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The Roles of Teachers, Classroom Experiences, and Finding Balance: A Qualitative Perspective on the Experiences and Expectations of Females Within STEM and Non-STEM Careers

Meeta Banerjee[1], Katerina Schenke[2], Arena Lam[3], Jacquelynne S. Eccles[4]

[1]California State University- Northridge, [2]University of California, Los Angeles, [3]WestEd, [4]University of California, Irvine, USA

ABSTRACT
In this article we explore the factors associated with women's choices to pursue Science, Technology, Engineering, and Mathematics (STEM) careers. Two 20-year longitudinal studies that were conducted in the United States surveyed adolescents on their educational and career aspirations. Interviews were conducted with a special subset of women when they were in their mid-30s and 40s to understand their decisions to (1) aspire to STEM careers if they initially had non-STEM career aspirations, or (2) leave or not pursue a STEM career if they initially had STEM career aspirations. Findings from semi-structured interviews uncovered three themes that participants used in explaining their career decisions: (1) the importance of family and work/life balance; (2) the importance of teachers and classroom experiences; and (3) interest in, and perceived value of, STEM subjects. We discuss the implications of these findings in relation to initiatives to encourage more women to pursue and persist in STEM careers.

Keywords: STEM; gender; United States; career choices; Eccles' Expectancy-Value Theory; long-term career aspirations

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INTRODUCTION

Encouraging individuals to pursue and participate in Science, Technology, Engineering, and Mathematics (STEM) careers continues to be a national concern in the United States (Beede et al., 2011; Engler, 2012; Fouad, Fitzpatrick & Liu, 2011; Fouad et al., 2010; National Science Foundation, 2017). According to a report by the US National Science Board (2015), examples of STEM careers in the United States include: mathematicians, engineers, social scientists, physical scientists, and biological/life scientists. Current statistics of career participation in some STEM fields in the United States—notably engineering and computer science—suggest gender differences in both the rates at which women in the United States intend to pursue these types of careers (i.e., their college major) and the rates at which women are represented in these careers (Hill, Corbett & St. Rose, 2010; National Science Foundation, 2017). Moreover, current research indicates that, despite an increase in the number of women attaining STEM degrees in the period 1993–2010, gender disparities still persist (National Science Board, 2015). According to Beede et al. (2011), women fill approximately half of the jobs in the United States economy, however, they hold less than 25% of STEM occupations and careers. These patterns also exist in undergraduate programs, as women hold a disproportionally low share of STEM undergraduate degrees (Beede et al., 2011). The pattern observed in the United States is also found in other countries, such as in the United Kingdom, Australia, and Japan (Arnett, 2015; Homma, Motohashi & Ohtsubo, 2013; Office of the Chief Scientist, 2016). Although empirical data that may explain these gender differences are available, less is known about phenomena that may play a role in changing career trajectories for some women, such as their experiences during primary education, or perceptions of support from teachers and family.

Much research on gender gaps in some STEM careers has focused on differences in achievement and ability in mathematics and science-related fields, which could constrain the choices individuals are able to make (for example, the need to achieve a minimum score on a test to declare a science major in university). However, recent findings suggest that such differences in mathematics achievement are small to nonexistent (e.g., Curran & Kellogg, 2016; National Science Foundation, 2017; Quinn & Cooc, 2015; Wang, Eccles & Kenny, 2013). As such, other explanations for the discrepancy in some STEM career pursuits should be investigated, such as gender differences in individuals' motivation to pursue those careers—particularly an individual's self-beliefs about their future success in those fields, and their STEM-related personal identities (Bong, 2001; Eccles, 1987, 2009; Jacobs, Lanza, Osgood, Eccles & Wigfield, 2002; Pajares & Graham, 1999; Watt, 2004). For example, females generally have lower self-efficacy beliefs and Ability Self-Concepts (ASC) for mathematics than males—even when their "objective" achievements in mathematics are the same (Bandura, Barbaranelli, Caprara &

Pastorelli, 2001; Jacobs et al., 2002; Zeldin & Pajares, 2000). Additionally, girls generally show lower interest in, and perceived utility value for, mathematics and science fields than boys while attending middle school (Jacobs et al., 2002; Jones, Howe & Rua, 2000; Miller, Slawinski Blessing & Schwartz, 2006). These differences in self-efficacy beliefs and ASC, interest, and perceived utility value also explain in part gender differences in entry into STEM courses and fields.

Data for this paper came from qualitative interviews with individuals who participated in two different longitudinal studies conducted over a period of 20 years. These interview data are unique in that researchers collected information on women's career aspirations while attending high school and selected a follow-up sample of women whose adult careers were incongruent with their high school career aspirations. By examining the narratives of these incongruent cases, we gain insights into pivotal moments and factors that shaped these women's trajectories, both into and away from STEM careers.

