Mathematics: Essential Research, Essential Practice

Proceedings of the 30th annual conference of the Mathematics Education Research Group of Australiasia

Edited by Jane Watson & Kim Beswick

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MATHEMATICS: ESSENTIAL RESEARCH, ESSENTIAL PRACTICE

volume 2

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Mathematics Education Research Group of Australasia

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Jane Watson & Kim Beswick

MERGA

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The 30th annual conference of the
Mathematics Education Research Group of Australasia
was held at Wrest Point Hotel Casino, Hobart, Tasmania. Australia
2–6 July 2007

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Preface

This is a record of the proceedings of the 30th annual conference of the Mathematics Education Research Group of Australasia (MERGA). The theme of the conference is *Mathematics: Essential research, essential practice*. The theme draws attention to the importance of developing and maintaining links between research and practice and ties in with the joint day of presentations with the 21st biennial conference of the Australian Association of Mathematics Teachers (AAMT). This special feature highlights the benefits of collaboration between researchers, practising classroom teachers, and curriculum developers.

We are pleased to welcome conference participants who are attending MERGA for the first time. We hope you will make yourselves known so you can be made welcome and introduced to others who share your research interests. Authors from nine countries are represented in these proceedings, as well as from nearly every university in Australia and New Zealand with education programs. There are also participants from state and private school systems and government ministries of education. We look forward to the dialog that will emerge from the varying perspectives brought by participants, especially through the forums that will take place on the joint day shared with the AAMT.

All research papers and symposia submitted were blind peer-reviewed (without the author/s being identified), by two experienced mathematics education researchers who followed strict guideline that have been honed over a number of years. Where the two reviewers, who did not know the identity of the other reviewer, disagreed about the acceptability of a paper, another blind review was carried out by a third reviewer. For consistency, a small panel of highly experienced reviewers undertook the task of reviewing papers in this category. Only those research papers that were accepted by two reviewers have been included in these conference proceedings. The abstracts for short communications and round table discussions were read by two reviewers, who provided feedback and advice to authors on the MERGA guidelines for these types of presentation.

We would like to thank the University of Tasmania, Faculty of Education, for the financial support provided to complete the publication of these proceedings, as well as the hardy team of PhD students and research assistants who helped the academic staff with the conference program.

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Choosing to Teach in the "STEM" Disciplines: Characteristics and Motivations of Science, ICT, and Mathematics Teachers

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This study examines prospective "STEM" [Science, Technology, Engineering, and Mathematics] teachers' motivations for undertaking a teaching career and their perceptions of the teaching profession, for undergraduate and graduate teacher education entrants from three major established urban teacher provider universities in the Australian States of New South Wales and Victoria (N=245). Motivations and perceptions were assessed using the recently developed and validated "FIT-Choice" [Factors Influencing Teaching Choice] Scale (Watt & Richardson, 2007). Differences are highlighted between males and females, and undergraduates and graduates, including switchers from previous careers. Demographic profiles for STEM teacher candidates are also provided. Findings provide important implications for enhancing the effectiveness of efforts to recruit mathematics, science, and ICT teachers.

It is now commonplace for governments around the globe to affirm that science, technology, engineering and mathematics ("STEM") disciplines are the drivers of technological advancement, innovation and provide the foundational infrastructure to secure a robust economic future (e.g., National Committee for the Mathematical Sciences of the Australian Academy of Science, 2006). The STEM disciplines are characterised as the engine-room of economic development in a world where the wealthiest nations secure their economic edge through increasingly knowledge-based economies. Advanced and developing economies alike seek to ensure that their education systems provide a sufficient number of tertiary educated people in STEM (Roeser, 2006). In some highly developed countries this avowed aim is not always easily achieved and is increasingly accompanied by tensions and problems when the education system is not able to fulfil the labour force demands for skilled and talented individuals (Jacobs, 2005). Other countries such as India and China are investing heavily to ensure that participation in these disciplines will result in sufficient numbers of people being prepared to pursue higher education and careers in STEM (Roeser, 2006).

