Second Edition

Handbook of Motivation at School

Edited by

Kathryn R. Wentzel and David B. Miele

ROUTLEDGE

"With this second edition of the *Handbook of Motivation at School*, Wentzel and Miele expand coverage of social-contextual influences on personal motivation, and introduce novel research methods that will move the field forward. For a thorough understanding of rigorous, theory-based research on student academic motivation, there are no better references than the companion volumes of this handbook."

Lyn Corno, Professor of Education and Psychology (retired), Teachers College, Columbia University, USA

The second edition of the *Handbook of Motivation at School* presents an integrated compilation of theory and research in the field. With chapters by leading experts, this book covers the major theoretical perspectives in the field as well as their application to instruction, learning, and social adjustment at school. Section I focuses on theoretical perspectives and major constructs, Section II on contextual and social influences on motivation, and Section III on new directions in the field.

This new edition will have the same popular organizational structure with theories at the beginning. It will also include new chapters that cover motivation as it relates to identity, culture, test anxiety, mindfulness, neuroscience, parenting, metacognition, and regulatory focus.

Kathryn R. Wentzel is Professor of Human Development in the Department of Human Development and Quantitative Methodology at the University of Maryland, College Park.

David B. Miele is Buehler Sesquicentennial Assistant Professor in the Counseling, Developmental, and Educational Psychology Department in the Lynch School of Education at Boston College.

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GENDER AND MOTIVATION

Helen M. G. Watt

Gender differences in education (and subsequently the workforce) have continued to occupy the interests of educators, researchers and policymakers since the pioneering work of feminist writers. In *The Feminine Mystique* (1963), Betty Friedan, who is often credited with launching the feminist movement, referred to the widespread dissatisfaction of American women in the 1950s and 1960s as "the problem that has no name." She argued that women (like men) need meaningful work that uses their mental capacities to achieve life satisfaction and that education was the pathway to avoid becoming trapped in the feminine mystique—the idea that women were naturally fulfilled by the roles of housewives and mothers. At that time, Eleanor Maccoby coauthored *The Development of Sex Differences* (Maccoby, 1966) and her famous *The Psychology of Sex Differences* with Carol Jacklin (Maccoby & Jacklin, 1974), which emphasized biological explanations in interpreting the more than 1,600 studies of sex differences they reviewed. However, with the introduction of new language, including "sexism" created by feminist writers in the 1970s, researchers became increasingly interested in explanations beyond biology, such as gender discrimination, gender socialization, and gender identity. Prominent Australian feminist scholar and teacher Dale Spender published *Invisible Women: The Schooling Scandal* (1982), Spender and Sarah published *Learning to Lose: Sexism and Education* (1980), and Lucy Sells identified mathematics—frequently stereotyped as a masculine domain—as the "critical filter" that limited girls' and women's access to many high-status, high-income careers (1980).

Theories of motivation aim to predict individuals' choices and behaviors. Because the Eccles et al. expectancy-value theory (1983) was initially developed specifically to understand girls' lower enrollments in high school mathematics, it would seem natural to turn first to this theoretical framework in an analysis of gender and motivation at school, within which much of my own work has been located. Much of the research concerning gender and achievement motivation has concentrated on whether and how girls and boys are differently motivated in particular learning domains, toward different career aspirations, and how features of the school learning environment can promote or diminish their motivations. I will use these frames as the organizational structure for the chapter referring to my own work and that of others, linking with

other motivational theories and constructs throughout. I first give a short overview of the historical context, then examine (a) boys' versus girls' motivations *in* particular subjects, (b) *how* motivations matter differently for girls and boys, (c) *in directing them towards* particular purposes and aspirations, and (d) as they are influenced by features of their learning *environments*. I conclude with discussion of continuing theoretical and methodological challenges and recommendations for future directions in the field.

OVERVIEW OF THE HISTORICAL CONTEXT

It was not until the late 1970s that researchers began to examine the belief that girls achieve less well than do boys in mathematics. An increasing emphasis on gendered participation rather than achievement coincided with large meta-analyses that challenged the view of girls achieving less well in mathematics (Friedman, 1989; Hyde, Fennema, & Lamon, 1990; Hyde & Linn, 2006) and science (Else-Quest et al., 2010; Hyde & Linn, 2006), leading to the "gender similarity hypothesis" (Hyde, 2005) that women and men are more similar than they are different and a realization that variation within gender far exceeds that between genders (Eagly, 1995). As a consequence, the problem has become: why do fewer girls than boys participate in mathematics? In Australia, this was first recognized officially by the Government in 1975: "Girls achieve at least equally well with boys in school, but the subject choices they make are more limiting" (Commonwealth Schools Commission, 1975, p. 154). In response, a raft of Government policy documents, reports, and curriculum and professional development activities ensued throughout the 1980s and early 1990s, focused on combating sexism in schools and developing girls' self-esteem and gender-inclusive curricula, many with special relevance to mathematics and science education (for a review, see Leder & Forgasz, 1992).

During the 1990s, public attention shifted almost exclusively to the educational needs and achievements of boys, with a concern that boys in particular become disengaged as they progress through school. This was linked in the media to such dramatic outcomes as school dropout and even suicide. Media and politicians focused on boys' academic achievement and disaffection with schooling, together with a call for positive male role models among teachers to bring out the best in boys (e.g., House of Representatives Standing Committee on Education and Training, 2002). In Australia, there was insistent and vocal concern regarding boys' education and participation in domains that were sex-typed as feminine, calling for more efforts to encourage boys' involvement. As a result, a number of educational researchers began to focus on boys' educational needs (e.g., Lingard, Martino, Mills, & Bahr, 2002; Martin, 2002), and feminist authors such as Susan Faludi (1991) argued that there was a media-driven "backlash" against the feminist advances since the 1970s.

