Educational Relevance in Adolescence

by

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Dedication

This dissertation is dedicated to all the educators who strive to make school relevant to students' lives and to motivate those of us who have struggled as students to make such connections in our own lives.

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Abstract

For centuries, educational stakeholders around the world have called for relevance in education. William James and John Dewey led philosophers and psychologists to examine the implications of relevance for student learning and motivation. They theorized that relevance was critical for comprehension of new information and for academic engagement. Beyond calls for educators to "make education relevant," Dewey advocated for teachers to help students learn to make their own connections between academic lessons and their concerns or preoccupations, because he believed that such self-regulated relevance appraisal skills were fundamental to personal and social development both within and outside of schools. In recent years, motivation scientists have developed *relevance interventions* that ask students to write short essays in which they connect academic lessons to their lives. Experimental studies have found mixed results showing that these writing tasks can have positive, null, and even negative effects on academic outcomes, such as student achievement and motivation. Such findings have catalyzed efforts to theoretically clarify and empirically test the psychological mechanisms causing discrepant outcomes.

Guided by Pintrich's motivation science framework, this dissertation synthesized research findings and theoretical work from educational psychology and philosophy to build an empirical research program. In two manuscripts, the present dissertation proposed and tested the educational relevance appraisal (ERA) model to help explain mixed intervention effects in expectancy-value theory. According to the ERA model, (a) relevance writing prompts elicit

cognitive appraisal processes through which students form relevance beliefs, and (b) those relevance beliefs directly affect achievement motivation.

The first manuscript, *Educational Relevance in the Motivation Sciences: An Interdisciplinary Synthesis*, contributed to the growing body of theoretical literature exploring the meaning of relevance and its role in promoting the development of motivational beliefs, as defined in expectancy-value theory. Taking guidance from pragmatist philosophers, the synthesis presented in Manuscript 1 aligned current specialized conceptualizations of relevance more closely with widely-held interpretations, so that researchers can respond more directly to common calls for relevance from educational stakeholders, especially students. The prominent hypothesis that relevance is equivalent to task value beliefs was critiqued and shown to be logically inconsistent with common usage of the concept in educational psychology and society. In particular, it was shown that relevance most fundamentally reflects the comprehensibility of relationships between concepts, rather than their motivational implications. 15 recent hypotheses proposing explanations for incongruent relevance intervention effects were then interpreted in terms of the ERA model assumptions.

The second manuscript, *Educational Relevance Appraisals and Their Relations to Motivational Beliefs: Testing a Mediation Model of Relevance Intervention Effects* reported findings from two studies at Freedom High School (pseudonym), a rural-fringe school that predominantly serves academically at-risk students from disadvantaged socioeconomic backgrounds. Both studies used structural equation modeling to analyze high school records and student survey data. The first study tested the ERA model during the last semester of the 2017-2018 academic year. Study 2 sought to replicate findings in support of the ERA model in the first semester of the 2018-2019 academic year. Evidence mostly corroborated ERA model

assumptions; however, key tenets in the motivation sciences were not support. In Study 1, task value beliefs did not predict course grades, and in Study 2, they negatively predicted course grades. Also, the hypothesis that students from disadvantaged socioeconomic backgrounds would experience less relevance and motivation in school was not supported.

Chapter 1 **Introduction**

Stakeholders in education have varying opinions about the meaning of and need for relevance in education, many of which inform educational policies and instructional practices around the world (Albrecht & Karabenick, 2019; International Bureau of Education, 2012; International Center for Leadership in Education, 2011; Kaiser et al., 2018). The widespread enthusiasm has inspired research efforts in the social sciences, which are critical for testing claims proposed about the role of relevance for students' learning and motivation. *Relevance intervention* studies grounded in expectancy-value theory posit that intervening on students' relevance perceptions should improve subsequent motivation and achievement (Albrecht & Karabenick, 2018). Findings from such studies have been mixed (Albrecht & Karabenick, 2017), suggesting the need for increased research attention to clarify the psychological processes that produce or undermine the intended intervention effects. Given its theorized central role in such interventions, research that clarifies the meaning of relevance and its role in developing task value beliefs is necessary (Rosenzweig & Wigfield, 2016), particularly in underserved groups, such as adolescents at-risk for academic underachievement and high school dropout.

In two manuscripts, this dissertation sought to inform current intervention efforts in social and educational psychology to promote academic motivation and achievement (Albrecht & Karabenick, 2018a; Harackiewicz & Priniski, 2018; Karabenick & Urdan, 2014; Lazowski & Hulleman, 2015; Rosenzweig & Wigfield, 2016; Yeager & Walton, 2011). The research was guided by Pintrich's (2003) framework, which states that a strong motivation science is (a) grounded in empirical research and (b) draws upon theoretical and methodological strengths of

multiple disciplines to (c) clarify and investigate use-inspired basic research questions. Both manuscripts were grounded in empirical motivation research. Manuscript 1 (M1) drew insights from philosophy to develop the educational relevance appraisal (ERA) model, which helps explain inconsistent effects of relevance interventions. Manuscript 2 (M2) empirically tested the ERA model in a sample of rural high school students from diverse backgrounds, in terms of the types of communities they lived in (e.g., rural and urban), socioeconomic status, and race.

Manuscript 1

Educational Relevance in the Motivation Sciences: An Interdisciplinary Synthesis sought to contribute to the growing body of literature exploring the meaning of relevance and its place in the motivation sciences, particularly intervention research based in expectancy-value theory. The analysis presented in M1 synthesized conceptualizations of educational relevance proposed in educational psychology and philosophy, aligning them more closely with common lexical definitions. The resultant synthetic conceptualization of educational relevance was used to develop the ERA mediation model, which was then situated within expectancy-value theory. Fifteen recent hypotheses proposing explanations for incongruent relevance intervention effects were then interpreted in terms of the ERA model assumptions. Finally, the discussion considered implications of the ERA model for future intervention research and instructional practice.

Manuscript 2

Educational Relevance Appraisals and Their Relations to Motivational Beliefs: Testing a Mediation Model of Relevance Intervention Effects reports findings from two studies at Freedom High School (pseudonym), a rural-fringe school that predominantly serves academically at-risk students from disadvantaged socioeconomic backgrounds. Both studies used structural equation modeling to analyze high school records and student survey data. The first study tested the ERA

model during the last semester of the 2017-2018 academic year. Study 2 sought to replicate findings in support of the ERA model in the first semester of the 2018-2019 academic year.

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Chapter 2

Educational Relevance in the Motivation Sciences: An Interdisciplinary Synthesis

Abstract

Educational stakeholders have long advocated for relevance in education. Since James and Dewey turned philosophers' and psychologists' attention toward the individual experiences and developmental outcomes of students, discourse on relevance has often focused on its implications for their learning and motivation in school. While James and Dewey were prominent scholars recognized for their authority in both philosophy and psychology, these fields have largely grown apart over the 20th Century; however, many scholars have since called for a reintegration of philosophical perspectives into the motivation sciences. Inspired by such calls, the theoretical work presented herein drew upon philosophical insights and methods to organize and, in several cases, critique current hypotheses explaining the complex and often conflicted effects of relevance interventions on targeted academic outcomes. Based on that work, the interdisciplinary educational relevance appraisal model was proposed to extend and situate the concept of educational relevance within the motivation science lexicon and expectancy-value theory. The major objective was to differentiate between conceptual and motivational relevance to help explain learning and motivational outcomes associated with making education relevant.

There has long been wide consensus that school should be relevant to students lives in order to support optimal learning and motivation (Ausubel & Robinson, 1969; Dewey, 1916; James, 1892). From international organizations to individual students, educational stakeholders advocate for relevance, but the defining characteristics and criteria for establishing it are rarely made explicit. In response to calls from leading organizations, such as the National Research Council (2003) and American Psychological Association (APA; Roberson, 2013), researchers have developed relevance interventions to help students identify connections between academic work and their lives. Experimental studies in labs, K-12 schools, and colleges have found that explaining the relevance of schoolwork for different careers and experiences or even having students generate their own connections can (in some cases) promote and (in other cases) undermine targeted academic outcomes, such as motivation and performance.

Unpredictable findings have prompted efforts to clarify the meaning of relevance and the psychological mechanisms at work in these interventions (Albrecht & Karabenick, 2018a). Rosenzweig and Wigfield (2016) called for researchers to develop theories that clearly define terms and specify psychological processes through which interventions affect motivation and achievement in schools. In response to such calls, the present paper proposed a theoretical model to explain relevance intervention effects. Following motivation science guidelines outlined by Pintrich (2003), the educational relevance appraisal (ERA) model presented herein derives from practical need, empirical research, and interdisciplinary insights to build on motivation theory, particularly expectancy-value theory. Insights are drawn from philosophical work on educational relevance, especially Dewey's writings on cognition, emotion, and motivation.

The present chapter begins with a brief outline of the motivation science framework and calls for interdisciplinary educational psychology research that draws on philosophy for the

development of motivation theory. After that introduction, the prevalence of societal concerns over educational relevance are illustrated, along with common definitions. Illustrative examples are included throughout, such as statements from prominent stakeholders and current students, gathered by the author through dozens of focus groups and interviews during the 2017-2018 school year at a Title I high school (pseudonym: Freedom High School) in the Midwest. The remainder of the chapter explicates a synthetic motivation science perspective on educational relevance through a critique of empirical intervention findings and associated hypotheses.

A Motivation Science Examination of Educational Relevance

Pintrich (2003) believed that educational psychology research must be firmly based in empirical findings from the field and an interdisciplinary approach. He argued that this would usher in an "evolution of motivational science," where diverse ideas and methods coalesce into a deeper, more rigorous understanding of motivational phenomena in educational contexts. Alongside other prominent educational psychologists (Alexander, 2003; Berliner, 1993), Pintrich (2003) noted that philosophy should be especially informative. For instance, Murphy (2003) highlighted three key contributions: (a) historical awareness, (b) intellectual rigor, and (c) aesthetic appreciation. Philosophers (especially pragmatists, such as William James, John Dewey, and Israel Scheffler) have considered many phenomena in educational psychology, elucidating their deeper meanings and significance across historical and cultural contexts (Pajares, 2003).

Consistent with the aims of motivation science, pragmatist philosophers also prioritize consideration of practical, current problems through the analysis of empirical phenomena (Legg & Hookway, 2019). For instance, as APA president, Dewey (1900a) argued that psychologists must advance theory to bridge the "painfully apparent" (p. 11) gap between educational practice

and philosophy. Inspired by the emerging scientific psychology of the late 19th Century, Dewey proposed an empirical and contextual approach to theorizing about and researching education. In particular, Dewey called for studies examining the effects of instructional methods and curricula on student development in actual classroom contexts, as opposed to labs. While his own empirical work in psychology was short-lived (Dewey, 1896), Dewey's prolific writings in philosophy have had a profound influence on American education, ushering in a new paradigm focused on students' experiences in school and their associations with learning and motivation (Berliner, 1993). As illustrated throughout this chapter, Dewey extensively considered the relationships between cognition and motivation, particularly the critical role of students' self-regulated relevance appraisal processes in connecting them.

Philosophers prioritize intellectual rigor, e.g., ensuring that theoretical arguments satisfy stringent formal and informal logical standards (Beaney, 2013), and aesthetic elegance, e.g., clarity, generalizability, and parsimony (Baker, 2016). Logic and conceptual rigor have been less pronounced in psychology, leading to calls for greater work in these areas (Murphy & Alexander, 2000). For example, Machado and Silva (2007) recommended that researchers in psychology employ conceptual analysis to (a) clarify the meaning of concepts, (b) ensure consistency when integrating concepts from different theories, (c) expose limitations and problems in models, (d) identify the structure of arguments, (e) reveal assumptions, and (f) explore alternative explanations. Philosophers have outlined methods for achieving these goals, such as using definition by genus and difference, Venn diagrams, and truth tables to illustrate definitional comparisons and steps in arguments, while identifying (in)formal fallacies (Howard-Snyder, Howard-Snyder, & Wasserman, 2013). The approaches guide the present analysis.

Educational Relevance as an Enduring Societal Concern

Calls to make education relevant abound in the United States and abroad (e.g., Briggs, 2014; Gallup & Strada, 2018; Kelly, 2017), reflecting an age-old philosophical debate about the purposes that education should serve individuals and society (Albrecht & Karabenick, 2019). For example, Aristotle (2007) asked, "What should be the character of this public education...should the useful in life, or should excellence, or should the higher knowledge, be the aim of our training?" (p. 78).[1] Like Aristotle, stakeholders (from policy-makers to students) question the roles that education should serve in their lives and communities, which sociological research has extensively documented (e.g., Ballantine, 2001). Answers are wide-ranging, often contentious, and framed in the language of educational relevance.

There are many highly visible, modern-day characterizations of educational relevance. In his address to the United Nations Educational, Scientific, and Cultural Organization, Gibbons (1998) proclaimed that education is relevant to the degree that it furthers national economic interests. The International Bureau of Education (IBE, 2012) proposed that education is relevant when it serves the needs and interests of developing individuals and communities, such as competency-building, sustainable growth, civic responsibility, and social cohesion. The United States Department of Education (Tanenbaum, 2016) stated that education should be relevant to students when it is interdisciplinary, entails multiple modes of instruction, and suggests solutions to grand challenges facing their communities. Through interviews with national experts and

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1 Aristotle's (2007) answer to his question was that "children should be instructed in useful things – for example, in reading and writings – not only for their usefulness, but also because many other sorts of knowledge are acquired through them…To be always seeking after the useful does not become free and exalted souls" (p. 79).

examinations of policies in countries across the European Union, Kaiser et al. (2018) found that students, graduates, employers, and policy-makers defined relevance in a variety of ways, but typically centered on connecting educational experiences to students' personal development, sustainable employment, and active citizenship. The authors concluded that governments should fund research and develop policy to realize communities' visions of educational relevance.

Students also place a high premium on educational relevance. In focus groups at Freedom High, all students were asked "In your classes, have you ever heard other students ask questions like, 'How is this relevant?'" to which they emphatically and practically unanimously concurred saying, "Yes, especially in math!" Many went on to explain that relevance was critical for supporting their understanding of course content and their motivation to get engaged. Similarly, in a series of interviews, Jewell, Nguyen, Kupar, and Usher (2012) found that high school students expressed a need for research focused on helping them to understand the relevance of what they are taught. Bridgeland, Dilulio, and Morison (2006) found that, in retrospect, adults often attributed their past decisions to drop out of high school to their lack of interest in school, arguing that educators should focus on making courses more relevant. Meyer (2010) found that current students who dropped out of mainstream high schools sought out alternative options that provided relevant training for their career goals and personal interests. Several studies have noted these concerns are also common among university students in a wide variety of academic subjects around the world (e.g., Albrecht & Karabenick, 2015; Kember, Ho, & Hong, 2008).

As the preceding examples illustrate, the drive to define and understand educational relevance is a prominent cross-cultural phenomenon. However, social commentators and philosophers warn against blind endorsement of the "cult of relevance" (Withey, 1975), arguing that such trends frequently distort the standard meaning of relevant, often in efforts to (sup)press

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particular agendas. Diorio (1975) noted that such distortions are based on biased, illogical, and uncommon definitions of educational relevance. For instance, government officials once argued that science, technology, engineering, and mathematics studies were relevant to the extent that they served American interests in winning the Cold War, e.g., advancing weapons development. Such claims equate relevance with value, suggesting that the only experiences that are relevant are those that (a) have tangible effects on (b) desirable outcomes. However, as the following analysis illustrates, these are not necessary criteria for relevance. Clarifying such distinctions between relevance and task value should help explain divergent intervention outcomes.

Defining Relevance

Consistent with the pragmatist philosophy, the ERA model defines relevance beginning with common understandings of the term, which are subsequently enriched with specialized definitions offered by psychologists and philosophers. The definitions proposed herein each serve at least one of the following purposes proposed by logicians Howard-Snyder et al. (2013): (a) instantiate concepts, (b) describe common meanings, (c) address vagaries in existing definitions, (d) situate concepts in theories, or (e) propose novel meanings. Strong definitions should satisfy six conditions: (a) not too broad, (b) not too narrow, (c) avoids ambiguous language, (d) does not include words being defined or close synonyms, (e) focuses on what the term means, rather than what it does not mean, and (f) uses language that will be understood in the context for which the term is being defined.

Common Definitions of Relevance

Merriam-Webster defines relevant (2002) as: "Bearing upon or properly applying to the matter at hand: affording evidence tending to prove or disprove the matters at issue or under discussion." The Oxford English Dictionary defines relevance as a "connection with the subject

or point at issue" and "pertinence to current or important issues, interests, needs, etc." (Relevance, 2009). Verb phrases, such as "bearing upon," "applying to," "connecting with," and "pertaining to," describe significant but unspecified (e.g., non-directional and acausal) relationships. The "point, subject, or matter at hand, at issue, or under discussion" do not refer explicitly to motivational topics or outcomes. For example, the weather is relevant to farmers' decisions regarding when to plant crops, but that doesn't mean that farmers' decisions are viewed as important or interesting to everyone. Synonyms for relevant include apposite, germane, important, meaningful, and significant. While important issues, interests, and needs are motivational issues, they are not defined as anticipated outcomes of relevance (a key criterion for related motivational constructs, as extrapolated below). Thus, it is important to note that relevance, as commonly defined, can represent connections with either personal or impersonal issues.

Students define relevance similarly to the general public. In focus groups and individual interviews, Albrecht (2019) asked a representative sample of Freedom High students to describe the relevance of lessons in randomly assigned classes to five frequent concerns for adolescents: comprehension, everyday experiences, future aspirations, personal interests, and life values (see Table 1.1 for examples of specific concerns among Freedom High students). Students questioned the relevance of aspects of course lessons, such as concepts (e.g., gravity), experiences (e.g., class activities), and academic subjects (e.g., math). They used relatively neutral, conceptual terms to describe the relevance relationship, such as affects, impacts, applies, pertains, relates, connects, intertwines with, revolves around, informs, and has to do with. Some used terms that indicated value (e.g., important and useful), but the particular value that students identified was often described as general, rather than personal. For instance, one student who planned to be a

mechanic said, "Basically all the subjects you'll learn you will need for any job. You'll need all the subjects if you wanna become a teacher, like anything. You just need it." Despite his open-mindedness, that student never connected what he was learning to being a mechanic, but he believed it was highly relevant, nonetheless.

Table 1.1

Examples of Freedom High School Students' Common Concerns

Concerns	Specific examples
Comprehension	Coherence with prior knowledge, other courses or academic subjects, lesson topics, learning goals, focus of discourse
Future education	High school, technical training, 2-year college, university, graduate school
Career aspirations	Undecided, veterinarian, medical, athlete, police, photographer, electrician, manual labor, military
Personal interests	Drawing, photography, cooking, building, Xbox, computer games, board games, basketball, football, racing, track, tennis, hiking, cycling, gardening, sleeping, reading, just doing nothing
Personal values	Be kind and compassionate. Give and expect respect. Be honest and trustworthy. Honor family, friends, and community. Work hard for what you want.
Everyday experiences	Homework, watching TV, hanging out with family and friends, chores, news, shopping, memories

As suggested by these definitions, relevance is widely defined in distinctively conceptual or ideational, as opposed to affective or motivational, terms as a characteristic of logical discourse and inquiry. According to linguists Sperber and Wilson (1995), relevance supports efficient and effective inferences about the meaning of events and messages. Wilson and Sperber

(2003) posit the Cognitive Principle of Relevance, which states that cognition seeks to maximize relevance, defined as the extent to which a cognitive input (such as a sensation, memory, or other stimulus) connects with current background knowledge. Relevance provides novel information that resolves questions or doubts and furthers understanding of issues under consideration. Key to their theory is the Communicative Principle of Relevance, which states that people expect the messages communicated to them to be conceptually relevant, supporting inferences of maximally worthwhile conclusions.

The Motivation Science of Educational Relevance

Pragmatist philosopher Israel Scheffler (1969) advocated for practically significant definitions that clearly indicate what education should be (ir)relevant to, how, and why. Others have added that definitions must also specify to whom education is relevant (e.g., Alexander, 2018; Withey, 1975). Several answers have been proposed for such questions, which are considered in light of empirical research findings and examined through a synthesis of philosophical and psychological perspectives in the following. Before moving on to those questions, clarification is provided regarding what aspect of education should be relevant.

One challenge to making education relevant is knowing what is meant by "education." Education could refer to broad schooling systems (e.g., education in the United States), which is the typical focus at the societal level (Curren, 2007). It could also refer to academic subject-areas, such as math or science, which are frequently the focus of developmental psychologists (e.g., Eccles et al., 1983). At the finest and (paradoxically) most potentially inclusive level of analysis, some suggest that researchers concentrate on the relevance of stimuli encountered in educational contexts (Priniski, Hecht, & Harackiewicz, 2018) or "any other attributes of the environment to which a student perceives an identity-based connection" (Hartwell & Kaplan,

2018, p. 88). Many philosophers (Diorio, 1977; James, 1892; Price, 1973) and educational psychologists (Albrecht, 2019) focus on making course *lessons* relevant, including instructional activities, content, and practices. For instance, Wigfield, Eccles, et al. (2015) claimed that students will be motivated and engaged when course materials and curriculum are perceived as relevant. Consistent with the latter conceptualization, the ERA model concerns the relevance of course lessons, excluding considerations of education (broadly defined) or stimuli, such as the color of classroom walls or a text received from a friend, that do not touch upon academic subject-matter in a particular course.