The United States of America secured a leading edge in science, technological, and engineering innovation and development in the decades following World War II and through until the 1990s, by welcoming and educating top scientists from around the world. Now they are concerned that trends in educational attainment in secondary schools and universities have undermined that edge (e.g., Jacobs, 2005). Participation in the sciences and mathematics in secondary and tertiary education has exponentially declined in the USA over the last two decades, to the point where there is grave concern about the viability of those disciplines to sustain economic growth and development (Jacobs, 2005). A similar concern exists in Australia where there is an increasing decline in STEM participation and educational attainment (Dow, 2003b).

Not surprisingly, the Australian Government identifies the STEM disciplines as central to the critical infrastructure needed to secure economic success in an increasingly globally competitive and unpredictable world. Australia's future is seen to lie in its potential as a knowledge-based economy and society – one built on the knowledge, intellectual capabilities, and creativity of its people (National Committee for the Mathematical Sciences of the

Australian Academy of Science, 2006). To achieve this potential, it will be necessary to raise the scientific, mathematical and technological literacy and the innovative capacity of students; strengthen the education system that provides the platform from which world class scientists and innovators emerge; and support the development of a new generation of excellent teachers of science, technology and mathematics (Dow, 2003a).

Well educated university graduates in STEM are inexorably linked to the quality of education which children and adolescents receive at school. Clearly, well educated, specialist teachers of those disciplines are the critical link for the next STEM generation. Without proper planning and careful management to ensure the education system provides a sufficient flow of knowledge workers through the STEM "pipeline", Australia could find itself in a similar situation to Norway where secondary schools can no longer offer science (Lyng & Blichfeldt, 2003), creating a downward spiral of suitably qualified STEM professionals – including teachers. Even now in Australia, while there are acknowledged and increasingly insistent teacher shortages in rural and remote areas, there is also a specific shortage of STEM qualified teachers (Harris & Jansz, 2006; National Committee for the Mathematical Sciences of the Australian Academy of Science, 2006). Similarly pronounced lack of supply in STEM teachers is evident in a number of OECD countries (Lawrance & Palmer, 2003) a situation that is all the more concerning, given the rapid escalation in the need for STEM-related skills in the modern world, both in careers and everyday life.

Teacher Recruitment

In Australia, recruitment efforts for teachers have included a strong focus on graduate-level teacher preparation. Within this approach, individuals graduating from non-teaching university degrees as well as those working within other professions are eligible and encouraged to undertake a teaching qualification within a reduced timeframe. However, without well-educated teachers capable of drawing children and adolescents into a fascination with STEM fields, there will be little chance of sustaining the numbers who remain in the pipeline. The pipeline metaphor seems especially appropriate to STEM disciplines, in that later knowledge development is highly dependent on earlier knowledge frameworks. If children miss out earlier on, it will be all the more difficult for them to engage effectively with the higher levels of STEM study.

To make teaching more attractive, it has been argued that increasing the salary and improving the working conditions should attract school leavers, university graduates, and people from out of other careers into teaching (Harris & Jansz, 2006). Unfortunately, Australian university graduates from the STEM disciplines are not particularly attracted to teaching as a career; and STEM disciplines are not popular among those already enrolled in teacher education (Lawrance & Palmer, 2003). A national study published in 2001 and commissioned by the Deans of Science found that among science and technology graduates there was very little interest at all in a teaching career (McInnes, Hartley, & Anderson, 2001). The lack of enthusiasm by STEM graduates for a teaching career may be a direct function of the general shortage in STEM professionals, increasing the number and type of high-status and lucrative career options available to graduates in those fields, thereby exacerbating the difficulties of attracting new graduates and career switchers into a career teaching in STEM (Harris & Jansz, 2006). Parenthetically, few of the science education graduates in the national study held degrees in mathematics (2%), life and physical sciences (4 to 7%), or computer science (0%); (McInnes, Hartley, & Anderson, 2001), signalling a need to examine profiles across the different STEM domains rather than shortages and solutions at an aggregate level. The present study consequently disaggregates and contrasts findings for mathematics, science and ICT teacher graduands.