THEORETICAL FRAMEWORK

Prominent theories in educational psychology provide some theoretical suggestions regarding influences on individuals' academic decisions. In the current study, we draw from one theory in particular, namely the Eccles Expectancy-Value Theory (EEVT; Eccles, 1987; Eccles et al., 1983). This theory was developed specifically to relate women's STEM-related career choices to the social and psychological factors linked to gender roles; gender role socialization in school and at home; social and personal identities; and motivational beliefs. This framework has two major components: a psychological component, grounded in classic expectancy-value theories (e.g., Atkinson, 1957); and a sociocultural component that links gender and other group differences to more peripheral, macro-social, and culturally-informed experiences from birth (see Figure 1, presenting the psychological components in the right-hand columns and the sociocultural components in the left-hand columns).

Thus, Eccles et al. (1983) sought to create a comprehensive theoretical framework to guide research focused on both social group and individual differences in achievement-related choices, engagement, persistence, and achievement, as related to STEM and other achievement-related domains. With regard to the psychological components, EEVT linked achievement-related behaviors and choices most proximally to individuals' expectancies, defined here as expectations or self-predictions of success for an upcoming task—i.e., the beliefs that answer the question "Can I do it?," similar to self-efficacy theories furthered by Bandura et al. (2001; see also Lent, Lopez & Bieschke, 1991) and Mindset Theory (Dweck, 2006). Furthermore, Eccles created a label for subjective task values (one's beliefs concerning the reasons he/she might engage in a task; the beliefs that answer the question "Do I want to do it?"). Subjective Task Value (STV) was assumed to comprise at least four subcomponents: attainment value, or the importance of the activity to a person's identity; interest, or the enjoyment one gets from the task; utility value, or the usefulness of the activity to fulfill short- or long-term goals; and cost, referring to what the individual has to give up in order to complete the task.

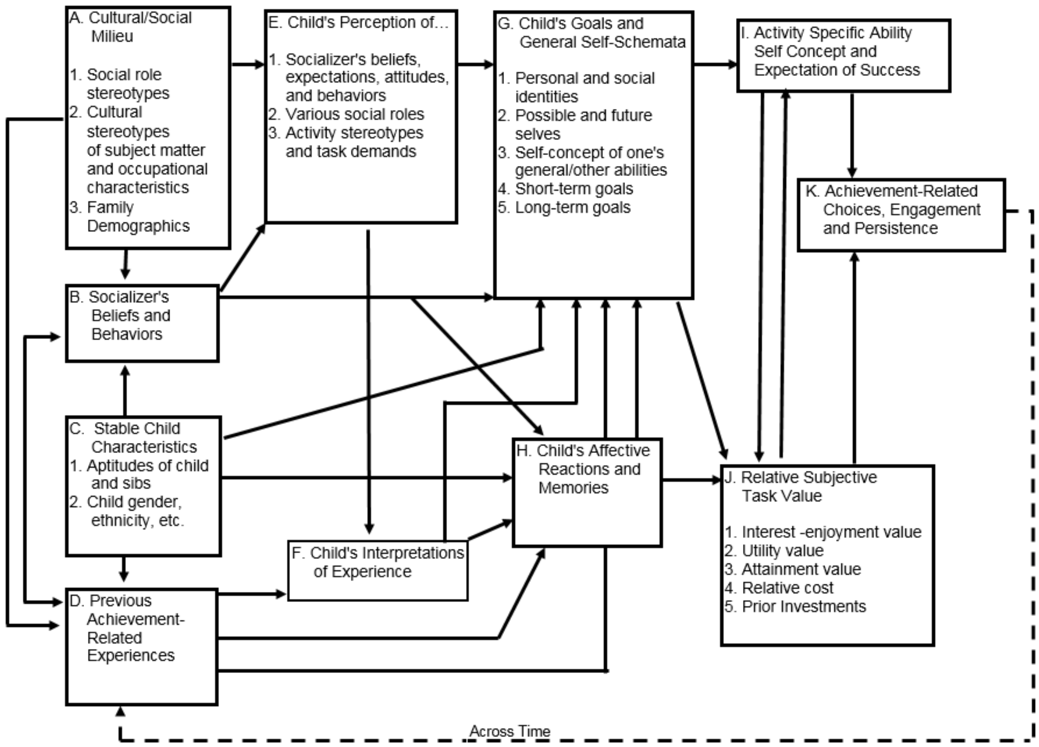

Figure 1: Expectancy-Value Theory's model of the cultural milieu and socializers' influence on children's achievement related to self-perception, values, and behaviors (Eccles, 2007).

