May 2016

Comparing the Effects of Two Utility Value Interventions on Graduate Students' Interest, Performance, and Perceptions of Utility Value

Ivan Vladimirov Ivanov
University of Nevada, Las Vegas

COMPARING THE EFFECTS OF TWO UTILITY VALUE INTERVENTIONS ON GRADUATE STUDENTS' INTEREST, PERFORMANCE, AND PERCEPTIONS OF UTILITY VALUE

By

Ivan Vladimirov Ivanov

Bachelor of Science
University of National and World Economy, Sofia
2005

Master of Science in Educational Psychology
University of Nevada, Las Vegas
2010

A dissertation submitted in partial fulfillment
of the requirements for the

Doctor of Philosophy – Educational Psychology

Department of Educational Psychology and Higher Education
College of Education
The Graduate College

University of Nevada, Las Vegas
May 2016

UNLV | GRADUATE COLLEGE

Dissertation Approval

The Graduate College
The University of Nevada, Las Vegas

December 15, 2015

This dissertation prepared by

Ivan Vladimirov Ivanov

entitled

Comparing the Effects of Two Utility Value Interventions on Graduate Students' Interest, Performance, and Perceptions of Utility Value

is approved in partial fulfillment of the requirements for the degree of

Doctor of Philosophy – Educational Psychology
Department of Educational Psychology and Higher Education

Gwen Marchand, Ph.D.
Examination Committee Chair

Kathryn Hausbeck Korgan, Ph.D.
Graduate College Interim Dean

Leann Putney, Ph.D.
Examination Committee Member

Carolanne Kardash, Ph.D.
Examination Committee Member

Lisa Bendixen, Ph.D.
Examination Committee Member

Shaoan Zhang, Ph.D.
Graduate College Faculty Representative

ABSTRACT

Comparing the Effects of Two Utility Value Interventions on Graduate Students' Interest, Performance, and Perceptions of Utility Value

by

Ivan Vladimirov Ivanov

Dr. Gwen Marchand, Examination Committee Chair
Associate Professor of Educational Psychology and Higher Education
University of Nevada, Las Vegas

The present compares the immediate and delayed effects of teacher- vs. student-generated utility value interventions on students' interest, performance, and perceptions of utility value. In addition, it examines whether sense of autonomy mediates the relationship between type of utility value intervention and performance. The study is grounded in self-determination theory and expectancy-value theory and adopts a 3x3 mixed model design, with random assignment of participants to two relevance instruction conditions and a control condition.

Findings suggest that the teacher-generated utility value intervention was more effective than the student-generated utility value intervention and the control condition in terms of increased performance and utility value. Furthermore, all students demonstrated significant increases on all dependent variables on the immediate post-test compared to the pre-test. The increased scores remained stable across time, with the exception of utility value, which dropped significantly from immediate to delayed post-test. Finally, the results indicate that autonomy did not mediate the effects of the utility value interventions on effort and performance. Educational implications and directions for future research are discussed.

ACKNOWLEDGEMENTS

The completion of this thesis was made possible through the support of several individuals, and I would like to take this opportunity to thank them.

I thank my wife Radostina for her love, enthusiasm, and support during this process. Her vision, ambition, and perseverance are beyond the ordinary and have always been an inspiration to me.

I express my gratitude to my advisor and dissertation committee chair, Dr. Gwen Marchand, for her continuous guidance, patience, and encouragement. She contributed substantially to advancing the study and writing this dissertation paper. I learned a lot from her extensive knowledge and skills in the field of motivation.

I would also like to thank Dr. Kardash, Dr. Putney, Dr. Bendixen, and Dr. Zhang for serving as members of my committee and for giving me valuable comments and suggestions.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1: INTRODUCTION

An important finding from educational research is that often learning fails not because of a lack of cognitive capacity but simply because the student does not have enough desire to learn (Csikszentmihalyi, 1990). Another finding is that as students progress through school, they lose their motivation to learn and their desire for easy work increases (Lepper, Corpus, & Iyengar, 2005). As a consequence, a major goal in education has become to make instruction more engaging so that students process information on a deep level and improve their academic performance.

One way to enhance student motivation and depth of learning is to make the material meaningful for students or, in other words, to increase their perceptions of its utility value. Utility value (Eccles et al., 1983) is the perceived usefulness or relevance of a lesson to one's everyday life, personal growth, or future goals. Although most students do not find it easy to see the utility value of a topic beyond the immediate situation (Brophy, 1999), when they do (usually after being prompted), they show improved motivation, effort, and performance (Jang, 2008). Researchers have established various positive effects from increasing students' perceptions of utility value of their schoolwork such as higher motivation to succeed in school (Lens & Decruyenaere, 1991) and engaging in more deep-level learning strategies (Lens, Simons, & Dewitte, 2001). However, the research in that field has been unsystematic and isolated, not considering different theoretical and practical approaches in a comprehensive way.

The current study aimed to be more integrative and to utilize the two major lines of research on interventions promoting utility value. Each line stems from a different theoretical perspective and employs an idiosyncratic approach to enhancing utility value. Although it has been established that each type of intervention can have positive effects on student motivation

and engagement, it has not been researched if they work preferentially under different conditions. Both of these perspectives are presented briefly below and in more detail in the literature review section.

Research Based on Self-Determination Theory

An important line of research (Deci et al., 1994; Jang, 2008; Reeve, Jang, Hardre, & Omura, 2002) sprang from the identified regulation model (IRM), derived from self-determination theory (SDT, Deci & Ryan, 1985; Ryan & Deci, 2000). The goal of these researchers was to develop successful teacher-generated utility value interventions. According to SDT, giving students choices and a sense of ownership of their learning (autonomy) increases their intrinsic motivation for an activity, which in turn promotes their effort and perseverance. In particular to utility value, "when students find a learning activity to be important and personally meaningful to them—even if it is a relatively uninteresting thing to do—they experience a high-quality (i.e., autonomous) type of motivation referred to as identified regulation" (Jang, 2008, p. 799). IRM builds on this by providing students with important reasons to self-identify with a task and see it as something they want to do because it is instrumental to their lives. The rationale is successful because it is presented in a way that promotes autonomy and internalization (Deci et al., 1994; Reeve et al., 2002). SDT and IRM are discussed in more detail in the literature review section.

Based on the IRM model, researchers (Deci et al., 1994; Jang, 2008; Reeve et al., 2002) developed successful teacher-generated utility value interventions that increased students' sense of autonomy and choice, and consequently, their motivation, effort, and performance. In such interventions, students were provided with "three autonomy-supportive factors: a meaningful rationale, acknowledgment of the person's perspective (negative feelings participants might

experience while undertaking such an unappealing task), and non-controlling language that offered choice rather than pressure" (Jang, 2008, p. 799). When these three factors were present, students perceived doing a boring activity as consistent with their will, values, and goals, which created a strong sense of autonomy for them and resulted in increased engagement and performance. In sum, such interventions have been found to have positive effects on students' academic motivation and achievement (Deci et al., 1994; Jang, 2008).

Another important finding from this research was that sense of autonomy mediated the effect of teacher-generated utility value interventions on student effort and performance (Jang, 2008; Reeve et al., 2002) The researchers differentiated various degrees of autonomy on a continuum from extrinsic to intrinsic motivation. For example, when students internalize extrinsic motivation to a degree that the activity becomes personally relevant and leads to increased effort, they are considered to have identified regulation (different types of regulation are discussed in the literature review). When a student reaches the degree of autonomy corresponding to identified regulation, the mediation effect is possible. In the current study, the term sense of autonomy was used instead of type of regulation because it did not measure different types of regulation.

This line of research demonstrates that teacher-generated interventions, although imposed by a teacher/researcher, can lead to positive motivational and academic outcomes. According to SDT, when students are told what is good for them and why the material is important, they feel controlled and lose motivation (Deci et al., 1994). However, when at least two out of the three autonomy-supportive factors are present, the negative effects of externally imposing a rationale for the importance of the material are negated. In addition, this line of research explains the mechanism underlying the effectiveness of teacher-generated interventions (autonomy support).

Research Based on Expectancy-Value Theory

Another line of research on utility value sprang from the expectancy-value model of Eccles and colleagues (Eccles et al., 1983; Eccles & Wigfield, 2002; Wigfield & Eccles, 1992), one of the dominant theoretical frameworks that explain the role of perceived value in achievement contexts. According to these researchers, utility value is a component in a complex model explaining motivation and achievement (the model is presented in the literature review section). Within the model, utility value is influenced by larger-scale components such as teachers, parents, students' goals, and self-schemata. In turn, it affects smaller-scale components such as achievement motivation and academic performance by increasing students' interest in the task and their academic performance. In addition, research on the model has revealed that utility value is a major component of academic motivation (Bong, 2001; Durik, Vida, & Eccles, 2006) and that it is correlated with other motivation constructs (self-efficacy, interest, mastery goals) (Eccles & Harold, 1991; Wigfield, 1994) (Hulleman, Godes, Hendricks, & Harackiewicz, 2010).

Hulleman, Harackiewicz, and colleagues (Durik & Harackiewicz, 2007; Harackiewicz, Rozek, Hulleman, & Hyde, 2012; Hulleman et al. 2010; Hulleman & Harackiewicz, 2009; Shechter, Durik, Miyamoto, & Harackiewicz, 2011) have developed a line of research that takes expectancy-value theory as a starting point. They designed several studies that measured the effects of different utility value interventions on student interest, performance, and perceptions of utility value. For example, Hulleman and Harackiewicz (2009) asked students to write reasons why schoolwork (in a science course) was relevant to their lives (student-generated intervention). This activity produced a .80 grade point increase in the final grade for students who had low initial expectations for success. However, when students were given reasons why the course material was relevant for them (teacher-generated intervention), this led to negative effects for

those students who had low initial expectations for success. The authors concluded that giving low-ability students a rationale for the importance of their schoolwork reminded them that they might not be able to do well, which, in turn, lead to reduced interest.

Overall, the findings from this line of research (presented in detail in the literature review section) indicate that teacher-generated interventions are effective for students with high initial interest and are detrimental for those low in initial interest. On the other hand, student-generated interventions improved performance and increased interest and perceptions of utility value for students with low initial interest, performance, or performance expectations (Hulleman et al., 2010). However, there are two issues with these studies. They do not provide theoretical explanation or an empirical test of the mechanism that makes the two types of interventions successful or not. Second, studies testing the effects of a teacher-generated utility value intervention do not discuss the quality of the intervention in terms of important motivational factors such as autonomy support (Deci, Eghari, Patrick, & Leone, 1994).

The Role of Interest

Interest is an important determinant in utility value studies and understanding its role is key to designing and implementing effective interventions. Interest, defined as "liking and willful engagement in a cognitive activity" (Schraw & Lehman, 2001, p. 23), has been found to be a major influence on learning and retention (Alexander & Jetton, 1996), allocation of attention and cognitive resources (Schraw & Lehman, 2001), and engaging in tasks over time. It is considered to develop from situational (transitory and spontaneous) to more durable and stable personal interest (Hidi, Renninger, & Krapp, 1992).