Empirical Research on Educational Relevance

Motivation research on relevance has been commonly framed in expectancy-value theory (EVT; Eccles et al., 1983; Eccles & Wigfield, 2002). According to EVT, students choose to engage and persist at tasks based on two motivational beliefs: success expectancies and value. *Expectancies for success* are beliefs that one will succeed in a given academic domain, such as mathematics. *Task value* represents the extent to which students believe that engaging in a task will lead to personally desirable outcomes. For instance, a task has *attainment value* when it is viewed as an opportunity to actualize or express central aspects of one's personal or collective identities (Eccles, 2009), *utility value* when it will help achieve current or future goals, and *interest value* when it will elicit positive emotional experiences. A task has *effort cost* when it is expected to require significant time and energy and *psychological cost* when it is believed to

elicit negative emotional responses.[2] Students should engage with academic tasks when they

believe that the tasks will be personally valuable and achievable (Wigfield, Eccles, et al., 2015).

Grounded in EVT, *relevance interventions* aim to promote interest, positive motivational

beliefs, and performance by helping students connect what they do in school to their lives

(Albrecht & Karabenick, 2018a). A growing number of experimental studies report that directly

communicating relevance to students (Durik & Harackiewicz, 2007) or assigning them to write

short essays that "elaborate on the relevance of [the course material] to your life" (Hulleman &

Harackiewicz, 2009) can be effective approaches to facilitate targeted academic outcomes. For

example, experimental studies have found positive motivational effects when students wrote

about relevance in college biology (Canning et al., 2018; Harackiewicz et al., 2015), psychology

(Hulleman, Kosovich, Barron, & Daniel, 2017), and statistics (Acee & Weinstein, 2010), as well

as high school math (Gaspard et al., 2015) and science (Hulleman & Harackiewicz, 2009).

Relevance interventions have also had null and negative effects on targeted academic

outcomes. For instance, Rosenzweig et al. (2018) found that writing about relevance did not

affect academic outcomes in college biology. While several studies have found that writing about

relevance can especially benefit underperforming students' motivation (Harackiewicz & Priniski,

2018), others have found that it has negatively affected such students. Albrecht et al. (under

review) found that writing about relevance negatively affected final course grades in statistics for

students with below-average college GPAs but had no effects when GPAs were average or

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2 For further elaboration of task value components, see Eccles (2005) and Gaspard et al. (2014).

For comprehensive reviews of cost, readers are referred to Flake, Barron, Hulleman, McCoach,

and Welsh (2015) and Wigfield, Rosenzweig, and Eccles (2017).

above-average. Canning, Priniski, & Harackiewicz (2019) found that writing about relevance was harmful for below-average-performing students' motivation but had no effect on academic outcomes for above-average-performing students in biology and psychology courses across six 2-year college campuses. Kosovich and Hulleman (2017) found negative effects on final course grades in a developmental math course at one community college.

Researchers have proposed several hypotheses for why relevance interventions should promote or undermine learning and motivation, which are explicated and critiqued in the following. First, two fundamental hypotheses regarding the nature of relevance and its role in relevance interventions are contrasted.

Distinguishing Relevance from Motivation

The basic premise of relevance interventions is that students will perform better and experience greater motivation in their classes when they perceive their coursework to be relevant; however, there have been and continue to be divergent views on distinctions between relevance and motivational beliefs.

Relevance hypothesis. The *relevance hypothesis* posits that students' relevance beliefs will affect subsequent learning and motivation, an implicit assumption in relevance intervention studies (e.g., Gaspard et al., 2015; Hulleman, Godes, Hendricks, & Harackiewicz, 2010). Making this assumption explicit, the ERA model indicates that interventions elicit cognitive appraisal processes that directly influence relevance beliefs. Relevance beliefs then influence motivational beliefs, which subsequently affect engagement and learning. In other words, relevance beliefs should mediate the effects of intervention treatments on targeted academic outcomes. To test this claim, relevance must be explicitly operationalized and measured separately from motivation.

Researchers have typically tested the relevance hypothesis by examining either the quantity or quality of students' relevance beliefs. For instance, Hulleman et al. (2017) defined relevance broadly as a general connection between ideas: "the presence of a relationship between one topic or idea and another topic or idea, which could include a goal but also includes a broader set of relationships" (p. 2). According to these authors, the key difference between value and relevance is that value is necessarily personal, whereas relevance represents a wider array of relationships. Hulleman et al. assessed the frequency with which students reported making connections between psychology lessons and their lives. They found that students who connected lessons to their lives more often became more interested in psychology over the course of the semester. Using another approach, Hulleman et al. (2010) coded the frequency of personal connections articulated in students' relevance essays but found no correlations with performance or self-reported motivation.

Research by Albrecht and his colleagues have corroborated the relevance hypothesis, using a self-report measure of relevance that assesses students' perceptions of connections between lessons and several of their common concerns. In a large survey study, Albrecht (2013) found that university students' relevance appraisals helped explain task value beliefs. Students who believed lessons (in randomly-assigned university courses) were relevant to their (a) personal interests, (b) career aspirations, and (c) life values reported greater task value. Albrecht (2019) found that high school students valued lessons (in randomly-assigned courses) most when they viewed them as relevant to prior knowledge, future academic and career aspirations, personal interests, and life values. Students' beliefs that lessons related to their prior knowledge indirectly affected achievement through success expectancies, whereas relevance to everyday life

did not help account for any motivational beliefs. Overall, relevance appraisals accounted for half of the variance in students' task value beliefs.

Relevance-value equivalence hypothesis. Several philosophers and motivation researchers reject the relevance hypothesis, asserting instead the *relevance-value equivalence hypothesis* that relevance is synonymous with task value. In a symposium presented at the American Educational Research Association Annual Meeting, Hartwell and Kaplan (2014) proposed that relevance was a vital motivational concept to investigate and distinguish from task value. However, three of the four presenters began their talks stating that relevance is the same as utility value (Durik, Schmidt, Shumow, & Rodenbeck, 2014; Harackiewicz, Tibbets, & Canning, 2014; Kosovich & Hulleman, 2014). Such views have developed over recent years, but have yet to fully dispel the relevance-value equivalence hypothesis.

Motivation researchers have proposed models that attempt to differentiate relevance from value. According to Priniski et al. (2018), relevance represents a continuum of personal meaningfulness, as opposed to task value, which they conceptualized as a composite of qualitatively distinguishable beliefs; yet, the authors also proposed that components of task value correspond with distinct types of relevance. Specifically, utility value reflects connections that are useful for attaining personal goals, and attainment value entails relevance for identity-related outcomes. Given this proposed correspondence between relevance and task value, the relevance continuum model does not succeed in showing how the two are distinct. In particular, theoretical work in EVT suggests that value beliefs do fall on a continuum of personal centrality, where more central goals (i.e., attainment value) should be more motivating than less central goals (i.e., utility value). As Eccles (2005) put it, "it is the hierarchy of subjective task values that matter, rather than the absolute values" (p. 107). The ERA model assumes Eccles's position and

therefore rejects the premise that relevance falls on a continuum distinct from that proposed for task value in EVT; rather, it is posited that relevance is a necessary but insufficient criterion of task value. In other words, value is defined by several additional criteria besides relevance (as detailed in the following).

Reducing relevance to value is redundant and renders prominent theories regarding the relationship between relevance and value illogical. For example, Wigfield, Rosenzweig, et al. (2015) posited that "the extent to which the students are exposed to learning materials and curriculum that they find meaningful and relevant predicts higher motivation and engagement" (p. 689). The relevance-value equivalence translation of these authors' claim would be circular: Students value (i.e., are motivated by) lessons that they find valuable (i.e., relevant). By distinguishing relevance from value, the ERA model avoids such circularity and indicates testable hypotheses to predict the development of motivational beliefs through relevance appraisals and related cognitive processes.

The ERA model definition of relevance. Building on Eccles's (2005; 2009) theory, the ERA model identifies criteria for task value beliefs and argues that those criteria distinguish task value from relevance (see Figure 1.1). Motivational beliefs are *personal*, representing expected benefits or costs for oneself or groups with which one identifies, whereas relevance can be either personal or impersonal. The focus on tangible *outcomes* also distinguishes task value from relevance; as suggested by the common definitions reviewed in the preceding, relevance is primarily conceptual, representing relationships between concepts. Finally, motivational beliefs are *valenced*, whereas relevance can be valence-neutral.

Philosophers have claimed that relevance is always value-neutral, because in widely-accepted usage, it refers to the nature of the relationship between propositions, not the content

represented in those propositions (e.g., Diorio, 1977); however, the ERA model rejects this position on the grounds that, while these criteria are necessary for task value and not for relevance, they are not mutually exclusive from relevance, nor is task value. For instance, if a lawyer wants to prove a point, then the fact that some information has bearing on that point (e.g., tends to prove it) reflects a valued relationship; and the lawyer is likely to be interested in understanding that information. In such cases, relevance relationships are personal, benefit-focused, and positively-valenced, i.e., they reflect value. Conversely, to someone who has no stakes in the debate, that relationship won't be valued, even though it is understood to be relevant to the point. This example illustrates that value is not necessary for relevance; however, the reverse is not the case, as illustrated next.

Figure 1.1

Venn Diagrams Distinguishing Relevance from Motivational Beliefs
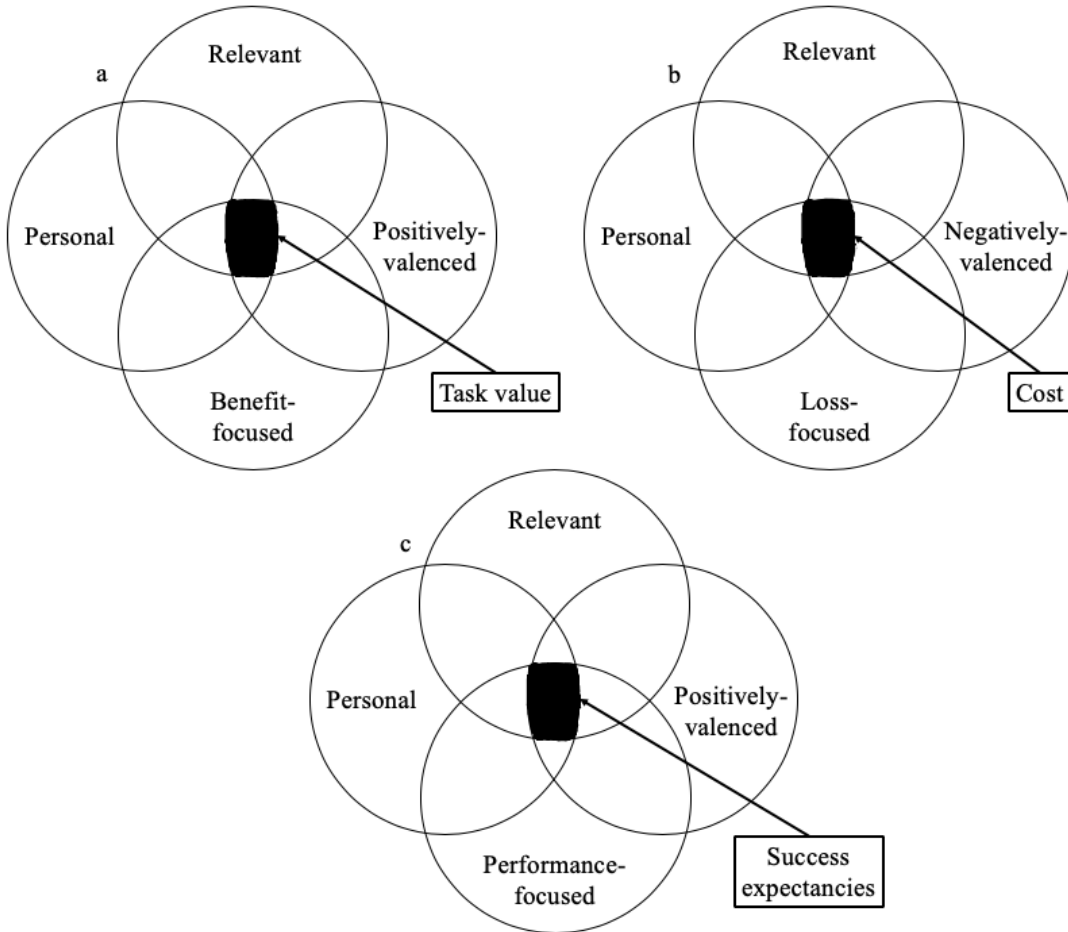
According to the ERA model, relevance is a necessary (albeit insufficient) criterion for

task value. Relevance and motivational beliefs are both cognitive representations formed through

subjective evaluations of academic experiences. Relevance represents connections between

concepts that vary in degrees of personal significance, ranging from not at all to completely

personally significant. To inform motivational beliefs, content must be conceptually linked or

appraised as relevant to personally valued outcomes. Some motivation scientists (e.g., Priniski et

al., 2018; Vansteenkiste et al., 2018) have argued that relevance is not necessary for interest

value, because students can be interested in academic tasks that make no reference to external

outcomes; this claim is rejected by the ERA model, according to which all types of motivational beliefs are outcome-focused and therefore represent anticipation of future experiences. As such, a student should only anticipate experiencing interest in a task based on its connections with prior experiences and personal interests. Still, the primary focus of relevance is on representing the relationship of the concepts to one another, rather than identifying outcomes associated with them. In other words, a lesson (e.g., on shapes in art) can be relevant to (i.e., bear upon) a concern or issue (e.g., geometry), regardless of whether or not the contents of the lesson or related issue are valued.

The following examples should ground these conceptual distinctions. A student may find that math is relevant to psychology, in that much of the research in psychology utilizes statistics; however, that relationship doesn't necessarily signify tangible outcomes for him, e.g., if he is not interested in or does not intend to conduct research. Even if he did, he may not believe that understanding math will tangibly affect that aim, e.g., perhaps he assumes that he will work on a team with someone else who can do the statistics. A lesson on Alzheimer's Disease in a cognitive development course may relate to students' lives, in that they may know someone with the disease, but students can still believe that learning about it will be more psychologically costly (e.g., causes anxiety) than personally valuable. Thus, a lesson can be appraised as relevant, regardless of the positive or negative valence that it suggests (Eccles, 2005) may result from engaging with it.

It is often taken for granted, but several philosophers have questioned the purpose of making education relevant. Scheffler (1969) described three common purposes. Some believe that relevant education will help future generations address societal needs. Others argue that relevance will help students gain transferable and effective knowledge for life and work. The

psychological perspective, however, focuses on developing engaged, lifelong, self-regulated learners. Thus, according to Scheffler, education should be relevant in order to develop students' capacity and habit to engage in systematic reflection, building increasingly complex and interconnected conceptual models. As Scheffler (1969) concluded: "[Relevant education should], in short, aim not only to assess ideas by their relevance to given questions, but also to discover new questions by expanding the sense of relevance" (p. 769). From the motivation science perspective, relevant lessons should support student motivation, engagement, and academic achievement (Albrecht & Karabenick, 2018b).

Based on the aforementioned considerations, the ERA model defines educational *relevance appraisals* or *relevance beliefs* as students' subjective perceptions that aspects (e.g., activities and subject matter) of academic lessons bear upon either personal (e.g., career aspirations) or impersonal (e.g., teacher-defined learning goals) concerns. The ERA model also distinguishes between two types of educational relevance. *Conceptual relevance* represents students' beliefs that lessons have significant implications for comprehension, whereas *motivational relevance* represents the belief that lessons bear upon personally valued concerns. Based on these distinctions, the ERA model proposes several hypotheses to help explain the relationships between appraisal processes elicited by relevance intervention prompts and targeted academic outcomes.

Relevance Should Indirectly Support Student Learning

One of Dewey's major contributions was his application of cognitive theory to educational research and practice (Mayer, 1992). Dewey (1910, 1913, 1934) proposed an organismic theory of cognition, according to which humans are intrinsically motivated to integrate new information from their environment into cognitive schemas or mental systems of

interconnected ideas and concepts. Dewey (1902) explained that learning is an active process that requires self-regulation. Indeed, he characterized the primary purpose of education as developing students' lifelong capacity for growth by helping them learn to engage in *self-regulated relevance appraisal processes*, which entail intentionally exploring connections between what is taught in school and various experiences within and outside of school (Albrecht & Karabenick, 2018b). Dewey (1910) referred to this process as *reflective judgment*: the "Active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends" (p. 6).

According to Dewey (1910), reflective judgment begins with perplexing stimuli, such as novel events or questions, that catch attention and compel sustained inquiry. Such inquiries aim to form coherent accounts, in which clear connections between stimuli, prior knowledge, and experiences are identified. Coherence is the ultimate aim of inquiry, because it expands and enriches understanding of the issue, as well as the prior knowledge and experiences with which it connects (Dewey, 1938). Theory and research in educational psychology support many of Dewey's tenets.

Elaboration hypothesis. The elaboration hypothesis predicts that relevance interventions will *directly* support learning to the extent that they help students elaborate on new information and prior knowledge. From a self-regulated learning perspective, students intentionally appraise relevance in their efforts to comprehend and assimilate new information. *Elaboration* refers to students' attempts to connect lessons to what they already know (Weinstein, 1982; Weinstein, Acee, & Jung, 2011). In other words, students use elaboration to identify conceptual relevance, perceived connections that indicate how new information bears upon related prior knowledge.

Extensive experimental research has demonstrated that students' can be taught to use elaboration and that their use of this strategy supports learning in a range of academic domains (Donker, de Boer, Kostons, Dignath van Ewijk, & van der Werf, 2014). Interventionists have attempted to rule out the elaboration hypothesis in order to parse out the effects of relevance writing on motivation and achievement. For instance, Hulleman and his colleagues compared the treatment effects of writing descriptive essays describing course concepts and their relevance to students' lives with the effects of just writing descriptive essays in the control condition (e.g., Hulleman & Harackiewicz, 2009; Hulleman et al., 2010). As noted above, that treatment has been found to improve, undermine, or have no effects on targeted academic outcomes in comparison to descriptive writing. Critically, while both experimental conditions entailed elaboration, they did not control for the concerns with which students relate lessons, which as noted above can vary in degrees of personal significance.

Albrecht et al. (under review) found that students in college statistics made impersonal and personal relevance connections in both experimental conditions. The authors found that students in the control condition had higher final course grades than those in the treatment condition and concluded that the relevance treatment undermined performance. The elaboration hypothesis suggests that both conditions should have improved performance to the extent that they were successful in eliciting elaborative learning strategies and that the purported negative effects of the treatment may actually reflect more positive effects in the control than the treatment condition. This could suggest that the inconsistent effects on performance observed in these relevance interventions are an artifact of failed manipulations. To test this hypothesis, researchers might examine the extent to which students elaborated on the content being learned.

Competence hypothesis. Extending the elaboration hypothesis, the ERA model posits that the use of elaboration *indirectly* affects learning by helping students identify connections between lessons and their prior knowledge (i.e., the conceptual relevance of lessons) and thereby facilitates comprehension and meaning-making. In his theory of meaningful learning, Ausubel (1962) posited that relevance supports learning by helping students elaborate upon and consolidate their knowledge:

> as new material enters the cognitive field, it interacts with and is appropriately subsumed under a relevant and more inclusive conceptual system. The very fact that it is subsumable (relatable to stable elements in cognitive structure) accounts for its meaningfulness and makes possible the perception of insightful relationships. (p. 217)

Ausubel and Robinson (1969) stated that two interacting factors are most influential for learning: (a) cognitive structure, "the quantity, clarity, and organization of learner's present knowledge," (p. 51) and (b) the nature of the information being learned. For meaningful learning to occur, the learner must view the information as potentially relatable to her prior knowledge in substantive and non-arbitrary ways, meaning that the connections identified have significance for understanding and are not random or determined merely on account of individual opinion, respectively. The final criterion of meaningful learning is the student's willingness to use elaboration. Thus, if students cannot perceive connections between lessons and prior knowledge, then they should struggle to comprehend the meaning of those lessons.

Students at Freedom High explained that they struggled to understand the meaning of lessons when the material did not relate clearly to their prior knowledge:

> Sometimes teachers will bring in a topic that they [the students] weren't learning about, but they'll [the teachers] make it really important, and it'll confuse them [the students].

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Every morning before my literature class, we'd…watch a warm-up video, just some

random video she picked that was inspirational, and nobody ever understood why she

would show them and what relevance to literature does it have.

Another girl stated that students question relevance when teachers get off topic, "You didn't get

what the point of that story [the teacher told] was and how it's related to what they were talking

about [in the lesson]." These examples illustrate students' efforts to connect lessons to prior

knowledge and how such appraisal processes may inform their feelings of competence: when

they cannot relate lessons to prior knowledge, they may feel like they cannot understand the

meanings of those lessons.

Grounding hypothesis. Researchers could also assess the levels of expertise students

have regarding both the content of lessons and concerns that they are relating, as well as the

particular characteristics of those lessons and concerns that they focus on. Dewey (1902)

observed that students enter school with an integrated knowledge-base and holistic orientation

toward learning and that the siloing of academic subjects presents information in such a way as

to require overly analytical and abstract ways of thinking. Consequently, he recommended that

lessons be grounded in students' concrete experiences. Cognitive scientists have since studied

the grounding phenomenon, in which concrete examples can support learning of abstract

concepts. Walkington (2013) showed that one way to intervene on students' perceptions of

relevance is to ground algebraic word problems by framing them in terms of students' interests.

