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The motivation and identity challenges for PhD holders in the transition to science and mathematics teaching in secondary education: A pilot study

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The Motivation and Identity Challenges for PhD holders in the Transition to Science and Mathematics Teaching in Secondary Education: A Pilot Study

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Abstract: Australian secondary education has endured a chronic shortage of qualified mathematics and science teachers for a number of years, particularly in rural and remote areas. A longitudinal research project examining the capacity for the holders of PhD level qualifications in mathematics and science to be utilised as one means of addressing this shortage has been commenced at two regional Australian universities. This paper reports on the pilot study which utilised semi-structured interviews involving five participants at various stages of the transition into secondary school teaching. The interviews examined the motivations of the participants to enter secondary teaching and the challenges associated with the transition. The principle findings were that all but one of the participants had considered secondary teaching as a career option for an extended period that, for some, had predated their PhD study. Those participants who had engaged in postdoctoral study reported substantial professional identity challenges associated with the change in career. Financial security considerations figured strongly in the decisions to initiate the transition to secondary teaching. The opportunities for further research identified by the pilot study are discussed.

Introduction

There is a current shortage of qualified mathematics and science teachers in secondary schools in Australia, particularly in rural and regional contexts (Lyons, Cooksey, Panizzon, Parnell, & Pegg, 2006) . In 2010, the vacancy rate in Australian secondary schools was highest in mathematics, with 8.3% of secondary school principals reporting at least one unfilled vacancy (McKenzie, Rowley, Weldon, & Murphy, 2011). One potential source of highly qualified personnel is those people who possess PhD level qualifications in these fields who may be motivated to pursue a career in secondary school teaching. The opportunity to have such a highly qualified practitioner of mathematics and/or science as a member of staff would appear, on the surface, to be something that school communities would be keen to adopt.

A longitudinal research study was commenced in November 2013 at two regional Australian universities to examine the experiences of people with PhD level qualifications in mathematics and science as they transition into secondary school teaching. This paper

reports on the initial pilot project that involved interviews with five people at various stages of the transition. The aim of the pilot study was to gain an overall view of the motivations and research and teaching experiences of PhD qualified individuals who were considering, or had completed, the transition into secondary school teaching and to understand the challenges involved in changing career focus from that of a content-expert academic and/or researcher to a secondary school educator.

The Theoretical Context

The shortage of mathematics and science teachers

The shortage of mathematics and science teachers has been reported in western countries for many years (e.g., Darling-Hammond & Hudson, 1990; Levin, 1985). While the issue of supply and demand of teachers is complex, research has indicated that the teacher shortage is due primarily to early teacher attrition, rather than the supply of new teachers not meeting the retirement rate (Ingersoll & Perda, 2010). The issue of early career attrition has been identified in a number of other Australian studies (Goddard & Goddard, 2006; Ramsey, 2000). Lyons et al (2006), in a large scale Australian study identified a shortage of appropriately qualified secondary school teachers of mathematics and science, particularly in rural and remote areas. Thomas (2000) described the mathematical sciences in Australia as being in crisis:

> There is no other word that adequately describes the situation across all sectors – an acute shortage of appropriately qualified teachers across schools, falling enrolments in advanced level mathematics courses both in schools and universities, the collapse of university mathematics and statistics... (pp. 5-6)

In schools where a shortage of qualified teachers is experienced, other teachers are required to teach these subjects to ensure that students have access to the full range of curriculum options (Hobbs, 2013; Ingersoll, 1998). International studies (Ingersoll, 1998; Steyn & du Plessis, 2007) have highlighted the negative impact that this situation has on the quality of education outcomes and teacher well-being. In 2012 Australia's Chief Scientist (Chubb, 2012) identified these challenges in a report to the Federal government in relation to mathematics and science education in Australia. As a consequence, substantial funds were allocated under the Australian Maths and Science Partnerships Program to assist in the development of science and mathematics education.

