Expectancy-Value-Cost Model of Motivation

Chapter · January 2014

DOI: 10.1016/B978-0-08-097086-8.26099-6

2 authors:

Kenneth E. Barron
James Madison University
68 PUBLICATIONS **8,676** CITATIONS

SEE PROFILE

Chris Hulleman
University of Virginia
48 PUBLICATIONS **2,293** CITATIONS

SEE PROFILE

Title: Expectancy-Value-Cost Model of Motivation

Authors:
Kenneth E. Barron
Chris S. Hulleman

Affiliation/Contact Info:
Dr. Kenneth E. Barron
Professor of Psychology
James Madison University
Department of Psychology
91 East Grace Street - MSC 7704
Harrisonburg, VA 22807
(540) 568-4065
barronke@jmu.edu

Dr. Chris S. Hulleman
Research Associate Professor
Curry School of Education and
Center for the Advanced Study of Teaching and Learning
University of Virginia
350 Old Ivy Way, Suite 300
Charlottesville, VA 22903
(434) 924-6998
chris.hulleman@virginia.edu

Abstract
Expectancy-Value models recognize the important role of two components in promoting overall motivation: having an *expectancy* of being successful in a task and having a *value* for engaging in the task. In the current chapter, we highlight the additional role that the *cost* of engaging in an activity plays in influencing motivation, and propose a revised Expectancy-Value-Cost model of motivation. Because cost has been less researched and written about, we pay particular attention to its past, present, and future role in an overall model of motivation.

To Appear In:

J. S. Eccles & K. Salmelo-Aro (Eds.), *International Encyclopedia of Social and Behavioral Sciences, 2nd Edition: Motivational Psychology*. Elsvier.

Expectancy-Value-Cost Model of Motivation

Although numerous theories of motivation have been proposed over the past few decades, Expectancy-Value models of motivation stand out for their ability to synthesize multiple theoretical perspectives, capture the key components of what motivates an individual, and explain a wide range of achievement-related behaviors. In the current chapter, we review the contemporary perspective of Expectancy-Value models used in education.

As its name suggests, Expectancy-Value models have centered on the importance of two components in promoting overall motivation: having an *expectancy* of being successful in a task and having a *value* for engaging in the task. In addition, as indicated by the title of our chapter, we propose promoting a third component into the overall name of the model to highlight the additional role that the *cost* of engaging in an activity plays in influencing motivation. Although cost is theorized to be a sub-component in prior Expectancy-Value models, it has been largely ignored in past empirical work (Wigfield & Cambia, 2010). Fortunately, cost has re-emerged with recent research demonstrating its importance in capturing motivational dynamics that complement expectancy and value components.

For example, consider the following three students enrolled in a calculus course. Math is a challenging subject for Rory, but by putting in extra effort and adopting the appropriate study strategies he has been able to perform well in prior coursework. However, he finally met his match with calculus. Even with additional effort, he is unable to understand the material. As a result, he lacks confidence that he will do well, and his motivation for calculus has decreased. In contrast, math is an easy subject for Jeff. He's always scored at the top of his class and continues to do well in calculus. But this year, his motivation also has substantially decreased. Jeff struggles to see the utility of learning calculus and how he'll use it in the future. Finally, there is

Jessica, who excels in math and finds it to be one of her favorite classes. She's also interested in several science careers that use calculus. However, due to an ambitious academic and extracurricular schedule, she is struggling to find enough time to complete her schoolwork. In particular, her grades in math have suffered. She knows she could do it; she just can't find the time. Now, she too admits her motivation for math is not what it used to be.

Each student faces a unique motivational challenge, reflecting one of the expectancy, value, and cost components. In Rory's case, he lacks the confidence (i.e., expectancy) that he can successfully learn calculus. In Jeff's case, he fails to see a reason or purpose (i.e., value) for learning calculus. However, Jessica's challenge is different. She possesses expectancy and value for math, but there are other barriers in her way (i.e., costs) that are thwarting her from being able to invest the time and energy to be successful. Thus for a comprehensive model of motivation, we propose including all three in a revised Expectancy-Value-Cost model.

Overview of Expectancy-Value Models

For more than 30 years, Eccles and her colleagues (Eccles et al., 1983; Wigfield & Eccles, 2000) have championed a contemporary version of Expectancy-Value models to better understand students' choices, persistence, and performance in education. This work grew out of earlier theoretical models of Expectancy-Value motivation (e.g., Atkinson, 1958; Lewin et al. 1944). Expectancy-Value frameworks also have been developed in other fields, such as Vroom's (1964) Valence-Instrumentality-Expectancy (VIE) model for work settings, but are beyond the scope of our chapter focused on education.