Each of these components overlap with the kinds of psychological influences proposed in theories of interest (Hidi & Renninger, 2006), Self-Determination Theory (Ryan & Deci, 2000), and science identity theories (Carleone & Johnson, 2007; Hazari, Sadler & Sonnert, 2013; Trujillo & Tanner, 2014). Specifically, EEVT posits that gender differences in career and achievement-related choices reflect gendered differences in relative expectations of success and task values. Indeed, there has been much evidence supporting the role of expectancies and values in choices such as selecting high school courses or college majors (Eccles, 2009; Parker, Nagy, Trautwein & Lüdtke, 2014; Updegraff, Eccles, Barber & O'Brien, 1996; Wang et al., 2013). However, few studies have used EEVT to longitudinally examine the process of making career choices.

EEVT also specifies a set of social experiences in schools and at home related to teacher expectancy effects (see also McKown & Weinstein, 2002), and gender role socialization in school and at home—both of which could lead to gender differences in psychological and career choice-related beliefs (see Eccles, 1993; Eccles et al., 1993). Again, extensive research evidence supports the importance of these social influences on gender differences in STEM-related choices and behaviors during the first two decades of life, but little research has looked at their potential long-term consequences. Teachers, for example, are considered to be a particularly powerful influence on students' self-beliefs and motivation for STEM (Gunderson, Ramirez, Levine & Beilock, 2012; Li, 1999; Tiedemann, 2002). Teacher expectations may influence students' self-expectations through their impact on competence beliefs. Whereas some teachers may respond to a student's low expectations by providing extra support—which has been found to be linked to interest (Wentzel, 1998)—low expectations may also arise as the result of, for example, differential treatment or negative teacher-student interactions (Furrer, Skinner & Pitzer, 2014; Midgley, Feldlaufer & Eccles, 1989; Skinner & Belmont, 1993). Research has indicated that females are more likely than males to be harmed by low teacher expectations of mathematics performance (McKnown & Weinstein, 2002).

In addition to the influence of teachers on interest in, and aspirations towards, STEM, life-style values also play a role in women's career choices. Females tend to place more value on family and are therefore more willing to make occupational sacrifices to accommodate the needs of their family (for a review, see Eccles, 1994; Frome, Alfeld, Eccles & Barber, 2006). Women in the United States tend to favor careers that emphasize family, and prefer to devote less time to their career. Moreover, gender differences in life priorities intensify during parenthood, even among a sample of mathematics and science graduate students (Ferriman, Lubinski & Benbow, 2009). As Eccles (1994) noted, these career decisions may sometimes arise from pressure surrounding gender socialization or cultural norms. As Frome et al. (2006) indicated, females tend to aspire to a family-friendly job, but report low levels of intrinsic value in physical science. Although it was noted that women may initially aspire to jobs with high time demands, they were far more likely to pursue more gender normative occupational aspirations (Frome et al., 2006). Moreover, these pressures may also develop from experiences within the classroom at all levels, including primary or secondary school and even university (Eccles, 1994; Frome et al., 2006). The aforementioned findings suggest that time-consuming careers in STEM overall have little appeal to women who consider it important to devote time to their families.

CURRENT STUDY

In this study, our aim was to explore the reasons why participants chose careers that did not align with their initial aspirations as measured while attending high school. We employed a qualitative approach to gain an in-depth perspective on the participants' personal decisions. The semi-structured interview protocol allowed for the interviewer to explore more deeply interesting topics arising from the participants' responses. We purposefully sampled participants whose adolescent career aspirations were incongruent with their actual career choice 20 years later at the time of the interview. These data allowed us to learn more about the narratives of women's experiences that directed them towards or steered them away from STEM careers. Two research aims guided the study: First, we explored the role of social support and experiences with partners, family, and teachers in the lives of women in both STEM and non-STEM careers. Second, we explored how ideals such as value, cost, and attainment specific to mathematics and science shaped participants' occupational careers and choices.