Teaching and motivation

A study at the University of Sydney examining the motivation of pre-service teachers to enter the profession identified the primary motivators as "reasons that reflect personal aspirations to work with young people to make a difference in their lives; to maintain a meaningful engagement with the subject area they were drawn to; and to attain personal fulfilment and meaning" (Manuel & Hughes, 2006, p. 5). A review of the literature relating to the motivation for entering the teaching profession identified the most frequent motivators

as "altruistic, service-oriented goals and other intrinsic sources" (Brookhart & Freeman, 1992, p. 46). Kyriacou and Coulthard (2010), in a study in the USA, identified a primary motivator for entering the teaching profession was to engage in a job that would contribute to society. A large scale Australian study (Richardson & Watt, 2007) identified the primary motivators to enter teaching as "participants' teaching ability-related beliefs, personal and social utility values and positive prior experiences of teaching and learning" (p. 51). Priyadharshini and Robinson-Pant (2003) identified a number of broad reasons why individuals change career and choose school teaching as the alternative. The reasons identified were dissatisfaction with the nature of the previous career, the need for greater stability and security, changing perspectives on life and memories/experiences of school.

An Australian government review of science and mathematics teaching and teacher education (Committee for the Review of Teaching and Teacher Education, 2003) proposed that the employment conditions and salaries available in school teaching did not attract highly qualified people to the profession. Thomas (2000), when describing the crisis in the mathematical sciences in Australia, indicted that there was a "brain drain of many of Australia's best mathematical scientists, especially, but not exclusively, to the USA" (p. 6).

A PhD qualified scientist or mathematician is the holder of the highest level academic qualification possible in their field of study. Such a highly qualified individual has been engaged in a very long training process to obtain that qualification, indicating a high degree of motivation directed towards that particular goal that has been sustained over an extended period of time. The choice to change to an alternative career appears, on the surface, to be a rather unusual one. One challenge often cited for PhD qualified researcher is the requirement to publish regularly (McGrail, Rickard, & Jones, 2006; van Dalen & Henkens, 2012). Kemp et. al. (1996), in a study of early career academic researchers (ECR) in Australia, identified number factors that challenged individuals in continuing their research career. Intense competition for post-doctoral positions and a lack of security in future employment was reported for ECR's. Nearly 20% of ECR's also reported "financial/work insecurity as something which inhibited further research or publishing" (p. 13).

Self-identity theory

The self-concept may be defined as "the totality of a complex, organised, and dynamic system of learned beliefs, attitudes and opinions that each person holds to be true about his or her personal existence" (Purkey, 1988). Terry, Hogg and White (1999) define self-identity as "a collection of identities that reflects the roles that a person occupies in the social structure" (p. 227). They also identify a close link between self-identity and the behaviours which are demonstrated in the wider social context. Identity theory is proposed as providing "clear justification for the inclusion of self-identity as a predictor of intention, given that, in both the theories of reasoned action and planned behaviour, intention is regarded as the most proximal predictor of behaviour" (Terry et al., 1999, p. 227).

In a review of the literature relating to the self-identity construct, Stryker and Burke (2000) identified two contrasting approaches. Self-identity was described as either focusing on the linkages of social structures with identities or on the internal process of self-verification. They concluded that:

> Persons typically are embedded in multiple role relationships in multiple groups and they hold multiple identities. These multiple roles and multiple identities may reinforce one another, but perhaps more often do not. When they do not, they introduce identity competition or conflicts that complicate the reciprocal relationships between commitments, identity salience, identity standards, and self-relevant perceptions. (p. 290)

Of particular relevance to the current study is the association by Stryker and Burke (2000) of identity with commitment. This relationship was also demonstrated by Hoelter (1983) who established that identity salience was "positively affected by (1) the degree of commitment to its respective role and (2) the degree to which its respective role is positively evaluated with regard to one's performance" (p. 140). Burke and Reitzes (1991) also support the view that the individual experiences emotional commitment to the identity, rather than the associated role.

Another challenge for the individual as he/she makes a professional and/or career transition is that the adoption and development of the new identity occurs relatively slowly. Burke (2006) describes a "dynamic view of identities as always changing (though slowly) in response to the exigencies of the situation. Insofar as an identity cannot change the situation…it adapts slowly, gaining control where it can, and adapting where it must" (p. 93). This slow rate of change of identity is also described by Marcia (1980). Bosma and Kunnen (2001) describe the process of identity development as an iterative process of person-context interactions that requires an openness to change on the part of the individual and appropriate environmental support and developmental history.