There are three defining features of Eccles et al.'s contemporary version of the Expectancy-Value model: being psychological, developmental, and integrative. First, in terms of being psychological, Expectancy-Value models are rooted in an individual's subjective beliefs.

Eccles et al. (1983) stressed "the model itself is built on the assumption that is not reality itself (i.e., past success or failures) that most directly determines children's expectancies, values, and behaviors but rather the interpretation of that reality" (p.79). In particular, to be optimally motivated, Eccles and her colleagues (Eccles et al., 1998) argued that a student has to answer "yes" to two fundamental questions: "Can I do the task?" and "Do I want to do the task?" The first question reflects a belief in having an expectancy to do a task, and the second reflects a belief in having a value or reason to do the activity. To truly understand a student's academic choices and behaviors, Eccles (2006) stressed the importance of needing to understand what a student is "psychologically thinking."

Second, in terms of being developmental, the model asserts that expectancy and value are shaped over time by individual and contextual factors (see Eccles et al., 1983; 1998 for reviews). These include personal and family demographics (e.g., gender, culture, SES), past experiences of success and failure, an individual's goals and self-concept, and the influence of different socializing agents (e.g., parents, teachers, peers, and schools). Expectancy and value beliefs then are hypothesized to influence the specific academic choices, persistence, and performance of a student in school. For example, Eccles originally developed her version of the Expectancy-Value model in the late 1970s and early 1980s to understand why girls were less likely to persist in taking higher-level math courses, even though they performed similarly to boys in early math courses. The bulk of research supporting this model has focused on large scale, correlational studies where students self-report their expectancies and values and then are tracked over time to investigate achievement related outcomes. Although expectancies and values are positively correlated with a wide range of adaptive achievement outcomes, a unique pattern emerges when both are tested simultaneously. Expectancy is more predictive of performance outcomes, and

value is more predictive of continued interest and future course taking outcomes (Eccles et al., 1983; Wigfield & Eccles, 2000). Despite the clear associations between expectancy and value and important educational outcomes, the growing body of developmental work also reveals an overall negative picture of student motivation. Students' expectancies and values typically decline as they progress through school (Jacobs et al., 2002).

Third, in terms of being integrative, the Eccles et al. model synthesizes multiple perspectives. In her earliest writing (see Parsons, 1980), Eccles observed how the adoption of different theoretical perspectives led researchers to focus on distinct subsets of the possible factors affecting achievement motivation with no clear way to link or integrate discrepant findings. Thus, she set out to develop a comprehensive motivational framework that integrated different perspectives to better explain students' academic choices, persistence, and performance. She also emphasized the importance of identifying motivational factors that were modifiable, which in turn could be used to design interventions to enhance student motivation. This led her to an Expectancy-Value framework and the components of expectancy, value, and cost, which we elaborate on in separate sections below.

The Expectancy Component

As noted above, the question "Can I do the task?" parsimoniously captures the essence of the expectancy component (Eccles et al., 1998). When students believe that they can do something, they are more likely to engage in that behavior. Initially, Eccles and her colleagues argued that expectancy beliefs were multifaceted and that there was merit to distinguish between two types of expectancies: *ability beliefs* that comprised someone's current/immediate beliefs about being able to complete a task and *expectancy beliefs* that reflect being able to do the task in the future. However, even though this clear, theoretical distinction is possible, empirical studies

of these two sub-components reveal that they are highly correlated and "empirically indistinguishable" (Eccles & Wigfield, 1995). As a result, most investigations collapse measures of ability and expectancy beliefs into a general expectancy scale. Although ability/expectancy beliefs fail to separate *within* a specific academic or nonacademic domain, students do hold different expectancy beliefs *across* different subjects in school (e.g., that they are better in math than English).

From the outset, Eccles et al. (1983) highlighted the close connection between expectancy and other constructs linked to students' beliefs about being able to complete a task, such as self-concept of ability, task difficulty, locus of control, and attributions. In subsequent writing, Eccles and Wigfield (1995; 2002) highlighted how expectancy was related to other theoretical perspectives such as Self-Efficacy Theory (Bandura, 1986), Self-Worth Theory (Covington, 1992), and Attribution Theory (Weiner, 1979). Similarly, we find it easy to link expectancy to more recently proposed motivational constructs, such as academic mindsets (Dweck, 2006). Thus, the expectancy component of Expectancy-Value models offers an overarching, umbrella construct that can capture and integrate a wide range of theoretical perspectives focused on the importance of believing that one can accomplish a task (see Eccles and Wigfield, 2002; Wigfield & Eccles, 2000 for reviews).