In the psychological literature, more than 30 years ago Eccles and her colleagues published their expectancy-value model of achievement motivation to understand girls' (and boys') educational experiences and choices (1983; Eccles, 2005, 2009; see Figure 16.1). This model outlined the psychological processes that predict achievement-related choices and behaviors. The Eccles et al. expectancy-value theory (EVT) elaborated the construct of task value to distinguish four classes: attainment, utility, intrinsic/interest, and cost (see Wigfield et al., this volume). In addition, expectancies and values were contextualized within a developmental framework drawing on decision theory, achievement goal theory,

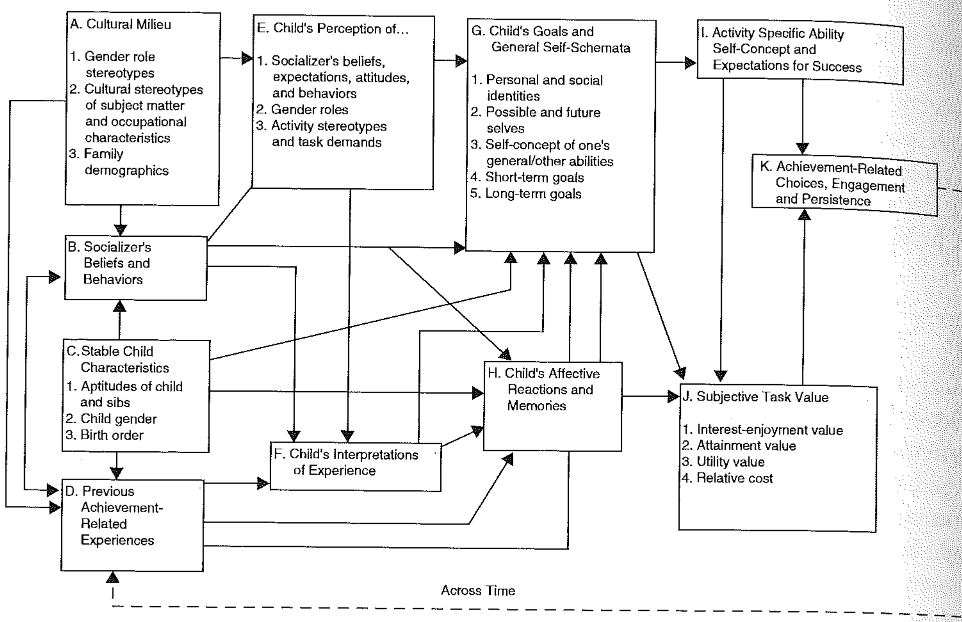

Figure 16.1 Current Formulation of the Expectancy-Value Model of Achievement Choices (from Simpkins, Fredricks, & Eccles, 2015)

and attribution theory to provide an integrated framework accounting for origins stemming from childhood. Empirical findings from research conducted within this framework established the centrality of ability-related beliefs and different kinds of task values to children's and adolescents' achievement-related choices and behaviors, and contribute to understanding the development of youths' self- and task-beliefs and how they predict educational and subsequent occupational choices (Jacobs & Simpkins, 2005; Watt & Eccles, 2008).

GENDER DIFFERENCES IN ACHIEVEMENT MOTIVATIONS AT SCHOOL

The bulk of the literature concerning gender differences in achievement motivations at school has concentrated on mathematics, because it has been identified as the critical filter restricting access to certain high-salary and high-status fields of education and career (Sells, 1980), and because it is typically regarded as a gender-stereotyped domain favoring boys and men. The next most-studied domain has been English/Language Arts, probably because this subject is most commonly studied by students. In this case, gender stereotypes favor girls and women. There has been comparatively little research examining gendered motivations in other domains.

Expectancies, Self-Concepts, and Ability Beliefs

It would at first seem reasonable to suppose that students' perceptions of their abilities would closely relate to their actual achievements. However, a large literature has documented higher mathematics ability-related beliefs and lower English/Language Arts beliefs for boys compared to girls (e.g., Eccles, Wigfield et al., 1993; Else-Quest et al.,

2010; Jacobs et al., 2002) despite no corresponding gender differences in actual achievement (Eccles et al., 1983; Eccles, Adler, & Meece, 1984; Stevenson & Newman, 1986). Boys' self-concepts in mathematics were less related to their actual achievement than girls' (Watt, 2005), supporting Crandall's (1969) notion that boys' self-perceptions are less realistic. Some researchers have suggested this may be due to boys tending to rate themselves higher in general than girls in self-reports of self-esteem (Bornholt, Goodnow, & Cooney, 1994; Maehr & Nicholls, 1980), rather than to genuine differences in domain-specific beliefs. In an earlier study (Watt, 1996), I demonstrated this does not seem to be the case in mathematics at least, because boys scored higher than girls both on their ipsative judgments of mathematical talent (relative to each of their other school subjects) and on traditional self-report ratings.

