognized and largely addressed by the time of the current evaluation.

The most common cause of problems appeared to be a lack of communication between the school and the Teacher Fellow, particularly where significant change had occurred in the school while the Fellow was away. In some instances a supportive senior staff member was replaced with one

who had limited interest, or understanding, of the Teacher Fellowship programme; in others, the coincidence of the Teacher Fellowship year with the introduction of NCEA caused problems. However, even a normal year's change within a school can prove to be a difficult adjustment for the returning Teacher Fellow:

“The ending [*of the Fellowship*] needs work. A lot happens during the year and it is really easy to return to school and find that in some ways things have passed you by and settling back in is hard. People have received opportunities in your absence and they are reluctant to give them up or people are unwilling or uninterested in your experience because for them it's been a case of life as usual and you don't want to feel that you are gloating etc. How to maintain healthy distance without feeling completely out of the loop and how to be supported back into your school are some issues that need to be addressed.”

In part, these problems may have been compounded by the recommendation that Teacher Fellows limit their contact with their school in the interest of providing them with a clean period of “time out”. It is expected that the administration's current practice reversing this instruction, *i.e.*, to actively encourage Teacher Fellows to maintain regular contacts with their schools, should minimise the risk of destructive surprises of this type.

The only other transitional theme to emerge, related directly to the nature of the Teacher Fellowship scheme, *i.e.*, the contrast between the experiences of being an active researcher with those of a returning teacher, and the Teacher Fellowship as an opportunity for personal reflection. While, for most ex-Fellows these experiences were seen as positive, for some, exposure to a world outside the classroom was either a temptation, or, more simply, gave them the space to realise that they no longer wanted to be a teacher:

“It was a life-changing experience and has probably kept me longer in teaching than I would otherwise have stayed... The hardest thing is coming back into the classroom and I had 6 months of wanting to walk away from the job afterwards. However, RSNZ went to great lengths to prepare us for this and I don't think there is any way around that one—Fellowships are so good that anything would seem a let-down afterwards!”

“I realised I didn't want to carry on teaching and wanted to change careers.”

“Running out of steam in second year after Fellowship and back to the old grind. Not stimulated by the school environment. In the Fellowship year and when I present to [the research] group it is stimulating. The school environment kills that and you are too busy/tired to try to change the culture. ... Teaching ends up being poor and I am not prepared to carry on being rushed, overworked and never completing anything properly. From the Fellowship you gain an understanding of how things need to be. The school culture does not allow that to happen so it leaves you with only one option.”

“The Teacher Fellowship year exposed me to an environment outside teaching and indirectly led me to leave teaching for a while. I think it is important for prospective fellows to be aware of the potential impact of the Fellowship on their lives and to consider the options it may raise for them long term in the areas of further study and career options within and outside of teaching. Life/Career counselling made available to fellows could be helpful.”

While it appears that the RSNZ Education team go to some length to prepare Teacher Fellows for their return to school, the observation that the loss rate from teaching is at its greatest in the first two-years post-Fellowship (see figure 8) suggests that additional early intervention, *e.g.*, counselling support, might be of significant benefit to this aspect of the scheme.

VIEWS OF HOST AND SCHOOL REPRESENTATIVES ON RETAINING TEACHER FELLOWS IN TEACHING.

Retention of the Teacher Fellows in teaching was an issue noted in both interview strands. While it is an area of obvious interest for the School representatives that teachers return to the school, or at least remain within the education system, it was of note that this also featured in the concerns of many of the Host representatives. One of whom took the view that the scheme should be more proscriptive, and compel Teacher Fellows to return, *e.g.*:

“I would see [*Fellows leaving teaching*] as a waste. Y’know, if I was running the scheme I would have a caveat on this that you have to go back to teach, for at least a year afterwards... I think a prerequisite of at least a year back in teaching afterwards, and after that they can revisit their career options, but it’s a shame if they don’t go back and teach afterwards.” – Host for 2001 Fellow

In contrast, another interview subject saw the NZSMT Teacher Fellowship as an opportunity for teachers to determine whether they really wanted to remain in teaching, and that this was a positive feature of the programme even if the answer was negative:

“Well actually, I don’t think it’s a bad thing really [*i.e., Fellows leaving*]. I think if someone wants to leave teaching it’s probably healthy for all concerned that they do. And that if this is a pathway to do that, albeit not what it was set up to do, I think that’s actually a useful outcome... There’s no point having someone back that doesn’t really want to teach.” – School Principal

From the web-survey, this appears to have been the case for at least one of the two ex-Fellows that indicated the Teacher Fellowship had a negative effect on teaching practice. In this instance, the Teacher Fellow recognised that the opportunity for reflection that the Fellowship had provided led them to the realisation that they no longer wanted to be a teacher (see quote, page 16).

However, the majority of respondents perceived that there may be an issue, but given the nature of the survey sample, in the majority of cases it had not affected them, *e.g.*,

<Do you think, theres a concern too that the person won’t return?> “That’s been raised; that has been raised.” <How were you able to address that discussion with the board?> “I said well one way of looking at it was that if we don’t keep challenging and refreshing these people, they are going to go anyway. That was one side of it, and talked about the huge commitment that these people have had in here. Y’know it’s a risk that we take. It’s not occurred to us, frankly; the ones who have gone away have come back, and gone back into it much more refreshed.” – School Principal

THE NZSMT TEACHER FELLOWSHIP AS A SEED FOR OUTREACH ACTIVITIES CONNECTING CHILDREN WITH ACTIVE RESEARCH IN NZ

“Developing links between schools and scientists is important for two main reasons. Firstly, many newer areas of science, such as biotechnology, are rapidly changing and involve knowledge that teachers themselves were never taught. Other teachers are uncomfortable teaching such subjects. Good links can help teachers come to terms with new subject areas. Scientists are also important role models if we are to attract talented students.” – MoRST ‘RS&T that is valued, trusted and supported by New Zealanders: a background paper to Picking up the Pace’ (2005) pg 2,

Perhaps the most positive single finding from this evaluation is the evidence of a linkage between Teacher Fellowships and their host's outreach to the community. A feature noted in both interview strands, *i.e.*, nine of eleven schools, and five of ten hosts reported ongoing cooperation, was that the majority of Teacher Fellowships act to link school students with the RS&T sector. As such Fellowships appear to act as vigorous promoters of ongoing outreach activities; in most instances this is between the Fellow's host, and their classes and school, but in some cases Fellowships have linked organisations to childhood education in general.

Although the NZSMT Teacher Fellowship scheme fits within the Supporting Promising Individuals output class, which is appropriate given the apparent calibre of successful applicants to the programme, it has to be noted that the scheme produces outcomes with significant overlap for other MoRST endeavours. In addition to being an activity linking school students, and the families, with the RS&T sector, a key goal being achieved by the NZSMT Teacher Fellowship is that it give teachers the ability to increase their students' confidence in a future in RS&T. As such, the NZSMT Teacher Fellowship programme is relevant to the "New Zealanders engaged with RS&T" and "Skills for the future" themes of the Picking up the Pace initiative²¹.

ARE THERE GAPS IN THE TEACHER FELLOWSHIP PROGRAMME?

As part of this evaluation, a review of the demographics of Teacher Fellows from 1994 through to the 2006 round was undertaken. Where possible the character of successful applications was compared with that of unsuccessful applicants, and the general teaching population at large.

Notably, selection processes for the Fellowship, at least over the years for which data is available are equitable and no statistically significant source of bias could be detected. If, as we assume, the relative quality of applications is constant over the male cf. female and European/Pakeha cf. minority axes, as well as being independent of socio-economic strata, and school type, this is reassuring. However, it must be noted that there is an under-representation of certain strata of teachers in the Fellowship ranks: namely, ethnic minorities, low decile, primary, and non-urban, school teachers. As under-representation appears to be primarily as a consequence of low application rates by these groups, future work by the Society should be addressed to determining what barriers to participation are faced by these groups in the hopes that it has the means to help overcome them.