Many theorists consider interest and utility value to be intrinsically related concepts (Pugh, 2011). More specifically, utility value is viewed as an integral aspect of personal interest which has a feeling and a value component (Hidi & Renninger, 2006; Schiefele, 2001). Thus, as a student comes to perceive value in an activity (e.g., after a utility value intervention), she looks for new opportunities to engage in the task, which maintains her situational interest, improves her learning, and eventually results in the development of personal interest (after sustained engagement). On the other hand, when a student receives a utility value intervention on a topic which she is personally interested in, this may affect the effectiveness of the intervention in a variety of ways (discussed in the literature review section).

Gaps in the Literature

A gap in the literature on utility value interventions is that there has been no research comparing the effects of student-generated utility value interventions (research line 1) and autonomy-supportive teacher-generated interventions (research line 2). Hulleman and Harackiewicz (2009) used both student-generated and teacher-generated interventions in their study but the latter was not adequately designed because it lacked the autonomy-support elements that make it successful. This gap has been acknowledged by scholars (e.g., Jang, 2008) and many important questions have been raised as a potential topic for research. Some of them are: Is one type of intervention more effective than the other? Does the effectiveness of each type depend on context and/or other variables (background knowledge)? What is the mechanism underlying the success of student-generated utility value interventions? Do student-generated interventions promote stronger sense of autonomy than student-generated interventions (due to the fact that the rationale comes entirely from the student)?

Purpose of the Study

This experiment was grounded in self-determination theory (SDT, Deci & Ryan, 1985) which emphasizes the role of autonomy as a basic human need. When this need is satisfied, people function better, experience a sense of well-being, and produce more academically. In particular, researchers have found that three factors increase students' sense of autonomy (Grolnick et al., 1997). These are: a) acknowledging students' inner experiences (perspectives and feelings), b) using non-controlling language that provides them with options, and c) providing students with a rationale for doing or learning something. For that reason, these three autonomy-supportive factors are considered to be essential for training programs and interventions such as those aiming to increase perceptions of utility value. In addition, SDT and its subcomponent, the identified regulation model, explain the mechanism through which students internalize information provided in such teacher-generated interventions. Namely, when students are given a meaningful rationale in an autonomy-supportive way, they incorporate the value of the activity in their self-system or identity (as aligned with their values and/or instrumental for their future goal) which increases their motivation, effort, and persistence (Deci & Ryan, 1991; Jang, 2008).

The current experimental study aimed to answer some of the questions mentioned above. It adopted a 3x3 mixed model design, with random assignment of participants to two relevance instruction conditions and a control condition. It compared the immediate and delayed effects of teacher- vs. student-generated utility value interventions on students' interest, performance, and perceptions of utility value. In addition, it examined whether sense of autonomy mediated the relationship between type of utility value intervention and performance. A thorough search of the literature did not find a study that has done that before.

The participants were graduate students most of whom were in-service teachers enrolled in a master's education program. The choice of graduate students vs. undergraduates was based on the fact that graduate students pursuing degrees in education majors are usually in-service teachers with invested interest in teaching and education. This increased the potential meaningfulness and utility value of the intervention lesson (see below). In addition, graduate students are supposed to possess more knowledge of and experience with educational psychology due to having had more classes. This was considered important for their capacity to generate potential benefits from reading the intervention lesson (which was one of the intervention activities). Having high prior knowledge of a subject allows one to process new material in a more effective and integrated way due to making connections between new and existing information (top-down processing, Schank, 1979).

All students read a graduate level lesson about epistemic beliefs, a topic related to personal growth, teaching, and educational psychology. This provided an authentic topic for the study because the students could perceive the lesson as important for their teaching practice. The participants completed the measures of the dependent variables three times: one week before the intervention (pre-test), immediately after the intervention (immediate post-test), and two weeks after the intervention (delayed test).

The lesson on epistemic beliefs, along with the rest of the materials and measures, was presented online and was easily accessible. All measures were established by previous research and have high reliability (see the methods section). The only exception was the lesson on epistemic beliefs along with the performance measure on it. Both were developed for the study with the assistance of an expert in the area of epistemic beliefs and were pilot tested.

The statistical analyses included 3x3 ANOVA tests that looked for main effects of time and type of intervention (independent variables or IVs) on interest, performance, and utility value (dependent variables or DVs) as well as for an interaction between the two IVs. Further, a series of regression analyses were conducted in order to test for a mediation effect of sense of autonomy on performance.

The goal of this experiment was to answer four research questions. First, it looked for main effects of treatment type on all dependent variables. In particular, it tested whether teacher- and student-generated utility value interventions would produce stronger effects on students' performance, perceptions of utility value, and interest compared to a control group. A note on interest is due here. Interest, defined as "liking and willful engagement in a cognitive activity" (Schraw & Lehman, 2001, p. 23), is a variable related to utility value and is usually included in measuring the effects of utility value interventions. Furthermore, it has been found that these interventions can produce varying effects on students' performance depending on the level of initial interest in the topic (Durik & Harackiewicz, 2007). For these reasons, interest was included as a dependent variable in this study. It was expected that both intervention groups will outperform the control group on all dependent measures.

In addition, answering this question was supposed to reveal if one intervention was more effective than the other in the context of a one-time lesson on epistemic beliefs. It was possible that they produce similar results due to compensating effects (specific plusses and minuses of each type of intervention). According to Jang (2008), student-generated rationales may be perceived as a more autonomous form of intervention by students, or in his words, "would supposedly be richly embedded within their high identified regulation toward the lesson" (p. 809). On the other hand, an externally provided rationale may have the advantage of an

experienced teacher revealing to students the hidden benefits from learning a boring lesson (Jang, 2008). Based on previous research, it was hard to predict if one type of intervention would be more successful than the other so the hypothesis was that there would be no significant difference between the two.

The second research question concerned the effect of time on all dependent variables. The expectation was that time will significantly affect all dependent measures represented by increased post-test scores. All groups were supposed to increase their scores from pre- to post-test due to exposure to the lesson and the intervention sessions.

Research question three asked whether there would be a significant interaction between time and type of intervention. The treatment groups were expected to outperform the control group on the immediate post-test measures. Additionally, they were predicted to have sustained positive effects on the delayed post-test measures whereas the control group scores were expected to drop significantly.

The fourth research question concerned whether sense of autonomy mediated the effects of type of intervention on performance. Previous studies have provided evidence that teacher-generated utility value interventions increase students' perceived sense of autonomy, which, in turn, improves students' effort and performance (Jang, 2008; Reeve et al., 2002). According to SDT, student-generated interventions should produce a similar effect due to the fact that students have the choice and freedom to generate their own rationales for the importance of the lesson, which should promote their sense of autonomy. In this light, the hypothesis was that the mechanism underlying student-generated interventions would be the same as in teacher-generated interventions.

The importance of this study is in addressing several questions raised by other researchers (e.g., Jang, 2008), namely, the need to compare autonomy-supportive teacher-generated and student-generated interventions in terms of their effects on interest, perceptions of utility value, and academic performance as well as to explain the mechanism underlying the effectiveness of student-generated interventions. It was not clear from previous research whether one type of intervention is more effective than the other because each has distinct plusses and minuses. Also, there has not been research examining how student-generated interventions influence students' sense of autonomy.

Further, the results of the study were expected to reveal if there are sustained effects from the interventions, an area that has been researched only partially. Past studies found positive delayed effects on engagement and performance (teacher-generated intervention, Jang, 2008) as well as on interest (student-generated intervention, Hulleman et al., 2010). The current study was designed to be more comprehensive in that aspect, exploring the delayed effects of both methods on interest, performance, and utility value. Finally, the experiment looked for an interaction between time and type of instruction. Significant results could reveal a moderation effect with important implications for educational practice. It is an area that has not been explored before.

CHAPTER 2: LITERATURE REVIEW

Self-Determination Theory

The overarching theory in this research is self-determination theory (SDT, Deci & Ryan, 1985; Ryan & Deci, 2000). It is an organismic theory of motivation which posits that there are three universal psychological human needs underlying intrinsic motivation (enjoying an activity for its own sake) and well-being. These are the need for competence, relatedness, and autonomy. According the founders of SDT, their satisfaction facilitates "optimal functioning of the natural human propensities for growth and integration, as well as for constructive social development, and personal well-being" (Ryan & Deci, 2000, p. 68). Only the need for autonomy is pertinent to this study so it will be discussed in detail.

Autonomy

According to SDT, "autonomy refers to volition—the desire to self-organize experience and behavior and to have activity be concordant with one's integrated sense of self. Autonomy concerns the experience of integration and freedom, and it is an essential aspect of healthy human functioning" (Deci & Ryan, 2000, p. 231). Activities that increase one's sense of autonomy are: encouraging self-initiation; giving people choices; acknowledging their inner experience, perspectives, and feelings; requesting their opinion; involving them in decision-making; engaging them in interactive activities (e.g., discussions, group projects); and providing them with a rationale for doing or learning something (Grolnick et al., 1997; Ryan, Sheldon, Kasser, & Deci, 1996; Skinner & Belmont, 1993). Numerous studies have found that providing autonomy support promotes intrinsic motivation, satisfaction, and well-being (Deci, Connell, & Ryan, 1989; Ryan & Grolnick, 1986). In terms of educational outcomes, students with a strong sense of autonomy (vs. feeling controlled) learn deeper conceptually, perform better

academically (higher test scores and grades), and have lower probability for dropping out of school (Grolnick, Ryan, & Deci, 1991).

Intrinsic Motivation

Intrinsic motivation is considered a basic, lifelong psychological growth function (Deci & Ryan, 1980) and it stems from the human drive to satisfy the psychological needs for competence, autonomy, and relatedness (Deci & Ryan, 2000). Intrinsically motivated individuals are those who find an activity interesting and enjoyable and would engage in it in the absence of external rewards or consequences. Doing the activity brings pleasure and satisfaction, thus becoming an end (reward) in itself rather than a means for attaining something else. Autonomy is related to intrinsic motivation because intrinsically motivated behaviors "have an internal perceived locus of causality (deCharms, 1968), which means they are experienced as emanating from the self rather than from external sources, and are accompanied by feelings of curiosity and interest" (Niemiec & Ryan, 2009, p. 134).

Autonomy and Utility Value

The current experiment employed two interventions whose goal was to promote a sense of autonomy, utility value, interest, and performance. It was based on the established finding that providing a rationale for the usefulness of a lesson or activity (promoting its utility value) increases autonomy (Niemiec & Ryan, 2009; Reeve et al., 2002). The process is explained by Deci and Ryan (2000), who point out that people have an inclination to be motivated when they are causal agents in relation to their own actions (deCharms, 1968). Understanding why an activity is personally relevant makes an individual feel like he or she owns it (willingly chooses to participate in it). In other words, increasing students' perceptions of utility value tends to promote their sense of autonomy. In turn, this leads to students becoming more intrinsically

motivated which improves their effort, engagement, and overall performance. One caveat is that providing a rationale only works when used in combination with non-controlling language and/or acknowledging students' perspective (Deci et al., 1994; Jang, 2008). This compensates for the negative effects of externally providing a rationale, which can be perceived as controlling, reducing one's sense of autonomy. In addition, it is important to note that although intrinsic motivation should go up due to increased sense of autonomy, the primary effect of utility value interventions is rather the generation of internalized extrinsic motivation. The mechanism is explained in the next section.

