

STEM Career-changers Transition to Teaching: I have to become a student again?

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Subject/Problem

Recruitment of science, technology, engineering, and mathematics (STEM) professionals into K-12 classrooms has been considered as one way of easing the shortage of math and science teachers nationwide (Chambers, 2002; Resta, Huling, & Rainwater, 2001; Stoddart & Floden, 1996). It is reasonable to expect that these professionals have access to the content knowledge and the practical professional experiences to allow them to achieve success in the classroom. However, studies have indicated that those who also complete credential requirements are more likely to remain in teaching and have students with higher test scores (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005; Monk, 1994). Previous work has led us to believe that STEM career changers need to go through credentialing programs alongside more traditional prospective teachers (Johnston & Grier, 2006; Grier & Johnston, in press). This research pointed to the development of a teacher identity as one outcome of participating in a credential program alongside more traditional candidates. This identity was established through the building of relationships and support systems as candidates completed coursework and student teaching (Grier & Johnston, in press). In this study, we identify the concerns of STEM career changers to better inform teacher education programs on how to be more mindful of the needs of this population as they return to the life of a student again on their path toward a new career.

One of the possible needs for those returning to being a student was identified by one author's own personal experience in transitioning from a STEM career to teaching. In being a part of a credential program alongside more traditional candidates, she was exposed to different viewpoints that made her able to recognize the importance of making science relevant to all students. For many STEM professionals, an interest in science, alone, was often enough to motivate them to learn the concepts. For this author, recognizing that not all students could be intrinsically motivated to learn science was a lesson that took time to comprehend. One of the first readings recalled from a science education course was a chapter from "Feminist Science Education," written by Angela Calabrese Barton (1998). The chapter described Barton's experience teaching chemistry at a community college with a student body that largely consisted of single mothers who held working-class jobs. Barton further described how she had shifted from using a typical apparatus (a metal ball connected to thick plastic tubing and a small rubber balloon) for demonstrating Charles' Law to allowing her students to bring in their own examples from their cooking experiences. Initially this author viewed Barton as no longer behaving as a scientist—she was no longer teaching "real chemistry". This author held tightly to her own comfort level with what Barton had described as "cold apparatus". It was not until after several years of teaching, that this author began to see the value in making science relevant to students by using examples from their own lives, rather than

expecting them to be like the author and be totally captivated by this strange apparatus simply because it was known to be scientific. Although the lesson was not immediately learned by being in the credential program, the seeds had been planted.

Related Literature

One obstacle to recruiting STEM professionals to teaching credential programs is the reluctance of many adults to become a student again (Haberman, 2005; Grier & Johnston, in press). While many are eager to become teachers, they do not perceive traditional university credentialing programs as fitting their needs. For example, Schulz (2007) concluded that the road to teaching has too many “bureaucratic pitfalls” that can discourage career changers from becoming teachers. This view that traditional teacher training is unnecessary for former STEM professionals due to their strong content knowledge is not uncommon.

Despite perceptions that traditional credential programs might not meet their needs, career changers have benefited from being in such programs. For example, in a study by Darling-Hammond et al. (2005), participants in the Teach for America project, selected from elite universities and considered amongst the brightest in their fields, had a positive correlation to higher test scores for the students in their classes when they had completed credential requirements. Monk (1994) specifically related these positive gains to additional methods courses and not to additional preparation in the content area.

There is, however, a need to appreciate these career changers as adult learners. As Knowles (1984) pointed out, adult learners need to know why they are learning something and can see its immediate value. Adult learners learn experientially and by problem solving and they recognize that learning can take place outside of the workplace or classroom setting (Speck, 1996). In addition, adult learning has ego involvement. Learning must take place in a setting of support from peers, with constant feedback, and without fear of judgment (Speck, 1996). However, despite these different needs, these more mature students still have much to learn, especially with making content approachable for diverse learners (Berry, 2000).

Methodological Design and Procedure

Because our intent is to identify the concerns of second-career STEM professionals as they seek to become credentialed science and math teachers, the research we are conducting is qualitative in nature and consists of interviews, field observations, and coursework artifacts for each participant. This study uses a design that is qualitative and naturalistic (Lincoln and Guba, 1985) in order to understand the context and perceptions of the career-changing STEM professionals in the credential program. Qualitative research provides a richness of information from the perspective of these credential students in our study.

