Hopes and Fears for Science Teaching: The Possible Selves of Preservice Teachers in a Science Education Program

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Abstract Given the high attrition rate of beginning science teachers, it is imperative to better prepare science preservice teachers, so that they can be successful during the early years of their teaching. The purpose of this study was to explore science preservice teachers' views of themselves as a future teacher, in particular their hopes and fears for science teaching and the experiences that help to shape their possible selves. Employed were qualitative methods, which included open-ended surveys and face-to-face interviews. Eleven preservice teachers who enrolled in a secondary science teacher preparation program participated. Findings showed six categories of future selves with the most frequent category being for effective/ineffective science teaching. When their hoped-for and feared selves were not balanced, participants articulated more fears. Regarding the primary influence in shaping their hopes and fears, diverse past experiences related to teaching and learning appeared to be more salient factors than science teacher education program. Given the enriched understanding of the science preservice teachers' perceptions, we provided suggestions for science teacher educators.

Keywords Science teacher preparation · Possible selves · Preservice teachers · Motivation for science teaching

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Introduction

According to the National Commission on Teaching and America's Future (2003), the attrition rate of teachers has increased faster than the supply of teachers. The greatest concern is for attrition of beginning teachers. Nationally, 30–50% of new teachers leave the field within their first 5 years (Alliance for Excellent Education 2004; Guarino et al. 2006; Ingersoll 2001; Ingersoll 2003; Quality Counts 2000). Among the new teachers who left the teaching profession, science teachers showed a higher attrition rate than that for teachers in other subject areas. National Commission on Teaching & America's Future (2002) reported that the attrition rate of the science teachers is more than twice the rates for social studies teachers.

Such high attrition rates negatively impact school effectiveness. Attrition disrupts the continuity and planning of programs and brings significant financial costs to school districts in recruiting and managing teachers. Costs of teacher attrition tend to be severely underestimated since it is difficult to measure the impact of teacher attrition on student achievement (Shen 1997; Theobald 1990). As a number of researchers have mentioned, teacher quality has a significant impact on student learning and achievement (Darling-Hammond 1999; Kersaint et al. 2007) and the high rate of teacher attrition often results in hiring under-qualified and inexperienced teachers.

We believe the problem of beginning teacher attrition demonstrates that new teachers struggle to maintain their motivation and take this as an invitation to explore their initial motivation to choose teaching as a career. We also believe that this issue is particularly interesting in the context of secondary science teaching and therefore chose to study preservice teachers in a program for science teacher preparation. An individual's career choice is not simply an outcome, but also possibly a determinant of subsequent behaviors and choices (Serow et al. 1992). As Feiman-Nemser (2001) noted, teacher development includes "parts of their past, including their own experience in school and in teacher preparation, with pieces of their present" (p. 1029). Thus, understanding preservice teachers' initial motivation to choose science teaching as their career, their sense of their future in relation to that career, and their view of themselves as future teachers will help us to better understand teachers' ongoing motivation and commitment to the teaching profession. Understanding the motivation of preservice science teachers is one way to shed some light on the problem of teacher attrition.

Theoretical Framework

Preservice Teachers' Possible Self

In the motivation literature, 'possible selves' have been used to explain individuals' future-oriented perception of the self (e.g., Markus and Nurius 1986; Markus and Wurf 1987). Possible self is defined as a person's ideas of what one would like to become and what one is afraid of becoming (Markus and Nurius 1986). In particular, the former is called the 'hoped-for self', while the latter is called the

'feared self'. Possible selves are cognitive manifestations of goals, aspirations, motives, and fears (Markus and Nurius 1986; Markus and Wurf 1987). For those who decide to become a teacher, the 'teacher self' would be one of the core possible selves.

Markus and Nurius' (1986) notion of the *working self-concept* is helpful for conceptualizing how people construct their possible selves. The notion of the working self-concept contradicts the traditional views of the self as a stable construct. Instead of a uniform, static, and fixed self-concept, the working self-concept includes an active array of self-knowledge, which changes depending on the individual's past experience, and the current interaction with social circumstances, including salient others (Oyserman and Fryberg 2006). It also forms a disposition towards the future. Thus, those who have a teacher possible self form an array of self-knowledge, which is influenced by past experiences and present interactions with school and classroom situations.

The working self-concept, this continuously forming and reforming schema, also provides interpretive frameworks for the individual's current self and related behaviors. The ideas about what is possible for the individual to become guide him or her to perceive and interpret current stimuli in a certain way. In addition, the possible self functions as guidance for the individual's future behavior and the choices considered. Depending on the possible self he or she envisions, the individual also pictures the associated plans or paths to achieve the desired end state, which regulate the current behavior. However, we also need to acknowledge that if the possible selves are not well anchored in the individuals' concrete reality, then the plans, paths, and related choice of actions have the danger of creating greater discrepancy between perception and reality. Therefore, in considering motivational properties of possible selves, it is important to have concrete, elaborated, and well-grounded possible selves (Day et al. 1994; Robinson et al. 2003). Concrete and elaborated selves are probably especially important for those preservice teachers who have not been exposed, as adults, to the classroom environment and the demanding reality of schools.

In addition to the need for concrete and elaborated possible selves, a number of researchers have argued for the importance of balance between hoped-for and feared possible selves for maximal motivational effectiveness (Hoyle and Sherrill 2006; Oyserman et al. 2004; Oyserman et al. 1995; Oyserman and Markus 1990; Oyserman and Saltz 1993; Unemori et al. 2004). It is known that if an individual's hoped-for self is balanced by a feared self in the same domain, then the individual tends to be more motivated, as there are additional sources of information about what could happen if the hoped-for self is not realized. Likewise, if an individual's feared self is a powerful motivation, when it is balanced with a hoped-for self, the individual knows what he or she can strive toward to avoid that feared self. It is the balance that allows individuals to most easily charter their course into safe waters. For example, Oyserman and Markus (1990), Oyserman and Saltz (1993), and Oyserman et al. (1995) study showed that adolescents who have more balanced possible selves tend to exhibit less delinquent behaviors, higher school achievement, and more achievement strategies than those who have less balance between expected and feared selves. Thus, exploring preservice teachers' balance of possible

selves is expected to provide useful information about their motivational characteristics such as persistence and effort in their future teaching career.