Autonomy and Extrinsic Motivation

Extrinsic motivation is defined as performing a task for the purpose of obtaining an external reward such as praise, grades, tokens, or avoiding a punishment. Thus, the activity is only a means to an end for obtaining some desired outcome. In the past, researchers had a dualistic view, with intrinsic motivation being seen as positive and desirable, and extrinsic motivation as harmful. However, more recent studies have found evidence that although being distinct constructs, intrinsic and extrinsic motivation are related and can work together (Lepper, Corpus, & Iyengar, 2005).

Self-determination theory provides a larger view on intrinsic and extrinsic motivation by putting them on a common continuum. This is achieved by using autonomy as a central and unifying construct underlying all motivation (Marchand, 2008). Autonomy is synonymous with self-determination and both involve the “degree to which individuals experience themselves as autonomous or as having choice in their actions and behaviors as opposed to being controlled or pressured” (Grolnick et al., 2002, p. 148, cited in Marchand, 2008). In other words, autonomous or self-determined individuals see their behavior as originating from the self rather than from an

external agent or force. In light of these definitions, autonomy is absent at the extrinsic end of the motivation continuum and is high on the intrinsic end, with varying degrees in the middle where there are different combinations of autonomy and external pressures. Intrinsic motivation is associated with high autonomy because individuals freely choose to do an activity out of their interest in it.

Deci, Ryan, and colleagues (Deci & Ryan, 2000; Niemiec & Ryan, 2009) have specified four types of extrinsic motivation that vary in the degree of autonomy they represent. They are viewed as lying on a continuum from entirely external to internal. Each form of extrinsic motivation is qualitatively different and can be distinguished on the basis of individuals' reasons for why they are performing a task. These reasons represent the degree to which their experiences emanate from the self or from external forces. The four different kinds of extrinsic motivation are referred to in SDT as "regulations" (Marchand, 2008). In the words of Marchand (2008), "an individual can engage in a behavior for reasons other than the pleasure of the task itself (so it is extrinsically motivated), yet, if that individual is freely choosing to do that activity, then their behavior is self-determined and stems from an internal locus of causality. Extrinsically motivated behaviors can become more self-determined (behavior is experienced as originating from the self) through a process of internalization" (p. 40).

Internalization means "bringing in" or understanding the value of an unpleasant task and integrating this value with our self system. The stronger the integration, the more self-determined the motivation. For example, a student may initially work on boring and unpleasant math problems just to pass a test imposed by the teacher (external reason for action). However, if the student understands how working on such math problems benefits the development of her quantitative reasoning or/and prepares her to fulfill her dream to become a scientist, then she

may develop self-determined reasons for engaging in the task and put more effort into it (although the task is still boring and unpleasant). Altogether, by distinguishing finer nuances, this view casts new significance on extrinsic motivation and links it to intrinsic motivation in a way that allows for scenarios when both types work together to produce positive effects (Marchand, 2008).

The first form of extrinsic motivation is called external regulation and it lies on the foremost external end of the continuum, having the least amount of autonomy (actually none). Here actions and behaviors are enacted in order to get a reward (e.g., good grade, praise, pocket money) or to avoid a punishment (e.g., disparagement, poor grade, disapproval). This motivation has only temporary effects that disappear quickly as soon as the reward/punishment is removed. For instance, a student stops studying hard when she sees that the teacher will not grade the upcoming test. Even when studying for a graded test, such a student would do only the minimum effort to get the desired grade, without seeking additional information or trying to understand the lesson on a deep conceptual level.

The second type is introjected regulation, which is still external but to a lesser degree. The individual has accepted a value (e.g., be a good student) but not as part of the self system (one's core values and beliefs that are considered part of one's identity). He or she possesses an idea of what "should" be and makes an effort to realize it. The effort is still somewhat superficial because the motivation disappears as soon as the goal "appears" satisfied. For example, a student who originally studied to pass a test now studies to appear a good student which brings her a sense of pride. In the case of failure, the student experiences feelings of guilt or shame (Niemiec & Ryan, 2009). Niemiec and Ryan (2009) explain this form of motivation using the concept of ego involvement (Nicholls, 1984; Ryan, 1982), which refers to a situation when one's self esteem

is contingent on one's performance. "When ego is involved, a student feels internal pressure to learn so as to avoid shame or to feel worthy (Niemiec et al., 2008). Both external regulation and introjected regulation are perceived as emanating from outside the self and thus have an external perceived locus of causality (deCharms, 1968)" (Niemiec & Ryan, 2009, p. 138). As in the case of external regulation, introjected regulation is experienced as relatively controlling (perception of low autonomy).

The third type, identified regulation, exemplifies a greater sense of autonomy. It is a form of internalized extrinsic motivation where one identifies with the personal importance of an externally provided activity and accepts this activity as part of one's own way of thinking or acting (Deci & Ryan, 1991). "Identified regulation is extrinsic because the activity is performed primarily because of its usefulness or instrumentality (work in order to develop a skill) rather than because it is interesting. It is self-determined because the student engages in the task willingly and for personal reasons rather than by being forced to engage the task because of external pressure" (Jang, 2008, p. 799).

In particular, seeing a behavior as personally important refers to its significance to the well-being or/and the future goals of the individual. For example, a student may have high motivation to take a chemistry class, although she considers it boring or frustrating, in order to pursue a career as a doctor. Thus, taking the chemistry class is viewed as a means to a personally important end. Because the desired goal transfers its positive connotation to the means, identified regulation is associated with increased positive energy and flexibility. It produces positive academic outcomes such as mastery motivation, higher academic aspirations, deeper conceptual learning, application of effective classroom coping strategies, and more positive emotions at school (Otis, Grouzet, & Pelletier, 2005; Ryan & Connell, 1989) (Marchand, 2008).

Finally, the form of extrinsic motivation that contains the highest degree of autonomy is integrated regulation. At this stage of internalization, the enacted behavior has been further synthesized with the self system and is seen as part of a deeper set of values that represent one's identity. For example, the student taking a chemistry class (mentioned above) may be motivated to do the uninteresting activity not only in order to study medicine but because becoming a doctor will enable her to help others, which is consistent with her core values and interests (Niemiec & Ryan, 2009). As a result of fully endorsing the behavior as a reflection of one's identity, students can regulate the behavior independently from external motivators, which leads to further increases in positive academic outcomes. It is important to note that although the academic effects of integrated regulation may appear similar to those of intrinsic motivation, the two cannot be equated. Unlike intrinsically motivated students, those having integrated regulation do not experience the activity as interesting and pleasant (Marchand, 2008).

In summary, Deci and Ryan's (1985) continuum of regulation provides teachers and researchers with a framework for understanding distinct forms of student motivation and behavior. The continuum demonstrates how students internalize the value of various tasks which leads to enhanced persistence and better performance in school (Marchand, 2008). It links types of regulation (sense of autonomy) to specific academic outcomes and offers teachers a map for diagnosing students' type of extrinsic motivation.

Researchers have used this aspect of SDT to create the identified regulation model (IRM) which is used to help teachers promote students' feelings of autonomy and increase their internalized motivation in the classroom. Within this model, teachers provide students with a meaningful rationale in an autonomy supportive way so as to turn external and introjected regulation into identified regulation.

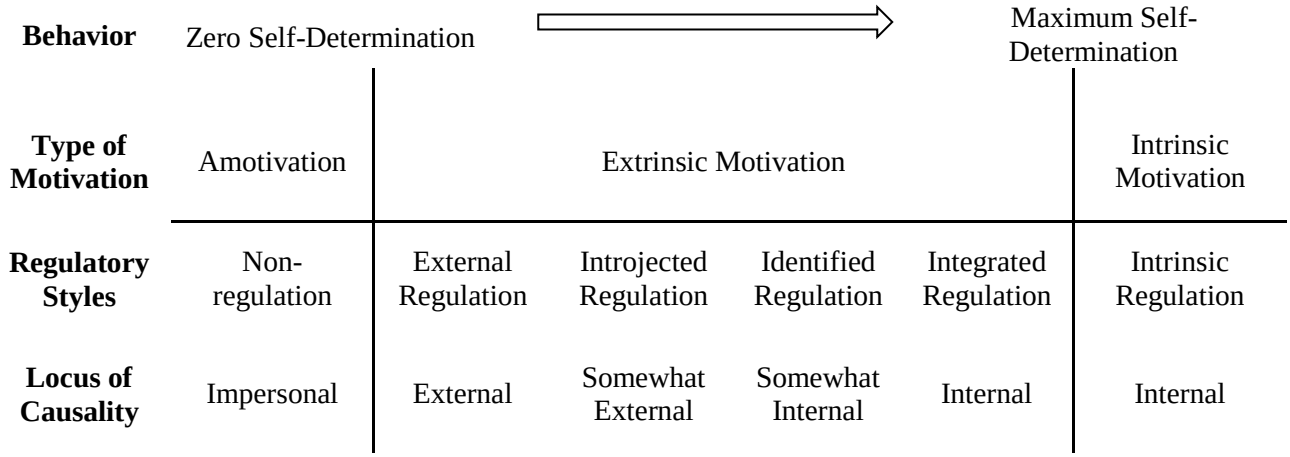


Figure 1. The Self-Determination Continuum.
Note. Adapted from Deci & Ryan, 1985; Ryan & Deci, 2000.

Utility value and relevance instruction (provision of a rationale) are two distinct components of the IRM. Relevance instruction can increase the perceived utility value of a task, which, in turn, can lead to a more productive type of regulation (e.g., identified rather than introjected). Thus, it should be clear that utility value is part of the types of regulation (identified and integrated) that are associated with highly internalized extrinsic motivation.

IRM and Teacher-generated Utility Value Interventions

Several researchers have used the identified regulation model to provide teacher-generated utility value interventions that are based on increasing students' sense of autonomy and choice (Deci et al., 1994; Jang, 2008; Reeve et al., 2002). As mentioned above, when students perceive a learning task as important and personally meaningful (even when it is boring), they develop identified regulation that is experienced as relatively autonomous (Jang, 2008). The mechanism underlying the process is as follows: teachers emphasize utility value by providing students with a meaningful rationale. Such a rationale promotes students' internalization of task value into autonomous motivation of their own by providing them with important reasons to identify with the task as something they willingly do because it is aligned with their goals (Deci

et al., 1994; Reeve et al., 2002). As a consequence, students put more effort and perform better on the task. Thus, an appropriately provided external rationale has the potential to facilitate motivation and performance (Jang, 2008).

In sum, SDT and IRM explain how teacher-generated interventions affect academic performance by shedding light on the mechanism that relates relevance instruction to autonomy, utility value, engagement, and effort. The current study built on this by exploring how teacher- and student-generated utility value interventions influence students' sense of autonomy, interest, utility value, and performance. Also, it tried to explain the mechanism underlying student-generated interventions and compares it to teacher-generated interventions.

SDT and Student-generated Utility Value Interventions

Unlike teacher-generated utility value interventions, there has been no research explaining the reasons why student-generated utility value interventions lead to positive academic outcomes. Several studies have provided evidence that when students generate their own reasons for the importance of a task (in the form of a letter to a friend), their interest, utility value, academic performance improve (Hulleman, Godes, Hendricks, & Harackiewicz, 2010; Hulleman & Harackiewicz, 2009). However, these studies did not reveal the mechanism underlying this process and did not explore the questions raised by SDT such as the degree of autonomy (type of regulation) that the interventions produced.