METHOD

Procedure

The current study draws from data collected from two longitudinal studies: the Childhood And Beyond (CAB) study (Project Investigator [PI] Eccles, 1987–2014), and the Michigan Study of Adolescent and Adult Life Transitions (MSALT, PI Eccles, 1983–2014). Participants who were attending high school were asked about their career aspirations via a survey. Individuals from the two studies were invited to participate in a new wave of data collection during the period 2012–2014. Initially, participants were asked to complete a brief questionnaire about their current demographics (e.g., educational level, occupation status, marital status). A longer follow-up questionnaire was then sent to the participants in order to obtain additional information about their occupations, family, and personal lives. The third section of the larger study asked a subset of participants—those whose initial aspirations were incongruent with their actual STEM careers (or lack thereof)—to participate in semi-structured interviews concerning their pathways from high school to their current careers. 60 individuals, both male and female, were identified to participate in the study. Of the identified sample consisting of a total of 49 participants, 22 were male, while 27 were female. Respondents completed the interviews conducted over the phone by research assistants in the research lab, which took between 45 minutes and one hour. Research assistants had extensive training with the first author before conducting the interviews. Although including a fixed set of questions, the interviews were semi-structured, allowing the participant to guide the interview.

Participants

As described in the previous subsection, the sample of women was derived from two larger longitudinal studies conducted in the US over a period of 20 years. The participants in both samples were followed since their early educational experiences: CAB participants were recruited into the study while attending elementary school, whereas the MSALT participants were recruited during their middle school years. Using data on career aspirations gathered while the participants attended high school and career attainment information obtained during the latest rounds of interviews, we coded participants' initial aspirations and current careers as STEM or non-STEM according to the Occupational Information Network (O*NET) specifications that define a STEM career as an occupation that requires "education in science, technology, engineering, and mathematics (STEM) disciplines" (National Center for O*NET Development, 2014). O*NET is a database documenting all occupations and was developed by the U.S. Department of Labor/Employment and Training Administration. O*NET provides information about the required level of STEM knowledge, skills, and work activities for each occupation on a scale from 0–100. A list of all STEM occupations is available online (https://www.onetonline.org/find/stem/).

Participants were then categorized into one of four quadrants: (1) participants who initially had aspirations to pursue a STEM career and who currently have a STEM career (congruent); (2) participants who initially had aspirations to pursue a STEM career, but who currently have a non-STEM career (incongruent); (3) participants who initially had aspirations to pursue a non-STEM career, but are currently in a STEM career (incongruent); and (4) participants who initially had aspirations to pursue a non-STEM career and are currently in a non-STEM career (congruent). The sample consisted of a total of 49 individuals who fell into the two incongruent quadrants. While there were 22 incongruent males, we wanted to focus on the 27 females in those incongruent quadrants to better understand factors associated with an individual's decisions to change their career orientations. This is primarily because existing literature has pointed to fewer women than men entering and staying in STEM fields in the US during the past 20 years (National Science Board, 2015; National Science Foundation, 2017).

The current non-congruent sample of interest consisted of 23 female participants from the CAB study and four female participants from the MSALT study. Of the non-congruent sample, 11 participants (41%) initially had non-STEM aspirations and 16 participants (59%) initially had STEM aspirations while attending high school. The majority (90%) of participants was European-American and lived in lower Michigan, United States. Participants' reported educational level ranged from high school graduate to professional school degree (e.g., JD/PhD). Within the current study, the average age of the CAB sample during this study was approximately 32 years of age, while the average age of the MSALT sample was approximately 42 years of age. The average educational level for the sample was a Bachelor's Degree. In the current study, 21 women reported that they had non-STEM careers and six had STEM careers. Of the 27 women, 13 (48%) reported they were in full-time employment, whereas 6 (22%) were employed part-time, 5 (19%) were homemakers, and 3 (11%) were self-employed. 22% of the sample (n = 6) were single, whereas 68% (n = 18) were married, and 11% (n = 3) were divorced. Of the sample of women, 16 (59%) had children, whereas 11 (41%) reported that they had no children.

Measures

Qualitative interview

We used a semi-structured interview protocol developed by Banerjee and Eccles (2013) in order to understand participants' reasons for pursuing careers that were incongruent with their initial aspirations. We asked questions about participants' career trajectories, as well as their experiences and the support they received during high school and college. This sample question asked participants whether there were barriers to successful pathways: "Do you feel that there are barriers to success for some people that impact their career choice or path?" Interviews started by asking the participants about their current occupation. Interviewers then allowed participants to provide a narrative about their career trajectory. Interviewers specifically asked about participants' experiences and beliefs regarding mathematics and science, as well as their perceived support from parents, teachers, and spouses.