The two-semester post-baccalaureate secondary credential program leads to certification in mathematics, science, and English for both traditional and career change candidates. The program can extend up to six semesters based upon the student’s program of study or due to an Internship position as the teacher of record in a local school. All students in the program are placed in a diverse low SES school setting for at least one of their two eight-week student teaching experiences.

In this study, we identified three career-changers with former STEM-related careers. The three female participants in the study were each seeking a secondary teaching credential in biology and were chosen for this study having met the criteria of having a previous career in math, engineering, or science and currently enrolled in a post-baccalaureate fifth-year secondary-level credential program. They were all local to the university and had sought out the credential program on their own, rather than being recruited through a formal program. Each was in a different stage of completion of their credentialing process: one was a part-time student, one a full-time student in the first semester of the two-semester program, and one a full-time student completing the second semester of courses and student teaching. While this diversity in perspectives provides a rich range of data, this also limits our ability to identify the specific source and experiences of these teaching candidates to draw broad conclusions.

Data were collected using a variety of qualitative methods including open-ended interviews and non-participant observations. Participants' background information and their initial perceptions of teaching, the credential program and students were collected during in-depth interviews. Six field observations during student teaching were conducted for each subject along with a post-observational discussion. Additionally, the following data are included in the analysis for each subject: teaching portfolios (including employment resumes and program assignments and lesson plans) and academic transcripts. Several program faculty and field supervisors were also interviewed about each participant to provide additional insights into their program of study and as a method of data triangulation. It should be noted that one of the authors of this study contributed data as both a faculty and a field supervisor.

Analysis

Qualitative data for each subject were analyzed by organizing the data into topics, codes, and then categories based upon predetermined themes from the research questions and emergent themes from the data set. A case for each career changer was developed by analyzing the categories for patterns that developed over the course of data collection period. The cases were then combined and analyzed for similarities and differences.

Results

Kelley

Background. Raised overseas in an American military family, most of her pre-college education occurred in American schools abroad. At 16 she came to the US to start college in a private southern university and struggled both academically and behaviorally since she was young and unsupervised. She attended the university for two years and dropped out. Kelley married and started a family and eventually moved to California where she "went back to university on my own terms." Starting her undergraduate studies from "scratch" at a private southern California university, she successfully completed her bachelor's degree in biology.

Originally Kelley planned on attending medical school when she returned to college, but with a two-year old at home she didn't feel that was fair to her child. After graduating, she pursued work in the biotechnology industry and enjoyed the work for many years. She frequently traveled at least two weeks a month but with the arrival of her third child she needed a change. She was also becoming less satisfied with her position

because of the emphasis on the project management features of business analysis and software engineering. She said she had strayed too far away from science and especially, biology.

Kelley described her house as the one in the neighborhood where all of the kids congregated so she felt very comfortable with youth. Additionally, she tutored several of the neighborhood kids in science and biology. With these experiences, a teaching career made sense. Looking to make a change that was family friendly but with a career she could still be challenged with and enjoy, Kelley decided to pursue a teaching credential. She said, “I’ve always had this on the back-burner. I’ve had a file on doing an education program and doing life science and biology. That’s why I did it.”

Kelley started the credential program as a part-time student because she had a four-year old at home and planned to complete the program in three or four semesters. She took an Intern position at a local low SES high school at the beginning of her second semester. In this position, she was the teacher of record for five class periods a day of physical science. It was a full-time job and she was still taking coursework in the evening to complete her credential. Kelley only stayed in the Intern position for two weeks before she gave her notice to resign along with a two-week notice for the school to find a replacement for her. Her decision to leave was supported by her supervisor who had tried to meet with the principal of the school on several occasions to discuss her teaching assignment which was out of her science content area. Technically, although hired to teach biology, she was not subject matter competent to be teaching physical science courses she had been assigned and would have to have been reassigned. Paired with a lack of support, a classroom in a portable away from the other science faculty and no resources for teaching she submitted her resignation before the meeting with the principal and supervisor could be scheduled. Kelley was placed in a local, low SES middle school with a cooperating teacher she had observed the previous semester teaching seventh grade science.

Drawing from Previous Identity. Kelley described herself as having fallen in love with biology and life science.