SDT offers a theoretical explanation of the positive effects of student-generated utility value interventions. When students generate their own reasons (a meaningful rationale) for the utility of a task, they should feel highly autonomous because these reasons come from their identity (their values and goals) and are meaningful to them. In turn, high autonomy combined with the meaningful rationale should help students develop a sense of ownership of the task. As a

result from internalizing the task as important for their identity and goals, students should be willing to exert more effort and persistence in order to learn the material (Deci & Ryan, 1991). In the words of Jang (2008), "student-generated rationales would supposedly be richly embedded within their high identified regulation toward the lesson (p. 809). What is more, if student-generated rationales come from the core values and identities of students, this may lead to integrated rather than identified regulation. Whereas in the case of identified regulation the sense of importance comes from relatively more peripheral goals (becoming a teacher), in the case of integrated regulation, it comes from deeper and more integrated parts of one's identity (making a difference and helping others).

Findings from Research based on SDT and IRM.

Deci, Eghrari, Patrick, and Leone (1994) conducted an experiment where they asked college students to conduct a boring task (pressing the space bar on a keyboard whenever a light appeared on the computer screen). They wanted to test whether the presence of three autonomy-supportive factors (a meaningful rationale, acknowledgment of the negative feelings students might have while doing such a boring task, and non-controlling language that gave students choice instead of pressuring them) would facilitate perceptions of utility value and engagement with the task. The researchers employed a 2x2x2 factorial design in which each of the three factors was manipulated as an independent variable resulting in eight group. Some students received all three factors supporting autonomy, some only two, some one factor, and some none. After the task, students had the opportunity to continue practicing it on their own while waiting for the experimenter to return with additional materials. Time spent on task was used as a dependent variable representing the amount of internalization that had occurred. Finally, students were given a questionnaire that measured their interest/enjoyment, experience of choice, and

perceptions of utility value.

The correlations between time on task and positive affect were used to determine the type of regulation that students experienced. In particular, students who said that they liked the activity and spent more time doing it were classified as having integrated regulation, whereas students who did not like the activity but spent time doing it were classified as having introjected regulation. However, the researchers only looked for the presence of introjected vs. integrated regulation, with introjected subsuming external regulation and integrated subsuming identified regulation. Thus, this study used only a crude measure of type of regulation so the findings should be interpreted with caution (i.e., integrated regulation should not be viewed as the same as in the IRM).

The results indicated that none of the three factors had a significant independent contribution to internalization but that when at least two of them were present, students internalized the importance of the task and had increased perceptions of interest/enjoyment, utility value, and experience of choice. Interestingly, Deci et al. (1994) found an unpredicted interaction of controllingness and acknowledgment on perceived usefulness. This finding suggests that "if people do not feel controlled and if their own perspective is validated, they will discover for themselves the activity's usefulness and importance" (p. 134). Another important finding was that students experiencing the autonomy-supportive conditions developed integrated internalization, whereas only some students in the control condition developed internalization (willingly spent time on the task when not required) and it was introjected (participated because they felt they had to) rather than integrated.

In another set of experiments, Reeve, Jang, Hardre, and Omura (2002) corroborated and expanded the findings of Deci et al. (1994). They used an authentic task where pre-service

teachers were asked to participate in a lesson of conversational Chinese. Some of the students were provided with a meaningful rationale in an autonomy-supportive way (non-controlling language and acknowledgment of negative feelings), whereas others were not given any rationale, were given a rationale in a controlling language ("The reason we are asking you to try hard during conversational Chinese is because we are going to give you a test on the material to evaluate how well you studied the information"), or were given a rationale in a way that promoted introjected, rather than identified, regulation ("The reason we are asking you to try hard during conversational Chinese is because doing so is what today's classroom teacher should do. It's what a good teacher ought to want to do."). The researchers conceptualized identified regulation as "a latent variable defined by the pair of indicators of perceived importance of the lesson and perceived autonomy while trying to learn it" (Jang, 2008, p. 799). Three models were tested: Reason to Try - Identification - Effort, Reason to Try - Perceived Importance - Self-Determination, and Reason to Try - Interest - Effort.

Reeve et al. (2002) found that students who received the three conditions supporting autonomy and self-determination put more effort into the lesson due to identified regulation (personally endorse and value the effort the student exerts during the boring activity) compared to students who did not experience autonomy support and a rationale. The results supported the mediation model that a rationale administered in an autonomy-supportive way leads to identification (identified regulation), which, in turn, promotes effort. This model explained students' effort ($R^2 = .35$) better than it explained their identification experience ($R^2 = .07$). The other two models did not fit the data as well as the first model, although interest was a significant predictor of effort. Overall, this study confirmed findings from previous research (Deci et al., 1994) that a meaningful rationale increased participants' sense of importance whereas the non-

controlling language function was to preserve or increase participants' sense of self-determination (Reeve et al., 2002).

In a second study, the authors tested the same three models but added initial expectations of utility value in the structural equation model. Again, only the Reason to Try - Identification - Effort model fit the data well and adding the new variable increased the explained variance that accounted for generating identification experience from .07 to .46. This was a novel finding indicating that peoples' preconceived notions of importance played a significant role in addition to the contextual influence exerted by presenting them with a meaningful rationale. The other two models did not fit the data well, which replicated the results from study 1.

Jang (2008) conducted a study to further expand the findings from Deci et al. (1994) and Reeve et al. (2002), again using self-determination theory and the identified regulation model as a basis. Employing structural equation modeling, he tested three models of motivation in order to explain why a meaningful rationale often enhances students' motivation, engagement, and learning during boring activities. The first model involved the following sequence: Rationale - Identified regulation - Engagement - Conceptual learning. In the second model, interest, rather than identified regulation, was the mediating variable: Rationale - Interest - Engagement - Conceptual learning. The third model merged the first two combining the mediating effects of both interest and identified regulation. College students were presented with a lesson on correlations, an uninteresting but potentially useful topic, with the experimental group receiving an autonomy-supportive rationale why knowledge about correlations can be beneficial for their everyday functioning and future roles as teachers, whereas the control group did not receive a rationale.

The results showed that the provision of a rationale enhanced all three measures

(perceived autonomy, d = 0.55, perceived importance, d = 0.71, and interest enhancing strategies, d = 0.56). In addition, students in the experimental group demonstrated more conceptual learning than those in the control group. The data supported best the identified regulation model. According to this model, "rationales facilitate engagement and learning because a rationale, when communicated in an autonomy-supportive way, reveals an activity's value and personal benefit. Such personal relevance information helps participants identify with and internalize the value of the task (identified regulation), and this internalization allows participants to engage volitionally in the learning activity" (Jang, 2008, p. 807). Although the other two models were also significant, they revealed that interest did not explain engagement and performance above and beyond the effect of identified regulation.

In conclusion, Jang (2008) explicitly pointed out the need to compare the effects of a teacher-generated and student-generated rationales as a potential area for future research. According to him, "student-generated rationales would supposedly be richly embedded within their high identified regulation toward the lesson, whereas, on the other hand, a teacher's externally generated rationale would have the advantage and insight of an experienced expert as to what hidden use underlies the enactment of the uninteresting task" (p. 809). The current study aimed to explore this potentially fruitful issue.

Summary. Research based on SDT and IRM has revealed that giving students a meaningful rationale for an uninteresting task in an autonomy-supportive way can be an effective tool for increasing their motivation and performance. Furthermore, these studies demonstrated the mediating variables that lead to positive academic outcomes, thus shedding light on the mechanism that underlies the process. In particular, students who receive a rationale in combination with non-controlling language and acknowledgement of their negative feelings

during a boring task experience identified regulation, which leads to increased interest, perceptions of utility value, effort, engagement, and ultimately to improved performance. It is important to note that these effects are accomplished through the combined effects of two factors, perceived importance and perceived autonomy (Reeve et al. 2002). Furthermore, it seems that even in the absence of a rationale, if the other two autonomy-supportive factors are present (not feeling controlled and having one's own perspective validated), many students discover the importance of a task and perform better on it (Deci et al., 1994).

Expectancy-Value Theory

Utility value, the central construct in this study, has been explored extensively from another perspective, which is worth mentioning because it engendered an important line of research. Eccles et al. (1983) developed an expectancy-value model of achievement motivation to explain students' performance, choice, and persistence (mostly in the domain of mathematics) (Wigfield, 1994). The model has been highly influential in education research and has generated numerous studies on the topic (for a review, see Wigfield & Eccles, 1992, 2000, 2002). It has two major components: expectancies for success (or outcome expectations) and task values, both being at the middle level of the model. These are affected by larger-scale variables such as distal cultural milieu, beliefs of key socializers, and past experiences, and in turn subsume smaller-scale components such as interest and utility value (Eccles, 2009).

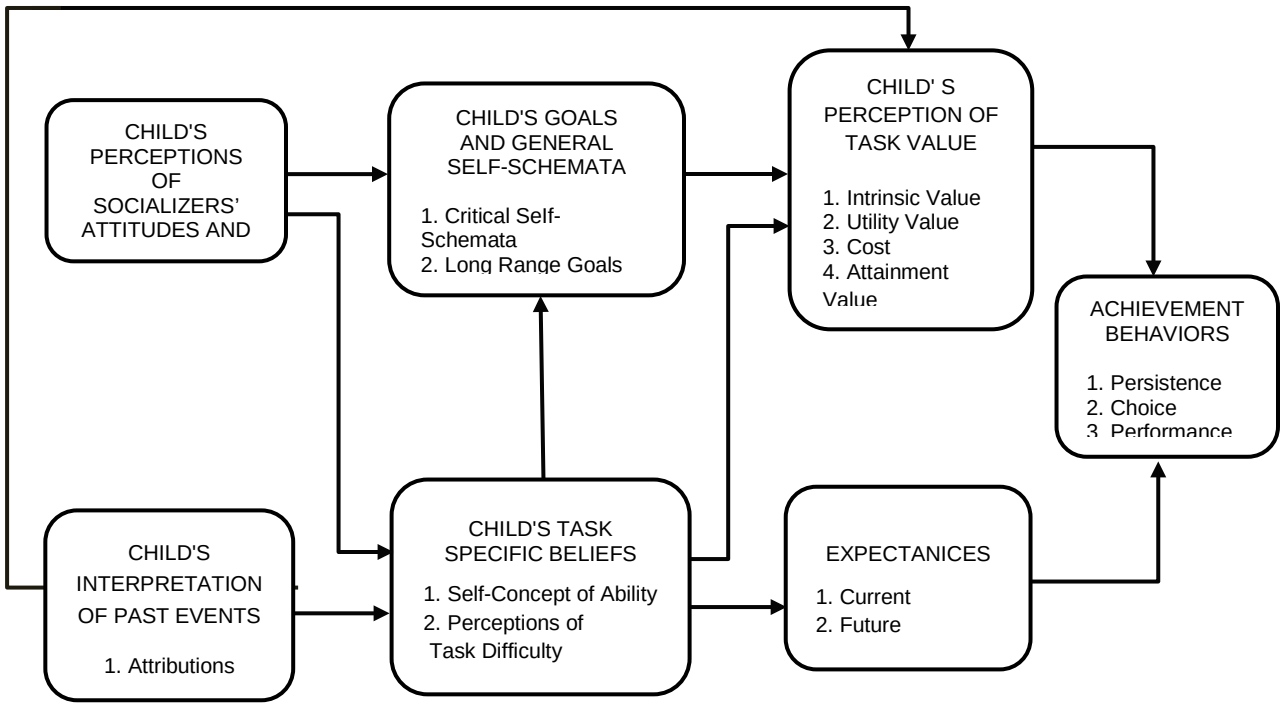


Figure 2. Eccles' (1983) model of achievement performance and choice.
Note. Adapted from Wigfield (1994).