This theoretical view of identity presents three aspects that must be considered, the identity itself, comprised of a personal understanding of self and constructed through social relationships and interactions, the role that is associated with that identity and the emotional commitment to identity. It also proposes that emotionality is attached to the identity, rather than the associated role and that emotional commitment to an identity is promoted by positive, affirming experiences related to the demonstration of the associated role.

Academic versus teacher professional identity

The identity associated with being a PhD qualified mathematician or scientist and that of the secondary school mathematics and/or science teacher have similarity, in that both utilise the content of mathematics and science as raw material in the performance of the associated professional role. However, the manner of use of that content and the context in which it is used differ. Beijaard, Verloop and Vermunt (2000) describe the teacher professional identity as a combination of the subject matter expert, didactical expert and the teaching pedagogical expert. The socio-cultural theorists (e.g., Bruner, 1964, 1977; Vygotskiĭ, 1978) argue that the foundation of successful education is the establishment and maintenance of appropriate student-teacher relationships. Some theorists (Collier, 2005; O'Connor, 2008; Ruddick, 1980; Teven & McCroskey, 1997; Wentzel, 1997) go further and argue that teacher care and support for students is essential for learning, with Wentzel (1997) describing this as Pedagogical Caring and Collier (2005) and Ruddick (1980) likening the

relationship between the teacher and student to that between the parent and child.

While the PhD qualified mathematician or scientist can easily lay claim to being a content expert in his/her chosen field, the requirements of the secondary school teacher in these wider social dimensions present the identity and role of the teacher in very different terms. Thus, while the mathematician or scientist may have engaged for many years as a student in an educational context and possess a very high level of content knowledge suitable for teaching at the secondary school level, there appear to be very real differences in the professional identity and roles involved in these different professions.

Research Questions

The literature examined indicated a number of possible factors that may be relevant to the experiences of PhD qualified individuals as they transition into secondary school teaching, including the high rate of attrition in early career teachers, the motivation for career change and the requirement to change professional identity.

The following research questions were developed to guide the pilot study.

- What factors motivated the holders of PhD level qualifications in mathematics and science to make the transition into secondary school teaching?
- What role do identity challenges have for the holders of PhD level qualifications in mathematics and science in making the transition into secondary school teaching?

The findings of the pilot study were intended to inform the longitudinal study by describing the nature of the potential challenges associated with motivation and identity relevant to the participants and provide direction as to how these may be further investigated.

Method

Participants

The pilot study involved five participants who held PhD qualifications in mathematics or science related fields. The participants were selected purposively to include individuals at various stages of the transition into secondary teaching. A summary of the profile of the participants is shown in Table 1.

Identifier	Age	Gender	Year PhD obtained	Field of Study	Stage of Transition
SP	44	Male	2001	Statistics	Considering career change
BU	31	Male	2007	Bio-informatics	End of teacher training
NU	31	Female	2010	Astrophysics	End of teacher training
RU	35	Female	2006	Microbiology and immunology	1 year teaching
MJ	57	Male	1998	Molecular biology	7 years teaching

Table 1. Participant profiles

The participant SP, an Associate Professor of Biostatistics at a regional university, had considered the career change to secondary school teaching on a number of occasions prior to and during his academic career, and was considering it again at the time of the interview for this project. Participants BU and NU had recently finished their teacher training qualification. While BU had been employed as a teacher for some time at a large private school during this teacher education training and had completed his teaching qualification to satisfy the conditions of appointment, NU had never taught in secondary schools in a context other than pre-service teaching practice. Neither of these participants had pursued an academic or professional research career after the completion of their doctoral studies. At the time of the interview, RU had just completed the first year of full-time teaching at a large private school. MJ had taught for six years in a small rural private school and had recently moved to teach in a large capital city private school. Both RU and MJ had been employed for over six years in postdoctoral research positions in Australia and overseas.

Data collection and analysis

Data were collected by the use of semi-structured interviews conducted by telephone. The common prompts used in the interviews are listed below.

- What is your age?
- What year and in what field did you obtain your PhD?
- What work have you done since finishing your PhD?
- When did you first start considering secondary school teaching as a possible employment option?
- What prompted you to consider secondary school teaching as a possible employment option?
- What challenges have you had, or do you currently have, in relation to pursuing secondary school teaching further?
- Who have you spoken to/who did you speak to in relation to your intention to pursue secondary school teaching as a career option?
- What attitudes have you seen in others, including your family, in relation to your desire to pursue secondary school teaching as a career?