The Value Component

As noted above, the question "Do I want to do the task?" was offered as a parsimonious way to capture the essence of the value component (Eccles et al., 1998). When students hold the belief that they value something, they are more likely to engage in that behavior. Building on the work of earlier value researchers (e.g., Battle, 1966; Crandall et al., 1962; Feather, 1982;

Rokeach, 1980), Eccles and her colleagues proposed many reasons why a task would hold value for an individual.

The first is *intrinsic* or *interest* value, which reflects the inherent enjoyment an individual experiences from engaging in the task for its own sake. The second is *utility* value, which reflects the usefulness of a task in helping achieve other short-term or long-term goals. In some of their work, Eccles and her colleagues labeled this extrinsic utility to emphasize engaging in a task as a means for achieving another end. The third is *attainment* value, which reflects that the task affirms a valued aspect of an individual's identity and meets a need that is important to an individual. In particular, attainment value represented a way for Eccles and her colleagues to capture a wide-array of additional values suggested by other researchers (e.g., Rokeach, 1980), without having to assess each of these additional values separately (e.g., relatedness value, competence value, esteem value, etc.).

In contrast to the first three sub-components of value that reflect positive reasons to want to engage in an activity, Eccles et al. (1983) proposed a fourth value labeled *cost*. Eccles et al. suggested that the overall value of a task can be negatively impacted by the perceived costs associated with performing the task. Initially, three types of cost were hypothesized: the amount of effort needed to be successful in the task, the time lost to engage in other valued activities, and negative psychological states resulting from struggle or failure in the task. The first two types of cost were hypothesized as costs of success (e.g., having to give up time and energy for a task or having to give up doing other valued activities), whereas the third was linked to costs of failure (e.g., embarrassment or anxiety). It was predicted that the choice to want to do an activity would entail a cost/benefit analysis. As the level of cost increases, the overall value of the activity should decrease.

Thus, four different sub-components of value were proposed to influence an individual's overall value of an activity: intrinsic value, utility value, attainment value, and cost. Eccles and Wigfield (1995) wrote "the first three [sub] components are best thought of as attracting characteristics that affect the positive valence of the task… cost, in contrast, is best thought of as those factors… that affect the negative valence of the activity" (p. 216). However, the work of Eccles and her colleagues remains largely silent on how to effectively measure cost or how researchers should weight the positive and negative sub-components of value into an overall measure. Instead, their work concentrated on evaluating the positive sub-components. Empirical work testing the factor structure supports the separation of the three positive types of value for students in fifth through twelfth grade (Eccles & Wigfield, 1995). However, in younger students, positive value beliefs only separate reliably into one or two factors (Eccles et al., 1993; Wigfield & Eccles, 1992).

Finally, like expectancy, the value component in the Eccles et al. model also offers an overarching, umbrella construct that captures and integrates a wide range of theoretical perspectives focused on the importance of wanting to engage in the task (see Eccles & Wigfield, 2002 for a review). These include Self-Determination Theory (Deci & Ryan, 1985), Interest Theories (Hidi & Renninger, 2006), Intrinsic-Extrinsic Motivation Theories (Sansone & Haraciewicz, 2000), Self-Worth Theory (Covington, 1992), and Achievement Goal Theories (Ames, 1992).

The Cost Component

In contrast to the extensive body of work on expectancy and the positively valenced value components, there has been much less empirical work on cost. To honor its theoretical placement in in Eccles et al.'s model, an initial discussion of cost was included above in the section of the

value component. But as promised, we review the past, present, and future role of cost in Expectancy-Value models. Importantly, we consider whether cost is worthy of being promoted from a sub-component of value as in past theorizing of Expectancy-Value models to a major component that complements expectancy and value components. We also will consider whether an additional overarching question (like "Can I do the task? Do I want to do the task?) would be beneficial to propose to parsimoniously capture the role of cost.

Past Work. In terms of its past, we first want to re-consider the theoretical placement of cost in Eccles et al.'s Expectancy-Value model. In their earliest writing, cost was described as an important mediator of value (Eccles et al., 1983). However, in subsequent writing, cost was promoted to one of four sub-components of value (along with intrinsic, utility, and attainment) that would be weighted in a cost/benefit analysis to determine one's overall value. This type of relationship implies that cost is better conceived of as a moderator variable of value instead. In a moderator relationship, the effect of one variable on an outcome depends on knowing the level of another variable. In other words, the overall effect of value on promoting motivation depends on knowing whether or not someone experiences high or low cost. Thus, incorporating cost into our Expectancy-Value models is critical to fully capturing the motivational dynamics of what attracts or detracts us from engaging in an activity.