Expectancies for success are not discussed in more detail here because they are not relevant to the current study.

Task Value

According to Eccles et al. (1983), task values are a substantial contributor to student achievement motivation and achievement. Eccles et al. (1983) defined it as the perceived importance of a task in relation to four components: its usefulness or relevance to one's future goals and everyday life (utility value); it being enjoyable and fun to do (intrinsic value); successfully completing the activity as important for one's self-worth and identity (attainment value); and the potential undesired consequences of doing the task, such as expended effort or negative emotions (e.g., fear of failure or performance anxiety).

Research on task value has provided evidence that it is correlated with achievement and other forms of motivation (Eccles & Harold, 1991; Wigfield, 1994). Utility value, in particular, has been established as a major component of academic motivation (Bong, 2001; Durik et al., 2006; Hulleman et al., 2008; Simons et al., 2004).

Research Supporting the Model

Eccles and colleagues have provided empirical support for the validity of their model. In several studies, they used confirmatory factor analyses demonstrating that the components in the model are empirically distinct. For example, expectancies for success and task values formed separate factors (Eccles et al., 1993; Wigfield et al., 1992). Also, children were able to distinguish among the components of task value (attainment value, interest, and utility value) even in elementary school (Eccles & Wigfield, 1995). In addition, the researchers provided evidence that students' value beliefs were domain specific.

Two findings from the research on this model are particularly relevant to the current study. The first one is that task values predicted performance, in particular, students who found a school task relevant to their future goals (i.e., high utility value) performed better in the classroom (Malka & Covington, 2005). Second, task values predicted future enrolment in more advanced classes (Wigfield & Eccles, 2000). Future enrolment is considered an indicator of sustained interest (Hulleman et al., 2012). These findings provide the rationale for incorporating both performance and interest in the design of the current experiment.

Relationship between Task Value and Other Motivation-related Constructs

Task value has been linked to other extensively researched variables such as goal orientations, choice, interest, and future time perspective. For example, several studies measuring task value used achievement goals in their design and provided evidence that mastery-approach

goals were correlated with both utility and intrinsic value (Linnenbrink, 2005; Simons, et al., 2004). Also, task values were found to mediate the effects of interest and mastery goals on performance (Hulleman et al., 2008). Further, several studies demonstrated that task values directly predicted student choices, in particular, taking advanced courses in the same academic disciplines and making relevant career choices (Wigfield et al., 2008). Finally, future time perspective researchers have noted that there is a type of motivation that goes beyond the immediate. Students have future personal goals and career plans so they see education as a means to attain this desired future. Therefore, if students hold such a value belief, they are most likely to be motivated to achieve in the immediate context (Wigfield, Eccles, Roeser, & Schiefele, 2008).

The relationship between task value and interest is relevant to the current study so it is discussed in greater detail. There is a consensus among scholars that interest is a fundamental facet of motivated behavior (Deci & Ryan, 1985; Dewey, 1913; Schiefele, 1991). One of the factors that make an activity more interesting is its high task value, when students find meaning and value in the activity (Hidi & Renninger, 2006). However, interest has distinct components, which need some elaboration in order to make clear how interest promotes task value. Presented here is only a brief description of the important aspects of interest. More details can be found in the literature review on interest.

Researchers have conceptualized two types of interest, typically referred to as situational and personal interest (Hidi, Renninger, & Krapp, 1992). Situational interest is transitory, spontaneous, and highly contextual. “It is a kind of spontaneous interest that appears to fade as rapidly as it emerges, and is almost always place-specific” (Schraw & Lehman, 2001, p. 24). On the other hand, personal interest is defined as a relatively steady and lasting attraction to, valuing

of, and liking of a particular domain (Schiefele, 2001).

It has been acknowledged that interest and task value are intrinsically related (Pugh, 2011). Actually, some theorists consider value to be an integral component of interest (Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006; Mitchell, 1993; Schiefele, 2001). For instance, the intrinsic and utility aspects of task value (Wigfield & Eccles, 1992) overlap with the feeling and value components of personal interest (Schiefele, 2001). These claims are in line with findings that interest has a reciprocal relation to task value (Wigfield & Cambria, 2010). Another link comes from the interaction between interest and value. It has been found that situational interest is maintained when the task is perceived as meaningful and/or when the individual feels personally involved in the activity (Mitchell, 1993). Because of these findings, interventions promoting utility value control for interest or use it as a mediating or dependent variable (see the section below).

Summary. The relationships discussed above demonstrate that task value is part of a larger net of constructs, some of which overlapping with it and others being correlated with it. Knowing how these constructs interact with each other enables researchers to come up with better designs for their studies. For instance, the experiments in the next section reveal how initial interest and perceived ability determine the effectiveness of utility value interventions.

Research on Utility Value Based on Expectancy-Value Theory

There have been multiple attempts to create interventions that enhance students' utility value. Some of them were part of an integral approach to enhancing student motivation, aiming at several motivational components (Martin, 2008). Other studies have focused on utility value alone. The latter are of interest to the current research and are presented next. In an experimental study (Experiment 2), Durik and Harackiewicz (2007) examined the effects of interest and utility

value in regards to the *catch* and *hold* hypothesis proposed by Mitchell (1993). They told students that they will receive instructions how to use a math technique and randomly assigned them to several groups crossing a *catch* condition (the instruction booklet had eye-catching and stimulating collative features) and a *hold* condition which focused on the utility of the math technique (how it can be relevant to students' everyday lives). In addition, the authors measured initial interest in math (pre-test), post-test personal interest in the technique, and competence ("It is important to me that I do well on the next set of problems") as related variables that illuminate the effects of utility value.

The researchers found that the personal utility emphasis benefited only individuals with high initial interest. These students reported stronger interest and task involvement as well as perceived their competence to be higher. In contrast, there were negative effects for students low in initial interest. It seems that the meaningfulness intervention reminded these students that they really did not like math or did not feel competent. These results revealed the need to consider individual differences in initial interest when using or testing situational variables that enhance task interest (Durik & Harackiewicz, 2007). This study is an example of using teacher-generated utility value intervention in order to promote student sense of utility value. In particular, teachers gave students reasons why a task or material was potentially valuable them. The next study is an example of student-generated utility value where teachers ask students to come up with reasons why the material is of value to their personal lives and/or professional goals.

In another experiment, a utility value intervention was implemented by Hulleman and Harackiewicz (2009). They asked students to write reasons why schoolwork (in a science course) was relevant to their lives. This activity produced a .80 grade point increase in the final grade for students who had low initial expectations for success. However, when students were given

reasons why the course material was relevant for them (teacher-generated utility value), this led to negative effects for those students who had low initial expectations for success. The authors concluded that giving low-ability students a rationale for the importance of their schoolwork reminded them that they might not be able to do well, which, in turn, lead to reduced interest.

Harackiewicz, Rozek, Hulleman, and Hyde (2012) designed an experimental intervention that involved parents in increasing the utility value of math and science for 10th grade students. It was based on Eccles's (2009) expectancy-value theory where parents are an important factor for increasing students' task values and outcome expectancies. Students were randomly assigned to an experimental group (involving parents) and a control group (no parent involvement). The researchers provided materials (two brochures and a web site) that explained the value of these subjects to parents in the experimental condition. The study was 15 months long and included several waves of sending materials to parents and involving them in exploring a web site.

At the end of 12th grade, the researchers measured students' enrollment in science and math courses (in how many such courses they had enrolled in the semesters following the intervention). In addition, students and parents filled out a survey that asked them about the level of interaction regarding discussions of utility value (e.g., “I have had more conversations with my parents about course choices and educational plans in 12th grade than in previous years”). Another survey measured students' and their mothers' utility value for math and science.

The results from a multiple regression analysis revealed that there was a significant effect of the intervention. Students in the experimental group enrolled in more mathematics and science classes in the 2 years after the intervention than did students in the control group. This amounts to nearly one semester of extra mathematics or science classes. Furthermore, there was a significant effect of parents’ education. The children of more highly educated parents took more

mathematics and science courses. Another finding was that the intervention significantly increased mother's perceptions of utility value and this led to more conversation on the topic between mothers and students. The findings suggested that the intervention promoted parents' involvement in their children's choices and that perceptions of utility value affected students' choices (Harackiewicz et al., 2012).

Based on these and other studies (Shechter, Durik, Miyamoto, & Harackiewicz, 2011), there has appeared a tendency in this line of research to view teacher-generated interventions as not effective. As a result, these researchers have shifted to studying interventions that employ student-generated utility value. For example, Hulleman, Godes, Hendricks, and Harackiewicz (2010) conducted an experimental study where they asked college students enrolled in an introductory psychology course to write a letter (to a friend, relative, or a significant other) on how the material was relevant to their lives. The task was assigned at mid-semester so that the students were familiar with the course material. The authors measured students' initial interest and utility value before the intervention (two weeks into the semester) as well as obtained a performance measure based on results from the mid-term test. Post-test measures of the same variables were collected at the end of the semester.

Hulleman et al. (2010) found that students in the intervention group, especially those with low initial interest and performance, developed more interest in psychology and increased their perceptions of utility value of the subject. They also improved their performance significantly more than their peers in the control group. The intervention had neutral effect for those students who had high initial interest and performance. These results were replicated in a laboratory experiment that entailed increasing the utility value of a math (computational) technique.

The design and complexity of the reviewed interventions vary significantly. The length can be from several days to a semester long. In short interventions, utility value is usually measured in combination with one or two related constructs (e.g., interest, outcome expectations), whereas in longer interventions, utility value is manipulated along with a number of other motivational variables (e.g., self-efficacy, goal orientation). The latter approach makes more sense theoretically because many of these constructs work together. In particular, the four aspects of task value (Eccles et al., 1983) mentioned above have a compensatory effect on each other in respect to motivation and achievement. For example, interventions that enhance utility value in math may not be successful because some students have low attainment value (e.g., they do not need to do well in math because they feel they are an "English" type person rather than a "math" person), intrinsic value (they do not enjoy doing math), outcome expectancy (low self-efficacy), or they experience failure anxiety (cost). Preliminary support for that hypothesis comes from the studies presented above where students with low initial interest did not benefit from a utility value intervention (e.g., Durik & Harackiewicz, 2007). Another example is a study by Pugh (2004) where students with identity related to English (being an "English" person rather than a "science" person) did not benefit from a transformative experience intervention. Consequently, targeting student efficacy belief, interest, and goal orientation, along with their perceptions of utility value, is a more sound approach to improving students' academic outcomes.