- How capable are you of seeing yourself in the role of a secondary school teacher?
- What challenges do you have in seeing yourself as a secondary school teacher?
- What challenges have you experienced during your pre-service teacher training? (If relevant)
- What challenges have you experienced during your teaching service? (If relevant)
- What other comments do you have to make in relation to pursuing secondary school teaching as a career?

Where the participant provided information that was considered relevant to the research questions of the study, additional prompts were made to assist them to provide comprehensive background information. Interview data were electronically recorded, transcribed and then analysed using interpretational analysis, where individual interview transcripts were coded and themes common to different participants were identified (Borg, Gall, & Gall, 2007).

Results

Financial and family influences on motivation for career change

Financial and family considerations appear to have a substantial role in the decision made by the participants to enter the teaching profession, particularly where financial challenges would impact negatively on family members. The financial considerations appear to have the potential to be either a positive and negative motivator for transition, depending on the circumstances of the participant. Participant SP, who had regularly considered the change to teaching but had not taken action to do so, identified the lack of financial assistance available during the period of his teacher training as the reason he was not able to make the transition.

> *One of them is I've got to study for a year and there are no scholarships available to fund it, I've got a family and I've got six kids. I'm sure we could do it but it'd be nice if there was a scholarship or something around…Two years really without a job. I guess it is financial in some sense but it just seems such a long time to be doing that. (SP)*

It should be noted that the financial challenge involved in funding the transition to secondary teaching described by this participant existed at previous times when the career change was considered and prior to having children. The drop in pay rate following the transition to secondary teaching was also considered, but this was not considered as important as the wider impact on the family situation.

> *And this is less of an issue but it's got to be something that's relevant. It would be a drop in pay at least for the first few years because as I've been told by Education Queensland when I called them, on graduating I'd be paid at basically the lowest level so the experience and PhDs and all that sort of stuff really doesn't count. The family's entrenched here and all that sort of stuff. (SP)*

The lack of value associated with the possession of a PhD by public school authorities was also described by NU.

> *So the main challenges are actually department, they didn't count my other degrees, only education. That is my main challenge or my main concern I'd say because they are considering probably others as well as like three years training teacher starting from scratch, from the second level of the salary. It's on a salary scale. (NU)*

This situation contrasted with that of MJ, an older experienced academic researcher with a wife and two school-age children who had completed his teacher training prior to commencement of his doctoral qualification. In this situation he was able to effect the change to teaching without the need for retraining and the associated financial challenge.

Both of the participants who were working as researchers immediately prior to their change to teaching, MJ and RU, identified the same financial motivation for the change from the research field: the lack of ongoing financial security.

> *It was the same problems I had as a research assistant. Just a lack of security, of tenure, never knowing when the next, when you're going to get paid next, research contract was running out regularly, difficulty getting money and not really planning my career as well as I should have to be honest. (MJ)*
>
> *Why didn't I want to be in research anymore? I guess I got fed up with chasing the, it was always writing grants and not necessarily getting funding to do what I really wanted to do but getting funding to do, sort of living year to year basically on grants and ending up doing the research that someone would fund me to do rather than the research that I thought was really valuable and what I wanted to do and what I really loved about it is science and I enjoy talking about science to people. (RU)*

The financial considerations associated with the decision to change to teaching were made by all participants in the context of their family situation. BU, who had no direct family dependents, when prompted in relation to his financial challenges during the transition into teaching stated:

> *I am aware of it, and certainly until I finish my degree I am kept at the bottom level, which is lower than I could otherwise ask for, but it's only for a few years…I'm sort of lucky to have a job as a student anyway and I didn't expect to make a whole lot of money. I don't think anyone gets into teaching for money…So, as long as I have enough money to live, it doesn't really matter. (BU)*

The lower pay rate that participants would receive in the early years of teaching was identified by a number of participants, but this factor did not appear as a particular disincentive to the career change. Any disincentive from this source appeared to be markedly

reduced if the participant received some form of financial recognition for the possession of a PhD from the employing body.