Beyond influencing value, it is possible to deduce additional connections on how cost negatively affects expectancy from Eccles and her colleagues' writing. This suggests that cost has a more prominent role than previously indicated. For example, Eccles et al. (1983) linked expectancy beliefs to two variables that we believe serve as proxies for two of the three hypothesized dimensions of cost. First, in regards to cost resulting from the amount of effort required for an activity, Eccles et al. discussed task difficulty perceptions as one of two main

contributors to expectancy beliefs, with the other being an individual's ability beliefs in that domain. When developing initial measures, Eccles and colleagues measured different dimensions of task difficulty and ability beliefs suggesting that both would interact to predict an individual's overall expectancy. Ability beliefs were predicted to positively impact expectancy, while task difficulty was predicted to negatively impact expectancy. In particular, one of the task difficulty dimensions assessed the effort required by the activity, which seems clearly related to costs due to the amount of effort required by the activity.

If task difficulty is re-evaluated in this light, past research by Eccles and her colleagues offers evidence how cost may fit into a modified Expectancy-Value-Cost framework. In their most rigorous test of the factor structure of the core components of their model, Eccles and Wigfield (1995) found that their analyses supported a structure of three task values (interest, importance, and utility), one combined ability/expectancy factor, and two task difficulty factors (perceptions of difficulty and perceptions of effort required to do well). Although no explicit measure of cost was included, if we use task difficulty as a proxy for cost (especially items assessing the perceptions of effort required to do well), we have support that cost separates into its own factor rather than loading negatively on either of the other value or expectancy factors. Furthermore, while value and expectancy scales were positively correlated with each other, they were all negatively related to the task difficulty scales. These findings are in line with predictions of how cost should be negatively related to both value and expectancy. Consequently, the work of Eccles and colleagues may not be so silent on offering empirical evidence for the distinction of a unique cost component that is related to both expectancy and value components.

Second, we also found Eccles and her colleagues linking expectancy to costs occurring from negative psychological consequences. While reviewing expectancy beliefs, Eccles et al.

(1983) highlighted a series of studies debating the relationship between expectancy and the negative psychological experience of math anxiety. Fennema and Sherman (1977) argued that math anxiety and expectancy were psychologically equivalent and simply the inverse of each other. In contrast, Meece (1980) argued instead that math anxiety resulted from a combination of low expectancy for success coupled with high psychological cost from a fear of failing. To test these competing ideas, Wigfield and Meece (1988) developed a measure designed to assess affective and cognitive dimensions of math anxiety while being careful to avoid item overlap that would artificially inflate the relationship between anxiety and expectancy. They found that the affective dimension of math anxiety shared moderate to strong negative correlations to expectancy and value, while the cognitive dimension had weak relationships. Moreover, while the affective dimension continued to be more strongly correlated to expectancy than value, it was not as strongly correlated as Fennema and Sherman (1977) suggested. These findings reveal that if math anxiety measures offer a proxy for assessing the negative psychological dimension of cost, we can infer that cost is clearly linked to expectancy.

Furthermore, Wigfield and Meece (1988) included measures of task difficulty, offering an additional test to evaluate how different hypothesized types of costs could be related. The affective anxiety scale was found to share strong, positive correlations with each of the different scales of task difficulty. Interestingly, they suggested that future research should explore the links between math anxiety, performance, and other components of the Expectancy-Value model more fully. They also argued that math anxiety should be considered conceptually distinct from expectancies. In particular, they highlighted the implications that this has for students:

> "Our results show that the anxiety that students report represents more than a lack of confidence in math; rather it also centers on negative affective reactions to math. In regard to intervention efforts to alleviate math anxiety, we would suggest that techniques to build anxious students' confidence in their math ability may not be enough to alleviate

> the strong negative affective reactions to math that they experience. Math anxious students also need training to reduce their fear and dread of math. As has been found in the test anxiety area, intervention efforts focused on both the cognitive and affective components of math anxiety may prove to be the most effective way to reduce its debilitating effects." (p. 214)

Thus, identifying cost as a sub-component of value appears to lack both conceptual and empirical support. Instead, we propose it's time to promote cost to a major component that could be combined and interacted with both expectancy and value components to determine when someone is optimally motivated. Of course, this quickly becomes an empirical question. Although initial attempts were made to include cost from the outset of their work (Parsons, 1980), explicit measures of cost and analyses incorporating cost were not fully developed. Without well-developed and agreed upon measures of cost, we are unable to test models that evaluate the merits of keeping expectancy, value, and cost components separate, and how these three components relate to each other and to student outcomes.