Longitudinal studies have found that boys continue to hold higher perceived mathematical abilities than girls in samples from the United States (Fredricks & Eccles, 2002; Jacobs et al., 2002; Wigfield et al., 1997), Australia (Watt, 2004), Canada (Shapka, 2009), and Germany (Frenzel, Goetz, Pekrun, & Watt, 2010; Nagy, Watt, Eccles, et al., 2010). Within Bandura's (1986, 1997) related self-efficacy theoretical framework, girls' lower opinions of their capabilities for mathematical activities than boys' are well-established (e.g., Bandura, 1997; Hackett, 1985; Pajares & Miller, 1994), with an effect size $d = 0.16$ favoring boys for mathematics self-confidence in Hyde's (2005) meta-analysis. Yet, investigations of specific domains within mathematics reveal that gender differences do not consistently appear. For example, boys were more confident in applied problem solving than girls, whereas both were similarly confident at computations (Vermeer, Boekaerts, & Seegers, 2000). Further work in this vein is needed to establish the nature and extent of domain-specific effects, at different developmental stages and across different learning environments.

At all levels of mathematical ability, girls express more uncertainty than boys about their performance (Joffe & Foxman, 1984; Leder, 1988; Thomas & Costello, 1988). Even among seventh-grade girls and boys who identified mathematics as the subject at which they were most talented (Watt, 1996), girls still rated their perceived mathematical abilities lower than that of boys. Girls are also more likely to rate their lack of mathematical ability as a more important cause of their perceived failures, whereas boys rate their mathematical ability as a more important cause of their successes (see Eccles, Adler, & Meece, 1984); according to attribution theory (see Graham & Taylor, this volume), this should reduce esteem for girls but build esteem for boys.

In English, there have been different findings across the longitudinal studies, which may reflect different measures employed to tap ability-related beliefs. In a U.S. study of English Language Arts ability beliefs through elementary and secondary school (Jacobs et al., 2002), gender differences favoring girls emerged early and remained in place, despite declining beliefs for both boys and girls. In that study, self-report items asked students to rate their performance and competence, which may be closely tied to demonstrated achievements. In contrast, perceived talent may tap students' perceived ability distinct from evaluations of their past achievements (see Bornholt et al., 1994) and thus be more likely to reflect gendered influences. To illustrate, boys and girls rated their perceived English talent similarly throughout secondary school in an Australian longitudinal study (Watt, 2004), which was intriguing because the girls actually achieved higher than boys on the standardized English achievement tests they completed at each occasion. The net effect of higher English talent perceptions for boys was thus similar to mathematics.

Values and Interests

Pertaining to the values part of the EVT equation, adolescent girls and boys have reported similar beliefs about the utility/importance value of mathematics in Australian (Watt, 2004), U.S., and Canadian samples (Watt et al., 2012); however, these beliefs declined through secondary school, especially at the final years (Watt, 2004). Concerning intrinsic value or interest, other studies—some explicitly located within the EVT framework and some not—have found that boys are more interested than girls in mathematics (Frenzel, Goetz, Pekrun, & Watt, 2010; Updegraff, Eccles, Barber, & O'Brien, 1996; Watt, 2004), including Hyde et al.'s meta-analysis (1990) and the PISA (Programme of International Student Assessment; OECD, 2004) results, which showed higher mathematics interest and enjoyment for 15-year-old boys than girls across all 41 participating countries.

A gender intensification hypothesis suggests that gender-typed activities may become more important to young adolescents over time as they conform more to gender-role stereotypes (Eccles, 1987; Hill & Lynch, 1983); thus, girls would become more negative about male-typed domains such as mathematics while boys become more positive, but boys would become more negative about female-typed domains such as English while girls become more positive. However, this hypothesis has not been supported by empirical data in relation to either mathematics or English. Given that gender differences in mathematics and English ability beliefs and values have been identified in early school years (e.g., Eccles, Wigfield et al., 1993; Marsh, 1989; Wigfield et al., 1997), it appears likely that boys and girls commence school with these different beliefs already in place. Jacobs et al. (2002) attributed such early gender differences to socialization experiences in the home and the wider society, such as portrayals of men and women in the media. The relatively stable magnitudes of gender difference suggest consistent sex-typed messages.

Adolescents' engagement with English has been a more recent focus. In my longitudinal study (Watt, 2004), progressive disengagement with English did occur through secondary school, with indications that times of curricular transition (commencing secondary school at grade 7, selecting high school subjects at grade 11) exacerbated losses in interest and value. Although girls maintained higher values than boys throughout secondary school, gendered developmental patterns were evident for intrinsic value: girls showed greater declines in junior grades and boys in senior grades. Such findings emphasize the importance of promoting girls' English engagement alongside emphases on boys' engagement as well.

Achievement Goals

Looking to another major theory developed to understand students' motivations, Achievement Goal Theory (AGT; Dweck & Elliot, 1983; Nicholls, 1984) examines the reasons why students engage with their academic work (see Senko, this volume). Individuals who hold a *mastery goal* are motivated to learn and understand purely to master the skills needed to complete the task; this has some resemblance to interest/intrinsic value in EVT, although the two theories were developed from different intellectual roots. In contrast, performance-oriented students are motivated to achieve better than others: *performance-approach* students are motivated to compete and demonstrate their abilities, whereas *performance-avoidant* students are motivated by fear of demonstrating poor performance (Elliot & Harackiewicz, 1996; see also Nicholls, 1989).