I fell in love with biology, and life science. Originally [I was] on a medical school track ... I took my MCATS, started interviewing for medical schools in my senior year [then I] decided that path probably wasn’t appropriate having already had a child. So then I wanted to go into R&D stuff, doing R&D and loving it. I ended up in engineering in the biotech industry.

As she began to feel more and more conflicted about balancing her career with her family life, she made the decision that teaching would be a good fit for her. Her content knowledge and love of biology would be an asset, in addition to her experiences as a parent, that she expressed, would help her understanding of how to work with teens. She related that these experiences made it easier for her to transition into student teaching. She said:

Also being a parent dealing with kids before, I have teenagers, and kind of deal with that, I have a little bit more knowledge, I mean the [traditional credential] students, they’re still very young themselves, I have a little bit more knowledge. I think there’s definitely a difference.

Kelley's confidence about her former career was evident in her demeanor in both the credential courses and in her student teaching placement. In the courses, Kelley spoke very authoritatively on topics such as resumes and interviewing but her advice did not always translate into the education setting. Her supervisor noted on several occasions that Kelley was not consistently helping her students make connections to their previous learning or making the content relevant to their lives. In her responses to these comments during the post-observation discussion, Kelley repeated that she was not familiar with the material in an in-depth way.

Additionally, she described herself as knowing how to be a professional. Despite her science background, she viewed herself more as a *professional*, than as a *scientist*. This, she explained, made it easier for her to deal with the issues that might arise in the classroom setting concerning her relationships with parents, administrators, or students.

Related to her professional identity, Kelley, when resigning from the Intern position gave two weeks notice to the school administrators—for which they were very grateful. The principal even offered to write her a letter of recommendation because of this professionalism. Kelley's supervisor met with the principal after her decision to leave. During this discussion the principal expressed his appreciation for the time to seek a replacement because another teacher who resigned the same day as Kelley left that same day and did not return to the school. Additionally, Kelley agreed to help her replacement with lesson plans and the schedule she had designed, however, the replacement teacher quit after two days of shadowing Kelley and her students.

Concerns about Being a Student Again. Kelley exclaimed that she “could be a professional student!” She discussed how she loves all subjects and does well in school. However, she admitted that this was not necessarily true of herself as a younger student. This was also a shift from when she first began as a credential student, as noted by her early course instructors. Early in the program Kelley was very resistant to the ideas and theories of diversity and student learning. However, after her student teaching placement in a Title I school with an 80% Hispanic student population her in-class discourse began to change around the end of her second semester as a part-time student.

Kelley described that she wanted her credential coursework to be relevant to her life as a classroom teacher. She also related that despite her knowledge of science, she now sees that it would not have been beneficial for her to have gone directly into the role of a teacher in a K-12 classroom.

If you asked me [if I needed to take credential classes to be successful in the classroom] before the credential program and before I walked into a classroom, I would have said it's bogus--to have to get a credential. But now.... In general, you have to learn about management, you have to learn about the diverse populations, I didn't realize about that. ...I came from a different world. I still need more practical stuff like classroom management, what to do with kids having difficulties. ...I like something you can take and walk away and use right away.

Another concern for Kelley were the financial and family issues related to her return to college and being a student again. Not only would her career change to teaching result in a lower salary, but becoming a student again would have financial impacts on

her family. Taking courses in the evenings and doing homework would also impact family time. However, her husband and parents saw teaching as ultimately a better option for her in terms of family life. She said:

Because I was so successful in what I did before, I get a lot of ‘why are you walking away from making a lot of money’ basically four times more than when I was a teacher. I still battle with that on a daily basis.

One of the biggest concerns for Kelley stemmed from the fact that she had become very confident in her abilities and identity as a professional in her former career. Becoming a student again meant leaving this comfort zone and going back to the lower rungs of the ladder. She said:

I came from a situation where I was really good at what I was doing. I knew what I was doing. Now you’re switching your career, and all of sudden you’re not at the top and not as confident. And you don’t know exactly what you’re doing. And that is humbling. Why am I doing this when I can actually go back, pick up the phone, walk into the building, know exactly what I’m doing? I could have been fine. I hate that I’m not as good as I should be and that is a little frustrating.