Present Work. Fortunately, interest in studying cost is changing in the present. First, researchers are adopting qualitative approaches that support the inclusion of cost constructs in addition to expectancy and value constructs to more fully capture motivational dynamics. For example, Watkinson et al. (2005) interviewed elementary-aged students to determine the reasons why children chose to participate in or avoid different activities during recess. When discussing reasons that made them avoid participating, children described psychological costs (e.g., being teased) as well as physical costs (e.g., being uncomfortable) in addition to identifying reasons linked to expectancy and value components. Similarly, Xiang et al. (2006) asked children why they liked or disliked participating in particular programs in gym class (e.g., a running unit). Again, a major portion of comments for why students disliked particular programs focused on perceived costs. Finally, Chen and Liu (2009) used qualitative approaches as part of a mixed

method study of student motivation to participate in university physical education classes. They measured expectancy and values quantitatively using modified items from Eccles and Wigfield (1995), but due to the lack of a validated scale for cost, they interviewed students to obtain qualitative data on perceived cost. Students offered numerous cost explanations for choosing to stop taking physical education, such as having a heavy workload and other pressing demands on their time.

In addition to qualitative investigations highlighting the importance of cost components, a number of researchers are beginning to measure cost quantitatively. Chiang et al. (2011) surveyed elementary students' about their expectancy, value, and cost beliefs and their willingness to participate in physical activity. They used existing items by Eccles and her colleagues to measure expectancy and value, but added three new items to assess cost (with one item for each of the three sub-types of cost proposed by Eccles et al., 1983). Factor analyses revealed cost loaded on a separate factor from a combined expectancy/value factor. When predicting levels of physical activity, students reporting higher costs were less likely to be active, whereas students reporting higher expectancy/values were more likely to be active.

Returning to a more traditional academic domain, Luttrell et al. (2010) reported the development of a new assessment inventory to measure interest value, utility value, attainment value, and personal cost for math. The cost items focused on two of the three types of cost proposed by Eccles et al. (1983): the amount of effort required by the activity and negative psychological consequences. Interestingly, many of the cost items were similar to the math anxiety items reported in Wigfield and Meece (1988). Factor analysis supported a four factor solution. Cost was found to be negatively correlated to all three value scales, whereas the three

value scales were positively correlated to each other. In addition, students who took three or more college courses rated math less costly than those who took zero, one, or two courses.

Conley (2012) included two new cost items in a large scale study to determine the most common motivation profiles for math students in middle school. Her new items focused on only one type of cost: the loss of engaging in valued alternatives. Again, cost formed a unique factor and was negatively correlated with expectancy, intrinsic value, utility value, and attainment value. Cluster analyses also revealed that cost played a critical role in discriminating more and less adaptive motivational profiles. Then on a measurement note, Conley offered a warning that totaling value and cost scales into an overall value index could mask important differences in motivational profiles of students. For example, the cluster of students who reported lower interest and lower cost would have the same overall value index as another cluster of students who had higher interest and higher cost, even though their profiles were quite different.

Finally, in a large scale study of both mathematics and English, Trautwein et al. (2012) evaluated items designed to assess cost, expectancy, intrinsic value, utility value, and attainment value. Their cost measure included one item focused on the amount of effort necessary for the class and one item focused on the loss of engaging in valued alternatives. For both math and English, factor analyses revealed that cost and the three value factors supported a four-factor structure. Furthermore, cost was negatively correlated to all three values, and was the most negatively correlated to expectancy. Lastly, analyses once again indicated that students' expectancy, value, and cost beliefs differed by academic domain (e.g., that students perceived different levels of cost for math than English).

In our own research program, we too have been active in re-considering the role of cost in Expectancy-Value frameworks, and how to approach measuring it. We also adopted

qualitative and quantitative approaches to inform our understanding. As part her master's thesis, Flake (2012) conducted a comprehensive literature review of the conceptualization and measurement of cost to determine the core dimensions of cost. Then she followed an in-depth scale development process that included additional qualitative data collection with students. Her goals were to re-evaluate the proposed dimensions found in the literature and to propose a new pool of items to assess each of the dimensions that emerged. A number of major findings resulted that now shape our views about cost.