Walkington and Bernacki (2018) proposed that relating lessons to students' concerns should

support learning to the extent that they draw upon the funds of knowledge that students have

gained by attending to such concerns.

Seductive details hypothesis. Walkington and Bernacki (2018) also warned that relevance may hinder learning by causing students to focus on aspects of lessons or concerns that distract them from the core content needing to be mastered. For example, a student who connects algebra to shopping may focus their attention on the basic arithmetic needed to calculate the cost of groceries, instead of focusing on learning the rules for solving equations.

Relevance and Engagement

Motivation regulation hypothesis. James (1892) argued that relevance should trigger and maintain students' interest and engagement in lessons by helping them relate lessons to issues that concern them. Beyond connecting course lessons to prior knowledge, Dewey (1913) believed that students should learn to relate lessons to their motivational concerns, a strategy referred to as *value enhancement* in self-regulated learning terms (Sansone, Weir, Harpster, & Morgan, 1992; Wolters, 2003). The relevance writing task developed by Hulleman and Harackiewicz (2009) should elicit value enhancement, while controlling for elaboration. Thus, this hypothesis states that it is value enhancement that leads directly to improved academic outcomes.

Research findings show that students use value enhancement in college and high school to increase their own motivation when it is lacking, and that the use of this strategy is positively related to motivation and achievement outcomes (Smit, Brabander, Boekaerts, & Martens, 2017). Wolters (1998) presented college students with several academic tasks and asked them what they would do to overcome boredom at those tasks. He found that college students frequently reported attempts to connect what they were learning to the issues and outcomes they valued. He also found that while the use of value enhancement strategies was positively related to the use of elaboration strategies, only elaboration related to students' achievement. Subsequent studies

found that middle school (Wolters & Rosenthal, 2000) and high school (Wolters, 1999) students also report using value enhancement techniques to motivate themselves, and students with "adaptive motivational beliefs" reported regulating their motivation more frequently.

In distinction from the motivation regulation hypothesis, the ERA model posits that the positive effects of value enhancement on academic outcomes are mediated by students' relevance beliefs. Specifically, finding connections between lessons and motivational concerns, such as personal goals and interests, should support motivational relevance beliefs, perceived connections that indicate how new information bears upon related motivational concerns, which should support subsequent motivation, as described next.

Value transference hypothesis. Perhaps the most challenging question that Scheffler asked is "relevant to what?" Common responses include that lessons should be relevant to students' cultures, lives, everyday experiences, career goals, and personal interests. According to James (1892), lessons must relate to one another, prior knowledge, students' interests, and practical needs. He argued that lessons should take on the value associated with the concerns with which they are connected. Similarly, Dewey (1913) believed that events and activities take on meaning for students when they relate to their needs, experiences, or whatever else they are preoccupied with or find significant. Price (1973) argued that lessons should be relevant to a non-educational experience, such as job preparation and democratic participation. Given such complexities, Walkington (2013) prudently noted that a major challenge for educators in making lessons relevant is knowing with which student concerns lessons should be connected in order to promote learning and motivation.

Several studies have found that the concerns with which lessons are related have different implications for learning and motivation. In a series of studies with students from a small

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Midwestern university, Albrecht (2013) developed a 12-item self-report survey that measures the relevance of lessons to three concerns: *career goals* (e.g., "The topics covered are relevant to the work I intend to pursue after college."), *personal interests* (e.g., "The topics covered are directly relevant to my personal interests."), and *life values* (e.g., "The things we discuss in this course are relevant to my values in life."). He found that relevance to personal interests and life values were most strongly related to students' emotional experiences in classes and course grades, whereas relevance to career goals was most related to task value. Vansteenkiste et al. (2004) found that students valued lessons more when they were connected to intrinsic, as opposed to extrinsic, goals. Canning and Harackiewicz (2015) found that hearing messages about the relevance of math to future careers undermined math motivation and performance for students with low confidence, but hearing messages about relevance for everyday uses (e.g., calculating tips) prevented negative effects.

Identification hypothesis. One of the most prominent relevance hypotheses posits that, when students connect lessons to their lives, they should come to identify more with the learning task and view engagement as an integrated aspect of their self-concepts, leading them to value learning the content. Dewey theorized that lessons would be motivating in proportion to the personal importance of the concern with which they are related. Dewey (1913) contended that educators must strive to connect coursework with "a guiding and inspiring purpose" (p. 52). In particular, Dewey (1916) believed that social goals were universal. Thus, Dewey (1909) insisted that educators relate coursework back to their social origins and make the social imports of curricular content explicit for students:

Interest in community welfare, an interest that is intellectual and practical, as well as emotional—an interest, that is to say, in perceiving whatever makes for social order and

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progress, and in carrying these principles into execution—is the moral habit to which all the special school habits must be related if they are to be animated by the breath of life. (p. 7)

As noted above, Priniski et al. (2018) argued that relevance varies in degrees of meaningfulness, corresponding to the personal importance or weight of the concerns. They defined personal relevance as "an individual's subjective perception of the degree to which a stimulus (an object, an activity, a topic) is connected (i.e., has some relation) to the individual personally" (Priniski et al., 2018, p. 12). The authors differentiated three types of relevance based on their relative degree of meaningfulness or personal significance. The least meaningful, *personal associations* are perceptions that a stimulus relates to an affective object or memory. *Personal usefulness* means that the individual perceives a stimulus to be useful or related to achieving valued goals. The most meaningful type of relevance, *identification* means a stimulus is perceived as integral to one's identity.

According to Vansteenkiste and his colleagues (Vansteenkiste et al., 2018; Vansteenkiste, Soenens, Verstuyf, & Lens, 2009) students take more personal ownership over their engagement when they perceive learning to be personally relevant, because the choice to engage feels congruent with their self-concept and feels autonomous. In support of this hypothesis, Assor, Kaplan, and Roth (2002) found that students' experiences of relevance-supportive instruction (e.g., teacher provides rationales for completing assignments) were the strongest positive predictors of interest and engagement among elementary and middle school students. Jang (2008) found that college students were more autonomously engaged in educational psychology and demonstrated greater conceptual understanding of correlations after being presented with rationales highlighting their importance.

Following from the value transference hypothesis, the identification process should be most pronounced when the outcomes with which lessons are related are more personally central or integrated into their identities. According to Ryan and Deci (2017), the quality of students' motivation should vary based on characteristics of the personal goals with which they connect lessons. Intrinsic goals (e.g., public service) inherently satisfy basic human needs (e.g., relatedness), whereas extrinsic goals (e.g., wealth) derive their value from external rewards (e.g., praise) that are contingent upon meeting personally unfulfilling standards of success. Thus, students should be most motivated to engage with lessons that relate to intrinsic goals. Vansteenkiste et al. (2004) found that students reported greater task value when they were told that learning about recycling would make them better members of their community, compared to helping them to be more financially successful.

Hartwell's (2014) identity-based model differentiates between three components of relevance. The *contextual target* represents academic content or environmental stimuli that are evaluated for relevance to one or more identity targets. *Identity targets* are aspects of the self, representing goals, needs, future selves, etc. The *relevance lens* refers to the type of connections students make between contextual and identity targets. Hartwell developed a 31-item self-report measure to assess five facets of students' identity-based relevance perceptions, including a *contextual target* (e.g., "looking at the connection you made and described above, to what extent is it related to something you learned in class?"), *identity target* (e.g., "looking at what within yourself you made a connection to, to what extent would you say it is related to your body or health?"), *time-related perceptions* (e.g., "looking at what within yourself you made a connection to, to what extent would you say it is related to your future?"), *relevance lens* (e.g., "looking at the actual connection you made, to what extent would you say it is useful or helpful to you in

some way?"), and *general perceptions* (e.g., "thinking about the overall connection you made, to what extent would you say it was easy for you to think of?").

Confidence hypothesis. The *confidence hypothesis* posits that writing about relevance improves task value and achievement outcomes by improving students' *feelings* of competence. This relates back to the competence hypothesis, because students who are not competent (e.g., who cannot understand the context or meaning of a lesson) should generally feel incompetent, whereas those who are competent should feel competent. Following from this reasoning, the ERA model posits that prior academic achievement, assuming it reflects obtained knowledge, should support feelings of competence, not only directly (as proposed in EVT; Eccles et al., 1983) but also indirectly through conceptual relevance appraisals.

Research has demonstrated that relevance writing can affect success expectancies. Hulleman et al. (2017) found that writing about relevance in college psychology improved underperforming students' success expectancies, which predicted final course grades; notably, the intervention did not directly affect task value beliefs. Brisson et al. (2017) found that reflecting on relevance claims supported 9th grade students' self-concept and homework self-efficacy in math. Albrecht (2019) found that conceptual relevance positively predicted high school students' success expectancies, which positively predicted course grades on average across academic subjects. Notably, students' perceptions of relevance to future aspirations, personal interests, life values, and everyday experiences did not predict expectancies. Albrecht theorized that relevance interventions should promote competence beliefs to the extent that they help students feel like they have prior knowledge that can help them comprehend new lessons. Others have found negative effects of relevance interventions on students' competency beliefs. Canning et al. (2019) found that asking community college students to write about relevance

undermined feelings of competence in underachieving students and improved it in higher-achieving students.

Appreciation hypothesis. Several theorists contend that relevance affects motivation through aesthetic experiences. Dewey (1934) proposed that relevance evokes emotional experiences by illuminating meaningful patterns among seemingly disparate bits of information or isolated experiences. Such patterns are aesthetically pleasing and inspiring, because they make sense of relations that were previously opaque. According to this view, discovering meaning expands perception so that students can appreciate the "big picture" or further implications of lessons. Inspired by Dewey, motivation scholars have endorsed the idea that relevance should support appreciation and subsequent motivation.

Brophy (2010) advocated for educators to help students develop the motivation to learn. In distinction from relatively affective (e.g., intrinsic motivation) and extrinsic (e.g., utility value) forms of motivation, Brophy described the motivation to learn as a primarily cognitive tendency to comprehend and master learning materials, which entails effortful relevance appraisal. Further, Brophy noted the critical role of teachers in helping students comprehend the conceptual and motivational relevance of their lessons and subjects. According to Brophy (1999), relevance-supportive instruction provides genuine opportunities for learning in which content is clear, coherent, and well-elaborated, drawing upon prior knowledge, connecting to big ideas, and applying content to the world beyond academia. Pugh (2002; 2011) proposed that relevance is required for students to have *transformative experiences*, in which they come to perceive connections between coursework and their everyday lives. When students have transformative experiences, they should attribute value to what they're learning and transfer or apply it in their everyday experiences.

Sanders (2016) defined relevance as *appreciation*, i.e., "absorption, satisfaction, recognition, making meaning, self-expression, self-realization, making connections, achieving insights, aesthetic appreciation, and so on" (Brophy, 2008, p. 137). Further, appreciation requires "propositional, procedural, and especially conditional knowledge of when, where, why, and how to use the content in their everyday lives" (Sanders, 2016, p. 54), which can be developed in most students given appropriate instructional support and the selection of course content that has "life application value."

Considering these perspectives, it is not clear whether or not appreciation necessarily entails value. If it does, then the ERA model would situate appreciation as an outcome of motivational beliefs, rather than an antecedent, and would reject the appreciation hypothesis on the grounds that relevance distinctively does not necessarily entail value. If the appreciation hypothesis does not require value for relevance, then it would be consistent with ERA model assumptions; however, the ERA model would not equate relevance with appreciation. Instead, relevance would be a necessary but insufficient criterion for appreciation, because the latter should necessarily entail aesthetic experiences that are not clearly necessary for relevance.

Persuasion hypothesis. Scholars also suggest that students can persuade themselves that learning lessons will be personally valuable when they intentionally appraise relevance. Acee and his colleagues (Acee, Weinstein, Hoang, & Flaggs, 2018) argued that interventions should be most influential when they guide students to appraise relevance through central routes (i.e., intentional and effortful consideration of persuasive information and its links to stored knowledge), rather than peripheral routes (i.e., less effortful and more superficial information processing). In order to promote central route processing, Acee and Weinstein (2010) developed an essay-writing intervention that guided students through exercises in which they brainstormed,

compared the pros and cons of, and ultimately defended the importance of learning statistics. The intervention improved task value beliefs for all students and final exam scores for students in one instructor's class. By extension, if persuasion positively predicts intervention effects, then a failure to convince students about the relevance of lessons should undermine their motivation. At Freedom High, students frequently pointed out that their teachers would make arbitrary or artificial relevance connections between lessons and students' lives. For instance, several noted that they would never actually use most of what they learned in math outside of school. One girl said, "I have to use math, like for adding like money and stuff like that, but I don't use geometry necessarily."

Anxiety hypothesis. Another explanation for negative effects is that relevance interventions can cause anxiety, particularly for underperforming students (Durik, Harackiewicz, & Hulleman, 2015). According to Dewey (1934), identifying relevance is always more-or-less emotionally evocative. This is especially true when lessons relate to issues that are "momentous and urgent" for the student (Dewey, 1913). In such cases, understanding becomes an imperative aim, initiating and directing students to engage in self-regulated learning, including reflective judgment.

According to Scherer (1994), "emotion has evolved as a relevance detection and response preparation system" (p. 128). Scherer (2013) argued that relevance appraisals are the launching point for emotional experiences and include appraisals of novelty, intrinsic pleasantness, and connection to personal goals or needs. Relevance appraisals examine whether situational stimuli (e.g., course lessons) have potential significance for one's goals, needs, interests, or other salient concerns. If relevance is established, then cognitive resources (e.g., attention) are allocated to appraise congruence, the more precise (positive or negative) implications of the stimuli for the

individual's concerns. Finally, appraisals of control establish whether one can agentically promote goal congruent outcomes and/or prevent the likelihood of incongruent ones. Emotions are formed from the conclusions of these and other appraisal processes (Scherer, 2013).

Relevance appraisals primarily determine the strength of emotional experiences, whereas congruence appraisals mostly determine valence (Smith, Tong, & Ellsworth, 2014). The strength of emotion is based upon the centrality or importance of the concerns toward which a stimulus or event (e.g., an academic lesson) is relevant. Scherer (2013) noted that

one of the major aims for appraisal theory is to further elucidate the different relevance criteria, for example, determined by individual needs, values, and aspirations on the one hand and by social expectations, norms, and conventions on the other. (p. 151)

This goal is also a critical issue for relevance interventionists, namely, determining the focal issues that are most important to students (e.g., Walkington, 2013). By targeting highly valued focal issues, researchers and educators should elicit the most powerful affective responses and associated action tendencies. Scherer (2013) elaborates on several promising focal issues to consider and delineate in future research on relevance appraisal processes:

develop the distinctions between these motivational classes, with continuously operative *needs* being mostly biologically based and thus universal, *values* being a high-level construct of desirable qualities and achievements and thus in large part shared by groups and cultures, *goals* (with a definite end state) being more concrete objectives toward which action is directed and thus likely to show a large variability over individuals and time, and *norms* being strictly constrained sociocultural codices for required behavior. (p. 154)

The ERA model predicts that relevance appraisals should contribute to students' emotional experiences in classes and is therefore consistent with the anxiety hypothesis.

Reactance hypothesis. Some students view intervention efforts as artificial, burdensome, or unnecessary, which elicits negative reactions. Karabenick and Collins-Eaglin (1995) found that college students often did not believe their teachers *should* try to relate to students' lives but should instead focus on connecting to content in other courses and to current needs in society. Kosovich and Hulleman (2017) found that community college students often reacted negatively (e.g., cursing in their essays) when prompted to write about how math coursework related to their lives. In their interviews, Freedom High students noted on multiple occasions that they or other students did not believe that school should be relevant to their lives and would therefore react negatively to or resist efforts to connect the two (Albrecht, 2019). For instance, one girl said, "Some people believe that like in school the questions should be about school, and so it shouldn't be relating to our lives." Freedom High students also reported frequently encountering teachers who used artificial examples relating coursework to students' lives, e.g., using math to calculate tips.

These findings suggest the need for longitudinal and person-centered research that controls for students' prior relevance beliefs when predicting intervention outcomes to determine the extent to which those beliefs change post-intervention. For instance, the intervention may not change students' opinions, when they hold strongly negative views pre-intervention and may have negative reactions in the form of decreased motivation and engagement.

Mixed interpretation hypothesis. Another explanation for divergent intervention findings is that the relevance language in the intervention writing prompts may be interpreted differently by students. Addressing Scheffler's (1969) how question, Hartwell (2014) directed

attention to the relevance lens or type of connections (i.e., affective or informational) students make between contextual and identity targets. Through analyses of essays in which high schoolers connected biology concepts to their lives, Hartwell and Kaplan (2018) found that those with average success expectancies and task value in biology viewed concepts as relevant when they helped them understand other course content, whereas those with high expectancies and value beliefs viewed concepts as relevant when they related to their personally important cares and concerns. In interviews with students at Freedom High, students either interpreted relevance conceptually or motivationally.

Hulleman et al. (2017) found that students reported higher success expectancies and utility value in college psychology when they reported connecting class materials to their "lives." However, it isn't clear with which aspects of their lives students were connecting lessons. For instance, when asked in cognitive interviews to describe their everyday experiences outside of school, most students at Freedom High described doing homework, studying, helping siblings with schoolwork, or engaging in other school-related activities. Describing the relevance of his Microsoft Office coursework to his "everyday experiences" and "life outside of school," one boy said, "I don't really go on my computer much, but I have one, and I sometimes use it for homework…[so] yeah I learn stuff about computers outside of school." This student was most likely using elaboration, rather than value enhancement, because he did not refer to any personal motivational concerns, but rather to completing academic requirements and learning about something that he would only use in the context of school. Thus, while some students may focus on motivational concerns when thinking about their lives, others may focus more on their conceptual concerns.

In one study, researchers coded 300 students' responses to the open-ended survey question, "What would you say makes this course 'relevant' and/or 'irrelevant'?" (Albrecht & Karabenick, 2015). They found that students most frequently said that relevant courses facilitated learning; others frequently said relevant courses provided knowledge or skills that could be useful in an applied sense. Students related coursework to other academic domains and requirements, careers, knowledge acquisition, personal development, and life values. Through interviews, Sanders (2016) found that college students described worthwhile courses as evoking cognitive, behavioral, and/or affective changes. *Cognitive changes* included students developing a broader perspective, undergoing a fundamental conceptual change, and engaging in self-questioning. *Behavioral changes* included students talking with others about their course, using content in their everyday lives, and expanding upon that content. *Affective changes* included students valuing the content they learned and feeling like they grew more mature through the process of learning it. Such findings suggest that students interpret questions of relevance differently, which could affect the outcomes of interventions using such language.

The ERA model posits that students' interpretations of relevance should moderate the effects of intervention prompts on subsequent relevance beliefs. For example, students who interpret relevance in cognitive terms should show greater changes in conceptual relevance, whereas motivational interpretations of relevance should lead to greater effects on motivational relevance.

Summary

The present chapter illustrated the sociocultural pervasiveness of calls for relevance in education over the last century. Inspired by the emphasis on interdisciplinary work in the motivation sciences (Pintrich, 2003), philosophical perspectives were considered and integrated

into current discourse on relevance among educational psychologists. Researchers and theorists have proposed many hypotheses to explain the complex and conflicting results that have emerged from relevance intervention studies. Specifically, hypotheses have been forwarded to clarify the psychological mechanisms that support or undermine students' learning and motivation. As detailed herein, many of those hypotheses have been considered over decades of philosophical work. The present chapter reviewed 15 such hypotheses, organized by the respective academic outcomes they attempt to explain.

The educational relevance appraisal (ERA) model was offered as a synthesis of past and current perspectives to explain divergent findings from relevance intervention studies in which students write essays connecting course lessons to their lives. The ERA model is fundamentally grounded in the relevance hypothesis that these interventions elicit self-regulated appraisal processes that affect motivation and achievement through changes in students' relevance beliefs. Specifically, the ERA model focuses on the effects of elaboration and value enhancement on academic outcomes, as mediated by two types of relevance. Conceptual relevance represents the belief that academic lessons relate to prior knowledge and therefore informs students' beliefs that they can comprehend course content and succeed at performing well in related academic tasks. Motivational relevance was defined as the belief that lessons have bearing on motivational concerns, such as future aspirations and personal interests, which should inform students' beliefs about the personal value of those lessons. The ERA model differentiates relevance from motivational beliefs based on three primary criteria. Relevance is conceptualized as a necessary although insufficient criterion of motivation, because in addition to and distinction from relevance, motivation is necessarily (a) personal, (b) valenced, and (c) outcome-focused. These distinctions have important implications for interpreting relevance intervention findings.

Implications for Motivation Science Research on Relevance

Current intervention research framed in EVT has largely overlooked the fundamental, cognitive meaning of relevance, namely, that new information relates in meaningful ways to prior knowledge and that beliefs regarding the relevance of academic lessons to motivational concerns are distinct from the motivational beliefs they are expected to support. Rather, motivation scientists have proposed definitions of relevance that functionally endorse the value-relevance equivalence hypothesis, which equates relevance with task value. The analyses presented herein illustrate how such definitions are based on fallacious logic; specifically, they beg the question of whether or not relevance plays a part in promoting academic outcomes. The ERA model provides a definition of relevance that prevents such circularity and contributes in several important ways to motivation theory.