Finding Support. Kelley found support from her family—husband, children, and parents. Unlike many who switch from STEM careers to teaching, Kelley described those around her as supporting her decision and being proud of her choice:

I think my father likes [that I am becoming a teacher]. I think my family likes it because it’s something I can do with the kids. I’m not on the road. My husband would absolutely shoot me if I took a job on the road. I know it’s not an option anymore with four kids. And I still have the battle that my family also wants me to be home full time. So I have it coming from all directions. Good thing, they like that I’m going to school. I come from a family that is very big in academics. I could get as many degrees as I want and my father would be happy. That’s what you’re supposed to do in his eyes. It’s always a question of the finances. But as long as I’m happy, they’re fine with it. The kids don’t mind so much. I think they like that when I home, I’m home.

Another source of support for Kelley were members of the college credential program team. She cited her advisor as someone who was there for her in this transition to being a student again:

I love that I can call my advisor and really talk to her, I never had an advisor. It almost feels like private school. I feel like an individual. Particularly with what I went through over here [with the Intern position], the support I had.

Views on Student Learning. Kelley’s main concerns about student learning were related to how she could manage her classroom and what she could do to relate to students from diverse populations. Her lesson plans were topic oriented and appeared to follow the textbook closely—this however, was in part an artifact of her cooperating teacher’s influence and way of teaching. When asked if she preferred this method over being more creative as is encouraged in the program Kelley said she liked, at least in the beginning, having the guides of the text book to help structure her lessons. Her supervisor

reports indicated a good rapport with students. Lessons are described as being enhanced by PowerPoints and “the use of referencing of textbook pages for students to use to see vocabulary and pictures”. As she progressed in her student teaching, supervision notes indicated improvements in engaging a variety of students and in the use of guiding questions. However, by the end of her first student teaching she was not consistently going “beyond” the textbook and helping students to make connections to events in their lives or between topics and concepts.

Sally

Background. Sally came from a family of professionals and was expected to be one as well when she grew up. She attended a large research I university in southern California and graduated with a pre-med degree in psycho-biology and a minor in French. Her parents were very influential in pursuing a degree that would lead to medicine. However, Sally stated, “I decided after a few classes where I had to operate on rats that I was not cut out for medicine.”

After graduating, Sally worked in the wine industry for a few years before pursuing her MBA. She was then hired as a project manager for a pharmaceutical company who developed drug delivery systems. Products she worked on included an IUD, a glaucoma medicine, and a testosterone patch. Her responsibilities were in marketing and developing the tools the sales force needed and doing product management such as pricing, packaging, and promotions. She also worked as a product manager for another pharmaceutical company on the east coast but worked international markets and traveled frequently. She and her husband moved back to the west coast where she worked in a marketing communications role. Sally said of her industry experiences, “After 18 years, doing what I was doing, it was time for me to change. Here I am with a teaching credential.”

Sally decided to pursue teaching because she had “an interest and enthusiasm for science” even though she identified herself as “primarily a business person.” She also wanted to give back to the community by doing something more rewarding and less profit minded and still working with people. Sally said, “Being an older mom made me realize the importance of doing the best you can for children, all children.”

Sally was in her second and final semester of the program as a full-time student. She was completing her second student teaching in biology, this time, at a high school with a large Hispanic population. Sally was never tempted to take an Intern position because first, she wanted to be fully prepared and have the support of cooperating teachers in her learning to teach process and second, because she did not consider herself to be financially “needy” enough to jump in without being fully prepared.

Drawing from Previous Identity. Sally expressed that she could draw upon her real life experiences to explain to students why they might consider a major in the sciences. She expressed that her own experiences as a one time pre-medicine student who realized that she did not like what she was doing put her in a good position to relate to students. Although she was not observed directly teaching students about why they might study science, her rapport with students was supported by supervisor observations. Supervisors also noted that she used questioning skills well and that she was often able to offer appropriate explanations using analogies to make content clear to students.

Sally saw her experiences as training her to “play together in the sandbox”. She expressed that her experiences in pharmaceuticals marketing made her able to relate well with others, but did not expose her to large amounts of science content that would be immediately useful for K-12 teaching. She said:

I think a lot of science teachers may have had first careers as research scientists so they have a little background. But that wasn’t me. I needed some time to get through the content and learn that. I had a business background. I definitely needed to brush up on some things to pass the CSET [California Subject Examination for Teachers].