Although not developed for the purpose of understanding gender differences in achievement motivation, AGT researchers have reported these, although further research is needed. In U.S. secondary schools, boys had higher performance-approach orientations in mathematics when previous achievement was controlled (Middleton & Midgley, 1997), resonating with boys' reported greater confidence in mathematics. In middle-school writing classes in the U.S., girls were higher than boys on mastery goals, but boys were higher than girls on performance-approach goals (Pajares, Britner, & Valiante, 2000); such findings are consistent with girls' greater interest in English and similar self-concept to boys despite higher measured achievements. In U.S. introductory university psychology classes, women endorsed mastery and performance-approach goals more than men did (Harackiewicz, et al., 1997). It seems clear that whether the domain under investigation is gender-stereotyped as more suited to men (e.g., mathematics) or women (e.g., English) is relevant to goal adoption, and perhaps also the extent to which individuals had choice in whether to study the domain (e.g., psychology specialization at university).

Negative Motivations

There has been less attention to gender differences in *negative* motivational factors, such as performance-avoidance goals in AGT, costs in EVT, fear of failure, and self-handicapping, to name a few of the negative motivations in the literature. An exception is mathematics anxiety, with an effect size showing worse anxiety for girls $d = -0.15$ (Hyde, 2005). Lately several researchers have become interested in the hitherto underexplored cost values within EVT (e.g., Conley, 2012; Perez et al., 2014). Among my recently surveyed contemporary sample of 1,172 grade 10 adolescents from nine middle-/upper-middle-class Australian schools (www.stepsstudy.org), I found no gender differences in adolescents' ratings for Effort cost in either mathematics or science (e.g., "When I think about the hard work needed to get through in maths/science, I am not sure that it is going to be worth it in the end"), but gender effects emerged on the two other cost dimensions—Psychological and Social costs. Girls experienced higher Psychological cost in both mathematics and science (e.g., "It frightens me that maths/science courses are harder than other courses"), but, intriguingly, boys experienced higher Social cost in both subjects (e.g., "I'm concerned that working hard in maths/science classes might mean I lose some of my close friends). Much more work is needed to examine gender differences in negative motivations and psychological and social deterrents (as well as attractors) to engagement and participation in diverse achievement domains.

HOW DO MOTIVATIONS MATTER FOR GIRLS AND BOYS?

How do motivations matter for students' short- and longer-term outcomes at school and beyond? Do gendered motivations translate into gendered outcomes? And, could the same motivations matter differently for girls versus boys? Again, much prior research has focused on how motivations explain gender differences in mathematics intentions and enrollments, because women are persistently underrepresented in mathematics and science courses and careers in Australia and other Western countries (Jacobs & Simpkins, 2005; Watt & Eccles, 2008). The size of this gap has declined substantially over recent years in the U.S. (Updegraff, Eccles, Barber, & O'Brien, 1996), likely due to reduced opportunity for girls to drop out of mathematics classes early in high school now that most school systems require a greater number of mathematics courses (Snyder & Hoffman, 2001).

This raises the question of whether other countries should consider keeping girls in the mathematics pipeline longer. Gender differences in mathematics participation seem to emerge at the very first point where students become able to choose which level of mathematics to undertake, across studies in Australia (Watt et al., 2006) and Germany (Nagy et al., 2008). Different high school course selection structures across these cultural settings provide adolescents with different degrees of opportunity to choose the extent of their involvement in higher-order and more complex mathematics. When presented with the opportunity, girls, relative to boys, begin to opt out (Nagy et al., 2008).

The extent to which students perceive the option of a real choice appears to activate values in their decision making, suggested by findings of a comparative study of middle-class samples from Sydney, Australia; Ontario, Canada; and Michigan, U.S. (Watt et al., 2012). Because of the structural differences in high school course selections and university admissions requirements, which allowed varying degrees of freedom for students to choose their mathematics courses, students in the different settings engaged in different motivational processes to make their enrollment decisions. Intrinsic value played a unique role for Australian students' senior year mathematics course choices, who had most choice in terms of selecting high school mathematics classes. There were no direct effects of intrinsic value on course choice in either the U.S. or Canadian samples. In contrast, direct effects of ability-related beliefs were identified in only the North American samples, likely related to a cultural emphasis on test regimes that focuses attention on ability rather than interest. These findings clearly emphasize a need for studies from other cultural contexts to identify motivational constructs that are dependent on features of different school systems and gender roles, in order to discover how and why structural curricular changes may bring about changes in school-related values.

Despite more than 30 years of concentrated research and policy interventions, women are both less likely to choose mathematical careers and more likely to leave if they do enter them (AAUW, 1993, 1998; NCES, 1997; NSF, 1999). Because mathematics is still considered a masculine domain (Hyde, Fennema, Ryan, Frost, & Hopp, 1990), we should worry that gendered expectancies and values translate into different patterns of mathematical participation for boys and girls. Ability-related beliefs and values predict advanced mathematics participation over and above achievement background, for enrollment intentions (Atwater, Wiggins, & Gardner, 1995; Crombie et al., 2005; Ethington, 1991) as well as subsequent actual enrollments (Simpkins et al., 2012; Updegraff et al., 1996; Watt et al., 2012). Values for mathematics also predict adolescents' science enrollment intentions (Atwater, Wiggins, & Gardner, 1995; Crombie et al., 2005; Ethington, 1991) and pursuit of a science career in adulthood (Farmer et al., 1999).