> *My first year teaching salary was because I guess [the school] took into account my experience of my PhD…So I believe they've given me about five years' worth of teaching experience on my contract so that was fine, well that was great. It was more than I expected. (RU)*

NU, a mother of three children, identified her family as the primary motivator for considering secondary teaching in preference to entering the research field.

> *So it was pretty difficult and then I finished my PhD, I said well it's really, it is very challenging for me to be good wife, mum and scientist so I didn't apply for any [post-doctoral positions] even my supervisor actually asked me to do that. So I stopped actually doing any science when I finished PhD and then going straight to the, apply for the education diploma. (NU)*

When the participants' comments relating to finances and family are considered, it is apparent that these factors figure strongly in the decision to change from the research career path to secondary school teaching. These factors also appear, for most participants, to be closely related. The financial challenges appear to occur at different stages of the transition. The initial challenge described is the lack of financial support available for researchers to make the transition into secondary teaching. None of the participants received any form of funding or support during their teacher qualification training that was not generally available to any pre-service teacher. SP referred directly to this issue:

> *It's like you hear lots of this rhetoric about "we're short of maths teachers" and yet, there doesn't seem to be anything whatsoever in place to fix that problem and for mine, you can't have it both ways. If you're complaining about the problem, you should have something in place to try and fix it and if you don't, well stop complaining about the problem and I find that really annoys me actually. (SP)*

The lower pay rate for the beginning teacher with a PhD was identified by most participants; however, this did not appear as a disincentive, particularly in the longer term. The financial security associated with secondary teaching appeared as a strong incentive for researchers to make the transition.

The motivation to enter secondary school teaching

The participants were asked to provide information in relation to the time that they first considered secondary school teaching as a possible career. Four of the participants responded that they had considered this option for many years. For the three male participant's, secondary teaching appeared as an intention prior to completion of undergraduate study and for two it was only because of the offer of an honours placement being received that they did not commence teacher training at that time.

> *It was not a career, it was and after three post docs you run out of time. At my age I needed to make a decision then, so I went back to something I'd already planned to do years ago. (MJ)*
> *Well when I left school…When I finished my undergraduate degree in maths and science, I was offered a scholarship to work, diploma of teaching and at the same time the university I was at at the time had created a new course a bit like [a statistics course I teach now] and realised it didn't have enough tutors and so they advertised for some tutoring jobs, a one year contract. So I took one of those and it just kind of snowballed from there I guess and here I am. (SP)*
> *I've always loved tutoring and teaching on the side all the way through high school and then through university, so I always figured I would go that direction at some stage. (BU)*
> *I guess it was always sort of in the back of my head as a, I hate to call it a backup because it's not meant to be a derogatory thing but it was always in the back of my head. But I started seriously considering it probably a year before I actually did my Grad Dip, so that would have been three years ago now I started thinking about it. (RU)*

This long-term intention contrasts with the view expressed by NU, who formed the intention while studying for her PhD. The attractiveness of teaching as a career due to the working conditions meeting her family situation appears to have been the source of her motivation with her consideration of teaching commencing with the increase in her family responsibilities.

> *When I got pregnant second time [sic]. But because I'm very stubborn I finish my PhD which took me a long time with two little ones… it is very challenging for me to be good wife, mum and scientist so I didn't apply for any [post-doctoral positions] (NU)*

One aspect of the intention to teach in secondary school that appears relevant is the type of school that the participants taught at. Of the four participants who had made the transition into secondary teaching, three were currently teaching at large capital city private schools. RU made specific reference to this teaching environment as being one of the factors that influenced her decision.

> *I certainly, when I made the decision to go into teaching I made the decision that I wanted to teach in a private school, that I have immense respect for all teachers but being a second career and something that I was changing to feel more appreciated and for a quality life that I wasn't prepared to, I didn't want to do it the hard way I just wanted to teach kids about science that were interested in science and I didn't really want to be in a teaching job that was more about student management and behaviour management than teaching so never intended to teach in a state school anyway. (RU)*

The attractiveness of PhD qualified staff to the larger private schools was also identified by BU who indicated that he would not have gotten his current position if he did not possess the qualification.