Science Teacher Education Programs

Individual's possible selves are shaped by their social context such as one's 'teaching career.' In other words, individuals build up their understanding about the future self through engagement with their social context, and the social context provides feedback whether the possible self is valued positively or negatively (Oyserman and Fryberg 2006). For the preservice teachers, one of the major social contexts is the teacher education program. Preservice teachers develop and shape their sense of future self as a teacher through their experience, interaction, and learning during the teacher education program.

Different teacher education programs adopt different curricula, instruction, and evaluation models, but inquiry-oriented and reflective practices are generally encouraged and aimed at preparing teacher candidates to think critically about their own teaching practice, to consider multiple perspectives for effective teaching, and to reflectively act upon ethical, political, as well as pedagogical issues (Bransford et al. 2005). One of the enduring components of teacher education has been student teaching. Student teaching has been claimed to be the most valuable experience of the teacher education program, as it provides powerful learning experiences through observation, scaffolding, feedback, and independent teaching practice (Guyton and McIntyre 1990; Segall 2002; Valencia et al. 2009). During student teaching, preservice teachers get a chance for extensive exposure to and training in the teaching profession through planning and implementing instruction, managing the classroom, evaluating students' progress, and communicating with other professionals and parents under the supervision and mentoring teachers and university advisors. Through the experience and reflection, preservice teachers may get a better idea of what the teaching profession would be like, and how they would fit into the profession (Chapman 1984, 1994; Chapman and Green 1986; Chapman and Hutcheson 1982).

However, a number of researchers have pointed to limitations of student teaching, such as lack of sufficient and diverse classroom experiences, routine and mechanical activities, communication problems among preservice teachers, cooperating teacher, and university supervisor, and a gap between the agenda of teacher educators and goals of preservice teachers (Darling-Hammond et al. 2005; Guyton and McIntyre 1990; Schulz and Mandzuk 2005; Zeichner and Gore 1990). Also, preservice teachers perceived a gap between educational theories they learned in college and the demanding reality in the classroom and in school (Bullough 1997; Flores 2001; Flores and Day 2006; Hobson and Tomlinson 2001).

Despite the challenges of teacher education programs, a number of researchers noted a significant relationship between the quality of teacher education and effectiveness of teaching, the satisfaction with teaching as a career, and the willingness to stay in teaching (Darling-Hammond 2000, 2006; Grossman 1990). Teacher education programs provide preservice teachers knowledge and skills, and also have a role to shape their beliefs, dispositions, attitudes, and identities as

teachers. Bullough (1997) has mentioned that teachers' self perception and teacher education cannot be separated; "Teacher identity—what beginning teachers believe about teaching and learning and self-as-a-teacher—is a vital concern to teacher education; it is the basis for meaning making and decision making. Teacher education must begin, then, by exploring the teaching self" (p. 21). Thus, we believe it will be beneficial for teacher educators to have a better understanding of how preservice teachers view their future selves as teachers.

Research Questions

Given this understanding of preservice teachers' possible selves and the relation of possible selves to teacher education, we attempted to answer the following research questions:

1. How do science preservice teachers envision their future possible self as a teacher? What are their hopes and fears?
2. How are their hoped-for selves and feared selves balanced or unbalanced?
3. How do they describe the experiences that helped to shape their possible selves?

Methods

Participants and Context

Eleven preservice teachers who enrolled in the secondary science teacher preparation program at a large Southeastern University participated. There were 7 females and 4 males, and their ages ranged from 19 to 34 years. Detailed demographic information is provided in Table 1.

The goal of this nationally recognized teacher education program is to provide opportunities and experiences that allow teacher candidates to enter education settings with the cognitive tools and attitudes needed for their successful professional development in science education. The teacher education program consists of two block schedules: Block I and Block II. Block I entails three core courses, *Practicum in Science Education*, *Science Curriculum and Learning*, and *Methods of Science Teaching*. It typically takes one or two semesters for students to complete Block I. Eight out of 11 participants belonged to this Block I group, which meant that they were in the teacher education sequence, but had not yet experienced student-teaching. As this research is aimed at capturing preservice teachers' perceptions of themselves and of the teaching, data were collected at the end of Block I courses in order to ensure that participants had the full experience of these courses.

Once they completed Block I successfully, they moved to Block II. Block II includes three core courses, *Science Education School-Based Internship*, *Reflection on Science Teaching*, and *Philosophy and Leadership in Science Classroom*

Table 1 Participants' background information

Group	Pseudonym	Sex	Age	Ethnicity	Grade level they want to teach	Subject matter they want to teach
Block I	Joyce	F	23	Caucasian	9th–12th	Biology, chemistry, physical science
	Julie	F	27	Caucasian	9th	Chemistry, physical science
	Lori	F	24	Caucasian	9th or 10th	Biology, chemistry
	Barbara	F	19	Caucasian	6th–12th	Biology, chemistry
	Terri	F	21	Asian-American	9th–12th	Anatomy, biology
	Kim	F	30	Caucasian	9th–12th	Biology, any science
	Ray	M	22	Caucasian	9th–12th	Environmental science
	Ted	M	32	Caucasian	8th–12th	Earth and physical science, biology
Block II	Megan	F	34	Caucasian	9th–12th	Biology, physics
	Terri	F	21	Asian-American	9th–12th	Biology, any science
	Tim	M	23	Caucasian	9th	Biology
	Mike	M	27	Caucasian	9th–12th	Biology, physical science

Practice. Students are also required to complete an 11-week long student-teaching experience. It usually takes one or two semesters for students to complete Block II. Three of participants belonged to the Block II group, which meant they fully experienced student teaching. One participant (Terri) participated twice when she was in Block I and Block II, thus four interview data were generated from Block II group. As with Block I, data were collected at the end of Block II courses in order to ensure that participants completed student teaching.