Relevance of Expectancy-value Theory and Research to the Current Study

Most of the studies presented here are examples of student-generated utility value interventions. Only two experiments (Durik & Harackiewicz, 2007; Hulleman & Harackiewicz (2009) employed teacher-generated interventions with negative effects, especially for students low in initial interest or expectancies for success. This line of research stems from Expectancy-

value theory because it takes as a central assumption that teachers (and parents in one study) play a significant role in influencing students' task values. The studies support the claim in Eccles's model (Eccles et al., 1983) that when teachers give students a rationale or ask them to generate their own, teachers change students' perceptions of utility value, which affects their academic performance.

The Expectancy-value model explains the role of antecedent factors (teachers, parents, expectancies for success) on utility value as well as the mediating effect of utility value on effort and performance. However, it does not illuminate the mechanism underlying the process the way Self-determination theory does (discussed above). These studies did not consider important factors such as perceived autonomy so the researchers could not provide a straightforward explanation of the negative effects of the teacher-generated utility value interventions. As evident from the research on IRM, teacher-generated interventions are effective only when they increase students sense of autonomy and lead to internalization of regulation.

In sum, expectancy-value theory is important for the current research because it provides evidence that utility value is related to students' interest, persistence, and performance. It also documents the positive effects of student-generated utility value interventions and explains the role factors such as initial interest and outcome expectations. This makes it a good starting point for studying different methods of relevance instruction that promote utility value. However, the theory does not explain the fine details and processes at play among type of relevance instruction, utility value, interest, and performance, or why one method may be more effective that the other. On the other hand, self-determination theory provides the resources to fill in this gap. Thus, the two theories can be used together productively with the assumption that each

theory has a different focus or level of analysis. Adding the research on interest makes this theoretical synthesis even more illuminating.

Findings from Studies on Interest

There is a consensus among scholars that interest is a fundamental facet of motivated behavior (Deci & Ryan, 1985; Dewey, 1913; Schiefele, 1991). Interest has been defined as "liking and willful engagement in a cognitive activity" (Schraw & Lehman, 2001, p. 23) and it refers to people's desire to engage in a particular topic/task over time along with the mental state that accompanies this engagement. It is considered to emerge and develop over time in a sequential phase-like fashion (Hidi & Renninger, 2006). Furthermore, interest is one of the major factors in the learning process, influencing what we choose to learn and the degree to which we learn information (Garner, 1992; Alexander & Jetton, 1996). The effects of interest are projected in active cognitive engagement, allocation of one's attentional resources, and positive learning outcomes (Reynolds, 1992; Schraw & Lehman, 2001).

Researchers have identified two types of interest, known as situational and personal interest (Hidi, Renninger, & Krapp, 1992). Situational interest is transitory, spontaneous, and highly contextual. "It is a kind of spontaneous interest that appears to fade as rapidly as it emerges, and is almost always place-specific" (Schraw & Lehman, 2001, p. 24). Situational interest has been demonstrated to positively affect reading comprehension (Alexander & Jetton, 1996; Hidi, 1990), focus attention (Hidi, 1995), facilitate integration of new and old information (Kintsch, 1980), narrow inferencing (McDaniel et al., 2000**),** and improve retention (Schraw, Bruning, & Svoboda, 1995; Schraw & Dennison, 1994).

More specifically, situational interest improves learning when the information is novel, salient, or pertinent to the task. Early research identified several characteristics of situational

interest: it is related to attention and learning; it is person specific; and it is provoked by prior knowledge, text structure, unexpected text content, and readers' goals (Schraw & Lehman, 2001).

In contrast, personal (or individual) interest is more durable, internally activated, and of high personal value. Krapp, Hidi, and Renninger (1992, p. 6) stated that "personal interests are considered to be relatively stable and are usually associated with increased knowledge, positive emotions, and increased reference values." Other studies found that personal interest played a role in holding attention which is essential for sustained engagement and long-term learning (Hidi & Renninger, 2006).

Mitchell (1993) pioneered a model of *catch* and *hold* functions of interest. Catching entails elements that grab attention, activate higher emotional and/or cognitive engagement, and promote students' interest in an activity. Among such stimuli are puzzles, computer activities, group work, and vivid or seductive details (highly interesting but unimportant/irrelevant text segments, Garner, Gillingham, & White, 1989). Holding interest includes giving students clear academic goals, making an activity meaningful, stimulating students to ask curiosity questions, and providing them with useful feedback.

Mitchell (1993) presented evidence for the catch and hold model by testing 350 high school students in a math class. He found that all variables used in the study (e.g., the use of computers or puzzles in the classroom) were positively correlated with situational interest, with student involvement being the strongest predictor of interest. Mitchell concluded that if educators want to catch and hold interest, they have to use elements that promote student engagement (e.g., promoting deeper processing).

One important implication for the current study is that situational interest can be

controlled both internally and externally. On the one hand, students can purposefully and consciously try to make a task meaningful (e.g., ask questions, explore implications). On the other hand, teachers can stimulate engagement and situational interest by providing specific cognitive goals and presenting information in a personally meaningful way. This finding emphasizes the importance of both teacher- and student-generated interventions for promoting utility value.

Durik and Harackiewicz (2007) corroborated the catch and hold model with one additional finding. They included initial interest in a domain (i.e., a measure of personal interest) as a mediating variable in two experiments that tested for catch and hold in mathematics. In Experiment 1, they presented college students with math problems high in features promoting collative motivation (manipulations of color, placement, and font size). Students low in initial interest benefited from this manipulation. It appeared that situational factors that enhanced task interest were especially helpful for these unmotivated individuals. The presence of collative features increased students' involvement as well as their concern about performing well on the task. On the other hand, collative features promoting catch were detrimental for students high in initial interest. Durik and Harackiewicz (2007) concluded that these individuals were already motivated so these manipulations were distracting for them.

In Experiment 2, in addition to the catch manipulation, Durik and Harackiewicz (2007) added a second factor that was intended to manipulate hold. They gave students instruction focused on the meaningfulness of the activity (how the math skill can be useful in their daily lives). Again, the two situational factors produced disparate effects for students with different levels of initial interest (low vs. high) in the domain. In addition to replicating the findings from Experiment 1 (catch effects), the researchers found that the personal utility emphasis benefited

only individuals with high initial interest. These students reported stronger interest and involvement as well as viewed their competence as higher. In contrast, there were negative effects from the hold manipulation for students low in initial interest. It seems that the meaningfulness intervention reminded these students that they really did not like math or did not feel competent. These results indicated that researchers should consider individual differences in initial interest when using or testing variables that enhance task interest.

The Development of Interest

Hidi and Renninger (2006) created a four-phase model of interest development in order to integrate past research and explain the relationship between situational and personal interest. The four phases include the following: (1) triggered situational interest, (2) maintained situational interest, (3) emerging individual interest, and (4) well-developed individual interest. These stages are assumed to be sequential and distinct, representing a cumulative, progressive development. In each phase there is a varying amount of affect, knowledge, and value, as well as differing degree of effort, goal setting, self-efficacy, and ability to self-regulate behavior. Past experiences and genetic disposition affect the length and the character of each phase. According to these authors, "the four-phase model of interest development describes phases of situational and individual interest in terms of both affective and cognitive processes. It also identifies situational interest as providing a basis for an emerging individual interest" (p. 113). In the first two phases (situational interest, maintained situational interest), situational interest can be initiated by features of the environmental. Some examples are personal significance; incongruous, surprising information; identification with a character; and intensity (Anderson, Shirey, Wilson, & Fielding, 1987; Garner, Brown, Sanders, & Menke, 1992). In these phases the learner is dependent on external support and needs to be told what to do. Another way to

maintain situational interest is through making a task meaningful to students and/or actively involving them in the activity.

The phases of personal interest are qualitatively different both cognitively and affectively. The positive feelings that students experience are based on enjoyment rather than excitement and curiosity. People in these phases have larger amounts of stored knowledge and stored value. Students seek the opportunity to repeatedly engage in an activity, ask themselves curious questions, set challenges, and become more resourceful. In these stages, individual interest is typically self-generated and produces effort that feels effortless (Hidi & Renninger, 2006). Overall, the four-phase model describes how interest is sparked, maintained, internalized, and how it affects attention, retention, and other academic variables. It has been supported by research and offers a useful framework for empirical and educational practices (Ainley, Hidi, & Berndorff, 2002; Durik & Harackiewicz, 2007).

The model is relevant to the current study because perceiving value in activities has been acknowledged to be "a key contributor in the progression from situational to individual interest, and to the deepening of existing individual interest" (Hulleman et al. 2008, p. 399). As a student comes to perceive value in an activity, she looks for new opportunities to engage in the task, which maintains her situational interest and eventually results in the development of individual interest (after sustained engagement).

Summary. The literature above demonstrates that interest is a central motivational construct that affects various academic outcomes. It develops over time from fleeting situational interest to more stable personal interest, with each having a cognitive and an emotional component. Both types of interest are related to utility value and need to be taken under consideration in research by measuring participants' initial interest in the topic.

Interest and Relevance

The relationship between interest and relevance has been researched mostly in terms of written text. Relevance refers to the extent to which information is germane to the reader's goals and purposes (Lehman & Schraw, 2002). Its importance to text processing and recall has been verified in numerous studies, which provided evidence for the existence of a relevance effect. This effect "occurs whenever text segments are designated as relevant to a particular goal, task, or learning outcome" (McCrudden, 2005, p. 7). It has been found that relevance instruction exerts significant influence on readers' goals and purposes when reading text (McCrudden, Schraw, & Kambe, 2005). One particular aspect of the relevance effect is that relevance increases interest. For example, in a study by Schraw and Dennison (1994), students read a text from an assigned perspective and rated sentences in terms of how interesting they are. Perspective-relevant sentences were rated as more interesting than perspective-irrelevant sentences. This finding implies that interest varies depending on one's perceptions of relevance.

Unlike the research discussed above, the current study provided relevance instruction after the lesson so that students could connect the rationale to what they already knew from the lesson. The reason for that is the isolated nature of the experiment (only one lesson). In previous studies, researchers incorporated the intervention in a regular semester, giving students enough time to get acquainted with the material but with enough lessons to come so that students can demonstrate increased motivation after the intervention. In the autonomy-supportive teacher-generated intervention, the students received reasons why the lesson is relevant to their everyday lives and future roles as educators. In the process, they were expected to revisit some of the major points of the lesson. In the student-generated group, the students were asked to come up with their own reasons why the lesson was relevant to them. To do that, they needed to activate

the memory of at least some of the main points of the lesson. Thus, although the relevance instruction/generation came after the lesson, the same mechanism linking relevance to interest should have applied, making the relevant information more interesting.

Interest and Utility Value

As mentioned earlier, there is evidence that interest and task value have overlapping elements (Pugh, 2011). Some scholars think that value is a component of interest (Hidi & Harackiewicz, 2000; Hidi & Renninger, 2006; Mitchell, 1993; Schiefele, 2001), whereas others consider the two constructs to have common characteristics (Wigfield & Eccles, 1992; Schiefele, 2001). There is a consensus, however, that interest and value are linked mainly through meaningfulness. When students find the material to be personally meaningful, their situational interest is activated and sustained throughout the activity. The opposite is also true. "Situational factors that hold interest empower individuals by bringing meaning and importance to the material (Mitchell, 1993). Once a person attends to a task, interest can develop or deepen if the material becomes infused with value" (Durik & Harackiewicz, 2007, p. 598).