> *In terms of administration, I wouldn't have gotten the job if I didn't have it, because without the teaching qualification I understand what made it possible. I suspect as well, that I do teach at a very exclusive school in [a capital city] and that's something that's attractive to them when employing someone. (BU)*

The literature identified a number of possible motivators for people to consider teaching as a career, including working with young people in a subject area they were drawn to (Manuel & Hughes, 2006) and to work in a field where they could serve the community (Brookhart & Freeman, 1992; Kyriacou & Coulthard, 2010; Richardson & Watt, 2007). These factors have all been evidenced in this study. In particular, the social interaction aspects of interacting and positively influencing young people were mentioned by two participants.

> *But I was basically looking for a way to apply maths that was a bit more sociable then I saw the way maths going… so I wanted to get into the teaching side of it. Something a bit more sociable. (BU)*
>
> *Sometimes I think it really is worthwhile and it's a really good thing to do but I get to touch a lot of students, that I get to make a difference in a lot of lives and much more than I did as a qualitative ivory tower research scientist stuck in my for 12 hours a day. (MJ)*

The requirement to publish does not appear to have been relevant to the decision to transition into secondary teaching for any of the participants. Neither SP, RU or MJ made any mention of the "publish or perish" issue commonly associated with academia and research (McGrail et al., 2006; van Dalen & Henkens, 2012) and all had sound publishing records during their research careers. SP, as an Associate Professor, had over 100 scholarly publications and MJ, having only been a secondary teacher for one year, was still having research published from her work as a researcher.

Professional identity challenges

It was hypothesised that individuals who held PhD qualifications and had worked for a substantial period of time as researchers would have challenges associated with changing their professional identity. Both RU and MJ, who had worked as researchers reported this challenge.

> *I guess also when I started there was almost a bit of guilt associated with seeing myself as a researcher and almost like I'm giving up on a research career of my PhD plus five to six years after that, probably maybe even a bit of, I can't think anyway. But I felt a little bit like I was sort of quitting on a research career to do something which I could have done years ago… My husband would certainly say that I had a struggle with the status issue and he knows me pretty well so I might deny it but he has said that to me before, not anymore but he said before I became a teacher that I would have had an issue with that so he's probably right. (RU)*

MJ, when responding to a prompt about the transition to secondary teaching, made the statement "only a teacher". When prompted to explain if he thought that secondary teaching was somehow below being an academic, he responded as follows:

> *All the time. I had to fight quite hard with myself to think that what I'm doing is worthwhile. Sometimes I think it really is worthwhile and it's a really good thing to do but I get to touch a lot of students, that I get to make a difference in a lot of lives and much more than I did as a qualitative ivory tower research scientist stuck in my office for 12 hours a day. That was a very different kind of life. So sometimes yes. I think status wise, well there's a little bit of me that feels that to be honest. I wish I didn't but I do. (MJ)*

The identity challenges that both participants described have also persisted with time. MJ, in particular, has experienced identity issues as an ongoing challenge and one that has not reduced with time. The MJ comment above appears to suggest that his response to these challenges is to reconnect emotionally to the teacher identity by reaffirming the importance he has in the lives of his students. When asked if his identity struggle had reduced over time, he stated that it had not. The identity struggle for MJ and RU was increased when they were exposed to research publications in their area of previous research.

> *No, to be honest I think it gets worse. I was very busy in the first few years of teaching and I was grateful to have a job and I worked really hard and that took all my time and all my thoughts and I didn't have thoughts for any other kind. After eight years or something of teaching I started to occasionally find myself thinking and I have mixed aspects of it and I find myself slightly jealous when I see stories on scientists on the news doing work in labs that look really familiar to me and I have a kind of nostalgia for it but I don't know even if I was given a chance whether I would go back to it. (MJ)*
>
> *Actually whenever a paper comes out from a colleague or one of mine I, I do miss it. I don't necessarily miss the environment or the work, I am quite happy in the classroom and even though I'm talking so much more than I ever did before I'm quite happy with that but I do miss the publication aspect of it. So I guess the discovery part of it. (RU)*

BU and NU, who had entered secondary teaching without having worked as postgraduate researchers, did not express any issues related to identity problems associated with being a researcher.