First, a review of the educational psychology literature consistently revealed three dimensions of cost that Eccles and her colleagues (Eccles et al., 1983) proposed from the outset of their work: (1) the amount of effort required to be successful in the task, (2) the loss of being able to engage in other valued activities, and (3) negative psychological states resulting from struggle or failure in the task. However, review of the psychological literature outside of education (specifically in behavioral economics) suggested the merits of adding another dimension of cost. Having decreased motivation to engage in a task may result not only from the amount of effort required by the activity itself, but also from the amount of effort that an individual has to exert on other activities that he or she is engaged in. As a result, Flake proposed adding two types of effort costs: the amount of effort required by the task itself (i.e., effort-related cost) and the amount of effort required by other tasks (i.e., effort-unrelated cost). Most university faculty who try to pursue their research know these two types of effort costs all too well when they consider how to find enough time to dedicate to research (effort-related costs) when they have teaching and service responsibilities to juggle as well (effort-unrelated costs). Similarly, in our opening example of the three students taking a calculus class, we initially diagnosed Jessica's motivational problem as cost. But now if we extended the diagnosis to a

particular type of cost, the original three dimensions of cost do not directly capture her motivational problem. Instead, it stems from taking on too many high-demanding classes and extra-curricular activities that are thwarting her ability to put more time and energy into calculus (i.e., she is experiencing effort-unrelated cost).

In addition to proposing new dimensions of cost, a second major finding from Flake's (2012) work is how items need to be written to best capture cost. A defining feature of Expectancy-Value models rests in an individual's subjective appraisal of the core components. In her qualitative study, Flake asked students to describe features of their most and least motivating classes in college. Interestingly, students reported effort-related costs in both their most and least motivating classes. However, their appraisals were quite different. In their most motivating class, expending additional effort was perceived positively; but in their least motivating class, it was clearly perceived negatively. This informed how to best approach creating a pool of items to measure cost. For example, above we suggested task difficulty measures from prior research could serve as a proxy for effort-related cost. One possible way to assess task difficulty could be to measure how challenging a course is (e.g., "This class is challenging."). However, challenge can actually increase a student's value because it pushes a student to grow increasing his or her competence. Instead, we recommend writing cost items that capture a negative appraisal from the outset (e.g., "This class is *too* challenging."). To agree that a class is *too* challenging suggests it has surpassed a critical threshold and that it is now overwhelming and is perceived to have cost. Measuring cost objectively as the amount of effort or task difficulty alone is not enough. To be perceived as cost, it must be perceived negatively by the respondent.

Then in terms of quantitative approaches, we are currently involved in a grant project funded by the National Science Foundation to develop a rapid measure of expectancy, value, and

cost that can be easily adapted and used across a wide age range and academic domains. We also are testing the measure to see the utility of measuring expectancy, value, and cost at different levels of specificity. For example, we have assessed expectancy, value, and cost at the level of a specific academic task (e.g., for a science unit on carbon), at the level of a specific class (e.g., biology), and at the level of academic semester (e.g., for your coursework this semester). We have three major preliminary findings to report (Flake et al, 2011; Getty et al., 2013; Lazowski et al., 2012). First, factor analyses strongly support the separation of expectancy, value, and cost components into three different scales. Second, expectancy and value are positively related, but in turn are both negatively related to cost. Third, expectancy, value, and cost provide unique predictive validity on important educational outcomes when tested simultaneously in regression or path models. Expectancy is the strongest, positive predictor of performance outcomes (e.g., test score for a science unit or final grade in an academic class), but is unrelated to interest outcomes (e.g., continued interest in studying that topic or pursuing a career in that area). In contrast, value is the strongest predictor of interest outcomes, but is unrelated to performance outcomes. Cost, however, is a negative predictor of *both* interest and performance outcomes and improves our ability to predict both. We also initiated a longitudinal study to track middle school students' expectancy, value, and cost for their math coursework. Our initial wave of results found small downward trajectories for fifth through seventh grade on expectancy and value, and small upward trajectories for cost. However, large drops in expectancy and value and large increases in cost occur by the time students end eighth grade.

In sum, current qualitative research showcases the value of adding cost into our overall motivation framework, especially to better understand the barriers when individuals are unmotivated. In addition, more researchers are designing and incorporating new measures of cost

in quantitative studies. This work is consistently revealing that cost separates into its own factor and is empirically distinguishable from expectancy and value factors.