²¹ MoRST (2005) 'Picking Up the Pace Summary'

URL <http://www.morst.govt.nz/Documents/work/pace/Pace-Summary-December-2005.pdf>

RECOMMENDATIONS

- This evaluation found that the NZSMT Teacher Fellowship scheme appears to be satisfying its Terms of Reference, and that no major structural changes are needed. However, during a document review associated with the evaluation it was determined that application rates for low decile schools have been consistently low over the lifetime of the scheme. It is recommended that the Society seek to determine the causes for this disparity and, if possible, address them.
- The discovery of the role of the Teacher Fellowship in encouraging outreach activities deserves further attention. The factors of the School–Fellow–Host interaction which permit outreach should be sought to determine if they are amenable to influence by the Society.
- The Society should work toward the establishment of a support network for Teacher Fellows in accord with the desire, and willingness to contribute, of the NZSMT Teacher Fellowship community.

APPENDIX I-TEXT OF THE WEB-SURVEY QUESTIONNAIRE

PERSONAL INFORMATION

Name: <PI_name1>

At the time of the Fellowship in <project_year>:

School: <School>

Principal Host: <Host>

Current details

Contact address: <Address>

.....
Phone no.: <Phone>

Place of work: <work_place>

(if appropriate and differs from above)

Please check and correct where necessary.

QUESTIONS RELATING TO YOUR FELLOWSHIP I

Q1/ **Are you currently a school teacher?** <Teacher_yesno>
[Yes/No]

Q2/ **Did the Fellowship enhance your understanding of your subject and/or curriculum areas?** <Understanding_yesno> [Yes/No]

Please describe what was learnt, or the barriers that prevented learning.

<Understanding_memo>

Q3/ **Did the Fellowship enable you to learn or enhance skills relevant to your current employment?** <Skills_yesno> [Yes/No]

Please describe either the skill learnt, or the barriers that prevented training.

<Skills_memo>

Q4/ **Did the Fellowship have an impact on your teaching practice?**

<Practive_radio>

- Yes, positive
- Yes, negative
- No, no impact

Please bold, or otherwise indicate, your selection.

If Yes, please describe how your teaching practice has changed.

<Practice_memo>

Q5/ **Did the Fellowship increase your knowledge of career options available to students?** <Careers_yesno> [Yes/No]

Please explain

<Careers_memo>

QUESTIONS RELATING TO YOUR FELLOWSHIP II

Q6/ Have you applied skills or knowledge gained as a consequence of the Fellowship to any of the following areas?

[Yes/No]	A classroom programme <Skills_class_yn>
[Yes/No]	Your school <Skills_school_yn>
[Yes/No]	The extended education community <Skills_edcomm_yn>
[Yes/No]	Your local community <Skills_comm_yn>
[Yes/No]	Other (if "Yes" please describe) <Skills_Other_yn>
	<Skills_other_memo>

If you have applied skills or knowledge, please describe how:

<Applied_skill_memo>

If you feel that there have been barriers to applying skills or knowledge learnt, please explain what they were/are:

<Applied_barr_memo>

Q7/ If you are still a teacher, have your responsibilities changed as a consequence of the Fellowship? <Responsibility_yesno> [Yes/No]

If Yes, how?

<Responsibility_memo>

What is your school's current decile rating?<new_decile>

Q8/ If you are no longer a school teacher, did you return to teaching following the Fellowship? <Returned_yesno> [Yes/No]

If Yes, how long (in months) elapsed between returning to school and your departure?

.....<Understanding_memo 1>

What are you doing now?

Working in education-related area <Working_ed>	Y/N	Working in science-related area <Working_sci>	Y/N
Working, other <Working_oth>	Y/N	Retired <Retired>	Y/N
Other <Active_other> If Yes, please describe	Y/N	<Active_other_memo>	

FUTURE TEACHER FELLOWSHIP ACTIVITIES

The Royal Society is investigating the need for a support network of Teacher Fellows to enable communication between past, present, and prospective fellows.