One avenue, proposed by RU that may offer some protection in respect of the identity changes is the opportunity for the PhD qualified teacher to engage in research activity associated with science and mathematics education while working as a school teacher. When RU was prompted in relation to her future involvement in education research she responded:

> *I hope so. I think that would be a good way to go but I guess its early days but at the moment that's sort of in the back of my head as something that I would be interested in definitely because that is, yes I do miss the research and I do miss that, I don't necessarily miss the lab. Well I mean of course you do but I'm quite happy with my decision and I would not go back to it. (RU)*

Discussion

In an era where there is a shortage of qualified mathematics and science teachers in Australia (Lyons et al., 2006), having people with PhD level qualifications transition into secondary school teaching appears as one way that this shortage may be addressed. This pilot project has identified a number of issues that will need to be examined in greater depth in the longitudinal study before the benefits to the secondary education sector from such a strategy would be realised.

The participants in this study appeared to be drawn to the private education sector due to the perception that teaching in that environment would involve teaching more motivated students with less behaviour management challenges. It was also identified that large private schools may be receptive to the idea of having PhD qualified staff, perhaps due to the benefits for the school image, and that these schools have the independence and flexibility to recognise PhD qualifications with an increased starting salary. Considering that in 2010, only 0.8% of secondary teachers possessed a PhD qualification in a discipline other than education (McKenzie et al., 2011), the capacity to substantially reduce science and mathematics teacher shortages directly in high need areas, such as rural and regional schools, by the targeted employment of PhD qualified individuals is considered questionable. However, their employment, even in private capital city schools, will increase the available supply of science and mathematics teachers and will have a displacement effect which may indirectly improve staffing levels.

The principle motivating factors that influenced the participants' decision to enter the teaching profession appeared to be a combination of financial and family considerations and the opportunity to pursue their area of subject specialisation, but in a more social context. While previous research has suggested that the secondary school teaching profession would not attract highly qualified individuals due to the employment conditions and salaries (Committee for the Review of Teaching and Teacher Education, 2003), this study does not appear to support this view. On the contrary, while the participants acknowledged that lower starting salaries were involved, there appeared little issue with the longer-term financial aspects of secondary school teaching. The security of an ongoing salary not dependent upon the need to apply for grants and outside funding was a very positive financial motivator, particularly where this provided security for those in family situations. The opportunity to engage in a more social and altruistic pursuit in an area of expertise has also been identified in previous research (Brookhart & Freeman, 1992; Manuel & Hughes, 2006).

One finding of particular interest in this study is that the intention to pursue secondary teaching as a career was a long term consideration for the majority of the participants. This intention often predated the commencement of postgraduate study. This also offers some explanation as to why these highly qualified individuals chose secondary school teaching as an alternative to their initial chosen career path. The decision to pursue this long-held intention appears to be primarily motivated in the first instance by a context where the researcher or academic career path has not met the expectations or needs of the individual. The factors motivating the participants to enter secondary teaching identified in previous research (Priyadharshini & Robinson-Pant, 2003), dissatisfaction with chosen career and the need for greater stability and security, have also been identified as important motivators in this study.

The challenges involved in the development of the identity of school teacher depended on whether the participants had engaged in postdoctoral research. The participants who had been employed in this type of research reported substantial and ongoing challenges with the transition, particularly when they observed research activity and outputs from colleagues in their field of specialty. The long term nature of identity change described by Burke (2006) appears particularly relevant. Identity issues also appeared to increase after the initial challenge and high workload associated with the career transition had been completed. The identity issues and interventions to support identity change, such as involvement in school-based research, appear as one area that will require particular attention in the longitudinal study.

Conclusions

This aim of this pilot project was to provide insight into the motivational and identity challenges of individuals with PhD level qualifications in science and mathematics as they transitioned into secondary school teaching and to provide a basis for further longitudinal investigation. While the study has limitations due to the small sample size, it has demonstrated that the holders of PhD level qualifications in mathematics and science are potential candidates for secondary school teaching recruitment. It has also demonstrated that where such an individual makes the decision to follow this career path, there are a number of potential motivational issues associated with family and financial circumstances and ongoing professional identity challenges involved in the transition.

The longitudinal study, which will follow this pilot project, will attempt to add further to the understanding of the challenges involved in the transition and to identify suitable interventions to maximise the outcomes for the individuals, pre-service training providers and schools involved.

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