Data Collection

The possible selves questionnaire developed by Markus and Wurf (1987) and Oyserman and Markus (1990) was modified and used. Participants were asked to write down five hoped-for selves and five feared selves as a future science teacher and to indicate the two most important possible selves in each category. Upon the completion of this open-ended questionnaire, semi-structured interviews were carried out to further explore those possible selves they generated with relation to other motivational properties and preservice teacher education program. A semi-structured interview protocol was created to serve as a reference guide for the interviewer to structure the conversation and encourage the participants to discuss their description of hoped-for and feared possible selves, major incidents that helped them to move close or far away from the possible self, perception and interests about teaching career, anticipated challenges, and their positive or negative views and experiences about teacher education program. The interviews lasted 45 min to 1 h and half and were audio-taped.

Data Analysis

We first analyzed participant's written statements about their hoped-for and feared selves to examine common patterns or differences among them. Similar statements were grouped under broader and more abstract categories (Strauss and Corbin 1998). Next, in order to explore the balance between hoped-for and feared selves, Oyserman and Markus' (1990) scoring technique was adapted. If the hoped-for possible selves and the feared possible selves represent a positive and a negative aspect of a same domain, then the pair was considered 'in balance'. For example, the pair of a hoped-for possible self of "never satisfied with self education and always having room for development" and a feared possible self of "static with lack of desire to accelerate professional education" were considered in balance. This matching pair was scored as 1 point. If the pair of possible selves they indicated as the most important was in balance, then the pair received a weighted balance score of 2. This weighting procedure is what varied from the Oyserman and Markus' (1990) technique. As not all participants listed five hoped-for and five feared selves, the balance score ranged from 0 to 10. Participants were ranked based on their score, and their related motivational patterns were examined from the interview data. Each interview transcript was read thoroughly and all responses relevant to our interests were noted. We inductively analyzed data by condensing extensive text into core categories and themes. Through an iterative process, common themes and patterns were identified across participants, while recognizing the uniqueness or differences among them (Le Compte and Preissle 1993; Strauss and Corbin 1998). In order to enhance trustworthiness of the current study, we employed researcher triangulation strategies by constantly comparing and discussing two researchers' thoughts and ideas throughout data analysis process.

Results

Description of Hoped-For and Feared Possible Selves

We initially identified eight categories from participants' written responses for their hoped-for and feared possible selves. Six categories were common to hopes and fears, but there was also one unique category for each type of self. The six matched categories were (a) sufficient versus insufficient content knowledge, (b) well-managed versus poorly managed classroom, (c) effective versus ineffective teaching, (d) being caring and helpful versus not being caring and helpful, (e) having positive versus negative attitudes toward students and teaching, and (f) demonstrating leadership versus not being liked or respected by fellow teachers. The greatest frequencies of comments were concerned with hopes for being effective and fears of being ineffective. The next highest frequency category focused on attitudes toward students and teaching.

Table 2 shows the eight categories, with example statements and representative quotations, and the differences in frequencies between the categories. We can see that in regard to the effective/ineffective category participants described both

Table 2 Original eight categories and examples from data

Hoped-for possible selves		Feared possible selves	
Matched category	Examples from data	Matched category	Examples from data
Good grasp of content	Expert	Bad grasp of content	Lack of rigor
	Teach rigorous course with real world application		"Not mastering subject material" (Ted)
	"I'd really want to have an extremely thorough understanding and knowledge of biology and be able to really explain that, get it across to the students in a way that they can understand it." (Ted)		
Management	Prepared, flexible	Poor management	"Authoritarian" (Joyce)
	Manage classroom wisely		"Science teacher who is unable to manage my classroom." (Mike)
	"Be able to create a positive learning environment." (Ray)		"When students walk all over you, you can't control your class." (Barbara)
	"A teacher that has a well structured and interesting class" (Barbara)		
Effective teaching	Effective, inspiring	Ineffective teaching	Unclear/ineffective
	Successful educator		Not being an enjoyable teacher
	Informative and engaging		Not relevant to students
	A grounded but not static S.T. in current required standards in relation to an applicable classroom		"Static with lack of desire to accelerate professional education" (Kim)
	"I just want to be a teacher that at least inspires some sort of interest in at least one student during my career, because if you don't, then you're probably not doing as good a job as you could be." (Barbara)		"Being a teacher who has many students that fail." (Ray)

Table 2 continued

Hoped-for possible selves		Feared possible selves	
Matched category	Examples from data	Matched category	Examples from data
	"By effective, I mean a teacher who can get the students involved, who can get them to understand and remember the material. So, I guess, an—so, an effective teacher would be one who all the students are going to succeed in the classroom for." (Joyce)		"Just worrying that you're going to be able to do a good job, worrying that you're going to have too much to do, worrying that I'm not going to be successful or have successful students." (Mike)
	"An inspiring teacher would be one who can really get the students interested in the material as opposed to just telling them, "Okay, this is for the test. You have to know this for the test."" (Joyce)		"There were times during practicum and during my student teaching when I was unable to explain I was unable to convey the lesson that we were trying to get, unable to help." (Tim)
	"I don't want to be one of those kind of teachers, though, that where I just like have to do everything a certain way all the time. I want to be flexible and be able to work with the kids and make sure they get it, that kind of stuff." (Ted)		
Caring and helpful	Friendly, helpful, person of guidance to students	Uncaring and unhelpful	Distant, uncaring, avoided, unhelpful
	"I know as a teacher you're supposed to have a teacher/student relationship with them, but I also want my students to be comfortable. If they have any other problems, not just with school, but if they ever need anything that they can also come and I could always give them help." (Terri)		"Hardened to students' life experience and current conditions" (Kim)
	"Someone the students can talk to… just somebody you could talk to and feel comfortable talking to about this stuff. I guess that's what I would like." (Barbara)		"Well, distant it was like emotionally distant, like just being one of those teachers who just kind of the students will come up to you and ask you questions and you clearly don't care how they're doing." (Joyce)