The Teacher Shortage

The teaching force is ageing in many of the OECD countries, with half the teaching force aged over 40 in some European countries (European Commission, 2000). In Australia the median age of teachers was 43 in 2001, with 44% older than age 45 (DEST, 2003). Australian mathematics teachers also appear older than the national average, signalling a particular imperative to encourage more people into mathematics teaching. Evidence from the Third International Mathematics and Science Study [TIMSS] further suggests that these teachers are not particularly happy with their jobs. Although the TIMSS study was designed to report on the learning of students aged 9, 13 and at the final year of secondary school from Africa, Asia, Europe, North America, South America, and Oceana (Australia and New Zealand), it also gathered fascinating data on the lives of teachers. Revealingly, it was the Australian and New Zealand teachers who represented the highest proportion who indicated they would "prefer to change to another career" (Lokan, Ford, & Greenwood, 1996, p.197). In mathematics in particular, 39% of teachers in a recent national study were undecided whether they would remain in teaching, and 16% actively planned to leave the profession (Harris & Jansz, 2006).

The retirement-fuelled exodus of teachers from the "baby boom" generation, who through their superannuation retirement packages receive financial inducements to leave work at 55, will quickly escalate shortages in the STEM disciplines, creating more difficulties in already hard-to-staff schools in rural and urban areas. Even if this generation of teachers could be persuaded to stay on until they reached the retirement age of 65, this would only alleviate problems in the shorter term. Faced with these dilemmas Education departments, teacher recruitment authorities and organizations are not able to solve their staffing problems by bringing in teachers from other countries as they did 30 years ago. On the contrary, recruiting companies from the UK, USA, and Asia are siphoning off new Australian teacher graduates into appealing positions overseas, making them unavailable to the Australian labour market until when and if they return.

A further deeply embedded problem is that males are heavily concentrated into the older age groups of teachers and that a "disproportionate number of male science, mathematics and technology teachers are aged over 45" (Dow, 2003b). Although teaching is increasingly a feminised profession in many OCED countries including Australia, fewer girls and women are retained in the STEM pipeline progressively through senior high school, university studies, and career choices; and women drop out of the STEM disciplines even when their achievement in those disciplines is equal to or higher than that of males (Jacobs, 2005). In Australia this has been well documented in the case of mathematics (see Watt 2005, 2006; Watt, Eccles, & Durik, 2006). In a highly competitive job market where Australia is facing a crisis in the availability of tertiary-trained workers (Birrell & Rapson, 2006), particularly in STEM, the women who *do* persist or excel in those domains can earn a higher salary and occupational status in careers other than teaching. The trend towards increasing numbers of women entering teaching, together with lower female participation in STEM disciplines, is likely to intensify the short-fall in STEM teachers.

The Present Study

We need first to be concerned about whether the shortage of STEM teachers can be met in the short and longer term; and secondly, whether those who are attracted into teaching in those disciplines have sufficient ability, personal interest in and enthusiasm for the sciences, mathematics and technology to enliven and sustain the interest of children and adolescents. Given the shortages of tertiary educated people across the labour market more generally, even those with low-level STEM skills may have attractive and lucrative career options. It is not desirable that 25% of mathematics and science teachers have no higher education in those domains (National Committee for the Mathematical Sciences of the Australian Academy of Science, 2006). To engage children and adolescents in STEM requires teachers with pedagogical as well as content expertise.