In the female gender-stereotyped domain of English/Language Arts, self-concept predicted leisure time reading for U.S. elementary schoolchildren (Baker & Wigfield, 1999; Guthrie & Wigfield, 2000; Wigfield & Guthrie, 1997) and high school adolescents (Durik, Vida, & Eccles, 2006), as well as high school language course enrollments (Durik, Vida, & Eccles, 2006). During secondary school in Australia (Watt, 2008), English intrinsic value was the key predictor of English enrollments in senior high school (similar to mathematics and consistent with EVT). English ability-related beliefs did not predict high school English course enrollments, and gender still continued to significantly predict English enrollments when motivational variables were modeled. It may be less important to worry about boys' lower participation in senior high English courses, since these did not subsequently determine the English-relatedness of their aspired careers (Watt, 2008). If we were concerned with boys' lower English course participation, however, it is boys' lower liking for and interest in English that would be most useful to address.

There have been fewer studies of gender differences in other subjects, although the centrality of expectancies and values has also been established in studies of sport and music. Self-concept and value for sport predicted sports participation (Sabiston & Crocker, 2008; Simpkins et al., 2012). Self-concept for music predicted participation in and outside of school (Austin, 1990; Klinedinst, 1991; Simpkins et al., 2012), and music value predicted time spent practising (McPherson & McCormick, 1999; O'Neill, 1999; Simpkins et al., 2012). Taken together, not only do motivations matter for girls' and boys' in-school experiences such as mathematics and English/Language Arts but for other domains of activity (sport and music) and longer-term career choices. Whether gendered motivations and motivational processes operate similarly across diverse achievement domains at school remains a relatively open question.

MOTIVATIONS FOR WORK AND CAREER

Gender differences in mathematical and scientific careers continue to fuel the concern of researchers who share an interest in gender equity. The concentration of men in masculine-typed careers has caused less consternation than has the concentration of women in female-typed careers, probably because the latter tend to be lower in status and salaries. Many have argued that girls prematurely restrict their educational and career options by discontinuing their mathematical training in high school or soon after (Bridgeman & Wendler, 1991; Lips, 1992), having important ramifications for women's well-being from both economic and psychological perspectives. First, gender differences in earning potential are important because women are more likely than men to be single, widowed, or single heads of households, needing to support themselves and other dependents financially without assistance from a partner or significant other (Meece, 2006). Second, women (and men) need to develop and deploy their talents and abilities to achieve their career goals, which substantially impacts their life satisfaction and general psychological well-being (Eccles, 1987; Meece, 2006).

STEM-Related Fields

In addition to mean-level gender differences, it is important to consider whether different gendered motivational processes are related to girls' versus boys' STEM-related career plans. In a comparative analysis of samples from Australia, Canada, and the U.S. (Watt et al., 2012), importance value predicted mathematical career plans only for girls. Although girls and boys perceived mathematics as equally useful and important, importance value played a very different role for girls and boys in their subsequent occupational choices, being a more salient concern for girls (Watt et al., 2012). Thus, as well as mathematics-related interests and perceived abilities, it is important that girls perceive mathematics as useful and important for them to aspire to related careers (Watt et al., 2012). It seems it may be more important to guard against girls' declining importance values than that of boys. Eccles and her colleagues have previously demonstrated that girls are engaged by tasks they regard as socially meaningful and important (e.g., Eccles & Vida, 2003). Mathematics is often taught in skills-based, abstract, and decontextualized ways and is therefore less likely to capture girls' interest and the value they place on it. Among the middle-class demographic, parents of girls have been reported to emphasize being happy and well-adjusted as primary goals, in contrast to being successful for boys (Willis, 1989), which may also help explain the stronger role of values for girls' career choice.

A pipeline metaphor has been frequently invoked to describe the progressive loss of girls and women from the fields of mathematics/science, which can be similarly applied to the loss of boys and men from female-typed domains such as humanities/creative arts or toward the helping and caring professions. The pipeline view has meant that researchers have tended to view limited career options as a result of limited participation, particularly in mathematics courses. In contrast, Armstrong and Price (1982) raised the suggestion that causality may be operating in the *reverse* direction. Rather than limited post-school options being a result of limited mathematical participation (or participation in other learning domains), the reverse may be true. Girls may look ahead to the end of the pipeline and be either put off, or encouraged, by what they see. This implies a dynamic mutually reinforcing relationship between, on the one hand, students' engagement in particular learning domains, which progressively filters them along a pipeline toward particular pathways of work and career and out of others, and, on the other hand, their perceptions of particular workplace cultures and opportunities shape their choice of relevant learning domains with which to engage.

Indeed, girls report opting out of mathematics and science at school because they want to be involved in helping professions, which do not require a mastery of those subjects (Eccles, Barber, & Jozefowicz, 1998), or because they perceive a mismatch between mathematics/science-intensive careers and planned family obligations (Frome et al., 2008). The under-representation of women (or over-representation of men) in STEM careers, in turn, leads them to reflect the values of the male majority. This is most noticeable with respect to the ways in which such careers accommodate—or fail to accommodate—the familial obligations women often carry, which affect girls' and women's aspirations toward those careers in the first place, stunt their development and progression should they enter, and deter them from persisting. Because women who hold mathematics/science-intensive jobs have often had to make personal and family sacrifices (Sonnert, 1995), girls frequently do not have women role models who can demonstrate how to balance career and family life (Blickenstaff, 2005).