Coding and analysis

The interviews were transcribed and then coded by a team of two coders (two of the co-authors), using Emergent Thematic Coding (Miles & Huberman, 1994). Initially, coders used the Constant Comparative Method (CCM; Strauss & Corbin, 1990), whereby coders iteratively read through all narratives, derive codes, and compile a list of codes. The two coders met every two weeks to discuss the interviews and created codes for the themes that were emerging from the narratives. This process continued until a final list of codes was agreed upon. Once the list of codes was finalized, the two coders coded the interviews for the purposes of obtaining reliability. Once acceptable inter-rater reliability—calculated with Cohen's Kappa (McHugh, 2012)—was reached (defined as K = .80), the two coders each coded half of the interviews and recorded their codes using the tagging function in Dedoose (Version 6.1.18; Lieber, Weisner & Taylor, 2015). The final list of codes consisted of tags associated with reasons why individuals pursued their current careers. Many of these themes mirrored the components of EEVT, including expectations for success in STEM and STV (interest, utility, attainment, and cost, as well as specific career aspects participants placed value on, such as a flexible work schedule, etc.). Additional codes were also included, such as spousal support of the current career and interactions with coworkers and supervisors, in order to capture characteristics of the adult labor market that are considered important within Self-Determination Theory (Ryan & Deci, 2000).

RESULTS

Using emergent thematic analysis, we found three overarching themes with regard to the women's experiences within their education and careers. Women in both study samples discussed (1) the importance and influence of both family and children on their occupational experiences and career choices; (2) the importance and influence of teachers in both high school and college; and (3) how aspects of value and interest played a role in both their aspirations and current occupational choices. Teachers were found to not only influence participants' career choices, but also to shape their perceptions of value and interest in subjects such as mathematics and science. We would like to note that pseudonyms were employed to preserve the anonymity of our participants.

Family: The Deciding Factor in Leaving STEM

Compared to men, many women have the difficult task of deciding whether to have a partner/spouse and a family, or not. Moreover, many women in particular are tasked with the choice of whether or not to have children. Many times, this decision to have a family outweighed the decision to have a career. Many of the women in this study had to make a choice on what types of jobs they pursued, and the choice to have a family may have shaped their occupational decisions. For example, Gina, who currently has a non-STEM career while initially having both STEM aspirations and a STEM career, stated:

> ...again, I'll talk before kids and after kids because it varies at points. Before kids certainly having a math degree and being able to go into the financial industry was very lucrative, which was great. I think the cons of it [were that] there was a lot of travel [involved]. There were a lot of demanding hours. You got pampered too. They took good care of you, good benefits, etcetera. But again, it's very demanding and it's very cutthroat. [In] the financial industry there are a lot of layoffs even now. That's something that

> you had to worry about. Post kids with my coaching and consultant the pros are [that] it's very flexible.

Additionally, Terri, who also had a non-STEM career, discussed how the relative cost of having a family was a deciding factor in whether or not to pursue her high school aspirations towards a STEM career:

> ...at that point I had gotten the job that I'm currently at. I figured for the amount of money that I'm making now and with the two kids that I had at the time, I now have a third child, that it was silly for me to pursue this dream [of] being in the medical field...

While these excerpts indicate that family expectations and the relative cost of family can influence career decisions, it is also important to note other factors that may impact career trajectories, such as the women's experiences with their teachers.

Teachers: Their Relative Importance and Influence

During the interviews, the participants were asked to talk about their experiences in science and mathematics classes during primary and secondary education. Inevitably, one of the common themes that came to the fore was the influence and importance that teachers had in shaping the careers of young women. For the study sample, 85% (n = 23) of the women mentioned that teachers were an important influence on all career aspirations—both STEM and non-STEM. As our participant Kathy, who currently works as a primary school science teacher (not considered a STEM occupation by the US National Science Board, 2015), stated:

> I love science. I loved it. Seeing now, how hands on a lot of classes are, I love that, and I wish it had been even more hands on, because I really ...loved what we did, and it wasn't even all that hands on when we did it. But I was always fascinated by the sciences, and just understanding how things work, and wanting to know more, particularly with the life sciences. I always enjoyed that class. I always seemed to have a teacher who is particularly gifted in that area, who could really share enthusiasm for the subject, and get you thinking about things, so I can remember a couple of teachers, even in junior high and high school, that I really enjoyed. I think that makes a difference, too.

It is vital to mention that 78% (n = 21) of the women identified certain characteristics of teachers that helped shape whether they liked or disliked science-related subjects. In some cases, it was the teacher's relative interest and knowledge of the subject that made the subject enjoyable. For instance, Laura, who is currently in a STEM career, stated:

> In the first and last one [mathematics class] I had a very good math teacher and I did very well. I did not find it difficult and everything is explained really well. In geometry and trigonometry I had a very good teacher also. In sophomore year [2nd year of high school] I took algebra and had a C and the teacher was terrible. I did not understand his class.