Would you find such a network of value? <Network_vote_yn> [Yes/No]

Would you be willing to take part? <Network_part_yn> [Yes/No]

What activities and/or means of communication would you find useful? (Please rank from 1–7 in order of importance, where 1= most important. Please use each number only once; however, you do not need to rank every option.)

	email newsletter <email_rank>
	Web/e-mail discussion forum <forum_rank>
	Regular meetings in main centres <meeting_rank>
	Regular talks/presentations by past and current Fellows <Present_rank>
	Field trips to current Fellowship projects <Field_rank>
	Other (please specify) <Other_rank>
	<Other_rank_memo>

COMMENTS ON THE FELLOWSHIP SCHEME

1/ Are there ways which you feel the Fellowship's application process could be improved?

2/ Are there ways which you feel the Fellowship's reporting process could be improved?

3/ Do you have any other comments relating to the Fellowship scheme?

4/ The Royal Society intends to conduct an impact assessment of the Fellowship programme, which will involve interviews with HODs or Principals that have had fellows and Fellowship hosts. The results of these interviews will be used to assess the role and effectiveness of the programme against its objectives and will NOT be used to measure the performance of individual Fellowships.

Do you have any objection to the Society approaching a representative, *i.e.* principal or HOD, from the School? <HOD_yesno> [Yes/No]

If no, who would be most suitable?

Do you have any objection to the Society approaching a representative from the host institution? <Inst_yesno> [Yes/No]

If no, who would be most suitable?

Thank you very much for your input into the evaluation of the Science, Mathematics, Technology and Social Sciences Teacher Fellowship programme.

APPENDIX II-INTERVIEW STRUCTURE-SCHOOL

Contract:	Project Title:
Date:	Fellow:
School contact:	
<p>Introduction and warm-up:</p> <ul style="list-style-type: none"> • State you are familiar with the outline of the Fellowship • Explain the purpose of the evaluation. • Assure confidentiality, and that will not be used to assess individual Fellowships 	
1/ Could you explain your relationship to <the fellow>? Thanks.	
<p>2/ I believe you worked with <the fellow> before their Fellowship. Do you believe that the Fellowship affected their classroom practice? [Yes No]</p> <p>If yes (or positive),</p> <ul style="list-style-type: none"> • In what way? • Have they implemented experiences from their Fellowship into their teaching? • Did they appear more enthusiastic about teaching following their Fellowship? • Have their attitude to Science/Mathematics/Technology changed since the Fellowship? <p>If no (or negative),</p> <ul style="list-style-type: none"> • Why do you think that might be? 	
<p>3a/ Has the Fellowship affected <the fellow>'s professional reputation? [Yes No]</p> <p>If yes (or positive),</p> <ul style="list-style-type: none"> • In what way? • Has their relationship with their colleagues changed? 	
<p>3b/ Is <the fellow> in a different role since the Fellowship? [Yes No]</p> <p>If yes,</p> <ul style="list-style-type: none"> • Do you believe the Fellowship contributed to the change? 	

4a/ Has the Fellowship had any effect on your school? [Yes No]

If yes (or positive),

- What were they?
- Has the relationship with <the host> continued?

If no (or negative),

- Are you surprised by this?

4b/ Has the Fellowship had any effect on your local community? [Yes No]

If yes (or positive),

- In what way?

If no (or negative),

- Is this dissapointing?

5/ Have there been any problems as a result of the Fellowship?

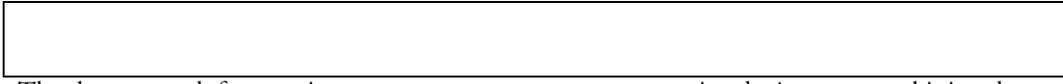
6/ Do you have any other comments you would like to make?

7a/ It appears that you feel that the Fellowship has been largely [positive/negative] for the school. Is this accurate?

7b/ From the point of the school, would you encourage other teachers to undertake a Fellowship?

If negative,

- Would you mind explaining why not?



Thank very much for you time, your comments are most appreciated. A report combining the summary of these interviews, similar interviews with hosts, and a survey of fellows will be prepared. We will let you know when it is made publicly available.