The Future. With renewed energy and a growing body of researchers now investigating cost, we expect many advances will occur over the next few years. With this work, a number of key questions will need to be addressed as future research unfolds. First, we need to resolve how cost is conceptualized and measured. For example in our work, we proposed adding at least one additional dimension of cost above and beyond the original theorizing of Eccles et al. (1983), but are there other dimensions worthy of consideration? Furthermore, because multiple dimensions may contribute to cost, researchers need to pay particular attention to how a measure is designed and compared with other research. As evidenced by most of the cost work cited above, researchers assessed only one or two of the potential dimensions in a given study. Also, it is not clear how cost dimensions will function alone or in conjunction with each other. Perhaps the experience of one type of cost could be enough to deter a student from being motivated, so creating measures of multiple dimensions and totaling them into a total score might be misleading and mask important effects.

Second, we need to consider how cost is tested in conjunction with expectancy and value. We propose that it is time to promote cost to a major component of Expectancy-Value models, so that researchers can simultaneously test the independent and joint effects of expectancy, value, and cost together. In other words, cost needs to enter our models in a way that allows a test of both its independent, additive effect as well as its potential moderator effect that can alter how motivated individuals are depending on their level of expectancy and/or value. This presents a major paradigm shift from early theorizing that explicitly suggested that cost was a mediator or moderator that led to an overall value belief. In addition, although much of the existing work on

Expectancy-Value by Eccles and her colleagues had downplayed the interactive or moderating role of expectancy and value, recent methodological developments in modeling interaction terms have emerged to offer more powerful tests, and have found support that the interaction between expectancy and value adds additional variance in explaining outcomes (e.g., see Trautwein et al., 2012). Now it's time to extend these tests to look at interactions involving cost as well.

Final Thoughts

In the current chapter, we have reviewed the current state of Expectancy-Value models in education, and the importance of developing a student's expectancy that he or she can do the task ("Can I do the task?") and a student's value that he or she wants to do the task ("Do I want to do the task?"). But in addition to having students respond yes to both of these questions to be optimally motivated, a student needs to be free of costs in order to demonstrate motivated behavior.

In our revised Expectancy-Value-Cost model, cost is a distinct component, along with expectancy and value, that determines motivated behavior. We argued that cost is multi-dimensional with at least four sub-components: effort related to the task, effort unrelated to the task, loss of valued alternatives, and negative psychological experiences. In addition, the effort and resources required for an activity are costly only when they are perceived to be too much by a student.

Thus, we would like to close with a new third question that captures the importance of being free of costs that can prevent us from being motivated. Specifically, to be optimally motivated, we need to ensure an individual also says yes to the question: "Am I free of barriers preventing me from investing time, energy, and resources into the activity?" As our opening example of students suggests, a student could clearly hold a belief that "Yes, I can do a task" and

"Yes, I value the task", but still remains unmotivated because the student's final answer is "No, I have barriers preventing me from engaging in the task." If we only ask two of these three questions, our models to predict and understand motivation will be limited.

Eccles & Wigfield (1995) highlighted in the article most extensively evaluating the measures of their model that "over time, there has been an evolution in the conceptualization of constructs linked to expectancy for success and task value, as well as a refinement in the components of each construct" (p . 217). We predict continued evolution once again as renewed energy is focused on cost and how the components of expectancy, value, and cost work together to impact motivation.

References

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology*, *84*, 261-271.

Atkinson, J.W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review, 64*, 359–372.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Battle, E. (1966). Motivational determinants of academic task persistence. *Journal of Personality and Social Psychology, 4*, 634-642.

Chen, A., & Liu, X. (2009). Task values, cost, and choice decisions in college physical education. *Journal of Teaching in Physical Education*, *28*, 192-213.

Chiang, E. S., Byrd, S. P., & Molin, A. J. (2011). Children's perceived cost for exercise: Application of an expectancy-value paradigm. *Health Education & Behavior, 38*, 143-149.

Conley, A.M. (2012). Patterns of motivational beliefs: Combining achievement goals and expectancy-value perspectives. *Journal of Educational Psychology*, *1*, 32-47.

Covington, M. V. (1992). *Making the grade: A self-worth perspective on motivation and school reform*. New York: Cambridge University Press.

Crandall, V.C., Katkovsky, W., & Preston, A. (1962). Children's belief in their own control of reinforcement in intellectual-academic achievement situations. *Child Development, 36*, 91-109.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.

Dweck, C. S. (2006). *Mindset*. New York, NY: Random House.

Eccles, J.S. (2006). A motivational perspective on school achievement: Taking responsibility for learning, teaching, and supporting. In R. J. Sternberg, & R. F. Subotnik (Eds), *Optimizing student success in school with the other three Rs: Reasoning, resilience, and responsibility* (pp. 199-224). Greenwich, CT: Information Age Publishing.