Given the potential for finding other more lucrative work, as well as the detractors we have outlined from teaching STEM, we ask the question why people still choose a teaching career in these domains. The purpose of our paper is to enquire into the profiles of characteristics, motivations, and perceptions of those who choose to pursue STEM qualifications with the intention of becoming teachers, including those who following a period of employment in another career have made the decision to become teachers. Our study makes two particularly important contributions to the existing literature. First, studies that have previously focused on teacher characteristics for specific discipline areas have tended to examine closely a particular group in isolation, with the consequence that it has not been possible to discover factors peculiar to those groups. A strength of our study is that the STEM teacher sample forms a subset of our larger sample of 1653 beginning secondary, primary, and early childhood teachers from across three major Australian universities. It is therefore possible to contrast characteristics and motivations for each of the mathematics, science and ICT subsamples, against the general profiles we have described previously (see Richardson & Watt, 2006). Second, although a recent influential national study focused on practising mathematics teachers (Harris & Jansz, 2006) has provided detailed statistics on their background characteristics and career intentions, we include additional information such as ethnic and socioeconomic backgrounds, and a stronger focus on motivations and perceptions. Teaching motivations were less rigorously investigated in the national study (via six "check-boxes" with an "other" option). Elsewhere we have argued the need for drawing upon established motivational frameworks and utilising rigorous measures in assessing motivations (Watt & Richardson, 2007). The present study meets both these needs, through implementing a comprehensive, validated, reliable measure for teaching motivations and perceptions, and exploring differences between mathematics, science, and ICT prospective teachers.

Method

Sample and Setting

Participants (*N*=245) were beginning teacher education candidates in STEM programs at three Australian universities, enrolled in either an undergraduate Bachelor of Education, or a graduate-entry 1- to 2-year teaching qualification. These participants comprise a subsample from our complete sample of teacher education candidates across those universities, for which demographic characteristics have been summarised by Richardson and Watt (2006). In the STEM subsample, both the proportion of women (53% vs. 67-84%), and of NESB [non-English speaking background] individuals (78% vs. 81-90%), were substantially lower than in the full sample (Table 1). Because teacher education candidates can undertake more than one specialisation, we identified the combinations of specialisations studied by prospective STEM teachers. Relatively low proportions of candidates undertook only one of mathematics (21%) or ICT (28%), while about half undertook science only (52%). The other profiles are presented in Table 2: most involved various combinations of STEM domains, although it was also interesting to observe combinations with the humanities, visual and performing arts, social studies, and languages. All participants were either undertaking (undergraduates) or had previously completed (graduates) a major in their area/s of specialisation.

Measures

Teacher education candidate characteristics. Participants stated their age in years, and checked boxes to indicate gender, undergraduate or graduate enrolment, and secondary teaching specialisation/s. Science specialisation was further disaggregated into general science, biology, chemistry, and physics at Monash university.

Table 1
STEM Representation Across University, Gender and ESB Groups

	Mathematics n's UG / grad	ICT n's UG / grad	Science n's UG / grad	Totals † UG / grad
USyd	12 / 13	2 / 2	23 / 20	29 / 26
Monash	13 / 30	6 / 20	16 / 54	24 / 78
UWS	11 / 33	3 / 17	14 / 38	20 / 68
Totals	36 / 76	11 / 39	53 / 112	73 / 172
% Female	42.9	44.0	55.2	52.7
% ESB	70.5	70.0	85.5	78.0

† *Note.* Totals for numbers of undergraduates and graduates within each university are not summed totals for mathematics, ICT, and science, because 82 individuals studied more than one STEM domain: 19 individuals are represented in each of mathematics and ICT, 62 in mathematics and science, and 1 in science and ICT.

Table 2
Teaching Specialisations

	Mathematics (N = 112)	ICT (N = 50)	Science (N = 165)
Mathematics	23†	19	62
ICT	19	14†	1
Science	62	1	86†
Humanity	3	5	5
Vis perf	1	2	0
SocStud	5	5	12
TESOL	0	4	0
LOTE	3	2	0

Note: † indicates number of students whose *only* method of study was mathematics, ICT or science.

Prior career background. Participants who indicated they had previously pursued another career were asked to provide details of that career. These were then classified in terms of STEM-relatedness or not.

Family background. Combined parental income from when participants were in high school was used as an indicative measure for background socioeconomic status (SES). Participants also nominated their parents' occupations, which were coded as STEM-related or not, and as teaching or not. Home language was coded as ESB [English-speaking background] vs. NESB [non-English speaking background].