APPENDIX III–INTERVIEW STRUCTURE-HOST

Contract:	Project Title:
Date:	Fellow:
School contact:	
<p>Introduction and warm-up:</p> <ul style="list-style-type: none"> • State you are familiar with the outline of the Fellowship • Explain the purpose of the evaluation. • Assure confidentiality, and that will not be used to assess individual Fellowships 	
1/ Could you explain your relationship to <the fellow>? Thanks.	
<p>2/ I believe you worked with <the fellow> before their Fellowship. Do you believe that the Fellowship affected their classroom practice? [Yes No]</p> <p>If yes (or positive),</p> <ul style="list-style-type: none"> • In what way? • Have they implemented experiences from their Fellowship into their teaching? • Did they appear more enthusiastic about teaching following their Fellowship? • Have their attitude to Science/Mathematics/Technology changed since the Fellowship? <p>If no (or negative),</p> <ul style="list-style-type: none"> • Why do you think that might be? 	
<p>3a/ Has the Fellowship affected <the fellow>'s professional reputation? [Yes No]</p> <p>If yes (or positive),</p> <ul style="list-style-type: none"> • In what way? • Has their relationship with their colleagues changed? 	
<p>3b/ Is <the fellow> in a different role since the Fellowship? [Yes No]</p> <p>If yes,</p>	

- Do you believe the Fellowship contributed to the change?

4a/ Has the Fellowship had any effect on your school? [Yes No]

If yes (or positive),

- What were they?
- Has the relationship with <the host> continued?

If no (or negative),

- Are you surprised by this?

4b/ Has the Fellowship had any effect on your local community? [Yes No]

If yes (or positive),

- In what way?

If no (or negative),

- Is this dissapointing?

5/ Have there been any problems as a result of the Fellowship?

6/ Do you have any other comments you would like to make?

7a/ It appears that you feel that the Fellowship has been largely [positive/negative] for the school. Is this accurate?

7b/ From the point of the school, would you encourage other teachers to undertake a Fellowship?

If negative,

- Would you mind explaining why not?

Thank very much for you time, your comments are most appreciated. A report combining the summary of these interviews, similar interviews with hosts, and a survey of fellows will be prepared. We will let you know when it is made publicly available.

APPENDIX IV–INTEREST IN A SUPPORT NETWORK FOR TEACHER FELLOWS

As an investigation into the perception of need for a Teacher Fellows support network, Fellows were asked what value they would see in such a network and, if it was established would they be willing to take part:

WOULD YOU FIND SUCH A NETWORK OF VALUE?

WOULD YOU BE WILLING TO TAKE PART?

The responses to these two questions are shown below.

Network of value?	Willing to take part?			Total
	Yes	No	No response	
Yes	60			60
No	11	6		17
No response	1	1	7	9
Total	72	7	7	86

There was strong support for the formation of a network, with 84% of survey respondents indicating that they would be willing to take part. However, respondents were more ambivalent about the perceived utility of a support network, *i.e.*, only 70% thought it would be of value.

When asked what for a support network should take, respondents ranked options in terms of their perceived importance.:

5.0 ± 0.1	email newsletter
2.5 ± 0.2	Web/e-mail discussion forum
2.4 ± 0.1	Regular meetings in main centres
2.6 ± 0.1	Regular talks/presentations by past and current Fellows
2.9 ± 0.2	Field trips to current Fellowship projects
3.3 ± 0.4	Other (please specify)

Mean inverse rank (0-6, higher mean rank indicates a consensus of importance).

The overwhelming favourite for a communications forum was an email newsletter. This was followed at some distance by organised field trips to current projects. Least favoured, and essentially indistinguishable, were the options of an online forum, scheduled meetings, and presentations.

The twenty respondents that offered their own suggestion also ranked them highly, although still typically lower than the email newsletter. These ranged from suggestions for workshops at the TENZ/HETTANZ and SCICON conferences, groups centred on particular disciplines, *e.g.*, technology, to statements that no one would have the time or resources to be able to contribute.