Eccles (Parsons), J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75–146). San Francisco, CA: W. H. Freeman.

Eccles, J. S. & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' academic achievement related-beliefs and self-perceptions. *Personality and Social Psychology Bulletin*, *21*, 215-225.

Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). *Motivation*. In N. Eisenberg (Ed.), *Handbook of child psychology*, Vol. 3 (5th ed., pp. 1017–1095). New York: Wiley.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*, 109-132.

Feather, N. T. (1982). Expectancy–value approaches: Present status and future directions. In N. T. Feather (Ed.), *Expectations and actions: Expectancy–value models in psychology* (pp. 395–420). Hillsdale, NJ: Erlbaum.

Fennema, E., & Sherman, J. (1977). Sex-related differences in mathematics achievement, spatial visualization, and affective factors. *American Educational Research Journal*, *14*, 51-71.

Flake, J.K. (2012). Measuring cost: The forgotten component of expectancy-value theory (Unpublished master's thesis). James Madison Univerisity, Harrisonburg, VA.

Flake, J., Barron, K.E., Hulleman, C.S., Grays, M., Lazoswki, R., & Fessler, D. (2011, May). *Evaluating cost: The forgotten component of expectancy-value theory*. Poster presented at the annual meeting of Association for Psychological Sciences, Washington, DC.

Getty, S., Hulleman, C. S., Barron, K. E., Stuhlsatz, A. M. & Marks, J.C. (2013, April). *Factors that affect learning in high school science: Measuring motivation, achievement, and interest in science*. Paper presented at the annual meeting of National Association for Research in Science Teaching, San Juan, Puerto Rico.

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, *41*, 111–127.

Lazowski, R. A., Hulleman, C. S., Barron, K. E., & Getty, S. (2012, September). *Development of an expectancy-value scale for an online science curriculum*. Paper presented at the Motivation Retreat, University of Tubingen, Germany.

Lewin, K., Dembo, T., Festinger, L., & Sears, P. (1944). Level of aspiration. In J. McV. Hunt (Ed.), *Personality and the behavioral disorders* (Vol. 1, pp. 333-378). New York: Ronald Press.

Luttrell, V.R., Callen, B.W., Allen, C.S., Wood, M. ., Deeds, D.G., & Richard, D.C.S. (2010). The mathematics value inventory for general education students: development and initial validation. *Educational and Psychological Measurement*, *70*, 142-160.

Meece, J. (1980). *A theoretical framework for studying students' course selection in mathematics*. Paper presented at the annual meeting of American Educational Research Association, Boston, MA.

Parsons, J. E. (1980) Self-perceptions, task perceptions, and academic choice: Origins and change. Unpublished final technical report to the National Institute of Education, Washington, DC. (ERIC Document Reproduction Service No. ED 186577)

Rokeach, M. (1980). Some unresolved issues in theories of beliefs, attitudes, and values. In M. M. Page (Ed.), *Nebraska symposium on motivation* (pp. 261-304). Lincoln, NE: University of Nebraska Press.

Sansone, C., & Haraciewicz, J.M. (2000). *Intrinsic and extrinsic motivation: The search for optimal motivation and performance*. San Diego, CA: Academic Press.

Trautwein, U., Marsh, H.W., Nagengast, B., Ludtke, O., Nagy, G., & Jonkmann, K. (2012). Probing for the multiplicative term in modern expectancy–value theory: A latent interaction modeling study. *Journal of Educational Psychology, 104*, 763–777.

Vroom, V.H. (1964). *Work and motivation*. New York, NY: Wiley.

Watkinson, E. J., Dwyer, S. A., & Nielsen, A. B. (2005). Children theorize about reasons for recess engagement: Does expectancy-value theory apply? *Adapted Physical Activity Quarterly, 22*, 179-197.

Weiner, B. (1979). A theory of motivation for some classroom experiences. *Journal of Educational Psychology, 71*, 3-25.

Wigfield, A., & Cambria, J., (2010). Students' achievement value, goals orientation, and interest development, and relation to achievement outcomes. *Developmental Review, 30*, 1-35.

Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*, 265–310.

Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology*, *25*, 68-81.

Wigfield, A., & Meece, J. (1988). Math anxiety in elementary and secondary school students. *Journal of Educational Psychology*, *80,* 210-216.

Xiang, P., McBride, R. E., & Bruene, A. (2006). Fourth-grade students' motivational changes in an elementary physical education running program. *Research Quarterly for Exercise and Sport, 77*, 195-207.