Prestige Careers

The persistent gender imbalance in choices for mathematics and English participation appears extraordinarily robust across contexts and time and remains a social *phenomenon*, regardless of whether we consider it a social *problem*. Shapka, Domene, and Keating (2008) contend that the *prestige* of men's and women's occupations is the more important dimension to consider, rather than the *type* of occupation. Yet, these two dimensions of career were found to moderately correlate among samples from Australia, Canada, and the U.S. (Watt et al., 2012). Thus, mathematics-related careers were more prestigious—something that has often been assumed but not operationalized or directly tested. In addition, when aspired career dimensions of prestige and mathematics relatedness were parsed, mathematical motivations also impacted aspired career prestige, via both planned highest level of education and mathematical career aspirations (Watt et al., 2012). Given the importance of mathematical motivations for mathematics-related and prestigious career plans, it is concerning that they *decline* for boys and girls throughout adolescence and that girls maintain substantially lower interests and perceived abilities than boys throughout secondary schooling, despite equivalent measured abilities over the same period.

Gender Differences in Career Goals

A question commonly posed in everyday life is whether girls actually *want* high-salary or high-status careers. Where is the problem, if girls and boys are inclined on the basis of different ability beliefs and values toward different types of education and career pathways? Should similar participation of males and females at school and in the workforce in gender-stereotyped domains be our goal? In order to directly examine girls' and boys' career motivations, we developed the theoretically comprehensive and psychometrically validated Motivations for Career Choice scale (MCC; Watt & Richardson, 2006) to meet the need for an explicit, theoretically based measure of career motivations. The MCC is an extension and generalization of the FIT-Choice scale (Factors Influencing Teaching Choice; www.fitchoice.org), grounded in EVT and developed to explain why people choose teaching as a career (Watt & Richardson, 2007). In brief, the MCC includes sets of factors that relate to social influences, prior experiences, perceived task demands and returns, interpersonal working environment, self-perceptions of abilities, and different kinds of values (intrinsic, social utility, and personal utility values).

Analyses from my contemporary STEPS grade 10 sample (Watt, 2014) revealed gender differences on 7 of the 17 career motivations assessed by the MCC. The most important motivators for both girls and boys were interest, ability, and salary; least important were wanting an easy job, social influences, and the desire to work with youth. There were no gender differences for career motivations related to own abilities, cognitive challenge, prior experiences, salary, status, family flexibility, autonomy, teamwork, portability, or secure progression prospects. This clearly signals that girls do not *prefer* lower-salary or lower-status careers. Boys were significantly more motivated than girls by social influences (e.g., "It is important to me to have a career that . . . is a career my family think I should pursue"), to pursue an expert career (e.g., ". . . involves high levels of expert knowledge"), and for an easy job (e.g., ". . . requires little effort"; although easy job was still rated low for boys). Girls were more motivated than boys by their interests (although still the highest-rated motivation by boys), to make a social contribution, enhance social equity, and work with youth. These differences appear consistent with previous findings that girls and women are more interested in "Social" occupations that allow them to socially contribute and help others (Fouad, 1999; Su, Rounds, & Armstrong, 2009).

Barriers to Career Choice

We do not know much about how individuals derive the set of career options from which they select or what becomes part of an individual's perceived career options. Reasons could include that individuals do not have knowledge about certain careers and therefore cannot consider them, that they hold inaccurate perceptions about what those careers entail and discard them for erroneous reasons, that they misjudge or underestimate their own relevant abilities, or that they perceive a misfit with their own gender or other social role schema (Eccles, 2005). For mathematics- and science-related careers in particular, individuals frequently have poor knowledge about the range of careers available, what they entail, and stereotypes about the types of people who pursue those occupations (NSF, 2010).

The field of occupational choice has focused on "choice" outcomes, although many individuals either do not have this luxury due to financial or social constraints and obligations, or they do not make their "choices" with awareness or volition. Gender is not the only relevant affordance or barrier to choice; the intersections of gender with social class, ethnicity, and other social categories need to be considered. Career "choice" presupposes the availability of alternatives as well as the individual freedom to choose from among them. Such an assumption in relation to occupational choice has been regarded as naïve or even misguided by Özbilgin and his colleagues (Özbilgin, Küskü, & Erdoğmuş, 2005), who reference labor market rigidities of supply and demand, persistent structural and institutionalized forms of discrimination and segregation, and path dependence by prior education and experience.

Informal "barriers" to participation in different kinds of careers also lie in patterns of participation and choice across multiple domains, as individuals anticipate "contingent futures" in which occupational pursuits may be compromised by other commitments (e.g., family obligations) (Maines, 1985). In examining adolescents' career choices, it is critical to consider the multiple domains (e.g., career, family, competing interests) of relevance in individuals' lives in order to determine how career decisions are made relative to other valued life goals. Theoretical developments need to take into account the degrees of freedom and awareness within which different individuals operate and in the context of other life commitments and goals. By and large, there has been less attention to social/contextual support and barrier systems, and a concentration on internal psychological variables (Lent, 2001). Sensitive, sound, robust theories and measurements are needed at the level of contextual effects to determine how they play into occupational outcomes (Roeser, 2006).