Motivations for teaching. Motivations for choosing teaching as a career were assessed using the *FIT-Choice* [Factors Influencing Teaching Choice] scale (full details and good construct reliability and validity with this sample are reported in Watt & Richardson, 2007). Measured motivations include intrinsic values, personal utility values (job security, time for family, job transferability), social utility values (shape future of children/adolescents, enhance social equity, make social contribution, work with children/adolescents), self perceptions of individuals' own teaching abilities, the extent to which teaching had been a "fallback" career choice, social influences, and prior positive teaching and learning experiences. Each factor was measured by multiple item indicators with response options from 1 (not at all important) through 7 (extremely important). A preface to all motivation items was "I chose to become a teacher because ...".

Perceptions about the profession. Participants rated the extent of their agreement with propositions about the teaching profession, with response options again from 1 (not at all) through 7 (extremely). Multiple propositions comprised factors concerning to the extent to which respondents perceived teaching as high in task demand (expert career, difficulty), and task return (social status, salary).

Career choice satisfaction. Participants' career choice satisfaction was measured by three items with response options from 1 (not at all) through 7 (extremely). As part of this section, participants also rated the extent to which they had experienced social dissuasion from teaching as a career.

Procedure

Surveys were conducted early in the academic year in 2002 at the University of Sydney, and 2003 at Monash University and the University of Western Sydney (UWS). They were administered in tutorial class groups to enhance data integrity and allow respondent queries. Administration was by the researchers and two trained assistants, with University ethics approval, consent of program coordinators, and informed consent of all participants. It took approximately 20 minutes to complete the survey.

Results

Who Chooses STEM Teaching?

Gender representation. Enrolments within each STEM strand were slightly more male dominated for mathematics and ICT, and conversely for science (Table 1). The mathematics statistics reflect the similar numbers of male and female practising teachers (Harris & Jansz, 2006).

Home language backgrounds. The majority of STEM teacher candidates were from ESB, and this was most pronounced for science (Table 1). Within disaggregated science strands at Monash, *all* teacher candidates studying biology, chemistry and general science were from ESB, compared with just under 85% studying physics. NESB concentrations among teacher candidates were higher in mathematics and ICT domains than across the full sample (Richardson & Watt, 2006). At the University of Sydney and UWS, NESB concentrations were higher than in the full sample (¼ NESB vs. 18% at USyd, 35% NESB vs. 19% at UWS), while the reverse was true at Monash (3% NESB vs. 10%).

Age profiles. Age profiles tended to be slightly higher for ICT, followed by mathematics and then by science (Figure 1). Summary statistics for science reflected typical ages of graduates in the full sample, whereas ICT and mathematics teacher candidates were an average 4-5 years older.

SES income backgrounds. Participant-reported combined parent income categories were somewhat lower on average for mathematics vs. science and ICT teacher candidates (Figure 2). For all three STEM domains, SES backgrounds were below those from the full sample, in which the median and modal category was $60,001-$90,000.

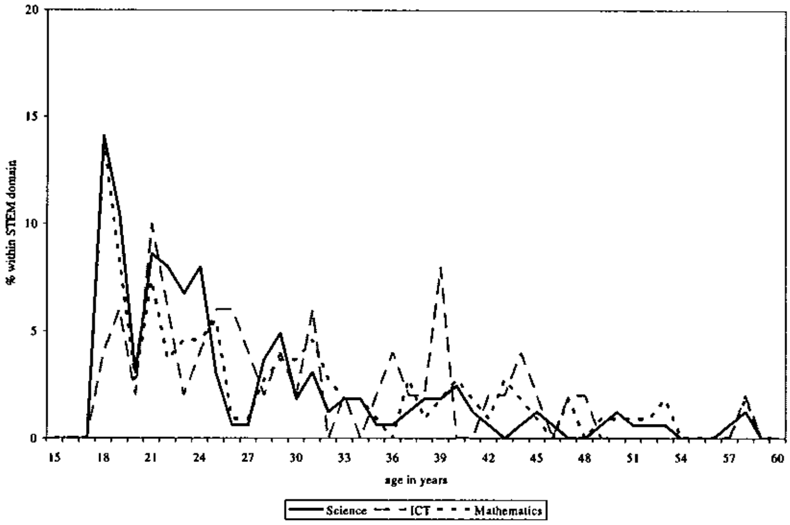

Figure 1. Age profiles for beginning teacher education candidates in STEM disciplines.[1]