Table 2 continued

Hoped-for possible selves		Feared possible selves	
Matched category	Examples from data	Matched category	Examples from data
Positive attitude	Positive Enjoy teaching "Create good attitudes in my students towards learning" (Ray) "I think the day that I quit enjoying teaching is probably when I'll stop trying to motivate my students and really wanting them to learn and wanting them to do good." (Ray)	Negative attitude	Having a negative attitude toward students Not enjoying teaching "Becoming pessimistic about teaching (e.g. nothing makes a difference)" (Julie) "Expecting bad things instead of great things of my students" (Kim) "Worn down/burnt out" (Tim) "Being disrespected, it's not exactly the way I want to word it, but I look really young for my age and I've always looked really young for my age. I'm just scared that when I start teaching that, because I look so young, that students are not going to be as respectful or not going to treat me as a teacher." (Terri)
Leadership	Camp Director "Dept. Head—lead department and set direction for teachers." (Julie) "I want to reform the way students are taught and just make sure that—I think there's a way of teaching that you can teach any student. I think any student can learn material, but it's just how you approach it and how you engage them" (Julie)	No leadership	Disrespected by students and other teachers "Science teacher who is not liked/not respected by fellow teachers." (Mike)
Unmatched category	Examples from data	Unmatched category	Examples from data

Table 2 continued

Hoped-for possible selves		Feared possible selves	
Matched category	Examples from data	Matched category	Examples from data
Content or level	"Biology, chemistry"	Unemployment or no employment	Jobless
	Physical science/earth science, physics" (Ted)		"Part time substitute" (Tim)
	"High school level teacher" (Tim)		Moving from school to school
			"Failed science teacher (leaves the profession)." (Mike)
No category	"Dr. So and So" (Terri)	No category	"Definitely one, being sick. I almost had to go to the hospital one day. They told me they couldn't get a sub, and what would I have been able to do?" (Megan)

cognitive (e.g., "teacher with successful students" and "boring") and affective aspects of effective teaching (e.g., inspirational and "lack of rigor"). The effective teaching category accounted for about 75% of the possible self-statements.

We also found two categories that were affective in nature. Several participants mentioned the caring role of teachers in terms of their hopes and fears. Interestingly, lack of caring for students was articulated as a fear by both Ted and Tim, neither of whom expressed hopes in the affective domain. The other affective category focused on having positive attitudes about teaching and students, and enjoying teaching. There generally were more fear statements than hoped-for statements in both of these affective categories.

Leadership was a relatively small category. With one exception, leadership was a category found more among the Block II participants than Block I. Julie was a Block I participant who saw the teaching profession as being about change and social responsibility. She indicated her hoped-for self of being a reformer. She was also unique because she was the only participant who overtly stated that she expected the teacher education program to prepare her for teaching and for leadership roles.

There was no category, other than leadership, that seemed to differentiate the possible selves of participants from Blocks 1 and II. That we did not find much to differentiate our two groups was contrary to our expectations. It is possible that the developmental difference between being in Block 1 or II is not large enough to show differences among students in a teacher educational program. However, as we will explain below, our block II students might actually be in a state of disequilibrium that makes for only a subtle difference in the data, but might turn out to be instrumental in facilitating professional growth.

Balance Within Possible Selves: Did the Hopes and Fears Match for a Balanced Structure?

Our next analysis examined whether or not each participant had balance between his/her hoped-for and feared possible selves. In other word, we explored if hoped for and feared selves represent a positive and a negative aspect of a same domain. The balance rating scores ranged from 0 to 10 (see Table 3).

Ted and Tim were rated the lowest on balance, scoring 0, which means none of their pairs of hoped-for and feared possible selves were in balance. They had noted concrete nouns, like biology and high school teacher in their hopes, but noted more affective adjectives (e.g., uncaring, burnt out, and not helpful) in their fears. Megan in Block II reported more imagined fears than hopes. She also reported a fear of physical limitations hindering her teaching, but did not report hopes for a physically robust self to counter the feared self. It is interesting to note that most of the Block II students were not as balanced as the Block I students. This suggests to us that student teaching may present the opportunity for disequilibrium in individuals' possible selves related to their new profession. It is also interesting to consider that having more balance may be necessary to encourage someone to be motivated enough to get as far as student teaching, but following student teaching people need to recalibrate, if they are going to survive the early years in the teaching profession (Ryan 1986). Ray, with a score of 10, might be a good example of this. He seemed

Table 3 Participants ranked by balance score

Participants	Block	Score
Barbara	I	10
Ray	I	10
Terri	I	8
Mike	II	8
Joyce	I	7
Julie	I	7
Kim	I	7
Lori	I	4
Terri	II	3
Megan	II	3
Ted	I	0
Tim	II	0

very motivated to become a good teacher, while also understanding how teaching can go bad for people. He used the calling metaphor to talk about his reason for becoming a teacher and seemed to experience that calling as an intrinsic motivation:

> I guess it just goes back to I just feel like it's a calling and that I feel like I will enjoy getting up and teaching every day and having an impact on students' lives. … I got a little more mature and realized that I could still have a nice life. I guess, however you want to classify nice life, but that I could still be successful without going to medical school or without making a million dollars. So, that's really the reason I came to terms with it, that I really did want to teach.

That can be contrasted with Ted who also said he was "called" to teaching, and who had 0 balance score. Ted admitted that he could be called to something else, if the money was right.

> I feel like it's what I'm called to do and all that but, of course, if my friend called me up and was like, "I know a dude that wants to hire you and give you a 100 grand a year selling plywood" I would pretty much be selling some plywood. I mean, that's a lot of money.

Ted seemed to use the metaphor more as an excuse to be pursuing teaching at this point, rather than to describe something he felt intrinsically.

The rest of the participants had moderate to high balance (three scores of 7 s, two 8 s, and two 10 s). Mike was the only Block II participant who had a high balance score 8. His hopes and fears were focused on being an effective science teacher, who helps other teachers. Julie, an ideal teacher candidate due to her focus on becoming an expert teacher and a leader among colleagues, scored slightly above the middle of our balance distribution. She was generally balanced, but her hopes were more about leadership, while her fears were about being an ineffective teacher. Like Mike, she used the *calling* metaphor and seemed to internalize that calling as something intrinsically meaningful.

How Do They Describe the Experiences That Helped to Shape
Their Possible Selves?