This quote demonstrates the importance of the relationship between the teacher's ability to teach the mathematical concepts and the participant's success in the subject. Both Laura's and Kathy's accounts highlight the importance of teachers for participants' interest in multiple STEM subjects. Interviewees mentioned the manner in which the class was taught, as well as whether or not the teacher's ability to explain and teach the course made it enjoyable. This theme was common and emerged in many interview transcripts. For example, another female participant with a non-STEM career who initially had aspirations towards a STEM career, stated:

> I can remember times when I was working on one [problem] with a math teacher. And you know how things felt like I just had no idea how to do something and how they would break it down and make it a lot simpler, and so I can remember those as positive experiences... I remember [the problems] being challenging, and I do remember needing to go in for help sometimes. But I had teachers that were willing to help and I don't have any negative experiences from them. I got through [the problems] okay.

The experiences teachers provided helped these women consider mathematics as enjoyable. We would like to note that 41% (n = 11) of the women in our sample had careers that used mathematics on a daily basis (e.g., accountant, mathematics teachers), but that were not considered STEM fields according to the O*NET specifications (National Center for O*NET Development, 2014).

Teachers as Sources for Eliciting Value/Interest

We found that teachers shaped participants' feelings of value (specifically interest and utility), as well as expectations for success in specific subjects. For example, one of the participants described how important teachers were in shaping her values, beliefs, and expectations regarding mathematics:

> When I was going through school I found very little value in math other than it was what I needed to succeed in to get my diploma, to move to the next level, to get to higher educational aspirations. But it was just a stepping stone as far as math was concerned. I was not a phenomenal math student ever. And that probably started in second grade, because my second grade teacher was very negative [laughs]. Basically told me I wasn't capable.

This same woman reported that she was currently in a non-STEM career. This participant's dislike of mathematics stemmed from her negative experiences with her early elementary education teacher, and the messages that were conveyed by that teacher—namely that she was not capable. This excerpt indicates that teachers can be instrumental in shaping career aspirations and interest in young children.

Although the previous participants discussed how their experiences with their teachers shaped their dislike of the subject, alternatively, teachers can also shape a student's interest in a subject. Alina—whose career trajectory was incongruent because her aspirations were in STEM, but her career was in non-STEM—

remembered not just her high school experiences, but also recalled her middle school teachers:

> It was really the teachers. There was one teacher in junior high school, Mr. Smith who I can't remember what grade it was, but he was just very good at explaining concepts, and he was a very personable person, so he made what we did enjoyable. I have good memories of math with him as a teacher. Then in high school I had the teacher, I don't recall his [name], but it was my geometry teacher. Geometry was fun. It was one of the math subjects I actually enjoyed. I think it was partially because the teacher made it enjoyable.

This quote similarly highlights the importance of teachers' ability to teach and explain mathematical concepts, as well as their personality ("he was a very personable person") on this woman's liking of mathematics ("he made what we did enjoyable"), hence creating a link between the teaching material and the individual's interest and task value.

These two excerpts provide insight into how the role of the teacher is important in facilitating feelings of positive expectations for success as well as shaping students' interest and their perception of value for certain subjects, especially ones that are usually considered "difficult" or "challenging." However, it is important to note that it is not just the teacher's individual characteristics that play a valuable role in promoting these positive aspects of subjects and learning in the classroom: the ways in which the teacher enables and enhances learning within the classroom is equally important. How teachers encourage participation in a specific subject can be fundamental to aiding a student's learning process (e.g., Ing et al., 2015). One participant, for example, who was in a STEM career but had initial non-STEM aspirations, explained:

> When I took chemistry, that's when I really kind of lit up. I took regular Chem and AP Chem at high school level, because again, I think the problem-solving nature of it, the applications, the labs, and seeing the real-world aspect of the knowledge helped. Plus, at that point, I was starting to get math so chemistry made more sense [laughs]. But anyways, life sciences classes, the inquiry-based learning that happens naturally in a science classroom worked for me, because I could ask questions and I was encouraged to do so.

This quote illustrates how multiple factors shaped this woman's perception of STEM subjects, specifically, the inquiry-based activities in her life sciences class that allowed her to see the real-world value of the knowledge that was transferred to her (utility value) and her growing understanding of mathematics, which supported her understanding of life sciences (indicating her increased expectancies for life sciences).

The Importance of Interest and Value

It is noteworthy that participants described more neutral experiences of their high school science courses compared to their mathematics courses. Only one individual described neutral experiences of their high school mathematics courses, whereas three women had neutral experiences of their sciences courses. We explored their experiences in both mathematics and science in order to see how themes related to value, such as interest and attainment, emerged. Interestingly, participants discussed how interest shaped their feelings and perspectives on both mathematics and science. Tori, who is currently in a non-STEM career, explained:

> I just remember math being very challenging, and it was a tough subject. It wasn’t something that came easily to me, whereas English and reading and some of the history, social studies, and even science, were a little more natural. Whereas math was always just a very tough subject. Even in college I took the math that was required and no more. There was no interest for me in going any further with it. It was just never my easy subject.