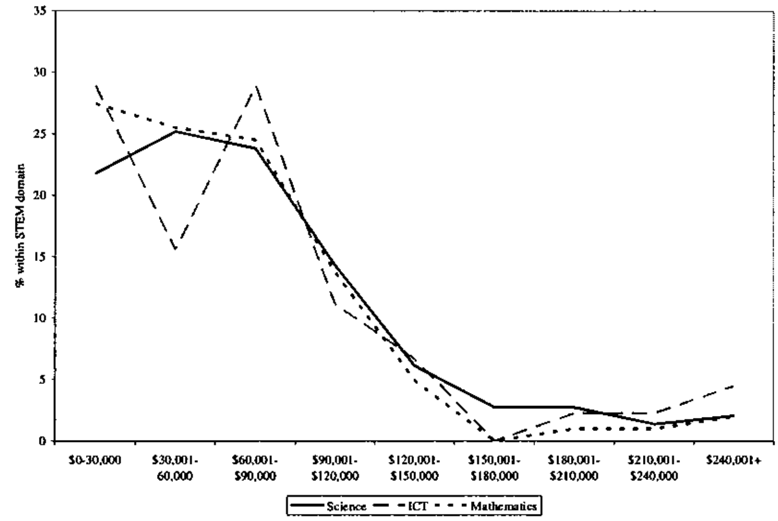

Figure 2. Combined parent income for beginning teacher education candidates in each STEM discipline (indicative SES).[2]

Parental careers. A considerable number of preservice STEM teachers (105, 43%) had parents who worked in STEM related areas (25–30% of fathers, ¼ of mothers): for science, 52 (31.5%) fathers and 43 (26.1%) mothers; for ICT, 11 (22%) fathers and 13 (26%) mothers; and for mathematics, 33 (29.5%) fathers and 27 (24.1%) mothers. Smaller proportions had teacher parents (25, 10%): for science, 25 (15%) had at least one parent who was a teacher (12% of mothers, 5% of fathers); for ICT, 6 (12%; 12% of mothers, 2% of fathers); and for mathematics, 10 (9%; 7% of mothers, 3% of fathers).

[1] . Summary statistics for science: *M*=26.92 *SD*=9.55, ICT: *M*=30.26 *SD*=9.57, mathematics: *M*=29.23 *SD*=10.62.

[2] . Summary statistics for science: *M*=2.96 *SD*=1.81, ICT: *M*=2.98 *SD*=2.07, mathematics: *M*=2.64 *SD*=1.64 (Income values: 1: $0-30,000, 2: $30,001-60,000, 3: $60,001-90,000, 4: $90,001-120,000, 5: $120,001-150,000, 6: $150,001-180,000, 7: $180,001-210,000, 8: $210,001-240,000, 9: $240,000 +)

"Career switcher" backgrounds. A large number of candidates in graduate programs in each of the STEM disciplines reported having pursued a prior career (46% in science, 55% in ICT, 47% in mathematics). Statistics for mathematics reflect those for early career teachers in the national study (Harris & Jansz, 2006). These proportions were considerably higher than the proportion of graduates in the full sample who had previously pursued other careers (Richardson & Watt, 2006). Of the STEM teacher candidates who had pursued a prior career, the proportion who had come from STEM-related occupations was very high. For mathematics and ICT teacher candidates who indicated they had pursued a prior career, over 90% had previously pursued careers in STEM, and 86% for science.

Why Choose Teaching?