The ERA model situates relevance appraisal processes and beliefs within EVT. Based on common claims both within and outside the motivation sciences, the ERA model proposes that (a) students' self-regulated relevance appraisal processes influence their relevance beliefs, and (b) such relevance beliefs influence their motivation and learning in school. Thus, relevance appraisal processes and beliefs are introduced as key antecedents of motivation, beyond those explicitly modelled in EVT, i.e., students' goals, self-schemas, and affective reactions and memories (Eccles & Wigfield, 2002). The ERA model enhances EVT by positing mechanisms to predict the development of distinct motivational beliefs; specifically, elaboration should inform conceptual relevance beliefs and subsequent expectancies for success, whereas value enhancement should affect task value through motivational relevance beliefs.

One promising avenue for explaining mixed outcomes of relevance interventions is to compare the elaboration and motivation regulation hypotheses. As reviewed above, both self-

regulated relevance appraisal processes have been found to relate positively to academic outcomes and motivation; however, they have rarely been compared in the same study as independent predictors of relevance and motivational beliefs (c.f., Wolters & Rosenthal, 2000). Descriptive and correlational studies could clarify the pre-intervention use of relevance appraisal strategies among high school students and their relative contributions in explaining success expectancies and task value. Longitudinal studies could build on that work by assessing those relationships over time to examine how appraisal strategy use relates to the development of relevance and motivation. Once those relationships are better understood, then experimental studies could be conducted that manipulate appraisal processes to evaluate whether they cause changes in targeted academic outcomes.

Because of the risk of causing negative effects on academic outcomes, the importance of conducting descriptive and correlational research before subsequent intervention efforts is stressed here. For instance, it may be found that elaboration or value enhancement has no effect or negatively relates to targeted outcomes after accounting for the other, e.g., in the case of suppression; if so, then it would suggest the need for researchers to develop interventions targeting one appraisal process over the other. Such studies could also uncover group differences in appraisal strategy use that might indicate the need to intervene on specific appraisal processes for some groups but not others or to provide scaffolding to help students learn to successfully execute the strategies required by relevance writing interventions.

Albrecht and Karabenick (2018) proposed that relevance appraisal processes can be more-or-less difficult for students depending upon their cognitive abilities. For example, students who are more creative should be more open to novel relevance connections; students with greater memory capacities could consider more possibilities at once; and those with more background

knowledge in an academic subject area should have more information with which to connect lessons. This implies that students may need different amounts and types of scaffolding to be successful in making positive relevance connections. Thus, researchers should examine whether group differences moderate the relationships between relevance appraisal processes and targeted academic outcomes; specifically, it will be important to examine whether those relationships vary based on prior academic achievement and confidence beliefs, which have been found to predict different outcomes of relevance interventions on academic outcomes, such as motivation and performance.

The mixed interpretation hypothesis highlights the elusiveness of the meaning students attribute to concepts such as "relevant," "everyday experiences," and "your life." For instance, research is needed that assesses whether students differentiate between value and relevance. Further, it is unclear whether students interpret such concepts as inclusive or exclusive of school-related experiences. For instance, when asked about their real-world experiences outside of Freedom High, most students included doing homework as part of their everyday lives. Indeed, the majority of students' daily lives are consumed by K-12 schooling, other school-related activities, and, for many, also post-secondary concerns that may be more conceptual (e.g., figuring out how to complete college applications) than motivational (e.g., picking a major that one finds interesting). Indeed, many students at Freedom High explained that they barely had enough time outside of school to pursue personal interests, because of excessive homework, testing, and extracurricular requirements needed for getting into a good college. Such interpretations could have important implications for the appraisal processes students employ and therefore the types of connections they make in relevance writing assignments, as proposed in the elaboration and motivation regulation hypotheses.

Future studies are needed to test the mixed interpretation hypothesis. For instance, researchers could use cognitive interviewing and other qualitative approaches to test assumptions regarding the ways that students interpret intervention prompts (Karabenick et al., 2007). Further, researchers might assess the specific appraisal processes that students employ in response to writing prompts; this approach could also be strengthened by assessing the types of concerns with which students connect their course lessons, e.g., by comparing the relative effects of intervention prompts on both conceptual and motivational relevance appraisals. As highlighted by the value transference and identification hypotheses, those concerns should affect motivational beliefs differently.

Future researchers need to operationalize relevance based on the ERA model's cognitively-oriented definitions. Several researchers have crafted surveys to assess relevance, but they have focused primarily on motivational relevance (Albrecht, 2013; Hartwell, 2014) or functionally confounded relevance with value (Sanders, 2016), according to the definitions proposed herein. As a new construct, conceptual relevance appraisals have not been assessed in prior work. Given that they are cognitive appraisals, they will most likely need to be self-reported, e.g., through surveys and interviews. A great number of relevance essays have been collected through the multitude of intervention studies reported herein; thus, another promising option would be to develop coding rubrics to differentiate conceptual from motivational relevance, which could then be used, for example, to build upon the definitions proposed in this chapter or to quantify relevance and predict targeted academic outcomes.

Implications for Practice

Educators are constantly bombarded with calls to make education relevant; however, such calls rarely explicate what relevance means, how it should be integrated into their lessons,

or when and how it should benefit their students. In addition to promising findings from published studies showing that intervening on relevance can improve students' achievement and motivation, the present chapter also detailed null and negative effects found in both published and unpublished research. This itself is a critical contribution to educators, who are unlikely to hear about the potential harm of their efforts to make their courses relevant. Thus, this chapter suggests that appropriate precautionary measures be taken to minimize the risk of such negative effects.

While efforts to scale up relevance interventions proliferate, the counterintuitive findings suggest the need to take a step back and examine the many hypotheses presented herein. This is especially critical in less high-achieving contexts than the prestigious universities where much of the research has been conducted (Harackiewicz & Priniski, 2018). In particular, several studies described in this chapter have reported negative effects of relevance writing assignments in community colleges where students are more likely to be at-risk for academic underachievement, and few studies have examined the effects of such interventions in high school contexts (Rosenzweig & Wigfield, 2016) that include students who are less high-achieving than their peers that attend college, e.g., at Freedom High, only 40% of students said that they intended to pursue a 4-year degree or beyond. Clearly, more research is needed, and secondary school teachers should be cautious of untested claims that these interventions will support their students' success, because they may inadvertently perpetuate the achievement disparities between low- and high-achieving students that they work hard to ameliorate.

The ERA model should expand the way that teachers think about the meaning of educational relevance, aligning them more with predominant interpretations of the concept. As the model proposes, this could be critical for understanding the types of relevance that students

seek. It could also provide important considerations for the types of relevance to target when seeking to improve learning and distinct motivational outcomes. These things said, while the ERA model is informed and supported by the research findings presented herein, further research is needed to test for causal relationships; thus, it also warrants healthy skepticism in the spirit of science and philosophy alike.

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Chapter 3

Educational Relevance Appraisals and Their Relations to Motivational Beliefs:

Testing a Mediation Model of Relevance Intervention Effects

Abstract

The extent to which students value an academic subject and expect to succeed are key predictors of their engagement and achievement. Expectancy-value theory indicates a host of antecedents to such beliefs, including students' perceptions of the relevance of coursework to their lives. Recent findings from social-psychological relevance intervention research provide clues as to the role of relevance appraisal processes in the development of motivational beliefs, but relevance is rarely conceptually or operationally distinguished from the outcomes it is believed to predict. Further, research is especially needed that examines relevance appraisals in adolescent populations from disadvantaged socioeconomic backgrounds or at-risk of academic underachievement, for whom relevance is believed to be particularly lacking and influential. The present research proposed and tested a theoretical model specifying the role of relevance appraisal processes and beliefs in promoting engagement and achievement through its positive influence on motivational beliefs in two studies at a mid-sized high school. Findings from Study 1 support for the proposed meditation model. Students' relevance appraisals and task value beliefs did not differ by social class or academic risk status. Study 2 findings largely replicated findings from Study 1, however,

there were several notable differences. Implications for expectancy-value theory and relevance intervention research were considered.

According to James (1892) and Dewey (1913), an educator's primary function is to promote comprehension and motivation by building systems of associations in students' minds that connect course content with their prior knowledge and practical needs. Such principles have gained traction through decades of research on learning and motivation (National Research Council, 2003), translating more recently into the common trope that teachers should help students identify the "relevance" of what they're tasked with learning in school to their lives (Bernard, 2010; Gallup & Strada, 2018; Roberson, 2013). However, evidence demonstrating the role of relevance in learning and motivation has been sparse and at times inconsistent, due in part to the fact that researchers have only recently begun to clearly demarcate relevance from similar motivational constructs (Albrecht & Karabenick, 2018a). In particular, there is a marked absence of research investigating the role of relevance in positive educational outcomes among students academically at-risk and from disadvantaged socioeconomic backgrounds, who may especially struggle to relate school to their lives (Schunk, Pintrich, & Meece, 2008).

Accordingly, research is required to differentiate relevance from closely-related motivational beliefs. Educational *relevance appraisals* or *relevance beliefs* are herein defined as mental representations of connections between course content and common adolescent concerns. Relevance appraisals are primarily the result of sociocultural messages and self-regulated appraisal processes (e.g., elaboration and value enhancement) and should predict students' beliefs about their competence and the anticipated rewards of engaging with academic tasks.

Two studies tested a theoretical model connecting relevance to motivation, engagement and achievement, and examined proposed disparities in relevance appraisals among students with diverse needs and socioeconomic backgrounds. Results demonstrated that relevance can be a useful construct for explaining students' motivational beliefs but did not support disparity hypotheses about motivation, i.e., students from diverse socioeconomic backgrounds reported similar relevance appraisals and motivational beliefs. Implications for motivation interventions in expectancy-value theory are considered.

The Motivational Psychology of Educational Relevance

Educational relevance research is most commonly framed within expectancy-value theory (EVT; Eccles et al., 1983; Eccles & Wigfield, 2002). EVT predicts that students will choose to engage with and persist in tasks that they value and expect to succeed at. *Task value* is the degree to which students believe that their schoolwork will be interesting, help them achieve personal goals, or actualize central aspects of their identities (such as ethical values). Value is commonly measured as a single construct, e.g., "I personally value math." (Kosovich, Hulleman, Barron, & Getty, 2015), especially with younger students, who discriminate less between value components than older ones (Wigfield & Eccles, 1992). *Expectancies for success* are students' beliefs that they can perform well at their coursework. Value and expectancy beliefs are important predictors of academic achievement and *engagement* (Wigfield et al., 2015), i.e., students' behavioral, cognitive, and emotional investment in school (Fredricks, Blumenfeld, & Paris, 2004). Success expectancies are robust predictors of achievement and engagement, whereas task value most frequently predicts engagement and less consistently achievement (Wigfield et al., 2015).

According to Eccles and Wigfield (2002), the most proximal antecedents of motivational beliefs are socializing influences, prior affective experiences, and individual interpretations or appraisals of task characteristics, including difficulty and relevance. A growing body of literature has illustrated the importance of families and schools (Simpkins, Fredricks, & Eccles, 2014) and prior affective experiences (e.g., Putwain et al., 2018) in shaping motivation. For example, students from low-income backgrounds have reported lower levels of motivation (e.g., competency beliefs) and engagement than their average- and high-status counterparts (Berger & Archer, 2016; Browman et al., 2017; Rumberger, 2011). In particular, parents' educational attainment has been an important predictor of students' value and competence beliefs (Kriegbaum & Spinath, 2016; Steinmayr, Dinger, & Spinath, 2012).

Regarding appraisals of task characteristics, students place a high premium on relevance. In an interview study across three universities in Hong Kong, Kember, Ho, and Hong (2008) found that establishing relevance was a top priority for students across a wide range of academic subjects. When asked, "Which topics are most important to research in your high school," Jewell, Nguyen, Kupar, and Usher (2012) found that clarifying the relevance of schoolwork to their lives was a top concern among students. Bridgeland, Dilulio, and Morison (2006) found that young adults attributed their decisions to drop out of high school primarily to their lack of interest in school, arguing that educators should focus on making courses more relevant to students. Recent advances in social-psychological intervention research are helping to clarify the complex roles of students' interpretations of relevance in promoting positive academic outcomes.

Relevance Interventions in Expectancy-Value Theory

As framed within EVT, *relevance interventions* assume that students will value academic experiences more when they identify connections to personally valued goals, interests, and life

values (Albrecht & Karabenick, 2018a). These interventions initiate *relevance appraisal processes*, such as elaboration and perceptions of instruction as relevance-supportive. For example, Harackiewicz and her colleagues have found that either directly communicating relevance to students (Durik & Harackiewicz, 2007) or asking them to self-generate connections between course content and their lives in brief writing assignments (*relevance essays*; Hulleman & Harackiewicz, 2009) frequently improve task value beliefs and sometimes performance in targeted courses, usually in comparison to a control group of students who write short essays elaborating on (e.g., defining and summarizing) course concepts (Harackiewicz & Priniski, 2018; Priniski, Hecht, & Harackiewicz, 2018).

Effects of relevance interventions have varied significantly (Albrecht & Karabenick, 2017; Lazowski & Hulleman, 2015) and are contingent upon a host of contextual factors. Durik, Shechter, Noh, Rozek, and Harackiewicz (2015) found that directly communicating relevance undermined math motivation and performance for students with low confidence. Conversely, writing brief relevance essays has improved underperforming students' motivation in college biology (Canning et al., 2018; Harackiewicz, Canning, Tibbetts, Priniski, & Hyde (2015), college psychology (Hulleman, Kosovich, Barron, & Daniel, 2017), and high school science (Hulleman & Harackiewicz, 2009), whereas other studies have only found positive motivational effects for students with low confidence in performing mental math calculations (Canning & Harackiewicz, 2015), women in college statistics (Albrecht et al., under review), and girls in high school math (Gaspard et al., 2015). Rosenzweig et al. (2018) found no effects of relevance writing in college biology. Others have found negative effects on achievement for community college students (Canning, Priniski, & Harackiewicz, 2019; Kosovich & Hulleman, 2017) and underperforming university students in statistics (Albrecht et al., under review). Accordingly,

Rosenzweig and Wigfield (2016) urged intervention researchers to develop theories identifying mechanisms through which interventions should affect academic outcomes, particularly with adolescent populations, who have been notably understudied.

Researchers have proposed various explanations for why relevance interventions have mixed effects. For example, students with low confidence or prior achievement may be threatened when presented with information about the relevance of their coursework (Durik, Hulleman, & Harackiewicz, 2015) but endorse such relevance when given the autonomy to relate it to their own lives (e.g., through writing; Hulleman, Godes, Hendricks, & Harackiewicz, 2010) or when given the opportunity to choose how they will complete the intervention (e.g., writing letters or essays; Rosenzweig et al., 2018). Students may also react negatively to the idea that their coursework may be relevant to them in ways that they hadn't previously considered (Albrecht, 2019; Rosenzweig et al., 2019). Indeed, Karabenick and Collins-Eaglin (1995) found that college students viewed their teachers as responsible for connecting content to other courses and real-world problems, but not to students' lives and experiences.

Research suggests that the concerns with which students connect their coursework may have different implications for academic outcomes. Albrecht (2013) examined college students' perceptions that their course lessons were relevant to career aspirations (e.g., "The topics covered are relevant to the work I intend to pursue after college"), personal interests (e.g., "The topics covered are directly relevant to my personal interests"), and life values (e.g., "The things we discuss in this course are relevant to my values in life"). Students' appraisals of relevance to personal interests and life values were positively related to their emotional experiences in classes (e.g., inspiration and situational interest), course grades, and task value, whereas relevance to career goals only related to task value. Canning and Harackiewicz (2015) found that emphasizing

relevance to everyday experiences improved interest in students with low confidence, whereas relating coursework to future careers undermined motivation. To tease out these relationships in high school students, the present research assessed students' appraisals of relevance to a range of outcomes: prior knowledge, future aspirations, personal interests, life values, and everyday experiences.

Relevance interventions may also affect task value beliefs and achievement through their influence on students' competence beliefs. For example, Brisson et al. (2017) found that asking German 9th graders to reflect on others' relevance claims improved their math self-concept and homework self-efficacy. Hulleman et al. (2017) found that writing about relevance did not affect utility value beliefs but improved expectancies for success, interest, and final exam grades for low-performing and male students in college psychology, and expectancies partially mediated intervention effects on final exam grades. The authors proposed that identifying relevance may support learning. Canning, Priniski, & Harackiewicz (2019) found that writing about relevance improved high-performing students' competence beliefs but undermined them in low-performing students in community college psychology and biology courses.

Defining Relevance for Expectancy-Value Theory

Cognition is driven to maximize relevance, in the sense that humans constantly seek to relate novel information to their existing knowledge in an effort to enhance their understanding of events they encounter and build new knowledge for future inferences (Dewey, 1910; Scherer, 2013; Sperber & Wilson, 2012). In common usage, claims are considered relevant when they bear a significant relation to a "matter at hand" or issue under consideration ("Relevance," 2019), such that learning the information will inform understanding of the issue.

Educational relevance is defined herein as a cognitive representation of conceptual links

between academic course content or *lessons* and students' salient *concerns*, including

personally valued outcomes but also basic comprehension (e.g., resolving confusion

about the point of a lesson or utterance).

Motivational beliefs, on the other hand, are judgments about the anticipated effects of engaging

with a broadly defined academic domain (e.g., math), namely whether that engagement will

facilitate desired outcomes. Thus, relevance includes a wider array of potential relationships than

does personal value (Hulleman et al., 2017). For example, a lesson on cognition is relevant to a

lesson on informal logic in that they share common characteristics, e.g., both address cognitive

biases and inference-making. Further, logical reasoning is a cognitive process, i.e., the topic of

logical reasoning is subsumed under the broader cognition category. However, appraising such

relevance does not guarantee that students will believe that learning about cognition is personally

valuable.

Relevance is a necessary but insufficient criterion for task value. Students can recognize

the relevance of lessons to concerns that they are attempting to comprehend, whether or not they

personally value those concerns. For instance, a biology lesson might focus on genetics, but

when the teacher digresses to talk about a movie that he saw the night before, his students may

recognize that the information he is conveying does not clearly relate to genetics. Not seeing any

connection to genetics or other concerns they may have, they deduce that attending to the story

will not benefit them in any way, and consequently disengage. Other students may find the

teacher's digression relevant to their personal interests (e.g., they may want to see the movie),

deduce that listening to the movie description will be interesting, and thus pay attention. Still

others may not personally value learning about genetics yet can recognize when a lesson is

relevant to that topic. For example, the movie to illustrate something about genetics, which may lead students to pay attention, because they recognize that it is conceptually relevant, whether or not they believe that learning about genetics will have personal value for them. Thus, relevance and value are not equivalent (c.f., Durik, Schmidt, Shumow, & Rodenbeck, 2014; Harackiewicz, Tibbets, & Canning, 2014).

Students may appraise the relevance of their lessons to a variety of issues and concerns, which differentially affect academic outcomes. *Conceptual relevance* is the belief that lessons include information that relates to prior knowledge. *Motivational relevance* represents the belief that lessons include information relating to common (albeit not necessarily personally) motivating concerns beyond academia. Albrecht and Karabenick (2015) asked college students to explain what made courses relevant and found that responses tended to emphasize either comprehensibility (e.g., "Helps to understand information that we see everyday in a better more informative way.") or practical applicability (e.g., "This class is relevant because I will need good math skills in the health sciences field."). Hartwell and Kaplan (2018) found that 9th graders with average success expectancies and value in biology interpreted relevance as an informative connection (e.g., descriptive or explanatory), whereas those with high expectancies and value interpreted relevance in more affective terms (e.g., enjoyable or interesting), noting connections that implied content may be personally valuable.

Some students may find it especially difficult to make connections between school and their lives. Braddock and McPartland (1993) and Meece (2002) argued that students from disadvantaged socioeconomic backgrounds may find it difficult to relate coursework to their lives, because they have lower education-related aspirations, fewer job opportunities, fewer role models, and are often tracked into less challenging courses. Further, high school students often

do not have fully developed career aspirations, meaning they may not even define personal value in terms of career relevance, but more in terms of importance for their daily lives and personal development. For such reasons, it is important that relevance be assessed in relation to more inclusive and potentially impersonal issues in comparison to task value, particularly in at-risk adolescent populations.

Relevance Appraisal Processes

Relevance interventions are designed to initiate cognitive appraisal processes believed to support the development of positive relevance appraisals, which should lead students to build confidence in and value academic tasks. Specifically, by prompting students to evaluate the relevance of curricular content and instructional practices, these interventions should guide students to use intentional learning and motivation regulation strategies.