The primary contributing factors in shaping students hopes and fears seem to be
their earlier experience with either a summer camp, church camp, tutoring
experience, or being a teaching assistant that lead him/her to shape their hoped-for
selves. For example, Lori who worked as a teaching assistant in the college setting
gave examples of how her teaching assistant experience helped her to learn
classroom management skills:

> Well, like how I dealt with the kid sleeping [during the teaching assistant
> years]. I called his name a couple of times, and when he did it again for the
> next couple labs I would stand right by him. Like today, the first day after that,
> I didn't stand by him today, and he's paying attention again and I can see he's
> trying. So, I think you kind of have to make him know that you're serious, and
> it feels a lot better that he wasn't sleeping.

Once the decision to be a teacher was made, several participants seem to justify
the decision by referring to the decision as a calling. Rarely were participants able to
describe concrete experiences that helped them develop their hopes and fears.
Instead they described the more general experience just noted. One exception was
Barbara who had a traumatic event, getting her period for the first time, during a
school trip. The adept caring shown by a teacher assuaged the trauma. This
experience made Barbara very aware of how important a caring teacher could be to
a student. She recalled how the teacher helped her during the experience:

> Anyway, for the first time on that trip I got my period and I had a teacher, two
> teachers actually on that trip who I really liked a lot. They were my friends.
> I know one teacher she took me to the store and she got me what I needed and
> she bought me ice cream and she was, "It's going to be okay." and I guess
> I felt comfortable talking to that. I was so freaked out, but she made it okay.
> I guess I would like that to be able to just make my students feel so
> comfortable that they could come to something so embarrassing like that.

These findings about the influential role of prior experiences, outside of the
teacher education program, are consistent with the study by Schutz et al. (2001) on
critical incidences of preservice teachers. They explored the notion that there are
critical incidences in peoples' lives that they interpret to be experiences that are
central to their pursuit of particular goals. These experiences are thought to expose
the extent to which a person is a good fit with the environment that they are pursuing
for the future. Schutz et al. (2001) found that preservice teachers shaped and
reshaped their goals based on experiences that seemed to demonstrate to them
whether or not they should continue to pursue the goal of becoming a teacher. It
seemed that most of our participants were able to interpret some general past
experiences, such as camps or tutoring, as providing evidence that they might be a
good teachers. However, we suspect that these more general experiences would not
qualify as critical incidences, whereas Barbara's really does.

In our data, for feared selves it was often a negative experience with education that allowed these participants in a teacher education program to imagine their teaching-related fears. In some cases, it was clear that the participant reflected on his/her perceived weaknesses and these reflections became the source for the stated fears. On the one hand, this reflection would seem to be a positive outcome of a metacognitive process, but in the statements these fears often came across as almost exaggerated or too focused on the negative. For example, Terri was worried about looking young and feared being perceived as a friend rather than an authority figure. She articulated her fear in this way:

> I've always looked really young for my age. I'm just scared that when I start teaching that, because I look so young, that students are not going to be as respectful or not going to treat me as a teacher. They might think of me as their friend. So, it's kind of stupid, but it's been one of those things on my mind that I'm really scared of, because I want to be viewed as the teacher and not one of them.

She was the only participant who was interviewed before and after internship and she indeed had to recover from being overly friendly to her students during her student teaching. Her experience was that of a self-fulfilling prophecy. First she explained how she fell into realizing her fear:

> Especially in the beginning, I really wanted my students to like me and so I think I tried a lot. Instead of being so strict on them sometimes, I was more lenient than I should have been and since I already look so young that was a problem, too. So, they already thought I was - that I wasn't a teacher.

She realized that she had let it go too far and had to assert control. She explained how she was able to recover:

> I just would have to catch myself before I let them do that and I just had to be a little bit more strict. Like I won't let them do some of the things I let them do before like go to their locker in the middle of class and stuff like that. At first they were kind of shocked I think when I initially started to be more strict and tried to back off from them, but we got to a balance towards the end so it was okay.

In general, when our participants were projecting into the future based on their perceived weaknesses, they were attributing the causes to *uncontrollable* factors (Weiner 1985). In other words, they were framing the possible problems in ways that they would be unable to change. This is not what we would call a good metacognitive strategy.

The aspects of the teacher education program that were reported as being influential were those that involved working with actual students (all the field experiences were deemed important) and interacting with actual teachers (either in field placements or university classes). For example, Megan explained the effectiveness of student-teaching experience in preparing to become a teacher:

> I have learned five million times more things just by being there [classroom] and doing it than I think anybody could have written a book about or actually

told me about. I'm definitely one of those people who can tell me what you think no matter how many times, but I'm not going to—I have to experience it for myself.

A few participants said that interacting with peers was good, but most were clear in that their hopes and fears were established prior to the teacher education program. Although our data are exploratory in nature, it is worthy to note that preservice teachers' prior experiences seemed to shape their hopes and fears more than what they experienced during teacher education program.

Interpretation of Findings

We noted that although some of our category findings about hoped-for and feared possible selves were consistent with those of Fajet et al. (2005), the differences were more striking. Fajet and his colleagues asked their preservice teacher participants to talk about characteristics of good and poor teachers. One similarity in the findings was that their most common theme was *pedagogy and classroom management,* which we found to be very similar to our *effective teaching* and *classroom management* category. However, they found that their preservice teacher participants were very focused on the affective aspects of teaching and rarely mentioned the cognitive issues. Our participants also mentioned many affective hopes and fears, but they also were very sharply focused on cognitive issues related to being effective. Also, unlike Fajet et al. (2005) findings, we found concerns for content knowledge and the ability to help students develop knowledge. It is possible that participants in our study were more mature in their teacher identity than the participants who were in the beginning of the teacher education program in the Fajet et al. (2005) study. We also think our participants were identified as science teachers and this also helps explain their focus on content and the more cognitive aspects of teaching. Although we do not have comparative data that would allow us to strongly assert this point, our participants often referred to themselves as prospective science teachers and not just teachers and this can be taken as evidence that the science part of their future career was salient to them during the study.

We found it interesting to examine our results in light of Sadler's (2006) study of student teachers in a science education program. His participants had concerns that matched ours in regard to a focus on management issues (for both instruction and student behavior in the classroom) and recognition of the role of content knowledge. In Sadler's data, it seemed that having a strong base of content knowledge provided the student teachers some level of comfort. It does seem that science education programs should be sure to allow students the time and coursework for building their content knowledge so that they may approach student teaching with that support for their self-efficacy.