Additionally, Janice, who was also in a non-STEM career, stated:

> I don't think anyone ever told me that I was bad at math. I just struggled with it. Internally, I always kind of just said, “I'm not very good at math.” When I got into high school, I avoided more difficult math classes. I'd have a teacher who wasn't able to help me understand. My Algebra 1 teacher...I just didn't get it. I just didn't get Algebra. I went into geometry and I seemed to get geometry for some reason. That was easy. Then when I went to Algebra 2, I didn't have those foundations from Algebra 1 but I had a really, really strong teacher and I got it. Algebra 2 was a breeze.

Within the first excerpt, Tori suggests that her interest in mathematics waned because she did not have any expectations of success in the subject. Instead, her interest in subjects that were more natural to her, such as language and arts, increased. The second excerpt highlights the importance of teachers cultivating interest in the value of STEM subjects. Janice initially assumed and internalized that she was bad at mathematics, however, having a teacher who helped facilitate increased expectations of success in the subject increased her interest and put mathematics into a more positive light. These excerpts underline the important interaction between expectancy of success and interest, which can influence career trajectories.

Furthermore, one of the women who is currently in a science career discussed the relative difficulty she had with mathematics compared to science:

> I don’t think I was expected to do particularly good at math and science because I was a girl, if that’s what you’re getting at. I don’t think it was a big surprise, especially since I excelled in and was interested in pretty much the opposite of that. When I got to college, I did really poorly at math. I mean really poorly. I know math and science are always lumped together, but

> science really did always interest me whereas math is very difficult for me to conceive.

This quote demonstrates the importance of not combining the domains of mathematics and sciences, as individuals perceive a difference in their expectancies for success and interest in these two different subjects. The early elementary teacher of this particular participant indicated that she displayed a limited ability to master mathematics. She associated this teacher with the "very little value in math" that she experienced, and with the notion that the only value she could see in mathematics was that it was required to obtain her degree (utility value). This woman also noted that gender stereotypes about student achievement in mathematics and science fields limited others' expectations of her early on. Despite this, her interest in science persevered and she attained a career in the STEM field. Hence, it could be suggested that because of differing experiences and expectations of mathematics and science fields, individuals' interest in mathematics and science, as well as their personal trajectories within these fields, should be considered separately.

DISCUSSION

This qualitative study sought to explore whether there are nuances and phenomena that need to be considered when studying women in the United States and their trajectories from high school aspirations—to either STEM or non-STEM fields—to the careers they pursue in their 30s and 40s. As mentioned previously, three overarching themes emerged via content analyses: (1) the importance and influence of both family and children on their occupational experiences and career choices; (2) the importance and influence of teachers in both high school and college; and (3) how aspects of value and interest played a role in aspirations and current occupational choices.

Women's discussions surrounding the choice to have a family or the choice to have a career were common themes we found in our study. For many of the women who switched from STEM aspirations to non-STEM careers, this was a deciding factor. For example, some of the women quit their jobs in STEM fields in an effort to spend more time with their children, or to be supportive of their partner's occupational choices. Although the current study does not include a male comparison group, many of its findings echo previous research, demonstrating that females attribute more value to family and are more willing to make occupational sacrifices to accommodate the needs of their family (for a review, see Eccles, 1994).

Our research data further illustrate how crucial the role of the teacher is within the classroom. Previous research has indicated that teacher-student relationships are vital for motivation and persistence to occur in the classroom, specifically in fields of mathematics and science (Furrer et al., 2014; Skinner & Belmont, 1993; Trujillo & Tanner, 2014). Existing literature, however, does not always illustrate how student-teacher relationships can play a role in increasing motivation for a particular subject, or how they may be associated with the making of career decisions. Our participants' narratives help us to gain a deeper understanding of how previous experiences can alter and shape the choices and decisions that women in the United States make with regard to their careers and professional success.

Finally, the participants underscored the importance of how experiences as early as primary education had influenced their self-beliefs about specific subjects, which later shaped their values, feelings, and efforts. These findings reflect the tenets articulated in our conceptual framework and EEVT. Early influences can therefore shape the types of careers and aspirations that women may have. The narratives presented in this study illustrate how key experiences can shape an individual's value and interest in certain subjects. Because mathematics was a challenging subject for some of the women in the sample group, for example, their interest in mathematics was low, arising from their low expectations of the subject. This finding concurs with quantitative studies that have found that expectancy and task value are tightly linked, with those who are "good" at a subject also holding high interest, whereas those who perceive themselves as not being "good" at a subject demonstrate low interest (Blickenstaff, 2005; Wigfield, 1994).