Perceiving relevance-supportive instruction. Based on decades of research, the National Research Council (2003) concluded that effective educators should make coursework "relevant to adolescents' experiences, cultures, and long-term goals, so that students see some value in what they are doing in school" (p. 212). Not surprisingly, one common approach to making coursework relevant is for teachers to include messages that illustrate the usefulness of learning the lessons for various goals, especially future careers. Shin, Ranellucci, and Roseth (2017) found that college students valued educational psychology more after hearing messages from both peers and teachers that learning the course content could be of value for future careers. Vansteenkiste et al. (2004) found that college students valued learning about recycling more when they received messages that it would facilitate intrinsic goals (e.g., making a community contribution) in comparison to extrinsic goals (e.g., becoming financially successful). Canning and Harackiewicz (2015) found that college students presented with information about the

usefulness of learning a math technique for future careers improved utility value for students with high confidence but hindered performance and interest for students with low confidence. Thus, teachers are likely to benefit from a better understanding of the particular concerns with which they should relate coursework in their efforts to promote positive academic outcomes.

Another approach to make coursework relevant is to clarify connections between lessons and students' prior knowledge. For instance, it is well-understood that curriculum and instruction should provide clear, coherent, and well-elaborated content that draws upon prior knowledge, connects to big ideas, and applies content to the world beyond academia (National Academies, 2018). For example, Brophy (2008) recommended that teachers should provide scaffolding to help their students develop the capacity to find meaning and worth in their schoolwork and self-regulate their motivation. Relevance writing interventions can provide such scaffolding (Albrecht & Karabenick, 2018b), e.g., directing students to focus on specific lessons (Hulleman & Harackiewicz, 2009) or concerns (Acee et al., 2010), techniques that students might use on their own moving forward.

Self-regulating relevance appraisals. Students intentionally seek to identify substantive, non-arbitrary connections between course content and their concerns to support their learning and motivation. According to Ausubel (1962, 2000), relevance supports learning by helping students integrate knowledge into their current cognitive structures. Substantive connections have potentially significant implications for their concerns (especially for comprehension) and are non-arbitrary when they are not random, spurious, or determined merely on account of individual opinion. For example, teachers will at times include superfluous details, needlessly repetitive information, or lengthy asides about their lives in lessons that do not contribute to students' understandings of the core content to be mastered. In recognition of this tendency,

students will often ask "What do I need to know?" Further, in their attempts to make lessons relevant to students' lives, teachers may include arbitrary applications that students don't really care about, e.g., claiming that learning math is important for calculating tips, which may only be compelling for a small set of individuals, given that most students carry phones with built-in calculators or may not eat at restaurants where tipping is expected.

To facilitate learning, students use *elaboration*, exploring connections between course content and prior knowledge (Weinstein, 1982; Weinstein, Acee, & Jung, 2011). Experimental studies have found that elaboration supports learning across several academic domains (for an extensive review and meta-analysis, see Donker, de Boer, Kostons, Dignath van Ewijk, & van der Werf, 2014). Because elaboration entails connecting new information to prior knowledge, its use should inform and promote beliefs about conceptual relevance. Students are likely to struggle with learning and consequently feel incompetent if they do not understand the conceptual relevance of new information to prior knowledge. For example, they may believe that they are not good at identifying such connections, i.e., low self-efficacy for elaboration (Usher, 2012). Berger and Karabenick (2011) found that 9th grade students' use of elaboration (e.g., "When studying math, I try to connect new material to what I already know.") at the beginning of their algebra courses did not predict changes in motivational beliefs (i.e., self-efficacy, value, and cost) over the semester. Self-efficacy predicted changes in elaboration.

To regulate their academic motivation, students use *value enhancement*, attempting to connect learning content to personally valued concerns (Sansone, Weir, Harpster, & Morgan, 1992; Wolters, 2003). Wolters (1998, 1999) found that college and high school students reported trying to connect course material to their lives, experiences, and interests when they were not motivated to complete their schoolwork. Students who used value enhancement also tended to

report using elaboration strategies, which were positively related to their achievement. Hulleman et al. (2017) found that the frequency with which college students reported connecting class materials to their lives (e.g., "When studying for quizzes and exams, how often do you connect the class material to your life?")[3] positively predicted utility value and success expectancies. Value enhancement has also been found to correlate moderately and positively with task value (Smit, Brabander, Boekaerts, & Martens, 2017; Wolters & Rosenthal, 2000). Because the purpose is to identify connections between course content and motivating concerns, value enhancement should positively account for task value, and that relationship should be mediated by perceptions of motivational relevance.

The Present Research

There is a notable lack of research investigating the role of relevance in the motivation, engagement, and achievement of adolescents and below-average achieving students. Accordingly, the research present here is intended as a preliminary step toward a broader design-based intervention effort at one high-needs secondary school in southeast Michigan in the U.S. While short of supporting causal inferences, its correlational design provides critical insights to inform motivation interventions. Because relevance appraisal processes are common in school contexts and manipulating them has had negative results when implemented in modest achievement contexts, the present research was designed to clarify their natural occurrence and interrelationships as a precautionary step prior to their use as interventions. In two studies, a model specifying the cognitive mechanisms through which relevance interventions influence motivational beliefs was tested using survey data and school records. Commonly proposed

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[3] It is unclear whether students were reporting the frequency with which they used self-regulated relevance appraisals or the frequency with which they were successful in making relevance connections. Further, "connect the class material to your life" may be interpreted as connecting to school or to non-academic domains (e.g., personal interests); thus, it is plausible that this measure assessed both elaboration and value enhancement.

socioeconomic disparities in relevance appraisals and motivational beliefs were also examined using multiple indicators of socioeconomic status.

The paths between relevance and targeted academic outcomes have not been clearly specified, because researchers frequently refer to relevance, motivation, and engagement interchangeably. To address this gap, a proposed educational relevance appraisal (ERA) model posits that relevance interventions work by directing students' relevance appraisal processes, which influence motivational beliefs through their effects on relevance beliefs. Study 1 tested the ERA model in May of the 2019 spring semester. The model was subsequently modified based on these results to create a more concise version. Study 2 tested the replicability of the reduced ERA model in the same school in November of the 2019 fall semester.

The ERA model was divided into two parts for clarity (see Figure 2.1). Part 1 examined the indirect effects of relevance appraisal processes on motivational beliefs. It was proposed that elaboration should positively affect success expectancies by reinforcing conceptual relevance beliefs. Value enhancement should affect task value by reinforcing motivational relevance beliefs, i.e., perceived connections between course lessons and their motivating concerns, including future educational and career aspirations, personal interests, personal values, and everyday experiences. Part 2 tested the main tenet of EVT: students should engage with and perform well at tasks that they value and believe they can succeed at (Eccles et al., 1983).

Figure 2.1

Relevance Appraisals as Mediators of Intervention Effects on Academic Outcomes
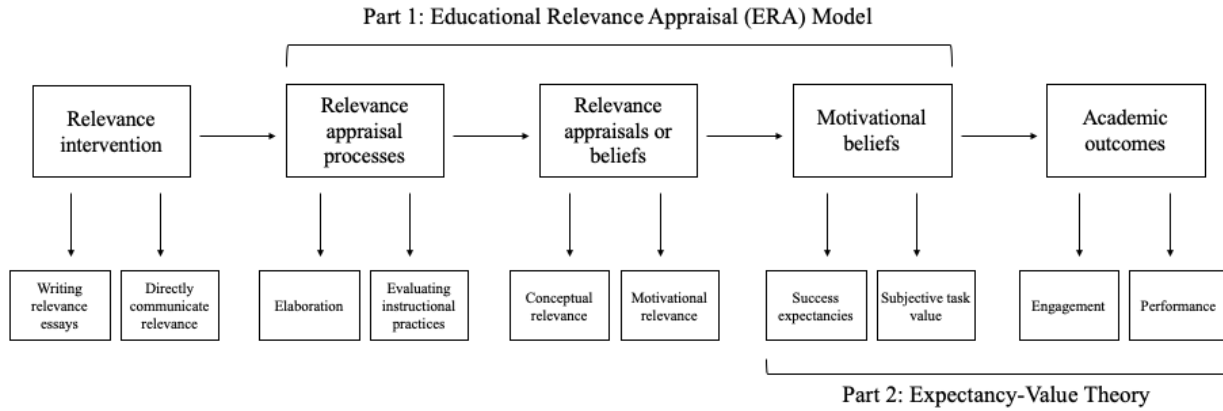
Note. Relevance interventions seek to improve motivational beliefs, which EVT posits will promote positive academic outcomes. The ERA model introduces relevance appraisals and related cognitive processes as key mediators between interventions and motivational beliefs.

Study Hypotheses

Socioeconomic Disparities Hypothesis

H1. Social class positively predicts relevance, motivation, and performance.

Part 1: Indirect Effects of Relevance Appraisal Processes on Motivational Beliefs

H2. Relevance beliefs mediate effects of appraisal processes on motivational beliefs.

Part 2: Motivational Beliefs Predict Academic Outcomes

H3. Motivational beliefs positively predict engagement and performance.

Overview of Methods

Research Context

Data for this research were collected at Freedom High School[4]: a rural-fringe high school in southeastern Michigan. The school had an atypical balance of students from urban and rural geographic locations; about half come from rural and the other half from urban areas. The rural students are typically from agricultural and commuter communities, where the primary economy is either farming or jobs that require driving to nearby communities. Students were mostly male (52%) and White (58%), with about 30% of students identify as Black and 10% as multiracial.

In addition to the school's geographic and racial diversity, there is a strong representation of students from disadvantaged socioeconomic backgrounds. Over 40% of the students are eligible for free or reduced-price lunch, making the school eligible for Title I funding. Roughly 70% of current students are at-risk for academic failure based on criteria established in Section 31a of the Michigan State School Aid Act. As reported by school records, roughly 40% of seniors that graduated in 2018 planned to matriculate to a four-year college, while about 45% intended to enter two-year colleges. Students who reported significant economic need were twice as likely as economically stable students to report intentions to pursue less than a four-year degree.

Research Participant Samples

This research was approved by the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board. Data were collected at two timepoints: May 2018 and November 2018. This sampling was chosen for multiple reasons. The survey items used for this research were included in a larger survey conducted bi-annually to assess students'

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[4] Freedom High School is a pseudonym. School descriptions and statistics in this section were reported by school publications, government agencies, and local news sources, but references have been omitted to protect anonymity.

perceptions of school climate as part of Freedom High's school improvement plan; thus, survey timing and frequency were based on the school administration's priorities, which included efforts to prevent survey fatigue and attrition from oversampling. Further, the purpose of this research was to examine students' relevance appraisals and their relationship to motivation across a representative sample of students and academic subjects, rather than in a select few subjects, as is common among researchers seeking to observe developmental trends in motivation.

This sampling strategy made it possible to assess the replicability of the theoretical model both with different groups of students (as seniors graduated in June 2018 and new freshman entered in September 2018), as well as with the same students appraising different courses with different teachers in a subsequent academic year, e.g., most juniors in May were seniors in November. Altogether, 376 students completed surveys in both May and November, 315 students only participated in May, and 329 only participated in November.

Study 1: Initial Test of the ERA Model

The purpose of Study 1 was to test the ERA model connecting students' social class, risk status, relevance appraisals, motivational beliefs, engagement, and course performance.

Study 1 Methods

Recruitment. All students at the school were given the opportunity to complete the survey during their regularly scheduled English classes. At the beginning of the online survey, students were presented with a brief overview of the survey's primary purpose, namely, to understand students' experiences in school for the purpose of school improvement. Next students were presented with a brief introduction to the research, followed by a more elaborate assent form. Students who agreed to participate were given the provided their names to be included in a lottery to win one of 200 $5 cash awards.

Participants. Participants included 643 students: 9th (n = 174, 29%), 10th (n = 163, 27%),

11th (n = 176, 29%), and 12th (n = 97, 16%) graders; Mean age = 16 years old; 323 girls (51%),

315 boys (49%); 349 White (55%), 130 Black (20%), 113 mixed-race (18%), 46 other (6%), and

5 missing (1%); Mean GPA = 2.7/4.0; 216 received free or reduced-price lunch (37%); 307

parents attained a 2-year degree or less (54%); 428 were classified at-risk (67%).

Procedures. Survey data for Study 1 were collected during May 2018. All students

completed the online Qualtrics survey (*Median* = 25 minutes) on individual laptops during their

regularly scheduled English classes. To make the survey more concrete[5] and assess beliefs from

a representative sample of course subjects, each student was randomly assigned to enter the

name of either their 1st, 2nd, 3rd, or 4th hour course in an open-ended prompt.[6] The course name

was then inserted into subsequent survey questions by Qualtrics. For instance, if a student was

randomly assigned to enter his/her 3rd hour course title (e.g., Algebra II), then a subsequent ERA

scale item would include that information: "In *Algebra II*, the lessons are relevant to my future

education."

Self-Report Measures

Elaboration. In order to increase the likelihood that students would interpret items

consistently with the self-regulated learning literature, an introduction to the items drew attention

to the effortful nature of elaboration: "One strategy students use to learn is to connect what they

are learning to what they already know. Do YOU TRY to make connections between what

---

[5] In a separate study, cognitive interviews were conducted to assess item interpretability (Albrecht, 2019). Albrecht
found that students frequently interpreted items including "the course," "this course," and "this class" to refer to any
class that they happened to be thinking of (which often changed from item to item), rather than the particular class
that they were asked to focus on. Thus, the course names were entered into each item to remind students which class
they should focus on.

[6] Because the school's master schedule did not restrict particular course subject offerings to designated parts of the
day (e.g., only offering math classes in the afternoons), this procedure was used to solicit feedback on a
representative sample of courses offered at Freedom High.

you're learning in [course name] and other things you know about?" Following this introduction, students responded to four items adapted from Wolters and Benzon (2013): "In [course name] I try to use what I already know to help me understand new things." "In [course name] I think about how the lessons relate to things that I am familiar with." "In [course name] I try to relate the lessons in this course to lessons in other courses." and "In [course name] I try to connect what we are learning to things I learned earlier in this class." Students indicated how often they used elaboration in the focal course on a 5-point scale (1 = *never* to 5 = *always*).

Value enhancement. As with elaboration, an introduction to the items (based on Wolters & Benzon, 2013) drew attention to the effortful nature of value enhancement: "One way to motivate yourself in a class is to look for connections between what you are learning and things you care about. Do YOU TRY to make connections between what you're learning in [course name] and the things you care about?" Following this introduction, students responded to four items: "In [course name] I try to think of ways that it would be helpful for me to have the knowledge or skills we are taught." "In [course name] I try to connect what I'm learning to what I want to do in my life." "In [course name] I try to relate what we're learning to my personal interests." and "In [course name] I really try to understand how the lessons are personally relevant." Students indicated how often they used value enhancement in the focal course on a 5-point scale (1 = *never* to 5 = *always*).

Relevance-supportive instruction. "In [course name] the teacher helps students relate lessons to their lives." "In [course name] the teacher relates learning goals to careers students might want someday." "In [course name] the teacher applies lessons to everyday life." and "In [course name] the teacher connects lessons to students' interests." Students indicated how often

they believed teachers tried to make their lessons relevant in the focal course on a 5-point scale (1 = *never* to 5 = *always*).

Educational relevance appraisals. The educational relevance appraisals (ERA) scales were designed to assess students' perceptions of the prevalence of connections on a 5-point scale (1 = *never* to 5 = *always*) between course lessons and five life domains: prior knowledge, career goals, personal interests, personal values, and everyday life. Albrecht (2019) found that the ERA scales demonstrated sound psychometric properties, including evidence of convergence with and discrimination from related motivational constructs (such as task value and expectancies for success). See Table 2.1 for reliabilities.

Expectancies for success. Based on Kosovich et al.'s (2015) expectancy-value-cost scale, expectancies for success were assessed with three items: "I'm confident that I can understand the material in [course name]." "I know I can learn the material in [course name]." and "I think I can be successful in [course name]." Students indicated their expectations for success in the focal course on a 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*).

Subjective task value. Based on Kosovich et al.'s (2015) expectancy-value-cost scale, subjective task value was assessed with three items: "I personally value [course name]." "[Course name] is important to me." and "[Course name] is useful for me." Students indicated the extent to which the statements reflected their attitudes on a 5-point scale (1 = *not at all true of me* to 5 = *extremely true of me*). Kosovich et al. (2015) detailed evidence of acceptable psychometric properties.

Behavioral engagement. Based on Skinner, Kindermann, and Furrer (2009), the behavioral engagement subscale included three items: "In [the course] I try hard to do well." "In [the course] I listen carefully during lessons." and "In [the course] I stay on task during

activities." Students indicated how often they felt engaged on a 5-point scale (1 = *never* to 5 = *always*).

Caregivers' highest educational attainment. Students reported their primary caregivers' attainment on a single item, "What is the highest level of education completed by either of your primary caregiver(s)?" Response options were coded ordinally (0 = *Some high school*, 1 = *Completed high school*, 2 = *2-year degree from community or technical college*, 3 = *4-year college degree, like a Bachelor's*, and 5 = *Graduate degree, like a Master's or PhD*).

Subjective socioeconomic status (SSES). SSES was measured using the MacArthur Scale (Adler, Epel, Castellazzo, & Ickovics, 2000). Students were presented with a 10-rung ladder and instructed: **"**Imagine that this ladder pictures how American society is set up. At the top of the ladder are the people who are the best off—they have the most money, the highest amount of schooling, and the jobs that bring the most respect. At the bottom are the people who are the worst off—they have the least money, little or no education, no jobs or jobs that no one wants or respects. Now think about your family. Fill in the circle that best represents where your family would be on this ladder right now."

Race. Students were asked "How would you describe your racial or ethnic group(s)? Check any that apply." Options included East Asian, Black, White, Arab American, Native American, South Asian, Latin American, and Other (open response). Students who indicated only White were coded 1. Students who indicated any other race either on its own or in combination with White was coded 0 for racial or ethnic minority.

Gender. Gender was coded 0 for male and 1 for female.

School Records Data

Free or reduced-price lunch (FRL). Students' eligibility for free or reduced-price lunch was dummy coded (0 = *not eligible* and 1 = *eligible*).

Academic risk status. Students were identified at-risk for academic underachievement if they scored below proficiency on English Language Arts (ELA), mathematics, science, and/or social studies MI State summative assessments. Risk status was dummy coded (0 = *proficient* and 1 = *not proficient*).

GPA. Cumulative high school GPA was reported on a 4.0 scale ($M = 2.74$, $SD = 0.90$).

Final course grades. Course grades were obtained one month after the end of the semester ($M = 7.07$, $SD = 3.61$). They were reported as letter grades and coded as ratio data (0 = *E*, 1 = *D-*, 2 = *D*, 3 = *D+*, 4 = *C-*, 5 = *C*, 6 = *C+*, 7 = *B-*, 8 = *B*, 9 = *B+*, 10 = *A-*, 11 = *A*).

Study 1 Results

Descriptive analyses. Tables 2.1 and 2.2 report Pearson correlations and scale statistics for research scales.

Table 2.1

Part 1: ERA Model Construct Correlations and Scale Statistics

Variable	1	2	3	4	5	6	7	8	9
1. Elaboration		.65	.34	.53	.51	.43	.44	n/a	n/a
2. Value enhancement	.60		.30	.59	.42	.49	.55	n/a	n/a
3. Success expectancy	.30	.18		.51	.41	.34	.37	n/a	n/a
4. Task value	.47	.51	.44		.52	.62	.64	n/a	n/a
5. Conceptual relevance	.62	.46	.39	.54		.46	.44	n/a	n/a
6. Career relevance	.49	.49	.27	.58	.50		.52	n/a	n/a
7. Interest relevance	.44	.48	.26	.57	.46	.45		n/a	n/a
8. Value relevance	.53	.49	.29	.53	.53	.45	.61		n/a
9. Everyday relevance	.56	.55	.27	.52	.55	.52	.55	.70	
Means									
May	2.79	3.01	5.61	2.74	2.97	2.99	2.18	2.30	2.52
November	3.43	3.30	4.08	3.35	3.18	3.08	2.59	n/a	n/a
Standard deviations									
May	1.04	1.03	1.31	1.08	0.95	1.06	1.07	1.11	1.09
November	0.88	0.94	0.89	1.15	0.85	1.20	1.20	n/a	n/a
Cronbach's α									
May	.85	.90	.92	.89	.85	.90	.94	.93	.90
November	.78	.84	.89	.91	.79	.81	.87	n/a	n/a

Note. $n = 604\text{-}616$. All correlations significant at $p < .001$. Correlations below the diagonal are between May 2018 measures. Correlations above the diagonal are between November 2018 measures. Life values relevance and everyday relevance were only measured in May.

Table 2.2

Part 2: EVT Construct Correlations

Variable	1	2	3	4	5
1. Success expectancy		.51*	.36*	.26*	.05
2. Task value	.44*		.49*	.08	.02
3. Behavioral engagement	.40*	.41*		.19*	.09
4. Course grade	.38*	.21*	.33*		.66*
5. May GPA	.24*	.04	.24*	.66*	
Means					
May	5.61	2.74	3.94	7.07	2.74
November	4.08	3.35	4.10	7.05	n/a
Standard deviations					
May	1.30	1.08	0.87	3.61	0.90
November	0.89	1.15	0.72	3.72	n/a

Note. $n = 584$-630. $^*p < .001$. Correlations below the diagonal are between May 2018 measures. Correlations above the diagonal are between November 2018 measures.