Motivations for teaching. In each of mathematics, science, and ICT, the highest rated motivations for choosing a teaching career were perceived teaching abilities, the desire to make a social contribution, to shape the future of students, and the intrinsic value of teaching as a career. Positive prior teaching and learning experiences were also quite high, resonating with the importance of attracting quality teachers in mathematics emphasised in recent reports (Harris & Jansz, 2006; National Committee for the Mathematical Sciences of the Australian Academy of Science, 2006). The lowest rated motivation was consistently choosing teaching as a "fallback" career, followed by the social influences of others encouraging them to undertake teaching. These patterns of motivations are similar to those previously documented for teachers across different domains and areas of teaching (Richardson & Watt, 2006). Few systematic differences were evident between teaching motivations for undergraduates vs. graduates and males vs. females across the STEM domains (Figure 3).

- Male students studying to be *mathematics* teachers were more motivated than females by job transferability ($F(1,99)=5.4$, $p=0.02$; male $M=4.4$ SD 1.4, female $M=3.8$ SD 1.4), making a social contribution ($F(1,99)=5.2$, $p=0.03$; male $M=3.7$ SD 1.7, female $M=3.3$ SD 1.8), and choosing teaching as a fallback career ($F(1,99)=5.0$, $p=0.03$; male $M=2.6$ SD 1.4, female $M=2.1$ SD 1.4).
- Prior teaching and learning experiences were more important to undergraduates training to be *science* teachers compared with graduates ($F(1,142)=11.6$, $p=0.001$; undergraduate $M=5.4$ SD 1.1, graduate $M=4.6$ SD 1.6).
- Female students studying to be *science* teachers rated working with adolescents as a more important motivation than males ($F(1,140)=3.9$, $p=0.05$; male $M=4.7$ SD 1.4, female $M=5.0$ SD 1.6). However, there was also a significant interaction between gender and degree ($F(1,140)=5.2$, $p=0.02$), due to undergraduate males being more motivated by their desire to work with children than graduates, while graduate females were more motivated in this regard than undergraduates.

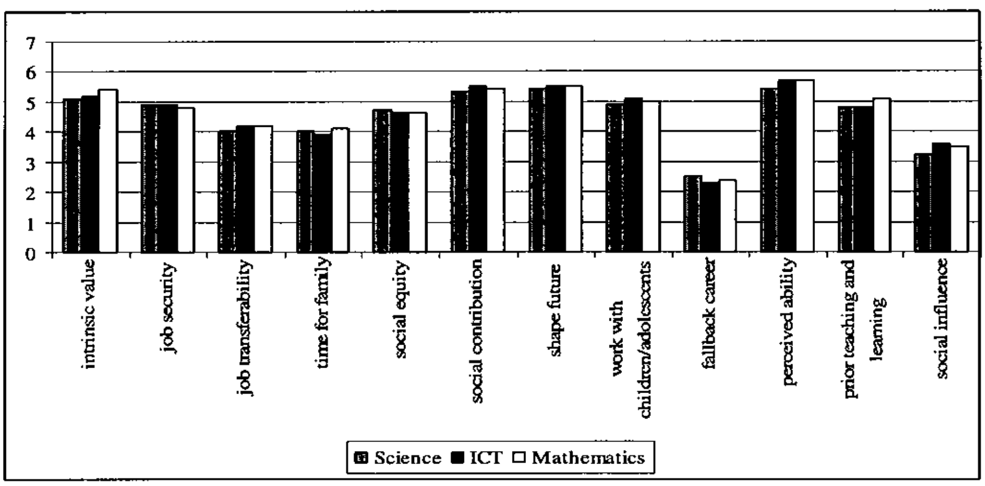

Figure3. Factors influencing teaching choice for teacher education candidates within STEM disciplines.

Perceptions about the profession. Participants generally perceived teaching as a career which is high in demand – and low in return. Participants rated teaching as a highly demanding career with a heavy workload that makes high emotional demands and requires considerable hard work; and as a highly expert career requiring specialised knowledge and abilities. At the same time, it was perceived to be relatively low in terms of salary and social status (Figure 4). Again, there were few differences by gender or undergraduate vs. graduate enrolment.