LIMITATIONS

The current study is unique because it provides an opportunity to explore how the trajectories of women who participated in this study over a period of 20 years have shifted their career orientation and changed over time. While this study provides a deeper understanding of what factors may influence the careers of women and their decisions to enter STEM or non-STEM careers, there are some inevitable limitations.

Although this study focused primarily on women, it is noteworthy that 22 male participants in our study were also categorized as incongruent, suggesting that perhaps it is not just women who are changing from STEM aspirations to non-STEM careers—that is, perhaps this phenomenon is not as gendered as initially thought. Future studies should explore if males are having similar experiences within schools and classrooms to their female counterparts.

Moreover, it should be noted that these findings are not applicable to all women in the United States. Primarily, this study was conducted on two samples of participants who came from white European backgrounds in the United States, focusing on a longitudinal study of individuals from the Midwestern United States and the majority of the participants were Caucasian. Women from ethnic minorities in the United States may also face barriers that pertain to race, ethnicity, class, and other social factors. Future studies should thus expand the research into communities of color in order to understand whether their experiences might be similar to the narratives presented in this study, or if there is an intersection with ethnicity and gender that may play a role in decisions and experiences regarding STEM subjects and careers.

Additionally, we also need to consider the role of parents in shaping the career interests and pathways of youth. Previous research has focused on the role of parents (Rozek, Svoboda, Harackiewicz, Hulleman & Hyde, 2017), and future qualitative studies may bring about a deeper understanding of the role of parents in STEM career choices.

In addition to the limited generalizability of the research findings to other women in the United States, the results may not generalize to women in countries outside of the United States. For example, differences in the relative importance of certain aspects of value were found in predicting career aspirations when comparing US and Australian adolescents (Watt et al., 2012). Other international differences could emerge as a result of structural differences in course requirements in primary and secondary schools, which may play a role in women's educational experiences of advanced STEM courses, as well as their perceptions of the attainability and attractiveness of STEM careers (Hall, Dickerson, Batts, Kauffmann & Bosse, 2011). Thus, more work is needed to investigate international differences regarding career aspirations and the rigidity of gender stereotypes in STEM, as well as gender differences in important values that inform career choices (e.g., family).

Implications

A strength of the current study is its methodology. Extant research on factors promoting or inhibiting career trajectories for women in STEM has been primarily confined to quantitative research studies. Typically, quantitative findings indicated that teachers had a limited effect on these career choices (Wenglinsky, 2002). Yet, the current study explored participants' perceptions of teachers and how teachers shaped their interest in, and motivation for, STEM fields. As previous research (e.g., McGee & Spencer, 2015) has suggested that exploring the role of parents in STEM career choices and academic socialization may also be key, future studies should begin to explore the tandem roles of both parents and teachers on occupational choices and career trajectories. The present study, however, suggests that teachers indeed fulfill an important role and participants have recollections of very specific interactions with their teachers, suggesting the advantage of a qualitative methodological approach. In particular, participants in the current study clearly indicated how specific moments and experiences with teachers influenced their later career decisions, adding vital details that could not be supplied in a quantitative study.

Furthermore, it could be suggested that the current coding practices of STEM careers as prescribed by O*NET exclude some careers that might be categorized as STEM. Categorizing careers by whether individuals use mathematics and science on a daily basis might have changed the results of the current study, as well as the reported statistics of those entering STEM careers. For example, the results might differ if the teaching of mathematics was categorized as a STEM career (instead of as STEM support), or if accounting was categorized as a STEM career. Some of the female participants were, for example, science and mathematics teachers in middle and high schools.

Women's decisions to pursue career paths and degrees in STEM fields are influenced by many factors. Xu (2016), for example, suggests that women's decisions to pursue advanced degrees are related to social and structural factors, and that these decisions are "based on their internalized social values and personal beliefs that go beyond the cost and benefit calculation" (p. 436). Because of the multiple factors that influence important life decisions and the significance of certain periods in an individual's life in making these decisions, efforts and initiatives cannot just rely on a quick fix. Larger contextual and societal factors, such as flexibility in the work place, must be addressed in order to encourage women with initial STEM aspirations to pursue and stay in those careers. The findings of this study have underscored the importance of teachers in women's active decision-making and their pursuit of careers in STEM.

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