In regard to the balance scores, before reflecting on the findings we had assumed that balance between hopes and fears was optimal. In looking at the data, we saw evidence that lack of balance in some cases, such as Julie's hope for leadership, might be construed as striving toward a goal. Consistent with flow theory (Csikszentmihalyi 1990, 1997), people need to have challenges to strive toward to

maintain their motivation. Perhaps a perfect balance between hopes and fears does not support motivation to continue to strive since the motivating challenges are less apparent in the presence of balance.

Another perspective we now have on the balance is that less than perfect balance also suggests disequilibrium. Experiences of disequilibrium are considered essential for conceptual change (Posner et al. 1982) and belief change (Pajares 1992). In order for educational experiences to impact students, belief change is often required. In the teacher education literature, we see the need for disequilibrium documented as a requirement for program impact on beliefs about teaching and learning (e.g., Hollingsworth 1989; Holt-Reynolds 1992). The goal is for the student to integrate new knowledge into her/his existing belief system. Without an experience of imbalance or disequilibrium to shake up their belief system, preservice teachers have been found to hold on to their prior belief despite what they learned in their coursework (Hollingsworth 1989; Holt-Reynolds 1992). Therefore, we think that the fact that our Block II students were less balanced might indicate that the student teaching experience provided some experience of disequilibrium that they will now need to resolve with new experiences as teachers to further integrate their beliefs about their future self as a teacher.

Concerns about preservice teachers' beliefs and the relative impotency of teacher education programs are well documented in the literature (e.g., Hollingsworth 1989; Holt-Reynolds 1992). In particular, a plethora of research supports the idea that it is critical for preservice teachers to change their beliefs, but also it is extremely difficult to change beliefs because they develop over years of personal experiences in schools and are often not explicit to the individual (e.g., Ashton and Gregoire 2003; Borko and Putnam 1996).

However, we also think that our findings give some insight into where the influence might be found. Given that we know that preservice teachers have prior histories (Holt-Reynolds 1992) and past and/or critical incidences (Schutz et al. 2001) that they bring with them to the program, we can develop instructional experiences that expose those historical experiences so that they can be used for discussion and reflection. We think those prior experiences can be used to foster disequilibrium that then can be used to encourage positive motivation to teach. Schutz et al. (2001) discussed the notion of emergent motivation, which they borrowed from Csikszentmihalyi's flow theory (1990), and how past experiences provide the substance from which that emergent motivation is derived. As the literature on beliefs change emphasizes, it is important to teach preservice teachers in a way that make their implicit experiences and beliefs explicit, and increase the opportunity to confront the contradictions between their existing beliefs and newly-acquired knowledge and understanding (Ambrose 2004; Anderson and Piazza 1996; Gregoire 2003).

Discussion and Implications

Before we present the implications of our study findings, we would like to discuss some limitations. Two limitations have to do with our participants all being in one

science teacher education program. First, although we targeted preservice science teachers, we now think that it would have been helpful to have data from other teacher education programs with which to compare these findings. Second, we also only collected data at one institution. Of course, participants from this science education program may have distinctive characteristics that are not shared with similar individuals in others science teacher education programs. Therefore, these findings should be understood in this light and interpreted with caution. Another limitation is that only 11 participants are included and, except for one individual, participants had only a single interview. Despite these limitations, we believe this study sheds important light on our research questions.

Understanding preservice teachers' initial motivation to choose teaching as their career and related future self perception can help teacher educators better prepare preservice teachers, so that they can enter education setting with the highest probability of success. Based on the findings of this study, first we think that science teacher educators should pay more attention to students who are unable to elaborate on their hoped-for possible selves. Examples from our data were Tim and Ted. As a number of possible-self researchers noted, the possible self-functions as a standard against which individuals calibrate external stimuli and reflect on the appropriateness of their current behaviors (Ibarra 1999; Markus and Nurius 1986; Markus and Wurf 1987). Thus, if individuals cannot elaborate their hoped-for possible selves, they are more likely to lose motivation and confidence, which may also elicit unpleasant emotions such as anxiety and frustration.

In order to consider possible strategies to help those preservice teachers like Tim and Ted, we first need to understand how the possible self is constructed. According to Ibarra (1999), individuals construct their possible selves through exploration of the fit between their own self-perception and the demands of the new roles. This negotiation process includes three iterative tasks: (a) observation of role models to build repertoire of possible selves, (b) experimentation through imitation and true-to-self strategies which attempts to increase authenticity, and (c) evaluation and modification of possible selves. Thus, first of all, it is critical for preservice teachers to have appropriate role models that they can observe, learn, and build a store of knowledge, skills, routine and attitudes required for teaching career. Furthermore, the teacher education program can facilitate this by providing mentoring relationships between preservice teachers and in-service teachers. The importance of mentoring for preservice teachers has been repeatedly addressed and supported in the existing literature (Fletcher 2007; Segall 2002; Valencia et al. 2009). In addition, this implies that teacher educators themselves need to have awareness and consciousness that their relationships with preservice teachers can function as a context where preservice teachers can develop role models.

The findings of this study showed that Tim and Ted also did not have balance between hoped-for and feared possible selves. In general, preservice teachers who completed student teaching (Block II participants) tend to hold less balanced possible selves than those who had not done student teaching (Block I participants). Unlike the existing theoretical proposition that suggests a linear relationship between the level of balance of possible selves and the level of motivation, our data showed that losing some balance due to new challenges and experiences can be a

necessary and important process for individuals' growth and learning. While preservice teachers experience student teaching, their existing idea and repertoire of teaching and being a teacher are inevitably challenged. As other researchers have suggested (Ibarra 1999; King and Hicks 2007; Posner et al. 1982), accommodating to a new environment requires individuals to re-examine and modify their pre-established meaning structure, and to create a new scheme that fits well to the new situation. Thus, adapting to new stimuli and different environments encompasses dynamic tension, because it comes with the process of discarding certain ideas about the teaching career and the related possible self that does not work well in the new circumstances. It is likely that the individual will maintain some notions about teaching as a career, and some aspects of the underlying possible self, that still fit well with the new environment and roles, and thus create a new array of knowledge about teaching career and possible self.