Concerns about Being a Student Again. Sally described herself as being excited about returning to school to become a teacher—ready to make a change and using her love of science to give back to others what she had been given. She would often bring to her classes magazine and newspaper articles about teaching or science in the news.

Sally viewed learning to teach as being easier for the more traditional students. “Younger students are more flexible.” She also expressed a desire to have been able to focus on student teaching with “no other pulls for her time/energy”. Sally also noted that she felt like she needed the credential program to learn how to teach. Towards the end of her second semester she stated that early on, she knew she had no idea of what kind of preparation and background teachers needed but now, has a full appreciation for having taken the program.

Finding Support. Being a student again, for Sally, meant being surrounded by people who were much more “friendly than those in the business world”. She described herself as feeling very welcomed as an older student:

In the classroom, I felt my opinion was as respected as anyone else’s. That I could say whatever I felt like saying, and not be laughed at, or I didn’t get nervous about volunteering my opinion. We were all the same that way, I felt very comfortable in the classroom, and with the faculty and the staff, too. It was very wonderful.

There were other older students in the program—some career changers and some first time career seekers—who Sally found support from and gave support to. She also assisted the more traditional aged students in the class and stated that she learned quite a bit from them as well.

Sally also found a wealth of support from her two cooperating teachers during her high school student teaching. Her supervisor noted the tone and words of respect for both of them—who were each career-changers as well—in working so well and being so dedicated to the diverse populations of students at the school, and having such high expectations for all of the students.

Views on Student Learning. Sally very quickly made the realization that in teaching science, you are also teaching students. She found her coursework about adolescents to be very valuable, and also liked the focus in the program on students with learning disabilities and from different cultures. These courses also led to her view of teaching as having “changed since I was a young student with the talking head in the classroom.” Sally also often reflected on her growth in learning about student from backgrounds different from her own:

I'm getting better at [teaching students from different ethnic backgrounds]. I come from a very Caucasian background, European background, so this has been new for me, but this is where we live. It is very important to know how to teach *all* kids. And I realize not everybody comes from as privileged background as I do.

Sally struggled during her high school student teaching to connect with the students and help them to see the relevance of science to their lives. She did very well in some classes with students who were considered "college prep" but the classes that were considered remedial challenged her. Her supervisor noted that the college prep classes had enrollments of fewer than 30 while the "remedial" classes were over capacity at either 36 or 38 students. Her cooperating teachers also mentioned their struggles at motivating this population. Still, they all believed—including Sally—that all kids can learn and they kept trying new ways of engaging the students and motivating them.

Sarah

Background. Sarah received her bachelor's degree in psychology with a minor in biology. She attended graduate school for her master's and studied the factors involved in drug addiction in rats. She went on for her Ph. D. and during her post-doctoral work studied alcohol consumption in rats and how stress influences their responses to various stimuli. She analyzed blood samples through radio-immunoassays and other biochemical techniques. She then worked as a research scientist and studied factors in rats self-administering of alcohol and other drugs in Skinner box-type studies that were designed to learn about addiction. She later used Rhesus monkeys as her test subjects to study the effects of alcohol over time because of their extended lifespan.

When Sarah had her first child she took time off from her research. She had another child and moved to the Midwest where she began teaching in a local university. She taught introduction to psychology, testing and learning theory, and developed a seminar in psychopharmacology. This is when she became interested working with youth who were drug abusers in a drug prevention program. She then moved to California and became active in her children's middle school classrooms teaching an occasional lesson on the brain and becoming very involved in the Big Brothers and Big Sisters Program. Sarah was intrigued by the students' curiosity but also saw the need for social programs in the schools that were not being funded. She said, "That's when I realized I loved teaching. That's what brought me to the credential program."

Sarah was in her first semester of the credential program and planned to complete the program as a full-time student in two semesters. Several weeks into the program Sarah's husband was laid off from a large biotechnology company and she made the tough decision to stay in the program and pursue her new career. She was placed at an upper middle class suburban high school for her first student teaching experience. However, her supervisor removed her from the school because she had a challenging cooperating teacher who would, for example, ask students to hand back papers in the middle of the lab that Sarah was teaching. Sarah was placed at the diverse high school where Sally was completing her student teaching and shared one of Sally's cooperating teachers and another biology teacher to successfully complete her first semester requirements.