SCHOOL ENVIRONMENT INFLUENCES

Contextual and social forces clearly shape children's and adolescents' motivations; school and class climate have been identified as especially important (Fullarton, 2002). Gender effect sizes are smaller than class/teacher effects (Rowe & Rowe, 2002), suggesting that much can be done to nurture students' perceived abilities and values, although the bulk of variation resides at the individual student level (Spearman & Watt, 2013). In this section I discuss influences of peers, classroom environments, teachers, and parents. Although research on these topics has not always reported gender effects, I suggest ways in which this literature could be expanded to incorporate gender-related questions into future research designs.

Peers

The peer group acts as an important reference for students' socialization of leisure activities, subject enrollments, and career intentions. Peer values reflect, reinforce, and shape beliefs and behaviors of group members (Leder, 1992). Students who contravene norms are disapproved, which has been found to reduce or even prohibit gender-atypical behavior; similarly, gender-typical praised behaviors are strengthened more than gender-atypical behaviors (Lamb, Easterbrooks, & Holden, 1980). Because mathematics is still considered a masculine domain (Hyde, Fennema, Ryan, Frost, & Hopp, 1990), this should discourage girls' enrollments into advanced levels and related careers.

Classroom Environments

The motivational climate of the classroom has been extensively studied by AGT researchers, who discuss classroom-level mastery versus performance-goal structures. In a mastery environment, the emphasis is on improvement, understanding, and self-development; in a performance environment, the classroom is characterized by competition, an emphasis on grades, and outperforming others. Mastery environments promote students' self-efficacy in mathematics (Friedel, Cortina, Turner, & Midgley, 2010; Wolters, 2004), their success expectancies, task values, and mathematical career intentions (Lazarides & Watt, 2015), and reduce maladaptive self-handicapping behaviors and avoidance of help seeking (Turner et al., 2002). Importantly, there is large variation in students' perceptions of the same classroom environment (Spearman & Watt, 2013; Wolters, 2004), pointing to the importance of moderating factors including gender, which frame and filter students' interpretations of their learning experiences. It is also concerning that students report gender-stereotyped teacher ability expectations, particularly in mathematics and science (e.g., Dickhauser & Meyer, 2006; Martin & Marsh, 2005; Wang, 2012).

Negative changes have been well documented for a range of constructs post-transition to secondary school, such as self-esteem (Seidman, Allen, Aber, Mitchell, & Feinman, 1994), self-concept of ability (Wigfield et al., 1991), perceptions of competence (Anderman & Midgley, 1997), and liking for school subjects (Wigfield et al., 1991). Researchers have shown that such motivational declines are often related to differences in the classroom environment pre- and post-transition, attributed to a lack of "person-environment fit" (Eccles & Midgley, 1989, 1990), especially during secondary school.

Teachers

In her program of research examining achievement goals for teachers, Butler (2007, 2012, 2014) found that teachers who hold *relational* goals, which involve striving to create caring relationships with their students, provide greater socioemotional support to their students and more cognitively stimulating instruction. Students develop value for and pursue those academic and social goals conveyed by their teachers, when their interactions and relationships are emotionally supportive and nurturing and facilitative of achieving those goals through providing help, advice, and instruction (Wentzel, 2009). Deci and Ryan (2010) argue, in their self-determination theory (SDT), that relatedness is a necessary base from which students can flourish. Indeed, in an Australian study of seventh- and eighth-grade girls (Spearman & Watt, 2013), perceived teacher relatedness affected both level of and change in students' science interest over two school terms. Although teachers tended to report greater relatedness than their students in that study, discrepant judgments could be used in a constructive manner, by providing teachers with the difference results and strategies and action plans to improve (Sinclair & Fraser, 2002).

An interesting angle for research in this vein could be to explore whether teacher relatedness (and other influential behaviors) could be more important for girls studying male-typed subjects such as mathematics and more important to boys studying female-typed subjects such as English. The quality of teacher-student relationships in mathematics was compared for girls and boys in an Australian study (Martin & Marsh, 2005), which identified more positive relationships (e.g., "I get along well with my teacher") reported by girls taught by women versus men, whereas there was no difference for boys taught by women or men. This may suggest that relatedness can be fostered more for girls who have same-gender teachers in male-typed domains, where women teachers additionally act as role models.

Parents

Although not directly in the school setting, parent influences affect students' achievement motivations. Their role is highlighted in the Parent Socialization Model component of EVT. Eccles and her colleagues have found that parents' gender-stereotyped beliefs about mathematics affect perceptions of their child's mathematical ability, which predict students' own gendered perceptions of ability (Eccles, Jacobs, & Harold, 1990;

Jacobs & Eccles, 1992) and thus their enrollment and career choices. Although reciprocally related, parents' influences on their children accumulate over time and outweigh the reverse relationship (Eccles, Jacobs, Harold, Yoon, Arbreton, & Freedman-Doan, 1993), even into adulthood (Chhin, Bleeker, & Jacobs, 2008).

Parents constitute an underutilized resource for increasing girls' and boys' mathematics and science motivations and participation. To illustrate, Harackiewicz and her colleagues (2012) conducted an intervention targeting parents' importance value for mathematics and science to determine whether this would affect their adolescent children's high school enrollments. The intervention involved mailed brochures and a website highlighting the usefulness of mathematics and science. Students whose parents were in the experimental group took nearly an extra semester of mathematics and science through senior high school. The intervention was most effective for high-achieving daughters and low-achieving sons, ineffective for high-achieving sons, and trended to a negative effect for low-achieving daughters (Rozek et al., 2015). The researchers interpreted the latter effect to low-achieving girls not considering careers in mathematics and science and becoming drawn to traditionally feminine careers, especially when parents shared their beliefs and discouraged their daughters from STEM careers.