These adaptation processes through new stimuli (i.e., student-teaching) make preservice teachers vulnerable and lose balance of possible selves. It is important for teacher educators to have awareness that preservice teachers go through this disequilibrium process at some point in time during their teacher education program. Instead of ignoring or treating it as a trivial matter, teacher educators need to teach and openly talk about this developmental process with preservice teachers. In addition, recognizing the importance and necessity of a lack of balance for their possible selves and vulnerable feelings associated with their professional preparation may increase preservice teachers' chance to seek help when difficulties arise, and to find solutions instead of suppressing concerns.

Conclusion

Given the increasing concern about beginning teachers' attrition rate, in particular the high attrition rate of science teachers, we attempted to explore preservice science teachers' future self-perception and the impact of the teacher education program. As Ingersoll (2003) showed, based on the analysis of the national Schools and Staffing Survey (SASS) and Teacher Follow-up Survey (TFS), the connection between teacher preparation and beginning teachers' attrition rate has been strongly supported, despite the evidence that preservice teachers do not overtly recognize the role of their teacher preparation program. Beginning teachers who had received particular types of preservice training (i.e., training that included student-teaching, feedback on teaching, observation of other classes, child psychology and learning theories) had far lower attrition rates than those who did not receive such training. In other words, the way beginning teachers perceive themselves and perform in their career has likely been shaped through their continuously forming array of self-knowledge and skills, which include the preservice teachers' future self-perception that they had at their preservice stage. Therefore, teacher education programs play a critical role in building beginning teachers' self-perception, career performance, and long-term career decision-making.

The challenge to support and retain beginning teachers is a continuing burden for today's schools. The current study contributes by demonstrating an in-depth

understanding of preservice teachers' entering motivations, future self-perceptions, and developmental characteristics, all of which will serve as means to improve teacher preparation programs and to retain quality teachers.

References

Alliance for Excellent Education. (2004). *Tapping the potential: Retaining and developing high quality new teachers*. Washington, DC: Alliance for Excellent Education.

Ambrose, R. (2004). Initiating change in prospective elementary school teachers' orientations to mathematics teaching by building on beliefs. *Journal of Mathematics Teacher Education, 7*, 91–119.

Anderson, D., & Piazza, J. (1996). Changing beliefs: Teaching and learning mathematics in constructivist preservice classrooms. *Action in Teacher Education, 18*, 51–62.

Ashton, P., & Gregoire, M. (2003). At the heart of teaching: The role of emotion in changing teachers' beliefs. In J. D. Raths & A. R. McAninch (Eds.), *Teacher beliefs and classroom performance: The impact of teacher education* (pp. 99–121). Greenwich, CT: Information Age Pub.

Borko, H., & Putnam, R. (1996). Learning to teach. In D. Berliner, & R. Calfee (Eds.), *Handbook of educational psychology* (pp. 673–708). New York: MacMillan.

Bransford, J. D., Darling-Hammond, L., & LePage, P. (2005). Introduction. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing worlds* (pp. 1–39). San Francisco, CA: Jossey-Bass.

Bullough, R. V. (1997). Practicing theory and theorizing practice in teacher education. In J. Loughran & T. Russell (Eds.), *Purpose, passion, and pedagogy in teacher education* (pp. 13–31). London, England/Washington, DC: Falmer Press.

Chapman, D. W. (1984). Teacher retention: The test of a model. *American Educational Research Journal, 21*, 645–658.

Chapman, D. W. (1994). *Reducing teacher absenteeism and attrition: Cause, consequences, and responses*. Paris, France: Institute for Education Planning, United Nations Educational, Scientific, and Cultural Organization.

Chapman, D. W., & Green, M. S. (1986). Teacher retention: A further examination. *Journal of Educational Research, 79*, 273–279.

Chapman, D. W., & Hutcheson, S. M. (1982). Attrition from teaching careers: A discriminate analysis. *American Educational Research Journal, 19*, 93–105.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York, NY: Harper and Row.

Csikszentmihalyi, M. (1997). *Finding flow*. New York, NY: Basic Books.

Darling-Hammond, L. (1999). *Solving the dilemmas of teacher supply, demand, and standards: How we can ensure a competent, caring, and qualified teacher for every child*. New York, NY: National Commission on Teaching and America's Future.

Darling-Hammond, L. (2000). Teacher quality and student achievement: A review of state policy evidence. *Education Policy Analysis Archives, 8*, 1–44. Retrieved from http://epaa.asu.edu/epaa/v8n1.

Darling-Hammond, L. (2006). *Powerful teacher education: Lesson from exemplary programs*. San Francisco, CA: Jossey-Bass.

Darling-Hammond, L., Pacheco, A., Michelli, N., LePage, P., Hammerness, K., & Youngs, P. (2005). Implementing curriculum renewal in teacher education: Managing organizational and policy change. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do* (pp. 442–479). San Francisco, CA: Jossey-Bass.

Day, J. D., Borkowski, J. G., Punzo, D. L., & Howsepian, B. (1994). Enhancing possible selves in Mexican American students. *Motivation and Emotion, 18*, 79–103.

Fajet, W., Bello, M., Leftwich, S. A., Mesler, J. L., & Shaker, A. N. (2005). Preservice teachers' perceptions in beginning education classes. *Teaching and Teacher Education, 21*, 717–727.

Feiman-Nemser, S. (2001). From preparation to practice: Designing a continuum to strengthen and sustain teaching. *The Teachers College Record, 103*, 1013–1055.

Fletcher, S. (2007). Mentoring adult learners: Realizing possible selves. In M. Rossiter (Ed.), *Possible selves and adult learning: Perspectives and potential* (pp. 75–86). San Francisco, CA: Jossey-Bass.

Flores, M. A. (2001). Person and context in becoming a new teacher. *Journal of Education for Teaching, 27*, 135–148.

Flores, M. A., & Day, C. (2006). Contexts which shape and reshape new teachers' identities: A multi-perspective study. *Teaching and Teacher Education, 22*, 219–232.