Thus, meaningfulness serves as a mediating variable that makes relevant information more interesting. The mechanism looks like this: relevance instruction makes students perceive some information as having utility value, thus making it more meaningful to them, and meaningfulness increases and sustains interest. This connection between utility value and interest is supported by past research (Brophy, 1999; Feather, 1988; Hidi & Harackiewicz, 2000; Krapp, 2002; Renninger, 2000; Wigfield & Eccles, 1992).

Schank's (1979) theory of interest also is worth mentioning because it is related to relevance and utility value. According to him, there are two ways that interest is generated during reading. One way is bottom-up, where external elements such as text content or structural

aspects of text affect readers' attention to produce interest. Bottom-up interest appears to be more situational. The second way is based on readers' goals and prior knowledge, which they use to interpret new information and to identify important text segments. This is referred to as top-down processing and according to contemporary interpretations, it corresponds to the activation of personal interest. In the context of the current study, relating the lesson to students' current roles as educators was expected to activate their personal interest in teaching and thus make the lesson more interesting.

Summary. Relevance instruction (assigning a perspective or telling students why a lesson is relevant to their future goals) that leads to increased perceptions of utility value can generate and sustain situational interest in a lesson for students low in initial interest. Also, it can activate and deepen already existing personal interest. Subsequently, increased interest should have a positive effect on students' performance (Schraw & Lehman, 2001).

Purpose of the Study, Research Questions, and Hypotheses

This study was grounded in three theoretical perspectives and their corresponding research: self-determination theory (Deci & Ryan, 1985), expectancy-value theory (Eccles et al., 1983), and the research on interest (Hidi, 1991; Hidi & Renninger, 2006; Mitchell, 1993). The three perspectives were used in a complimentary fashion so that each provided a different angle for illuminating the current study with specific insights. Expectancy-value theory provided the background or the large picture of the factors involved as well as the nature and direction of their relationship (antecedents, mediators, effects). SDT explained the mechanism and the fine details in the processes under study, and the literature on interest provided additional explanations concerning important processes and relationships.

This study explored the effects of two relevance instruction methods (utility value interventions) so relevance instructions can be used as an example of how the three lines of theory and research were tied together to inform the current project. Although not explicitly mentioned by Eccles and colleagues (Eccles et al., 1983), the expectancy-value model can be used to interpret relevance instructions as part of the functions of the antecedent factors (teachers, parents) that shape the formation of students' task values. More specifically, the model implies that teachers/parents can exert positive influence on students by being explicit about the relevance of academic subjects and tasks. The model provides a rationale for such influences based on findings that increased perceptions of task value improve students' interest and performance. In other words, the model informs teachers *what* to do (use relevance instruction) and *why* they should do it (because it improves performance).

On the other hand, SDT focuses on *how* relevance instruction works. Namely, it uses the concept of autonomy to reveal the mechanism through which students internalize teachers' values and integrate them in their own identity, which results in increased effort and engagement. The research based on the identified regulation model (Deci & Ryan, 1991) has established that providing students with a meaningful rationale (relevance instruction) in an autonomy-supportive way increases their sense of autonomy, which helps them appropriate the reasons for doing a task as their own and makes them more motivated and engaged. SDT and IRM explain theoretically the motivational dynamics of both types of relevance instructions (teacher- and student-generated utility value). However, there are no empirical studies comparing the effects and inner dynamics of the two methods.

Finally, the literature on interest provides some important details and caveats concerning the successful implementation of relevance instruction. In particular, researchers caution that

initial interest in a topic can be a confounding variable in interventions using relevance instruction (Hulleman et al., 2010). Thus, it is recommended that initial interest be incorporated in the research design. The current study followed this suggestion. Further, the literature on interest reveals how increased interest boosts academic performance. Students who are highly interested (e.g., due to relevance instruction) pay more attention and process information more deeply which results in better retention and more consolidated knowledge (Schraw & Leman, 2001). Finally, interest researchers have established that interest develops in time from situational interest to more stable personal interest. Effective relevance instruction can hold students' attention (Mitchell, 1993) long enough to transform situational interest into a deeper form called maintained situational interest or even into personal interest (Hidi & Renninger, 2006). Several studies have supported this relationship (e.g., Hulleman et al., 2010). This finding provides a reason for measuring delayed effects of interest, utility value, and performance.

Rationale for the Study

The studies presented in the literature review demonstrate that both teacher- and student-generated utility value interventions can have positive effects on student interest, performance, and perceptions of utility value (Jang, 2008; Hulleman & Harackiewicz, 2009). Furthermore, the studies based on SDT and IRM show that teacher-generated interventions work only when they support students' sense of autonomy. In addition, they explain the mechanism underlying the effects of providing a meaningful rationale on performance (Deci et al., 1994; Reeve et al., 2002). An extensive review of the literature, however, failed to find an empirical study that contrasted the two types of intervention and illuminated the motivational dynamics that result from student-generated interventions. The only study that incorporated both types of interventions was Hulleman and Harackiewicz (2009). However, their teacher-generated

intervention was not autonomy-supportive which explains its ineffectiveness (as mentioned above, teacher-generated interventions are effective only in the presence of at least two autonomy-supportive factors). Furthermore, they did not look at the underlying mechanisms explaining the success or failure of the interventions.

The current experimental study compared the immediate and delayed effects of teacher- vs. student-generated utility value interventions on graduate students' interest, performance, and perceptions of utility value. Its main goal was to determine if one method is more effective than the other in terms of enhancing these academic variables. Further, it examined differences between the two methods in terms of degree of autonomy support that each intervention produces as well as the durability of effects (immediate vs. delayed). Thus, the study contributes to educational research by revealing both quantitative and qualitative differences between the two methods in the context of an authentic lesson (related to students' interest in teaching).

There are several reasons for using three measures of interest, utility value, and performance (pre-test, post-test, and a follow-up test). It has been established that promoting utility value improves students' engagement with the material (Jang, 2008; Pugh et al., 2010b), which, in turn, leads to utility value and interest in a topic being internalized as part of one's identity and self-concept (Jang, 2008; Pugh, 2004; Pugh et al., 2010b). This connection has been supported by research. For example, Hulleman et al. (2010) found that a student-generated utility value intervention increased not only students' situational interest but also their maintained situational interest (as measured with the item " I am interested in majoring in psychology"). This is consistent with Eccles's (Eccles et al. 1983) model of expectancies and values where task value is correlated with identity. Consequently, it was important to examine if the two relevance

instructions methods had delayed effects on interest, performance, and perceptions of utility value.

Research Questions and Hypotheses

There are four research questions in this study, each trying to answer the questions raised by previous research.

RQ 1: **Does type of intervention produce significant main effects on graduate students' performance, interest, and perceptions of utility value?**

Hypothesis $H_{1:}$ Type of intervention will have a significant positive effect on performance, interest, and perceptions of utility value. Students in the intervention groups will score significantly higher than students in the control group on all dependent variables. There will be no significant difference between the two experimental groups.

RQ 2: **Do scores on interest, performance, and utility value change over time (main effect for time)?**

Hypothesis $H_{2:}$ Time will have a significant effect on performance, interest, and perceptions of utility value. All students will score higher on the immediate and the delayed performance post-tests than the pre-test. All students will score higher on the immediate and the delayed interest post-tests than the pre-test. All students will score higher on the immediate and the delayed utility value post-tests than the pre-test.

RQ 3: **Does treatment type moderate the change in participants' scores across time (interaction effect)?**

Hypothesis $H_{3:}$ There will be a significant interaction effect for time and type of intervention on performance, interest, and perceptions of utility value. There will be no significant difference

between the post-test scores of the two experimental groups but both will be significantly higher than the scores of the control group (on both immediate and delayed post-tests).

RQ 4: **Does student sense of autonomy mediate the relationship between the type of intervention and graduate students' performance?**

Hypothesis H_4: Student sense of autonomy at the time of immediate post-test will mediate the effects of both student-generated and teacher-generated utility value interventions on graduate students' performance.

Rationale for the Hypotheses

In regard to research question one, it was expected that students in the student-generated and teacher-generated intervention groups would score significantly higher than the control group on both the immediate and delayed measures of interest, utility value, and performance. The rationale for this prediction was that each utility value intervention would make students obtain (receive or generate) reasons why the topic is relevant to their lives and roles as educators. According to the identified regulation model (Deci & Ryan, 1991) discussed above, this sense of relevance should help students to internalize the utility value of the lesson into autonomous motivation of their own. Internalized extrinsic motivation can have some of the effects of intrinsic motivation, in particular, increased interest, effort, perseverance, and overall engagement (Jang, 2008). Confirming this hypothesis would be consistent with findings from previous studies (Hulleman et al., 2010; Hulleman & Harackiewicz, 2009).

However, there was no reason to believe that there would be a significant difference between the two utility value interventions in terms of their effects on interest, utility value, performance. There is no prior research comparing the effects of the two types of intervention but both methods are based on the principles of autonomy support stated by SDT and should

produce similar effects. Potential differences in the effects of the two intervention may come from the format or the content of the lesson. For example, the shortness of the intervention, the novelty of the topic, or the high abstractness of the material may make one of the two intervention types more effective than the other.

In regard to research question two, students in all conditions were expected to score significantly higher on the immediate and delayed post-tests compared to the pre-test. The rationale for the main effect for time was that the students would be exposed to the topic long enough to gain knowledge of the subject. In addition, the interventions as well as the summary would help them consolidate their knowledge of the topic.

In regard to research question three, it was hypothesized that there would be a significant interaction between time and treatment type. In particular, it was expected that the treatment groups would outperform the control group on all measure both on the immediate and delayed post-test, although there would be no significant differences between the effects of the two interventions. The rationale for lack of difference between the two treatment conditions applies here as well. In addition, the scores of the control group were expected to drop significantly more on the delayed test compared to the scores of the treatment groups. The expected difference between the drop in scores was due to the hypothesis that the students in the intervention groups would internalize the value of epistemic beliefs as part of their identity whereas those in the control group would not. This internalization was supposed to produce sustained learning.

In regard to research question four, mediation effects for sense of autonomy were hypothesized for both interventions. Past research has established the mechanism through which sense of autonomy mediates the effects of teacher-generated utility value interventions on effort and performance (Jang, 2008; Reeve et al., 2002). The same principle should apply for student-

generated interventions because when students generate their own rationales, they should experience a strong sense of autonomy due to their own agency in the process.

The interventions in the current study are viewed as types of relevance instruction. In other words, their goal was to make the lesson more relevant to students and thus to increase its perceived utility value. It is important to note the difference between relevance instruction and utility value. The two interventions are types of relevance instruction that provide students with reasons, or ask students to generate reasons, why the material is relevant to their lives and goals. However, students may or may not change their perceptions of utility value due to the interventions. Thus, the current study manipulated the type of instruction (independent variable) rather than utility value itself.