CONCLUSIONS AND OUTLOOK

Is it a problem if girls and boys develop different interests and ability beliefs and choose different pursuits? I believe the answer is yes, for reasons educed from the findings discussed through this chapter. First, girls' lower self-concepts (or boys' inflated self-concepts) translate into patterns of gendered participation that advantage boys' achievement prospects, despite no corresponding gender differences in achievement. Second, girls' lower interest in mathematics and certain sciences coincides with heightened experiences of psychological cost and anxiety. Third, ability-related beliefs and values in mathematics affect nonmathematical outcomes of societal concern, such as aspired level of education and career prestige. Fourth, mathematics-related careers have been empirically demonstrated to associate with career prestige, evidencing mathematics-related career fields as a gateway of concern to researchers interested in social gender equity. Fifth, it seems demonstrably not the case that girls and women prefer lower-salary or -status careers than boys, thus opting out of advanced mathematics harms their own career goals.

Should equal gender participation be our goal, and for all learning domains? I do not think so, but when girls' mathematics participation is reduced for negative reasons such as anxiety and lower self-concept, and when those participation choices will adversely impact their aspired future careers, we need to think carefully about why girls come to hold less positive mathematics motivations than boys despite same achievements. It is also important to devise ways to raise awareness about mathematics as a critical filter that has significant consequences for the individual in the longer term and for societies that rely on mathematics and the sciences for economic development and innovation. Adolescents often have quite inaccurate ideas of which careers require developed mathematical skills. Therefore, detailed information would be likely to promote girls' interest in mathematics when their preferred careers involve it. If this information could be conveyed by women who are passionate about their work and capable of maintaining a balance between family and work, girls would have positive role models as examples. Countries that involve higher female science participation in post-secondary education and the workforce have been found to reduce gender stereotyping of science, whereas strong gender-science stereotypes exist where men dominate science fields (Miller, Eagly, & Linn, 2014).

Because interests and ability-related beliefs exert important influences on the extent of boys' and girls' later mathematical participation, girls' lower intrinsic value and ability self-perceptions should be of particular concern for future studies and intervention efforts. Why do girls find mathematics less interesting than boys do and have less liking for it? We also need to more closely examine the bases for boys' and girls' perceptions of their mathematical talents and expectations for success. Such differences are evident even among very young boys and girls (Jacobs et al., 2002), pointing to the crucial role of family and culture. We need studies to focus on exactly when young boys' and girls' intrinsic values and ability beliefs begin to diverge, so that intervention efforts can be concentrated at that point.

Key factors that have previously been found to influence task interest include personal relevance, familiarity, novelty, activity level, and comprehensibility (Hidi & Baird, 1986). What we need to be asking as educators is whether these factors are equally fulfilled for both boys and girls in mathematics classrooms. Eccles and her colleagues have demonstrated that girls are engaged by activities that they perceive to be socially meaningful and important (2003), and we have seen that mathematics importance value impacted girls' career choices more than that of boys. Making explicit connections between mathematics and its social uses and purposes may help to heighten girls' interest and the importance they attach to it.

Many of the studies have been conducted with relatively homogeneous samples in terms of ethnic group and socioeconomic status. Therefore, a priority for future research should be to investigate gendered trajectories in the contexts of diverse ethnic and socioeconomic groups from different country settings. It is possible that gender differences and developmental declines may be more pronounced in other groups. The gender intensification hypothesis, which proposes that gender influences accumulate to amplify gender differences over time, should not be ruled out without testing across a broader range of contexts. Because cultural socialization influences the values students develop (Wigfield, Tonks, & Eccles, 2004) and which processes shape their career intentions (Watt et al., 2012), more comparative studies in more diverse settings are needed to advance our understanding of those choice processes.

There is a great need for studies that incorporate multiple domains of functioning within the same participants. If individuals make their career choices *relative* to other career options and life goals (Eccles, 2005), within-person comparisons *across* domains become far more important to understanding choices than group-level analyses *within* particular domains. How do girls and boys weigh competing career goals with other valued life goals? Person-centered forms of analysis have rarely been adopted in this field to analyze how career choices are made within the landscape of competing options and costs. One study found that mathematically competent girls are more likely than mathematically competent boys to have multiple talents and that these girls' intention to study advanced mathematics related to their conception of the range of their abilities, rather than their perception of mathematical ability (Hollinger, 1985).

School is a particularly critical context, since it permits the greatest access for researchers to be able to ask students about their decisions and perceptions before they self-select out of further studies in general or specific subject areas in particular. The design of future studies would fruitfully include multiple measures across time to detect the nuances of motivational developments and multiple informants to assess the accuracy of students' perceptions when designing educational interventions. For example, if students perceive teachers' beliefs accurately, interventions would target teachers' attitudes; if not, students' interpretations would be the focus. Gender comparisons need to take into account (a) teacher gender; (b) an expanded range of subject domains beyond mathematics, science, and English/Language Arts; (c) coeducational/single-sex and other types of schools; and (d) across developmental stages and different country and cultural systems. Further investigation of the role of gender as a moderator will allow identification of differential effects particular to boys or girls in specific kinds of contexts. In this endeavor, outcome variables need to go beyond choice intentions; much further work is needed to find out how motivations at school predict subsequent actual educational and occupational outcomes in later adulthood.

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