Hypothesis 1: Disparities in academic outcomes. Multivariate analysis of variance (MANOVA) was used in SPSS to examine group differences in three separate sets of outcomes: academic achievement, relevance appraisals, and motivational beliefs. Each set consisted of multiple dependent variables. Academic achievement included GPA and course grades. Relevance appraisals included conceptual, future aspirations, personal interests, life values, and everyday experiences relevance. Motivational beliefs included success expectancies and task value. This approach first tested for multivariate group differences in a set of dependent variables with an initial omnibus F test. When significant differences were observed, univariate omnibus F tests examined differences in each individual dependent variable based on each independent

variable. When significant univariate differences were observed in independent variables with two groups (i.e., FRPL eligibility, academic risk status, gender, and race), then their means were compared. Because parents' educational attainment had more than two groups, *post hoc* tests were employed to identify which group means differed significantly. Each MANOVA included all five independent variables. Interactions were not assumed or modeled.

Results from the first MANOVA revealed significant differences in academic achievement based on parents' highest educational attainment, academic risk status, gender, and race. There were no differences based on FRPL eligibility. See Table 2.3.

Table 2.3

MANOVA Tests of Group Differences in Academic Achievement

	Wilk's Λ	F	df	η^2
Parents' educational attainment	0.93	5.70***	6, 980	.03
FRPL	0.99	0.80	2, 490	.03
Risk status	0.86	38.67***	2, 490	.14
Gender	0.92	20.51***	2, 490	.08
Race	0.92	8.44***	2, 490	.03

Note. $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Omnibus univariate tests of between-subject effects revealed several group differences in each achievement outcome. At-risk students had lower GPAs than on-track students, $F(1, 491) = 77.50$, $p < .001$, partial $\eta^2 = .14$. At-risk students also had lower course grades than on-track students, $F(1, 491) = 26.52$, $p < .001$, partial $\eta^2 = .05$. Girls had higher GPAs than boys, $F(1,$

491) $= 40.95$, $p < .001$, partial $\eta^2 = .83$, and girls had higher course grades than boys, $F(1, 491) = 16.77$, $p < .001$, partial $\eta^2 = .03$. White students had higher GPAs than racial or ethnic minority students, $F(1, 491) = 16.05$, $p < .001$, partial $\eta^2 = .03$, and white students had higher course grades than minority students, $F(1, 491) = 9.69$, $p = .002$, partial $\eta^2 = .02$. Tukey post hoc tests showed significant group differences in GPA and marginally significant differences in course grades based on parents' highest educational attainment. See Table 2.4 for group mean differences.

Table 2.4

Group Differences in GPA and Course Grades

	GPA	Course grade	*n*
Parent's educational attainment			
High school or less	2.51$_a$	6.65$_a$	161
2-year degree	2.59$_a$	6.99$_{a,b}$	97
4-year degree	2.98$_b$	7.36$_{a,b}$	138
Graduate degree	3.06$_b$	7.89$_b$	103
Academic risk status			
At-risk	2.50$_a$	6.42$_a$	290
On-track	3.12$_b$	8.05$_b$	209
Gender			
Female	3.02$_a$	7.85$_a$	256
Male	2.60$_b$	6.62$_b$	243
Race			
Minority	2.67$_a$	6.76$_a$	222
White	2.94$_b$	7.71$_b$	277

Note. Within each set of student characteristics, column cell means with different subscripts are significant at *p* < .05. Grade point average was on a 4.0 scale. Course grades coding included 6 = C+, 7 = B-, 8 = B, 9 = B+. Cell means for parents' educational attainment were compared using Tukey's Honest Significant Difference test.

A second MANOVA tested mean differences in relevance appraisals. As shown in Table 2.5, there was a significant difference in relevance appraisals based on FRPL eligibility, $F(5, 539) = 2.46$, $p = .03$; Wilk's $\Lambda = 0.98$, partial $\eta^2 = .02$; however, omnibus univariate tests of between-subject effects revealed no significant differences in individual relevance appraisals. No significant differences were observed based on parents' highest educational attainment, $F(15, 1488) = 0.70$, $p = .73$; Wilk's $\Lambda = 0.98$, partial $\eta^2 = .006$, academic risk status, $F(5, 539) = 1.59$, $p = .16$; Wilk's $\Lambda = 0.99$, partial $\eta^2 = .02$, gender, $F(5, 539) = 1.38$, $p = .23$; Wilk's $\Lambda = 0.99$, partial $\eta^2 = .01$, or race, $F(5, 539) = 1.16$, $p = .33$; Wilk's $\Lambda = 0.99$, partial $\eta^2 = .01$.

Table 2.5

MANOVA Tests of Group Differences in Relevance Appraisals

	Wilk's Λ	F	df	η^2
Parents' educational attainment	0.98	0.70	15, 1488	.006
FRPL	0.98	2.46[*]	5, 539	.02
Risk status	0.99	1.59	5, 539	.02
Gender	0.99	1.38	5, 539	.01
Race	0.99	1.16	5, 539	.01

Note. [*]$p = .03$.

Finally, a third MANOVA tested differences in motivational beliefs. As shown in Table 2.6, there was a significant difference in motivational beliefs based on academic risk status, $F(2, 559) = 8.55$, $p < .001$; Wilk's $\Lambda = 0.97$, partial $\eta^2 = .03$. Omnibus univariate tests of between-subject effects revealed that at-risk students ($n = 311$, $M = 5.46$, $SE = 0.08$) reported lower success expectancies than on-track students ($n = 257$, $M = 5.91$, $SE = 0.09$), $F(1, 560) =$

15.74, $p < .001$; partial $\eta^2 = .03$; but there were no differences in task value, $F(1, 560) = 0.55$, $p = .46$; partial $\eta^2 = .001$. No significant differences were observed based on parents' highest educational attainment, $F(6, 1118) = 0.79$, $p = .58$; Wilk's $\Lambda = 0.99$, partial $\eta^2 = .004$, FRPL eligibility, $F(2, 559) = 1.07$, $p = .34$; Wilk's $\Lambda = 0.996$, partial $\eta^2 = .004$, gender, $F(2, 559) = 1.27$, $p = .28$; Wilk's $\Lambda = 0.995$, partial $\eta^2 = .005$, or race, $F(2, 559) = 0.58$, $p = .56$; Wilk's $\Lambda = 0.998$, partial $\eta^2 = .002$.

Table 2.6

MANOVA Tests of Group Differences in Motivational Beliefs

|	Wilk's Λ	F	df	η^2
Parents' educational attainment	0.99	0.79	6, 1118	.004
FRPL	0.99	2.46	2, 559	.004
Risk status	0.97	8.55*	2, 559	.03
Gender	0.99	1.27	2, 559	.005
Race	0.99	0.58	2, 559	.002

Note. *$p < .001$.

Pearson correlations were estimated in SPSS to examine relationships between SSES, relevance appraisals, motivational beliefs, and academic achievement. SSES positively related to GPA ($r = .11$, $p = .008$). SSES did not significantly relate to course grades ($r = .08$, $p = .09$), success expectancies ($r = .07$, $p = .09$), task value ($r = -.04$, $p = .37$), conceptual relevance ($r = .02$, $p = .61$), future aspirations relevance ($r = .05$, $p = .27$), personal interests relevance ($r = -.008$, $p = .85$), life values relevance ($r = .03$, $p = .51$), or everyday relevance ($r = .04$, $p = .29$).

Path analysis was used in Mplus to examine direct and indirect effects of significant student background characteristics on academic outcomes (i.e., GPA and course grades). As shown in Figure 2.2, GPA and course grades were simultaneously regressed on parents' educational attainment, SSES, academic risk status, gender, and race; and course grades were regressed on GPA. Parents' attainment ($\beta = .24$, $p < .001$), risk status ($\beta = -.35$, $p < .001$), gender ($\beta = .24$, $p < .001$), and race ($\beta = .15$, $p < .001$) each accounted for significant variance in GPA ($R^2 = .29$, $p < .001$). SSES marginally predicted GPA ($\beta = .08$, $p = .06$). GPA ($\beta = .65$, $p < .001$) predicted course grades ($R^2 = .42$, $p < .001$), but parents' attainment ($\beta = -.05$, $p = .23$), SSES ($\beta = .005$, $p = .90$), risk status ($\beta = -.002$, $p = .97$), gender ($\beta = .02$, $p = .65$), and race ($\beta = .05$, $p = .22$) did not, after accounting for GPA. Indirect effects of student background characteristics on course grades were calculated in Mplus with 1,000 bias-corrected bootstrap standard error estimates (Muthén & Muthén, 2017). Parents' educational attainment ($\beta = .15$, $p < .001$), risk status ($\beta = -.23$, $p < .001$), gender ($\beta = .16$, $p < .001$), and race ($\beta = .10$, $p < .001$) each had significant indirect effects on course grades through GPA.

Figure 2.2

Student Background Characteristics Predict Academic Achievement
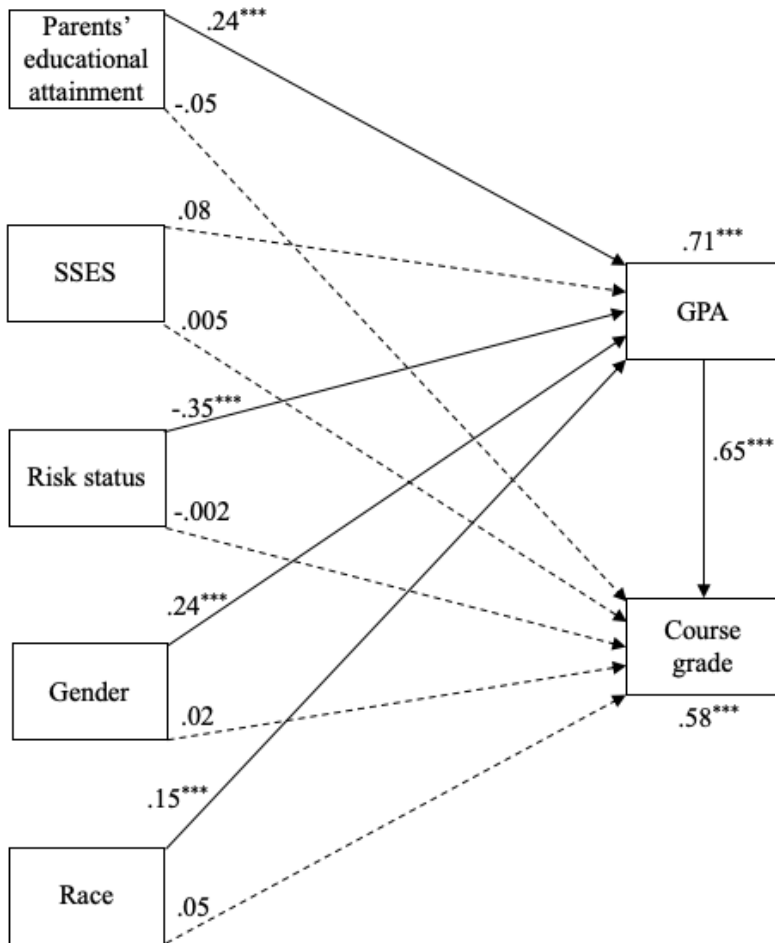
Note. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Dashed line indicates non-significant path. Estimates are STDYX standardized in Mplus. SSES is subjective socioeconomic status.

Hypothesis 2: Relevance mediates effects of appraisal processes on motivational beliefs. The ERA model (H2) was tested in four steps. According to Kenny (2018), analyses must show that (1) the causal variable affects the outcome variable, (2) the causal variable affects the mediator, (3) the mediator affects the outcome variable, and (4) the direct effect of the causal variable on the outcome is zero after accounting for the mediator. After testing the mediational

model, two versions of the ERA model were tested using structural equation modeling (Byrne, 2012; Kline, 2016) in Mplus 8 (Muthén & Muthén, 2017). The first (full) model included all relevance indicators. The second (reduced) model trimmed relevance variables and items to create a more concise and empirically-supported model. Model (mis)fit was assessed based on standard practices (Byrne, 2012; Schreiber, Nora, Stage, Barlow, & King, 2006) using the Chi-Square Test of Model Fit, Comparative Fit Index (CFI ≥ .90), Tucker Lewis Index (TLI ≥ .90), Root Mean Square Error of Approximation (RMSEA ≤ .08), and Standardized Root Mean Square Residual (SRMR ≤ .08).

Step 1: Relevance appraisal processes positively predict motivation. First, success expectancies and task value were simultaneously regressed on each appraisal process. Structural regression model estimates corroborated the basic premise of relevance interventions: appraisal processes positively predicted motivational beliefs (see Figure 2.3). Elaboration and relevance-supportive instruction each accounted for unique variance in success expectancies and task value. Value enhancement also accounted for task value but not success expectancies. Elaboration was the strongest predictor of success expectancies, whereas relevance-supportive instruction was the strongest predictor of task value. Appraisal processes accounted for 14% of variance in success expectancies and 41% in task value.

Figure 2.3

*Direct Effects of Intervention-Targeted Appraisal Processes on Motivational Beliefs*
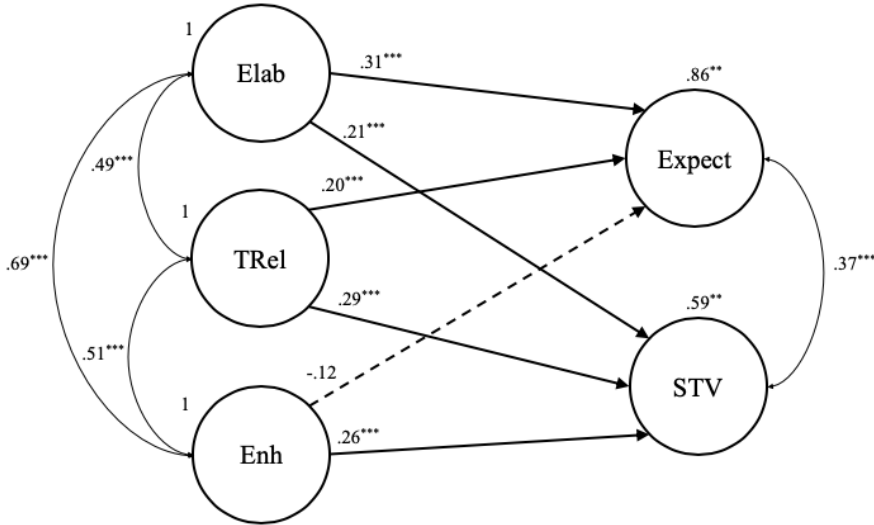
Note. $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$. Dashed line indicates non-significant path. Estimates are STDYX standardized in Mplus. Observations were included in estimation but not visualized in figure. The full model demonstrated adequate fit: $\chi^2 (109) = 214.94$, $p < .001$; RMSEA = 0.04; CFI = .99; TLI = .98; SRMR = .03. Elaboration (Elab), relevance-supportive instruction (TRel), value enhancement (Enh), success expectancies (Expect), task value (STV).

  Step 2: Appraisal processes predict relevance beliefs. Second, relevance beliefs were regressed on appraisal processes. As shown in Figure 2.4, each appraisal process accounted for unique positive variance in each relevance belief, with the one exception that value enhancement did not relate to conceptual relevance. The path between value enhancement and conceptual relevance was, therefore, trimmed from the ERA model in subsequent analyses. Elaboration was the strongest predictor of conceptual, future aspirations, life values, and everyday relevance

beliefs. Value enhancement was the strongest predictor of personal interests relevance. Appraisal

processes accounted for between 35% and 54% of variance in each relevance belief.

Figure 2.4

Appraisal Processes Explain Relevance Beliefs
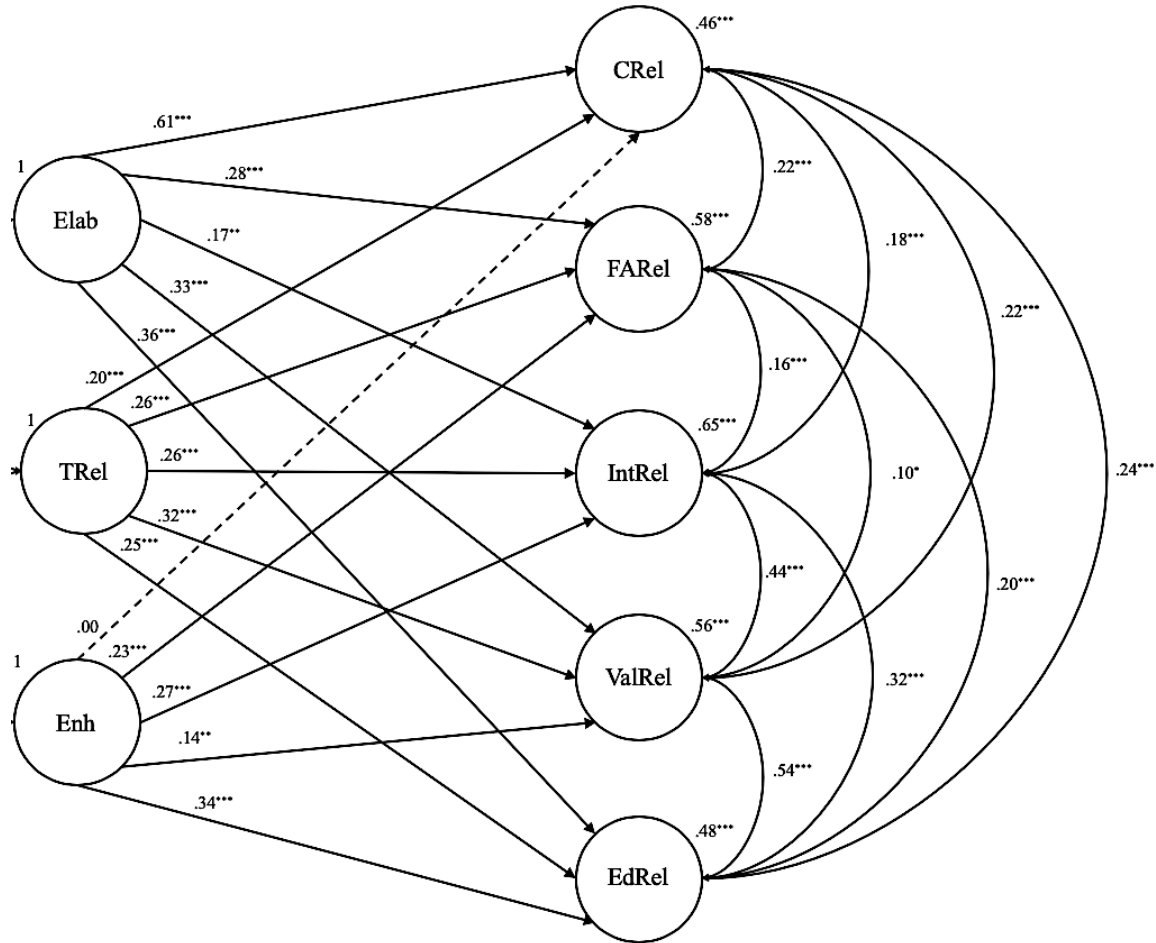
Note. : *$p < .05$, **$p < .01$, ***$p < .001$. Dashed lines indicate non-significant path. Estimates were STDYX standardized in Mplus. Observations were included in estimation but not visualized in figure. The model demonstrated adequate fit: χ^2 (406) = 1126.60, $p < .001$; RMSEA = 0.05; CFI = .95; TLI = .94; SRMR = .04. Elaboration (Elab), relevance-supportive instruction (TRel), value enhancement (Enh), conceptual relevance (CRel), future aspirations relevance (FARel), personal interests relevance (IntRel), life values relevance (ValRel), everyday relevance (EdRel).

Step 3: Relevance beliefs predict motivational beliefs. Third, motivational beliefs were regressed on relevance beliefs. As Figure 2.5 shows, each relevance belief, except everyday relevance, positively predicted task value, whereas only conceptual relevance predicted success expectancies. Therefore, everyday relevance and the paths between motivational relevance variables and success expectancies were trimmed from subsequent ERA models. Future aspirations and personal interests relevance were the strongest predictors of task value. Relevance beliefs accounted for 17% of variance in success expectancies and 56% in task value.
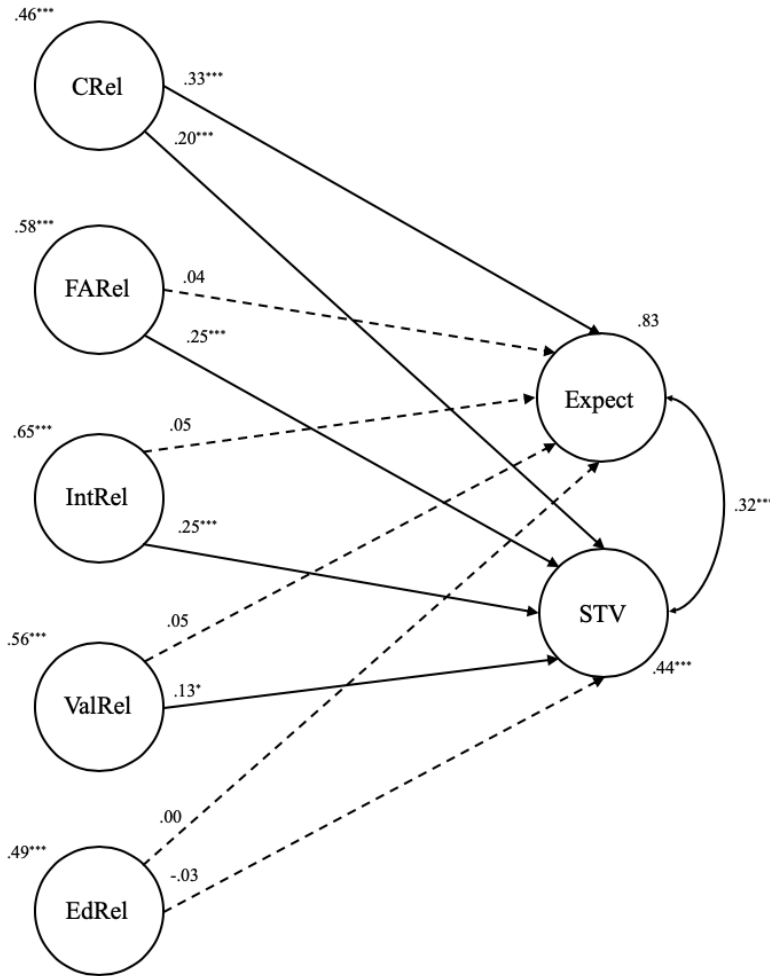
Figure 2.5

Relevance Explains Motivational Beliefs

Note. : *$p < .05$, **$p < .01$, ***$p < .001$. Dashed lines indicate non-significant path. Estimates were

STDYX standardized in Mplus. Observations were included in estimation but not visualized in

figure. The model demonstrated adequate fit: χ^2 (589) = 1521.97, $p < .001$; RMSEA = 0.05; CFI

= .95; TLI = .94; SRMR = .04. Conceptual relevance (CRel), future aspirations relevance

(FARel), personal interests relevance (IntRel), life values relevance (ValRel), everyday

relevance (EdRel), success expectancies (Exp), task value (STV).