Drawing from Previous Identity. Wisdom from age was viewed as an advantage for Sarah in the classroom. For example, when discussing how to make students from different cultures feel welcomed in her classroom, she recognized that there were ways to present herself in view of this goal without trying to be a friend to her students. “I got over trying to be cool about 15 years ago. I’m just too old for that.” She also discussed how her age and experiences allowed her to see things from multiple perspectives.

[I am] able to look at issues from more than two sides. Age and experience has given me the ability to see many different viewpoints. Things can be so much more complex than they seem at first. I think that ability is due to experience and age. I don’t believe the 20-something is incapable of learning about that though. It just needs to be more explicitly discussed or talked about.

In class, Sarah did not tell the other credential students in the program that she had Ph.D. However, during her student teaching she did let students know she used to be a research scientist and conducted many experiments with them. She used plain language that was meant to encourage the students to think, participate, and perhaps even consider a career in science. Her supervisor stated that Sarah had high expectations for her students and that she created learning experiences that were relevant to their lives and their previous learning.

Concerns about Being a Student Again. Sarah had followed her husband’s career to many new cities, and noted that family considerations controlled many of her choices. She explained that she would be staying in her current location for the completion of the credential program. Therefore, being a student again required balancing family life with personal goals.

Sarah believed that she was a better student as an adult. As a younger student, she had relied upon memorization. Now, she approached learning in a more conceptual way.

I am a better student now. I have developed the ability to analyze things much better than when I was in my 20s. With the younger students in class, they are good students, too, but it’s just a different thing you get when you are older.

There’s a theory of intellectual development that you continue all your life. It’s easier to see shades of gray. It’s easier to analyze stuff now.

Despite this confidence of being a more analytical learner, Sarah, similarly to other career-change students, expressed fears of being able to do well.

Initially, Sarah disliked the credential program and was annoyed at the prospect of taking all of the courses, especially because she had taught before at the college level.

At first, I was annoyed, all these subjects, all these classes, and I taught before.

But I will be a much better teacher.... So I am converted to the idea that [requiring former STEM professionals to take the same courses as all credential students] is a good idea, no matter how qualified they are. It is so important because you have to be aware of what you are dealing with in the classroom. This reminds me of this guy I was in pre-requisite class with. ... I said, “Wow, I am excited about all these techniques”, and he said, “Oh, I’m just going with the lecture method”....I just couldn’t believe it... Lecture was my strategy when I taught college. And even if I don’t find a teaching job when I move back to Ohio, and if I go back to teaching college, I will be a much better teacher.

Finding Support. Sarah's friends and family were supportive of her decision to seek a career in teaching, despite some resistance from her 12-year-old son, who would simply like to have his mom around more:

I think my son at times gets annoyed when I'm not around. I think it will be hard for him when I am full time teaching. ... And I don't expect him to see it in terms as "My mom will be a happier person because she's not bored at home". ... My friends are proud of me. They are proud of me doing this, taking and making this effort, they feel very supportive.

With Sarah's difficult first semester, she did rely on her supervisor but was always reluctant to do so. The supervisor was constantly encouraging her to talk about her feelings and concerns and reinforced Sarah when something wasn't quite right with her first cooperating teacher. Sarah, once in her new placement said she felt very supported and wanted to teach in a diverse school such as this one where the teachers had the common goal of teaching all children no matter what their ability or background.

Views on Student Learning. As noted earlier, Sarah expressed the belief that limiting teaching methods to lecture was not the best approach for reaching all students. Some of the strategies that she appreciated learning included bringing writing into the science classroom. She explained that her new fear was "not having enough time to use all of the SDAIE (Specially Designed Academic Instruction in English) strategies" she was learning about in her classes for teaching students with varied needs. Supervision notes suggested that Sarah was indeed able to use a wide variety of learning activities. For example, one note read, "Nice lesson that provided a variety of learning opportunities for students. Your use of demonstrations throughout the block period really breaks up the time and helps keep students engaged."

Sarah's experiences prior to entering the teacher credential program had included working with a drug abuse prevention program and volunteering in her children's schools. She credited this experience with her recognition of her love of teaching. In working with these younger students, she found middle school students to be especially rewarding. "I got involved in the middle school, [teaching] a lesson on the brain. Those kids were so wonderful, the kinds of questions they asked—so curious". She contrasted this to some of her frustrations with college students whom she found expected good grades simply because they had paid for their education lamenting "their self-entitlement was dragging me down". She also noted that students needed more than just the content taught in their courses. She said, "But I also saw the need in this school for a peer mediation program. [There was] lots of bullying. Homogenous population breeds intolerance for kids that are different. They needed conflict resolution."