Gregoire, M. (2003). Is it a challenge or a threat? A dual process model of teachers' cognition and appraisal processes during conceptual change. *Educational Psychology Review, 15*, 147–179.

Grossman, P. L. (1990). *The making of a teacher: Teacher knowledge and teacher education*. New York, NY: Teachers College Press Teachers College Columbia University.

Guarino, C., Santibanez, L., & Daley, A. (2006). Teacher recruitment and retention: A review of the recent empirical literature. *Review of Educational Research, 76*, 173–208.

Guyton, E., & McIntyre, D. (1990). Student teaching and school experiences. In W. R. Houston, M. Huberman, & J. Sikula (Eds.), *Handbook of research in teacher education* (pp. 514–534). New York, NY: Macmillan.

Hobson, A. J., & Tomlinson, P. D. (2001, September). *Secondary student-teachers' preconceptions, experiences, and evaluations of ITT*. Paper presented at the British Educational Research Association Annual Conference, University of Leeds, Leeds.

Hollingsworth, S. (1989). Prior beliefs and cognitive change in learning to teach. *American Educational Research Journal, 26*, 160–169.

Holt-Reynolds, D. (1992). Personal history-based beliefs as relevant prior knowledge in course work. *American Educational Research Journal, 29*, 325–349.

Hoyle, R., & Sherrill, M. (2006). Future orientation in the self-system: Possible selves, self-regulation, and behavior. *Journal of Personality, 74*, 1673–1696.

Ibarra, H. (1999). Provisional selves: Experimenting with image and identity in professional adaptation. *Administrative Science Quarterly, 44*, 764–791.

Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal, 38*, 499–534.

Ingersoll, R. M. (2003). Turnover and shortages among science and mathematics teachers in the United States. In J. Rhoton & P. Bowers (Eds.), *Science teachers' retention: Mentoring and renewal* (pp. 1–12). Arlington, VA: National Science Education Leadership Association and National Science Teachers Association Press.

Kersaint, G., Lewis, J., Potter, R., & Meisels, G. (2007). Why teachers leave: Factors that influence retention and resignation. *Teaching and Teacher Education, 23*, 775–794.

King, L., & Hicks, J. (2007). Lost and found possible selves: Goals, development, and well-being. *New Directions for Adult and Continuing Education, 114*, 27–37.

Le Compte, M. D., & Preissle, J. (1993). *Ethnography and qualitative design in educational research*. New York, NY: Academic Press.

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist, 41*, 954–969.

Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. *Annual Review of Psychology, 38*, 299–337.

National Commission on Teaching & America's Future (U.S.). (2002). *Unraveling the "teacher shortage" problem: Teacher retention is the key*. Washington DC: National Commission on Teaching & America's Future.

National Commission on Teaching & America's Future (U.S.). (2003). *No dream denied: A pledge to America's children*. New York, NY: National Commission on Teaching & America's Future.

Olson, L. (2000). Quality counts: Who should teach? *Education Week, 19*, 8–61.

Oyserman, D., Bybee, D., Terry, K., & Hart-Johnson, T. (2004). Possible selves as roadmaps. *Journal of Research in Personality, 38*, 130–149.

Oyserman, D., & Fryberg, S. A. (2006). The possible selves of diverse adolescents: Content and function across gender, race, and national origin. In C. Dunkel & J. Kerpelman (Eds.), *Possible selves: Theory, research, and applications* (pp. 17–39). Huntington, NY: Nova.

Oyserman, D., Gant, L., & Ager, J. (1995). A socially contextualized model of African American identity: Possible selves and school persistence. *Journal of Personality and Social Psychology, 69*, 1216–1232.

Oyserman, D., & Markus, H. R. (1990). Possible selves and delinquency. *Journal of Personality and Social Psychology, 59*, 112–125.

Oyserman, D., & Saltz, E. (1993). Competence, delinquency, and attempts to attain possible selves. *Journal of Personality and Social Psychology, 65*, 360.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research, 62*, 307–332.

Posner, G., Strike, K., Hewson, P., & Gertzog, W. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education, 66*, 211–227.

Robinson, B. S., Davis, K. L., & Meara, N. M. (2003). Motivational attributes of occupational possible selves for low-income rural women. *Journal of Counseling Psychology, 50*, 156–164.

Ryan, K. (1986). *The induction of new teachers*. Bloomington, IN: Phi Delta Kappan Educational Foundation.

Sadler, T. D. (2006). "I won't last three weeks": Preservice science teachers reflect on their student-teaching experiences. *Journal of Science Teacher Education, 17*, 217–241.

Schulz, R., & Mandzuk, D. (2005). Learning to teach, learning to inquire: A 3-year study of teacher candidates' experiences. *Teaching and Teacher Education, 21*, 315–331.

Schutz, P. A., Crowder, K. C., & White, V. E. (2001). The development of a goal to become a teacher. *Journal of Educational Psychology, 93*, 299–308.

Segall, A. (2002). *Disturbing practice: Reading teacher education as text*. New York: Peter Lang Publishing.

Serow, R. C., Eaker, D., & Ciechalski, J. (1992). Calling, service, and legitimacy: Professional orientations and career commitment among prospective teachers. *Journal of Research & Development in Education, 25*, 136–141.

Shen, J. (1997). Teacher retention and attrition in public schools: Evidence from SASS91. *Journal of Educational Research, 91*, 81–88.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.). Thousand Oaks, CA: Sage.

Theobald, N. D. (1990). An examination of the influence of personal, professional, and school district characteristics on public school teacher retention. *Economics of Education Review, 9*, 241–250.

Unemori, P., Omoregie, H., & Markus, H. R. (2004). Self-portraits: Possible selves in European-American, Chilean, Japanese, and Japanese American cultural contexts. *Self & Identity, 3*, 321–338.

Valencia, S., Martin, S., Place, N., & Grossman, P. (2009). Complex interactions in student teaching: Lost opportunities for learning. *Journal of Teacher Education, 60*, 304–322.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*, 548–573.

Zeichner, K., & Gore, J. (1990). Teacher socialization. In W. R. Houston, M. Huberman, & J. Sikula (Eds.), *Handbook of research in teacher education* (pp. 329–348). New York, NY: Macmillan.