***Step 4: Relevance beliefs mediate relationship between appraisal processes and
motivational beliefs.*** Finally, motivational beliefs were regressed on appraisal processes and
relevance beliefs, while relevance beliefs were regressed on appraisal processes. Figure 2.6
shows the paths between appraisal processes and motivational beliefs. Note that relevance beliefs
were included in the model as mediators but were not illustrated in the figure for the sake of
clarity. In support of H2, elaboration and relevance-supportive instruction no longer predicted
either motivational belief. Therefore, these paths were removed from the ERA model in
subsequent analyses. However, there was still a direct effect of value enhancement on task value,
which was reduced from $\beta = .26$ to .17, suggesting partial mediation. The direct path from value
enhancement to task value was retained in the ERA model. The full ERA model demonstrated
adequate fit: χ^2 (460) = 1218.03, $p < .001$; RMSEA = 0.05; CFI = .95; TLI = .95; SRMR = .04.

Figure 2.6

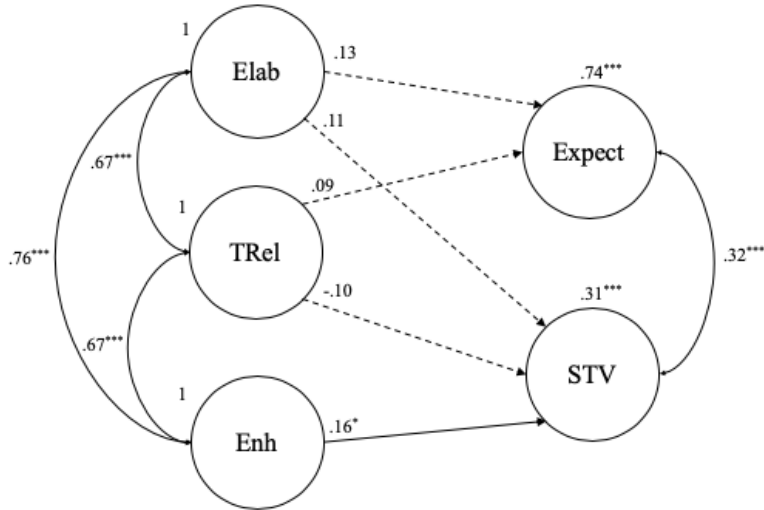*Relevance Mediates Relationships Between Appraisal Processes and Motivational Beliefs*

Note. $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$. Dashed lines indicate non-significant path. Estimates were STDYX standardized in Mplus. Observations were included in estimation but not visualized in figure. All five ERA variables were included as mediators but excluded from figure for clarity. The model demonstrated adequate fit: $\chi^2 (584) = 1511.12$, $p < .001$; RMSEA = 0.05; CFI = .95; TLI = .94; SRMR = .04. Elaboration (Elab), relevance-supportive instruction (TRel), value enhancement (Enh), success expectancies (Expect), task value (STV), educational relevance appraisals (ERA).

To probe the mediation model, indirect effects were calculated in Mplus with 1,000 bias-corrected bootstrap standard error estimates (Muthén & Muthén, 2017). Elaboration indirectly affected success expectancies through conceptual relevance ($\beta = .19$, $p = .001$) and indirectly affected task value through conceptual relevance ($\beta = .13$, $p = .005$), future aspiration relevance ($\beta = .06$, $p = .005$), and interest relevance ($\beta = .04$, $p = .02$), but not life values relevance ($\beta = .03$, $p = .12$). Value enhancement had indirect effects on task value through future aspiration

relevance ($\beta = .05$, $p = .006$) and interest relevance ($\beta = .06$, $p = .003$), but not life values relevance ($\beta = .01$, $p = .17$). Students' perceptions of relevance-supportive instruction indirectly affected success expectancies through conceptual relevance ($\beta = .07$, $p = .01$) and task value through conceptual relevance ($\beta = .05$, $p = .01$), future aspiration relevance ($\beta = .06$, $p = .002$), and interest relevance ($\beta = .06$, $p = .001$), but not life value relevance ($\beta = .03$, $p = .10$). Life values relevance was removed from the model, because it did not contribute to understanding the relationship between appraisal processes and motivational beliefs.

Hypothesis 3: Motivational beliefs predict engagement and performance. In addition to Part 1 of the mediation model, the full ERA model predicted course performance and engagement with success expectancies, task value, and GPA (see Figure 2.7). The full model demonstrated adequate fit: χ^2 (632) = 1556.02, $p < .001$; RMSEA = 0.05; CFI = .93; TLI = .93; SRMR = .05. Success expectancies ($\beta = .29$, $p < .001$) and task value ($\beta = .32$, $p < .001$) both explained engagement ($R^2 = .27$, $p < .001$). Success expectancies ($\beta = .17$, $p < .001$), engagement ($\beta = .10$, $p = .02$), and GPA ($\beta = .60$, $p < .001$) explained final course grades ($R^2 = .48$, $p < .001$), but task value ($\beta = .07$, $p = .11$) did not. Conceptual relevance was regressed on GPA, because students with high GPAs should have more relevant background knowledge with which to connect their course lessons. GPA positively predicted conceptual relevance appraisals, ($\beta = .10$, $p = .003$).

Figure 2.7

Full ERA Model in May 2019
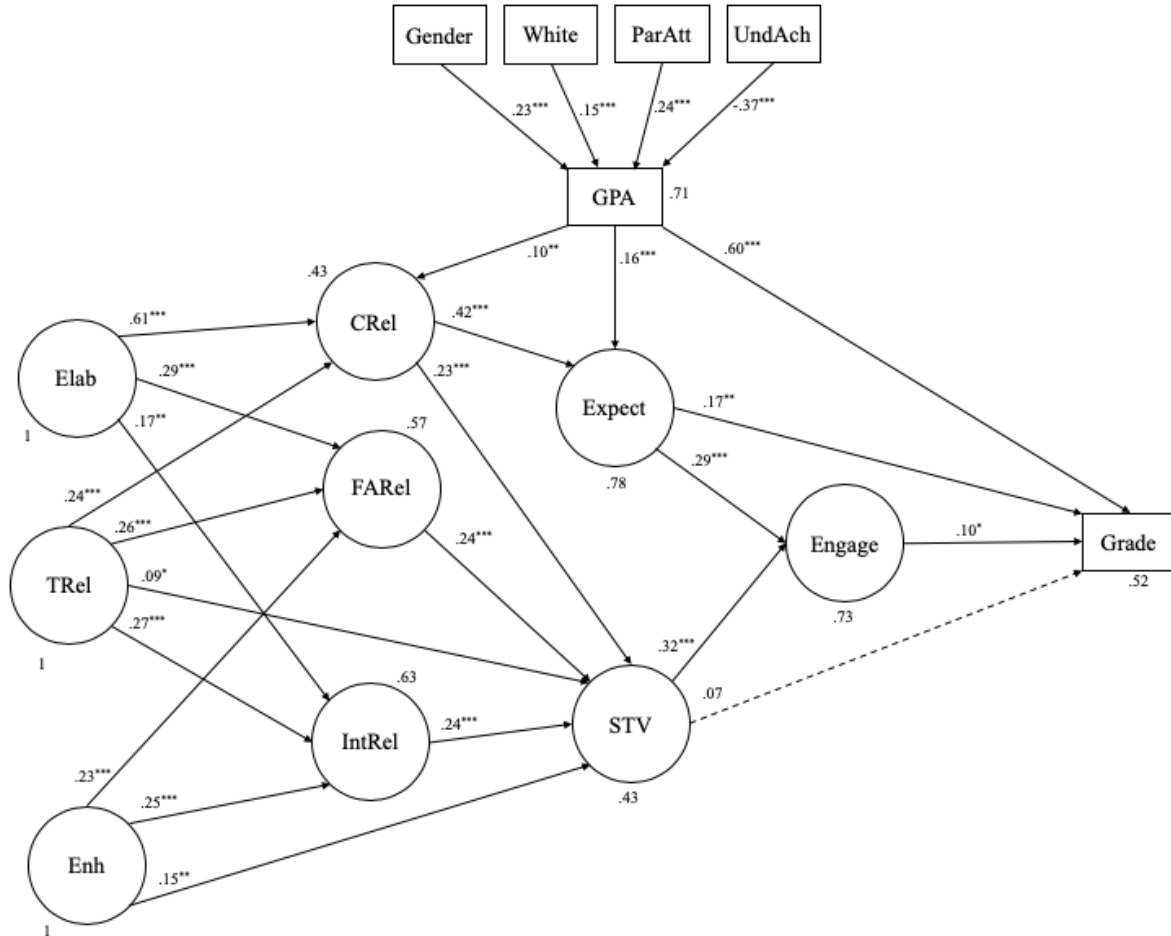
Note. *$p < .05$, **$p < .01$, ***$p < .001$. Circles represent latent variables and squares are single-item indicators. Estimates are STDYX standardized in Mplus. The full model demonstrated adequate fit: $\chi^2 (632) = 1556.02$, $p < .001$; RMSEA = 0.05; CFI = .93; TLI = .93; SRMR = .05. Elaboration (Elab), relevance-supportive instruction (TRel), value enhancement (Enh), conceptual relevance (CRel), future aspirations relevance (FARel), personal interests relevance (IntRel), Gender (0 = male, 1 = female), White (0 = racial or ethnic minority, 1 = white), parents' highest educational attainment (ParAtt; 1 = high school or less, 2 = 2-year degree, 3 = 4-year

degree, 4 = graduate degree), underachieved on state exams (UndAch; 0 = on-track, 1 = at-risk),

success expectancies (Expect), task value (STV), behavioral engagement (Engage), final course

grade (Grade).

The reduced ERA model. To make the model and subsequent surveys more concise, the

two lowest-loading indicators were removed from each of the future aspirations and personal

interests relevance subscales. The reduced ERA model demonstrated adequate fit: χ^2 (464) =

1104.27, $p < .001$; RMSEA = 0.05; CFI = .94; TLI = .94; SRMR = .05. Path coefficients

remained practically consistent (increasing by .04 or less) with corresponding coefficients in the

full model, except the coefficient between interest relevance and task value, which increased

from .22 to .31 (see Figure 2.8).

Figure 2.8

Reduced ERA Model in May 2018

Note. $^*p < .05$, $^{**}p < .01$, $^{***}p < .001$. Estimates are STDYX standardized in Mplus. Circles

represent latent variables and squares are single-item indicators. The model demonstrated

adequate fit: χ^2 (598) = 1489.85, $p < .001$; RMSEA = 0.05; CFI = .93; TLI = .93; SRMR = .05.

Elaboration (Elab), relevance-supportive instruction (TRel), value enhancement (Enh),

conceptual relevance (CRel), future aspirations relevance (FARel), personal interests relevance

(IntRel), Gender (0 = male, 1 = female), White (0 = racial or ethnic minority, 1 = white), parents'

highest educational attainment (ParAtt; 1 = high school or less, 2 = 2-year degree, 3 = 4-year

degree, 4 = graduate degree), underachieved on state exams (UndAch; 0 = on-track, 1 = at-risk), success expectancies (Expect), task value (STV), behavioral engagement (Engage), final course grade (Grade).

To probe the reduced ERA mediation model, indirect effects were calculated using standard errors estimated in Mplus from 1,000 bias-corrected bootstrap estimates (Muthén & Muthén, 2017). Elaboration indirectly affected success expectancies through conceptual relevance ($\beta = .26$, $p < .001$) and indirectly affected task value through conceptual relevance ($\beta = .13$, $p < .001$), future aspiration relevance ($\beta = .07$, $p = .002$), and interest relevance ($\beta = .06$, $p = .01$). Value enhancement had indirect effects on task value through future aspiration relevance ($\beta = .05$, $p = .01$) and interest relevance ($\beta = .07$, $p = .004$). Students' perceptions of relevance-supportive instruction indirectly affected success expectancies through conceptual relevance ($\beta = .10$, $p < .001$) and task value through conceptual relevance ($\beta = .05$, $p = .003$), future aspiration relevance ($\beta = .05$, $p = .004$), and interest relevance ($\beta = .09$, $p < .001$). Neither expectancies for success ($\beta = .03$, $p = .06$) nor task value ($\beta = .03$, $p = .06$) indirectly affected final course grades through engagement. Conceptual relevance ($\beta = .07$, $p < .001$) indirectly affected course grades through success expectancies.

Study 1 Discussion

Hypothesis 1 predicted that social class would positively predict relevance appraisals, motivational beliefs, and performance in classes. Study 1 replicated the common finding that socioeconomic status predicts achievement (Sirin, 2005; White, 1982); however, this was only the case for parents' highest educational attainment and not FRPL eligibility. FRPL is often criticized as a poor indicator of social class (Diemer, Mistry, Wadsworth, López, & Reimers, 2013). For instance, Harwell and LeBeau (2010) found that FRPL often includes students who

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should not be eligible and excludes students who are eligible but either don't know or haven't applied for FRPL. Parents' educational attainment, on the other hand, is more relevant to their children's academic achievement than their eligibility for FRPL, because the former is more likely to reflect the amount of academic capital that parents can provide their children, whereas it isn't clear what FRPL represents (Domina et al., 2018; Harwell & LeBeau, 2010). In this sample, FRPL and parents' attainment were only correlated at $r = -.25$. Further, 19% of students who came from households where parents attained a high school degree or less did not receive FRPL, while 10% of students whose parents attained a 4-year or graduate degree did receive FRPL.

Contradicting the common hypotheses that students from disadvantaged socioeconomic backgrounds perceive less relevance in their schoolwork and exhibit lower motivation than their more advantaged peers, this research found no differences in self- or school-reported indicators of social class. While such disparity hypotheses are prominent among motivation scientists (e.g., Schunk, Pintrich, & Meece, 2008), there is a dearth of evidence providing empirical support. A common finding is that social class is positively related to competency beliefs (Rumberger, 2011), but only a few studies have found similar correlations with task value beliefs (e.g., Kriegbaum & Spinath, 2016; Steinmayr, Dinger, & Spinath, 2012). Critically, prior studies have not directly tested relationships between social class and relevance appraisals.

Hypothesis 2 predicted that relevance beliefs would mediate the effects of intervention-targeted appraisal processes on motivational beliefs. Study 1 found mixed empirical support. As expected, students' use of self-regulated relevance appraisal strategies and perceptions of teachers' relevance-supportive instruction each explained unique variance in their relevance appraisals, and relevance appraisals accounted for variance in motivational beliefs. Whereas elaboration and perceived relevance-supportive instruction both accounted for unique variance in

all relevance appraisal dimensions, value enhancement helped explain motivational relevance appraisals but did not explain conceptual relevance. These findings suggest that the particular appraisal processes initiated by relevance interventions may affect relevance appraisals and subsequent motivational beliefs differently.

Differential effects of appraisal processes on conceptual and motivational relevance are especially noteworthy, because they relate differently to motivation. Conceptual relevance was the only significant predictor of success expectancies, beyond prior achievement, and also accounted for variance in task value beliefs, beyond motivational relevance. Appraisals of relevance to future aspirations and personal interests each explained unique variance in task value, but relevance to life values and everyday experiences did not. These findings suggest that relevance interventions may support both success expectancies and task value when they guide students to engage in elaboration, i.e., connecting coursework to their prior knowledge. Directing students to relate their coursework to future aspirations and personal interests, on the other hand, may promote task value beliefs but are less likely to support success expectancies. The added value of connecting coursework to life values and everyday experiences is questionable.

Hypothesis 3 predicted that motivational beliefs would positively predict engagement and performance in classes. Study 1 found partial support: success expectancies and task value each accounted for variance in behavioral engagement, but only success expectancies and engagement predicted final course grades, beyond prior achievement. The finding that task value did not predict course grades challenges the basic premise of EVT.

Study 2: Replicating the ERA Model

Study 2 sought to replicate the ERA mediational model another randomly-assigned set of classes during the fall semester of the 2018-2019 school year at Freedom High School. All hypotheses were the same as in Study 1.

Participants

Participants included 705 students: 9th ($n = 214$, 33%), 10th ($n = 145$, 23%), 11th ($n = 150$, 23%), and 12th ($n = 131$, 21%) graders; 321 girls (51%), 313 boys (49%); 321 White (52%), 302 racial or ethnic minority (49%); 301 parents attained a 2-year degree or less (54%); 418 students were identified academically at-risk (65%). About half of the students participated in both the spring and fall surveys ($n = 329$) and the other half were new to the fall survey ($n = 376$).

Procedures

Study 2 followed the same procedures used in Study 1, except that instead of following Kenny's (2018) steps for examining mediation, Study 2 imposed the reduced ERA model from Study 1 on student data from November 2018.

Measures

The same self-report measures included in the reduced ERA model in Study 1 were collected in November 2019. Final course grades and academic risk status were collected from school records. FRPL eligibility and GPA were not assessed in Study 2 due to logistical constraints; also, freshman did not have GPAs at the beginning of their first semester at Freedom High School.

Study 2 Results

Descriptive analyses. Table 2.1 reports Pearson correlations and scale statistics.

Retesting the reduced ERA model. Study 2 used the same procedures for assessing model (mis)fit as in Study 1. The structural equation model demonstrated adequate fit (see

Figure 2.9). As expected, success expectancies and task value explained unique variance in behavioral engagement. Further, success expectancies and engagement positively predicted final course grades. However, task value negatively predicted course grades.

Figure 2.9

Reduced ERA Model in November 2018
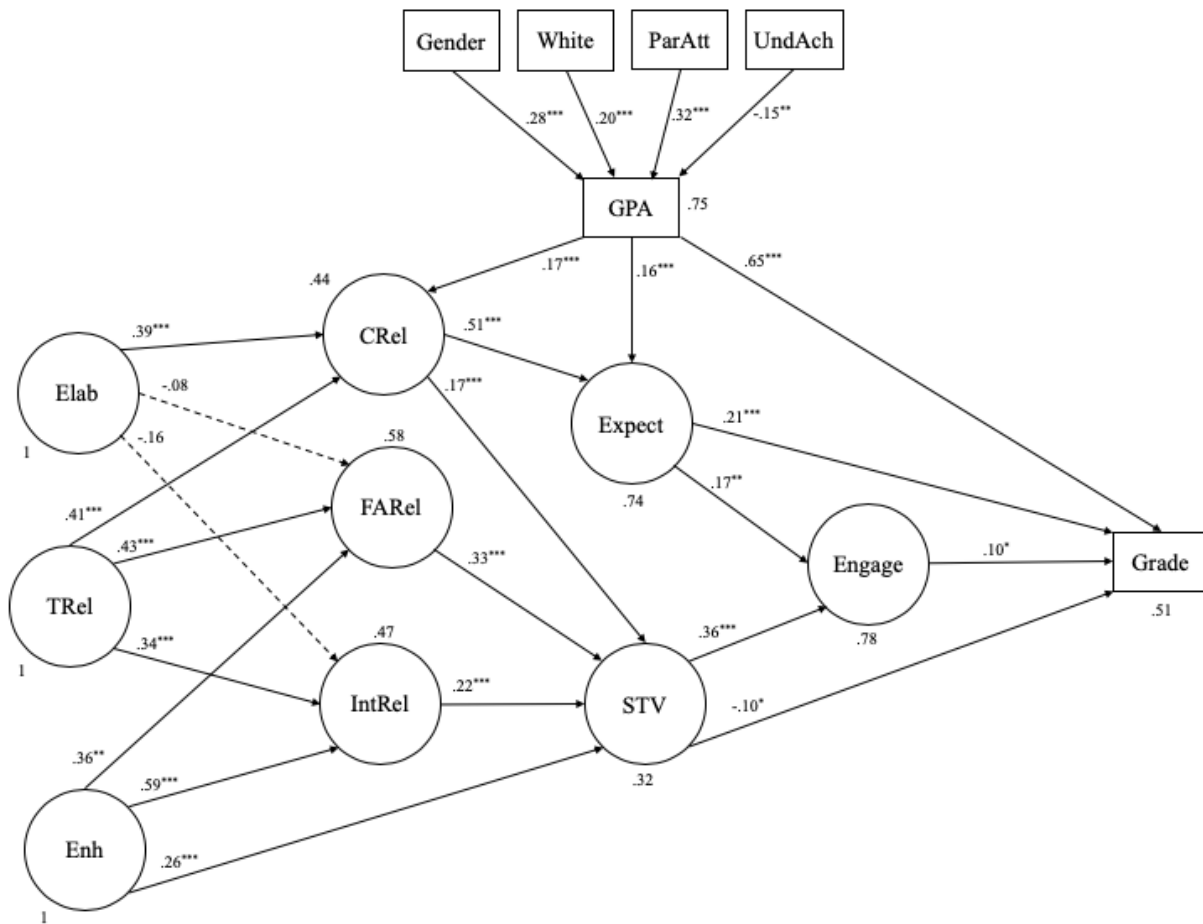
Note. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$. Estimates are STDYX standardized in Mplus. Circles represent latent variables and squares are single-item indicators. The model demonstrated adequate fit: χ^2 (496) = 1224.09, $p < .001$; RMSEA = 0.05; CFI = .92; TLI = .91; SRMR = .06.