- For both *science* and *mathematics* candidates, graduates rated teaching significantly higher in demand than undergraduates (science: $F(1,140)=15.7$, $p=0.001$; undergraduate $M=5.6$ SD 1.1, graduate $M=6.2$ SD 0.8; mathematics: $F(1,99)=7.3$, $p=.008$; undergraduate $M=5.5$ SD 1.0, graduate $M=6.0$ SD 0.9).
- *Science* graduates also perceived teaching to require a higher level of expertise than undergraduates ($F(1,140)=4.1$, $p=0.05$; undergraduate $M=5.1$ SD 1.2, graduate $M=5.4$ SD 1.0). However this main effect was modified by a significant interaction of gender and degree, wherein graduate males rated expertise higher than undergraduates, and conversely for females ($F(1,140)=7.2$, $p=0.008$). Female *ICT* teacher candidates rated the demands of teaching to be higher than males ($F(1,45)=4.1$, $p=0.05$; male $M=5.9$ SD 0.9, female $M=6.5$ SD 0.6).
- Female *science* teacher candidates perceived teaching salaries as higher than males ($F(1,140)=5.0$, $p=0.03$; male $M=3.0$ SD 1.4, female $M=3.6$ SD 1.3).

Career choice satisfaction. Similar to the full sample, mathematics, science and ICT teacher candidates reported moderate experiences of social dissuasion from a teaching career. Despite this, and despite perceptions of teaching as a career high in demand and low in return, mean *satisfaction* ratings for teaching as a career choice were uniformly high (see Figure 5).

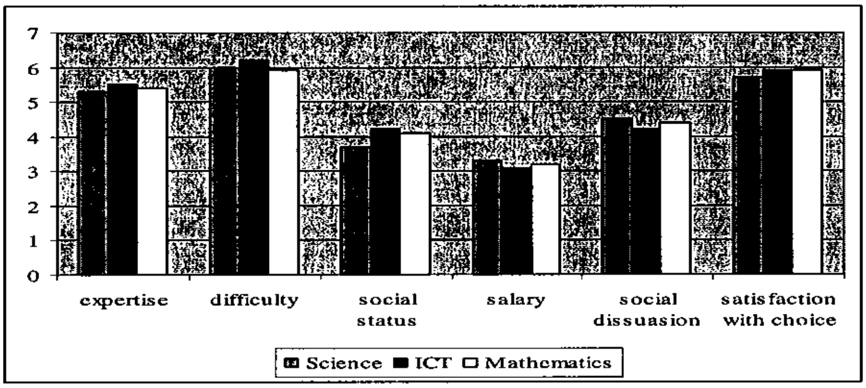

Figure 4. Perceptions about teaching for candidates within STEM disciplines.

Discussion

Our study has provided a detailed portrait of who chooses to undertake a teaching career in each of mathematics, science and ICT using a subsample drawn from a large-scale sample, which permits comparisons between these and other beginning teachers. We identified low proportions of women entering mathematics and ICT teaching, and despite women comprising approximately half of the science teacher candidates, they were very poorly represented in physics. Higher proportions of NESB individuals undertook mathematics and ICT teacher education compared with our full sample of teacher candidates, and they also tended to be older and from lower socioeconomic backgrounds. Roughly half the STEM teacher candidates had parents from STEM-related careers, and roughly half themselves came from prior STEM-related careers. Few had parents who were teachers. STEM teacher candidates mostly undertook specialisations within STEM domains, although it was also interesting to observe combinations with social studies and to a lesser extent humanities.

Teaching ability-related beliefs, personal (job security, time for family, job transferability) and social utility values (desire to shape the future, enhance social equity, make a social contribution, work with children / adolescents), and positive prior experiences of teaching and learning were all important motivations. Participants perceived teaching as a career that is highly demanding, and low in return in terms of salary and social status. They also reported relatively strong experiences of social dissuasion. At the same time, they had high levels of satisfaction with their choice of a teaching career. Importantly, these motivations and perceptions from the separate groups of STEM teacher candidates reflected those from our full sample (Richardson & Watt, 2006), and were generally similar for undergraduates vs. graduates, and males vs. females. The implications are that recruitment campaigns targeting these motivations should be effective for STEM teachers too, and suggest older graduates working in STEM-related careers as a fruitful group to aim to attract into teaching careers.

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