Discussion

The three transitioning career-changers in this study all had as many elements in common as they did elements that differ with regards to their backgrounds, reasons for pursuing a credential and their views about students, learning, and their own needs. Kelley and Sally were previously in STEM related fields and Sarah was a research scientist.

Kelley, Sally, and Sarah all had young children at home who needed caring for while they were in their evening classes up to four nights a week. Kelley and Sarah identified their family and friends as their main system of support. Sally, while having support from her husband in caring for their son while she was in class, identified her peers in the program as well as her cooperating teachers as her main sources of support.

The findings of this study in several ways agreed with the literature (Haberman, 2005; Grier & Johnston, in press) on the reluctance of career-changers to become students again—however this study presented an alternate picture as well. Kelley and Sarah expressed initial misgivings about their needs to enter a credential program because of either their previous experiences in working with youth or especially in Sarah’s case—teaching at the university level. However each, by the end of the first semester of student teaching, saw the value in learning about students especially when working with diverse student populations. Sally, on the other hand, valued her learning experiences in the credential program from the very beginning and was very enthusiastic about returning to school having felt she had no idea how to teach.

None of the participants expressed any kind of stress or difficulties in the coursework or readjustment to learning in a new discipline. These findings are contrary to our previous study in which the engineer career-changers lamented having to write reflections and read educational textbooks (Johnston & Grier, 2006). It is interesting to note that all three of these women, during their interviews, would not “complain” about their experiences in the program, even when specifically prompted to do so. This may be explained in terms of maturity or even professionalism that is carried over from their previous careers. Or, perhaps it is a difference in discipline-specific skills in which the life sciences preparation may be more similar to education than is engineering.

All three participants wanted their teacher credential experiences to be very practical and relevant to their lives as teachers. Between the three, there were varying degrees of educational foundational theory acceptance. Sally and Sarah were much more willing to participate in class discussions and were willing to figure out what the theories meant and see how their views either matched or didn’t match the theories presented. They were fully immersed in the role of a learner. Early in the program Kelley only wanted answers or solutions that worked. She focused solely on the practical elements that could be directly applied. Her supervisor thought this may be a factor in why her four weeks as an Intern were not successful—once her bag of tricks was exhausted, she had nothing else to call on for her day-to-day survival. Kelley, like the author, who was reluctant to alter her teaching of chemistry, may need more time to recognize the value of the more theoretical aspects of the credential program.

Again, each of the three participants called upon their identities in their previous careers while in their teacher preparation program. Each expressed a want to make science exciting and relevant to their students and did so with varying degrees of success. Sarah and Sally were most successful in this area while Kelley had good intentions but struggled with making science engaging for her students. Kelley, as a biology major, never conducted scientific research on her own and had a very literal interpretation of science and science teaching. While the same may be said of Sally’s background, she focused her strengths from her previous identity and her views of student learning to be about teaching students science.

The three career-changers identified that they had supportive families and mentors, were valued in the program for their life experiences, and found the educational community to be a much friendlier and family friendly environment as opposed to their previous careers.

Conclusions

As science educators, many of us are involved in teacher preparation. As we emphasize the need for more quality science and math teachers, we need to develop a better understanding of how to help career changers transition to their positions within the teacher community. In this study, we identified the three career changing STEM professionals as they transitioned back into the life of a student in a teacher credential program as they sought to become science teachers. A longer term and future goal in following these individuals is to determine if the development of a teacher identity and the collegial relationships developed in the credential program are related to success in the classroom and if there is a greater likelihood that they will remain in teaching. Therefore, leading to the questions: how and when do career changers become enculturated into their new profession?

This study also raises questions about designing alternative certification programs exclusively for second career teachers. These three women provided value to the program because of their experiences and their interactions with their more traditional aged peers. Through case studies, such as this, we can better understand the needs of these preservice teachers and how we can address these needs within existing programs, thereby increasing the likelihood that second career teachers will remain in the classroom as effective teachers.

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