Elaboration (Elab), relevance-supportive instruction (TRel), value enhancement (Enh), conceptual relevance (CRel), future aspirations relevance (FARel), personal interests relevance (IntRel), Gender (0 = male, 1 = female), White (0 = racial or ethnic minority, 1 = white), parents' highest educational attainment (ParAtt; 1 = high school or less, 2 = 2-year degree, 3 = 4-year degree, 4 = graduate degree), underachieved on state exams (UndAch; 0 = on-track, 1 = at-risk), success expectancies (Expect), task value (STV), behavioral engagement (Engage), final course grade (Grade).

To probe the ERA mediation model, indirect effects were calculated with the same procedures used in Study 1. Elaboration indirectly affected success expectancies through conceptual relevance ($\beta = .20$, $p < .001$) and indirectly affected task value through conceptual relevance ($\beta = .07$, $p = .005$). There were no indirect effects of elaboration on task value through future aspiration relevance or interest relevance. Value enhancement had indirect effects on task value through future aspiration relevance ($\beta = .12$, $p = .003$) and interest relevance ($\beta = .13$, $p = .001$). Students' perceptions of relevance-supportive instruction indirectly affected success expectancies through conceptual relevance ($\beta = .21$, $p < .001$) and task value through conceptual relevance ($\beta = .07$, $p = .005$), future aspiration relevance ($\beta = .14$, $p < .001$), and interest relevance ($\beta = .08$, $p = .005$). Neither success expectancies ($\beta = .02$, $p = .13$) nor task value ($\beta = .03$, $p = .08$) had indirect effects on final grades through engagement. Conceptual relevance ($\beta = .11$, $p < .001$) indirectly affected course grades through success expectancies. The full model demonstrated adequate fit: $\chi^2 (465) = 1179.34$, $p < .001$; RMSEA = 0.05; CFI = .92; TLI = .91; SRMR = .05.

Study 2 Discussion

Study 2 mostly replicated findings from Study 1 with a few exceptions. In Study 2, elaboration did not predict motivational relevance appraisals, and task value negatively predicted final course grades. All other relationships were consistent in direction and significance with those found in Study 1, although several differed in magnitude. Specifically, elaboration was less predictive of relevance appraisals in Study 2, whereas value enhancement was more predictive of motivational relevance appraisals and task value beliefs. In Study 1, future aspirations relevance was more predictive of task value beliefs than personal interest relevance, whereas the opposite was found in Study 2. Overall, the ERA model fit the empirical data well.

The relationships between appraisal processes and relevance beliefs. In May, elaboration was a stronger predictor of conceptual relevance than relevance-supportive instruction. In November, the two were equally as predictive, suggesting that students relied more on teachers' instructional practices to inform their relevance beliefs. Further, elaboration did not appear to affect students' motivational relevance beliefs, whereas value enhancement became more pronounced. Students may rely less upon elaboration in the first semester of new courses, because they have less academic background knowledge with which to connect lessons.

General Discussion

Relevance interventions are believed to support academic motivation and achievement by directing students to explore connections between academic tasks and their lives. Findings from experimental studies show that directly communicating relevance to students or asking them to self-generate connections between course lessons and their lives can improve or undermine motivation and achievement for a variety of students in different academic contexts (Albrecht, under review). Further, these inconsistent effects tend to be most pronounced for academically at-risk students (e.g., Albrecht et al., under review; Canning et al., 2019). Because of the

potential for relevance interventions to undermine academic motivation and achievement, the present research tested a theoretical model based on the existent relevance intervention literature as an initial step in developing a design-based intervention for use in a high-risk setting. Most classroom-based research on relevance and motivation has been conducted in high-achieving post-secondary contexts, particularly in math, science, and psychology courses (Harackiewicz & Priniski, 2018). The research reported herein examined these phenomena in a representative sample of courses at a high school where the majority of students were classified academically at-risk. Three primary hypotheses were tested and are considered in respective sections of this discussion. [7]

H1. Achievement, Relevance, and Motivation Increase with Social Class

The present research explored deficit hypotheses that social class should positively predict students' academic achievement, relevance appraisals, and motivational beliefs. Of the social class indicators tested, only parents' educational attainment positively predicted GPA, beyond gender, race, and academic risk status. There were no group differences in achievement

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[7] The findings reported herein cannot prove that the relationships found are causal, because the research was correlational and quasi-experimental. That said, the findings can be interpreted as either corroborating or refuting ERA model tenets when predicted relationships were found or not found, respectively. As such, "affected," "effect," "explained," and "accounted for" should be interpreted as correlational terms. "Predicted" indicates time-precedence; for example, GPA, FRPL, gender, race, and parents' educational attainment were established before the beginning of the semester, preceding the survey; and the survey was completed before course grades were assigned.

based on FRPL, and subjective socioeconomic status did not predict academic achievement after accounting for parents' attainment, gender, race, and risk status. These findings are mostly consistent with prior research in which parents' educational attainment predicted their students' academic achievement (Sirin, 2005). As noted in the Study 1 discussion, FRPL is not considered a strong indicator of socioeconomic status and often has inconsistent relationships with academic achievement.

Using multiple indicators of social class, the present research found no disparities in students' relevance appraisals or motivational beliefs. These findings challenge deficit hypotheses that students from disadvantaged backgrounds have a harder time connecting schoolwork to their lives and are less motivated academically. Indeed, there is limited evidence supporting such deficit hypotheses. Prior studies have not measured relevance directly, and studies showing relationships between social class and motivational beliefs are uncommon (c.f., Kriegbaum & Spinath, 2016; Steinmayr, Dinger, & Spinath, 2012). Findings from the present research suggest that students from disadvantaged socioeconomic backgrounds appraise course lessons as relevant, valuable, and achievable just as much as their more advantaged peers.

H2. Appraisal Processes Affect Motivational Beliefs Through Relevance

The ERA model posits that students appraise or explore the relevance of curricular content and instructional practices to distinct conceptual and motivational concerns. Students' appraisal processes are theorized to directly inform their relevance beliefs and indirectly affect their success expectancies and task value beliefs through relevance. In two studies, the present research found mixed support for these hypotheses.

In both studies, students' use of relevance appraisal processes helped explain their motivational beliefs. Replicating prior findings from the self-regulated learning literature,

students in these studies frequently reported self-regulating their relevance beliefs by exploring or appraising connections between coursework, instruction, and their concerns, and the use of those learning and motivational strategies were positively related to motivational beliefs. The present research contributed to those findings by revealing positive relationships between the use of relevance appraisal strategies and students' relevance appraisals. Both studies corroborated the primary ERA model hypothesis that students' use of relevance appraisal strategies indirectly affect motivational beliefs through relevance appraisals; however, future studies are needed to establish whether relevance appraisals actually mediate those relationships.

Both studies showed that value enhancement directly and indirectly explained task value through motivational relevance, i.e., students' beliefs that lessons were relevant to their future aspirations and personal interests. These findings support the primary hypothesis of relevance interventions that the use of value enhancement should improve task value beliefs by increasing students' sense of relevance to their future aspirations and personal interests. It is less likely that students who connect lessons to their life values and everyday experiences will perceive greater task value, as evidenced by the absence of relationships between these variables. Thus, it is especially notable that elaboration and value enhancement (both potentially elicited by relevance writing tasks) were positively related to life values and everyday experiences. These findings suggest that inconsistent intervention findings may be partially explained by the particular concerns with which students connect their course lessons.

The Hulleman and Harackiewicz (2009) writing prompt asks students to connect course topics to their lives. While some may relate topics to their future aspirations and interests, others may connect them to their everyday experiences, resulting in positive effects in the former case and null effects for the latter. Future studies that manipulate the specific concerns with which

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students connect course materials could test this possibility. The finding that value enhancement still had positive direct effects on task value beyond its indirect effect through motivational relevance demonstrates the need to assess other mechanisms through which value enhancement affects task value beliefs. For instance, value enhancement may elicit affective reactions, which EVT posits should predict task value beliefs (Eccles & Wigfield, 2002). Indeed, writing about relevance has been found to positively predict interest in several studies (Priniski et al., 2018).

Findings in support of the ERA model demonstrate the need to account for students' pre-existing use of self-regulated relevance appraisal strategies when attempting to intervene on them. For instance, students' level of familiarity with these strategies could affect the way they respond to writing assignments that ask them to perform value enhancement. For example, Hulleman et al. (2017) found that students who reported connecting lessons to their lives more frequently also reported higher levels of utility value and interest in psychology; however, the relevance writing task did not affect the frequency with which students connected course materials to their lives. As noted above, the question used to assess connection frequency ("When studying for quizzes and exams, how often do you connect the class material to your life?") may have confounded elaboration and value enhancement, i.e., students could make connections to support their learning or motivation, suggesting the potential for measurement error, which is not accounted for in OLS regression analyses. Further, the authors did not assess interactions between the intervention and connection frequency. Thus, it could be the case that there were positive effects for one group (e.g., students who made frequent connections pre-intervention) and negative effects for the other (e.g., students who made fewer connections pre-intervention). This possibility should be explored in future intervention studies.

Both studies found that elaboration explained success expectancies and task value beliefs indirectly through conceptual relevance appraisals. This suggests that relevance writing tasks may affect motivational beliefs by manipulating students' use of elaboration and highlights the need to broaden current perspectives on relevance that depict it primarily as a connection to personal goals (e.g., Vansteenkiste et al., 2018) while overlooking more common, conceptual interpretations of relevance. Indeed, in both studies, conceptual relevance was the only variable that accounted for unique variance in success expectancies beyond prior achievement and task value, and of those variables, conceptual relevance bore the strongest relationships with success expectancies. These findings also illustrate an important relationship between cognitively-oriented appraisals and more affectively-oriented motivational beliefs, particularly, that students' beliefs that course lessons relate to their prior knowledge may also inform their beliefs that engaging with those lessons should have personal benefits (i.e., task value), beyond their effects on success expectancies.

The present studies did not find direct or indirect effects between value enhancement and success expectancies; nor did motivational relevance appraisals relate to success expectancies after accounting for direct effects of conceptual relevance. This finding, which is consistent with ERA model assumptions, challenges the hypothesis that value enhancement should improve (e.g., Hulleman et al., 2017) or undermine (e.g., Canning et al., 2019) students' success expectancies in school. Again, future research is needed that parses out the effects of elaboration and value enhancement to see whether one predicts specific motivational beliefs while accounting for the other.

While the relationships between appraisal processes and success expectancies were relatively consistent across studies, relationships between appraisal processes and task value

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were less consistent. Elaboration indirectly affected task value beliefs through motivational relevance appraisals at the end (Study 1) but not the beginning (Study 2) of the school year. As noted above, students may have had a harder time connecting course lessons to their future aspirations and personal interests at the beginning of the year, because they had less knowledge of the course content than at the end of the year. Further, students' career aspirations and personal interests are likely to develop over the course of a year, meaning that they would have more knowledge of those careers and interests with which to relate course lessons and may want to relate course lessons to those issues more as they develop.

H3. Motivational Beliefs Predict Engagement and Performance

The main premises of EVT are that students should engage with and excel at tasks that they value and at which they expect to succeed (Eccles et al., 1983). These premises were partially supported in the present research. In both studies, success expectancies and task value beliefs explained unique variance in behavioral engagement; and success expectancies and engagement both predicted course grades, beyond prior achievement. However, relations between task value and academic outcomes were more complicated.

Contradicting EVT, task value did not predict course grades in Study 1 and negatively predicted them in Study 2 after accounting for variance in success expectancies, engagement, and prior achievement; however, there were no bivariate correlations between task value and course grades. This could suggest classical suppression in which the negative effect of task value on course grades was suppressed by measurement error variance (Kline, 2016). Once the error variance was accounted for by including other variables, then a negative relationship between task value and course grades was revealed. Another possibility is that one or more variables moderated the relationship between task value and course grades. For instance, students who are

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academically at-risk valued their classes the same as on-track students, despite the former's

comparably low prior achievement and expectancies for success.

In focus groups and individual interviews, students frequently said that they valued

classes in which they could hang out with their friends or where the teachers were lenient. In

such cases, students may be disengaged, e.g., distracted by their friends or otherwise off-task,

and still say that they value the class. Thus, while task value and engagement were positively

correlated, students may have reported valuing their classes whether or not they were engaged

and therefore had earned better or worse grades, respectively. After partialling out the variance

associated with engagement, variance associated with task value may have included variance

belonging to disengagement. Given these considerations, future research could use cognitive

interview procedures to examine the meaning students attribute to terminology used in surveys

designed to assess task value beliefs (Karabenick et al., 2007).

Future Directions

Further research is needed to elucidate the role that relevance appraisal processes play in

K-12 academic outcomes. One strength of the present studies is that they tested the ERA model

across academic disciplines; however, that design made it impossible to gauge the extent to

which relevance appraisal processes and beliefs change and relate in a given course across time.

Longitudinal research could help to clarify the role of appraisal processes in the development of

relevance beliefs and motivation. Research studies are also needed that test the generalizability

of the ERA model across disciplinary subjects. Experimental studies could assess the particular

appraisal processes initiated by relevance interventions, intentionally manipulate them, and test

their effects on relevance beliefs and motivation. Ideally, experimental manipulations would be

paired with longitudinal observations to truly test the ERA model's main tenet that relevance

beliefs mediate the relationship between appraisal processes and motivation.

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Chapter 4 **Conclusions**

Over the last century, educational stakeholders have called for relevance in schools, but the meanings and implications of these calls have remained largely elusive and contentious. The manuscripts presented in this dissertation clarified the meaning of educational relevance and theory regarding its role in promoting educational outcomes that have been targeted by social-psychological relevance interventions (Harackiewicz & Priniski, 2018; Rosenzweig & Wigfield, 2015). Guided by Pintrich's (2003) motivation science framework, this dissertation synthesized research findings and theories from educational psychology and philosophy to build a use-inspired research program. Specifically, the dissertation will guide future efforts to intervene on student motivation and achievement at Freedom High School. In the following, conclusions are considered in light of that research agenda, other relevance intervention work, and expectancy-value theory.

The Meaning of Educational Relevance

The conceptual analysis in Manuscript 1 offered a synthetic definition of relevance that brings current conceptualizations in the motivation sciences into closer alignment with societal interpretations and concerns. Through an analysis of lexical definitions, it was shown that relevance is commonly understood in more logical than affective terms, i.e., in common discourse relevance is a term indicating that something bears upon an issue or matter at hand. Based on linguistic and philosophical considerations, as well as statements made by Freedom High students, the ERA model defines *educational relevance* as a cognitive representation

indicating that aspects of academic lessons (e.g., content matter or teachers' utterances) are conceptually related to issues that concern students. Importantly, the issues that lessons relate to can vary in personal importance for students and therefore can have different implications for their motivation. Importantly, the fact that a lesson (e.g., on rocks) is relevant to a students' motivational concerns (e.g., her interest in rock-climbing) does not mean that the student will necessarily find the lesson personally valuable. For example, she may not believe that it would be personally beneficial to know how the rocks she climbs were formed.

Relevance appraisals or beliefs are distinct from motivational beliefs, as described in expectancy-value theory (EVT; Eccles, et al., 1983). In Manuscript 1, the view that relevance is synonymous with task value was critiqued and shown to lead to circular explanations for intervention effects in motivation research. Based on conceptual work in expectancy-value theory (Eccles, 2005) and philosophy (Diorio, 1977), it was concluded that relevance is a necessary but insufficient criterion for task value. Task value not only requires that students believe that lessons are significant to an issue but also that the issue concerns personally significant and valenced outcomes (e.g., benefits or costs to oneself or a group with which one identifies). Assuming these distinctions makes it possible for researchers to meaningfully indicate relevance as an antecedent of motivational beliefs, beyond students' goals and prior affective experiences in school, which will make important contributions to EVT.

By distinguishing between different types of educational relevance, the ERA model helps to explain distinct effects of cognitive appraisal processes on motivational outcomes. *Conceptual relevance* represents students' beliefs that lessons have bearing upon prior knowledge and may therefore have significant implications for comprehension. *Motivational relevance* is the belief that lessons bear upon personally valued concerns and therefore that

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understanding the lessons may be important or useful for pursuing those concerns. The ERA model predicts that elaboration indirectly affects success expectancies through conceptual relevance appraisals, whereas value enhancement should indirectly affect task value through motivational relevance appraisals. These hypotheses were corroborated in both studies reported in Manuscript 2.

Implications for Future Intervention Studies at Freedom High School

The research presented in this dissertation should support future intervention efforts at Freedom High and beyond. Descriptive findings showed that the majority of students already use appraisal strategies targeted by relevance interventions, which must be accounted for in future studies that test the ERA model both at Freedom High and other institutions. As noted above, pre-intervention use of relevance appraisal strategies may moderate intervention effects, e.g., students who are more familiar with the strategies are likely to be more successful at applying them when prompted. Correlational findings in Study 2 suggest that the use of specific appraisal strategies relate differently to relevance beliefs at different times of the year, which will need to be replicated and further examined in future research. For example, beyond other correlational replications, qualitative studies could examine students' experiences with appraisal strategies at different times of the year to identify when students may need more support to successfully implement those strategies. The findings also suggest the need for studies that manipulate appraisal strategies to target specific academic outcomes.

Challenging Deficit-Thinking in the Motivation Sciences

Initiatives to diversify research in the motivation sciences are on the rise. This dissertation focused on students at-risk for academic underachievement and those from disadvantaged socioeconomic backgrounds. These groups are notably underrepresented in the

motivation sciences, particularly the relevance intervention literature (c.f., Canning et al., 2019; Harackiewicz, 2015) at the secondary school level. As reported in M2, the present research found no disparities in relevance appraisals or task value beliefs based on academic risk status, socioeconomic status, gender, or race. Thus, these findings counter pervasive deficit hypotheses in the motivation sciences, which run the risk of perpetuating injustices against disadvantaged populations. For instance, these findings counter beliefs (or prejudices) that at-risk students aren't as motivated as their on-track peers or that students from low-SES backgrounds don't find as much value in school or need to just "pull themselves up by their bootstraps" to succeed.

Research is needed to further test motivational deficit hypotheses. After extensive literature reviews, it remains unclear where the common claim that at-risk and low-SES students are less motivated in school originated in the motivation sciences; since, very few studies appear to have found such disparities. It is more likely that other researchers have also found disconfirming evidence but have not reported it, e.g., because of publication bias against non-significant findings. Thus, it is critical in the spirit of science and justice that researchers continue to investigate motivation in these underserved groups, disseminate their findings widely, and dispel unwarranted deficit thinking in the motivation sciences.

Limitations

A major limitation of this dissertation research is that it cannot support causal inferences. While the ERA model predicted several findings, it must be put to more rigorous, particularly experimental and longitudinal, tests before it can demonstrate its instrumentality in predicting intervention outcomes. Critically, the direct "effects" of pre-intervention cognitive appraisal processes on relevance and motivational beliefs observed in this research may not have the same effects when manipulated by relevance interventions. Further, students self-reported use of

relevance appraisal strategies are not well-understood in that the meaning that students attribute to self-report items have not be examined in-depth, e.g., through cognitive pre-testing. Thus, those self-reports may not correspond as predicted with alternative operationalizations, such as coding rubrics for intervention essays. In each of these cases, the findings of this research may not replicate and would therefore challenge viability of the ERA model as an explanation for intervention effects.

While a major contribution of this research was that it explored the psychological processes included in the ERA model with adolescents who were academically at-risk and came from socioeconomically disadvantaged backgrounds, it could not determine the generalizability of these findings to other groups worth studying. For instance, most of the relevance intervention literature focuses on effects in (primarily high-achieving) post-secondary contexts. As such, the findings reported in this dissertation may not map well onto those populations. Indeed, it is likely that students who make it into college are more likely to use and be comfortable using the types of learning and motivational strategies identified in the ERA model, given those strategies' positive correlation with achievement and the relative independence of college students in comparison to adolescents in high school. The ERA model may also not replicate well with younger students, e.g., in primary school, who are least likely to be familiar with such strategies.

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