CHAPTER 3: METHODS

Study Design

In the current study, participants were randomly assigned to three instructional conditions to determine whether two types of relevance instruction (experimental groups) were more effective than a control condition in terms of interest, performance, and perceptions of utility value immediately after the intervention and two weeks later (delayed test). Furthermore, the study compared the results from the two interventions so as to determine their effectiveness in promoting learning in the context of a short, graduate level lesson on epistemic beliefs. Again, the comparison included both immediate and delayed measures of the dependent variables. The design of the study can be described as a 3x3 mixed model design, with random assignment of participants to one of two relevance instruction conditions or a control condition, while all other materials remained the same. In addition, the study looked for a mediation effect of student sense of autonomy.

Participants

This study employs convenience sampling. One-hundred thirty-two graduate students enrolled in an introductory methodology course at a major southwestern public university participated in the study. The majority of the students (81%) were in-service teachers enrolled in a master's level program. 91% of all students were education majors. The students in this course were part of the department subject pool. They were required to participate in research and received three credits for their participation. Those who enrolled were given codes ensuring confidentiality and the codes were randomly assigned to the three conditions. At the beginning of the study, all participants were asked to download, fill out, and return via email a consent form

and a demographic questionnaire (age, ethnicity, academic major, and whether they teach or not).

The choice of graduate students vs. undergraduates was based on the fact that graduate students pursuing degrees in education majors are usually in-service teachers with invested interest in teaching. This increased the potential meaningfulness and utility value of the intervention lesson (related to benefits for teachers). In addition, graduate students are supposed to possess more knowledge of and experience with educational psychology due to having had more classes. This was considered important for their capacity to generate potential benefits from reading the intervention lesson (which was one of the intervention activities). Having high prior knowledge of a subject allows one to process new material in a more effective and integrated way due to making connections between new and existing information (top-down processing, Schank, 1979).

Attrition

Forty-four (or 33%) of the subjects were removed from the study in order to avoid compromising the data and results. Thus, 88 cases remained as the overall sample. Twenty students were removed due to a technical error on the website. The error made their data inaccessible. Five students were removed for not following the study instructions. This category included: using information from the internet to answer the open-ended test questions (a web search detected that the answers were copy-pasted); missing the designated session day with more than two days (e.g., doing session 3 a week earlier); not completing a session in one sitting; or completing a session in the middle of the night (between 12 AM and 5 AM); Five participants were removed due to missing data (not completing a questionnaire or omitting questions) and another five were removed for not completing the study (missed sessions 2 and/or 3). In addition,

SPSS outlier analysis detected nine cases as outliers which were removed from the study. Outliers were defined as time spent on assignments or scores on the dependent variables which were greater than three standard deviations from the mean.

Table 1

Removed Participants by Group and Category

GROUP MEMBERSHIP	MISSING DATA	WC ISSUE	DID NOT COMPLETE STUDY	DID NOT FOLLOW INSTRUCTIONS	OUTLIERS
Group 1	2	7	2	2	3
Group 2	1	6	1	2	4
Group 3	2	7	2	1	2

N = 44

Materials

The Lesson on Epistemic Beliefs

The lesson on epistemic beliefs (EB) was developed using passages from college and graduate level textbook chapters discussing epistemic beliefs. It has three parts. In the first part, students learn basic information about EB such as: what epistemic beliefs are, how they are related to ill-structured problems, and the three general stages of epistemic development that people go through (absolutism, dualism, evaluativism, Kuhn, 1991). For example, students are told that: (a) there are differences in people's underlying beliefs about knowledge, or epistemic beliefs; (b) these differences in beliefs are related to the way people make and justify their own judgments about ill-structured problems; and (c) there is a developmental sequence in the patterns of responses and judgments about such problems (King & Kitchener, 2004).

In the second part, students are presented with research findings from studies on epistemic beliefs in education. In particular, they learn how such beliefs affect learning,

information comprehension, and strategy use. For instance, participants read that when learners believe that learning happens quickly in an all-or-none fashion, they are apt to believe that they have mastered something before they really have. Furthermore, they tend to give up quickly in the face of failure and express discouragement or dislike regarding the topic they are studying. In contrast, when learners believe that learning is a gradual process that often takes time and effort, they are likely to use a wide variety of learning strategies as they study and to persist until they have made sense of the material.

In the third part of the lesson, students are shown how epistemic beliefs are related to decision making and information processing in daily life. For example, students see research findings that epistemic beliefs influence critical thinking and the generation of quality arguments in a dialogue. Furthermore, they are shown how naïve epistemic beliefs can obstruct decision-making by supporting confirmation bias. The importance of naïve epistemic beliefs to everyday life are not emphasized explicitly in this part of the lesson but enough links are provided so that students can make inferences in that direction when they are prompted to generate them.

Overall, the goal of the lesson is to present students with conceptual information about EB as well as to give them enough latent references to potential application of this knowledge to educational settings and daily life.

Teacher-generated Intervention (Group 1)

The students in the teacher-generated utility value condition received an additional short text (about five pages) on the potential usefulness of the knowledge of epistemic beliefs. Half of this second text focuses on how such knowledge can improve the pedagogical skills and overall effectiveness of a teacher/educator. For instance, students with naïve beliefs tend to systematically underestimate the complexity of more complex tasks. In other words, they

simplify tasks to black and white, absolutist solutions. Teachers can avoid this by presenting problems in discussion terms where students are exposed to more complex perspectives. There is evidence that discussions and reasoning activities contribute to student epistemic development.

The other half of the text concentrates on making explicit the everyday benefits of understanding epistemic beliefs. For example, such understanding can help a person to suspend judgment until more information or evidence is available. Further, students are taught the benefits of having sophisticated epistemic beliefs for making productive decision. This knowledge can have important implications for one's well-being and success in life.

The lesson was presented online in the form of text. Non-controlling language was used along with recognition of students' feeling (that they may find the material complex, dry, or boring) as prescribed by the identified regulation model (Deci et al., 1994). The main lesson is thirty minutes long whereas the second text (teacher-generated condition) is fifteen minutes long.

Student-generated Condition (Group 2)

In the student-generated condition, the students had to write a short letter on how the knowledge of epistemic beliefs related to their everyday lives and future goals. In particular, they were asked to write a letter to a significant person (e.g., friend, relative, partner) describing to this person why they found the material relevant. The students were told that the purpose of the letter was to link the topic to their lives through their social connections. They had fifteen minutes to complete the letter with no restrictions in size. Also, the students were asked to take the full time to think about the task and work on it.

Control Condition (Group 3)

In the control condition, the students had to write an outline summary of the lesson. The instructions asked them to summarize the main ideas and to order them hierarchically on the

basis of importance. They were instructed that there was no limit in the size of the summary, that they had fifteen minutes to complete it, and that they should take the full time to think about the task and work on it. This controlled for increases in knowledge due to exposure to the material (teacher-generated condition) and summarizing the material in written form (student-generated condition) by students in the other two conditions. The time period in which the participants received teacher-generated reasons, generate their own reasons, or did the outline was the same. This procedure ensured that students spent equal time engaged with the material.

Interest Scale

Students' initial interest in the topic was assessed with five items (e.g., "I think I will like learning about epistemic beliefs"). It was adapted to the topic from an established instrument based on prior research (Harackiewicz et al., 2002; Hulleman et al., 2008; Hulleman et al., 2010). Hulleman et al. (2010) reported $\alpha = .91$ for this scale. Students' situational interest and sustained situational interest (delayed measure) in the topic was assessed with five items (e.g., "I think the topic of epistemic beliefs is very interesting"). Hulleman et al. (2010) reported $\alpha = .93$ for this scale. Participants responded to all self-report items on 7-point Likert-type scales from 1 (strongly disagree) to 7 (strongly agree).

It is important to note that the initial and situational interest items differ in wording so that they are phrased appropriately for the occasion. For example, the item "I think I will like learning about epistemic beliefs (initial interest) is reworded to "I think what we're learning in this lesson is fascinating" (situational interest). For that reason, the two scales are compatible and can be used in a pre-post design. Using two different measures of interest is somewhat controversial in terms of the reliability of the instrument but has been the preferred method used

by interest researchers. The internal consistency reliability coefficients for both measures were .84 and above (see Table 2 in the results section).

Utility Value Scale

Students' perceptions of utility value were assessed with three items (e.g., "I think what we learn about epistemic beliefs is useful for me to know"). Participants responded to all self-report items on 7-point Likert-type scales from 1 (strongly disagree) to 7 (strongly agree). All items were adapted from those used by Hulleman et al. (2010) who reported $\alpha = .88$ for this scale. The internal consistency reliability coefficients for all three time points were .91 and above (see Table 2 in the results section).

Performance Test

The performance measure was developed specifically for the study. The pre-test, post-test, and delayed test of performance were identical. The test consists of seventeen multiple-choice questions that probe students' factual knowledge and conceptual understanding as well as three open-ended questions that measure higher-order knowledge such as application. Ten of the multiple-choice questions came from the test banks that accompany the materials used to develop the main lesson. The essay questions were developed with the help of an expert in epistemic beliefs. The measure was pilot tested with a group of college students to ensure clarity and correct interpretation of the questions. Once the results were collected, the established statistics were used to support the reliability of the multiple-choice portion of the measure. The internal consistency reliability coefficients for pre-test, immediate post-test, and delayed post-test were 0.31, 0.60, and 0.63 respectively.

Sense of autonomy (type of regulation)

Sense of autonomy was measured with the Relative Autonomy Index (RAI, Ryan & Connell, 1989). RAI is a measure of academic autonomy that is composed of 17 items and it aims to determine the source of student motivation, whether a student engages in activities because she feels coerced or because she seeks understanding and sees the activity as instrumental for her goals. The RAI subscales were tested by Ryan and Connell (1989) with children ranging from 4th-12th grade and produced the following internal consistencies: external (average $\alpha = .63$), introjected (average $\alpha = .77$), and identified (average $\alpha = .81$) (Marchand, 2008). The internal consistency reliability coefficients were .80 and above (see Table 2 in the results section).

Procedure

In the beginning of the semester, the students enrolled for participation in this study as part of their research requirement for the course. Those who enrolled on time were given personal codes (ensuring confidentiality) and were randomly assigned to one of the three conditions: student-generated utility value, teacher-generated utility value, and control. The students received initial instructions about the timeline and general procedures via email immediately after enrollment.

Initially, all participants accessed the WebCampus online system, downloaded, completed, and returned electronically a consent form and a questionnaire assessing their demographics (e.g., age, gender, major). They also completed the online measures of initial interest in epistemic beliefs and utility value of the subject. During the same session, students' initial performance (pre-test) was assessed with an online test. The test was available on WebCampus where they could take it at a convenient time of the designated day. The

instructions for the test asked the students to assume they are in a classroom taking a test and that they should find a place with no distracters and give their best effort. In addition, the students were told that it was fine if they did not have any knowledge of the topic of epistemic beliefs. There was a forty five-minute time limit to complete the measures.

A week later, the students viewed the intervention materials via the WebCampus online system. All students read the main lesson on epistemic beliefs. They were instructed to read the lesson only once and not to review it again. They were asked to try to learn as much as possible from the lesson and were informed that they would be tested on the material. After the lesson, the students in each group had fifteen minutes to complete their respective activity (receive teacher-generated reasons for utility, write a letter, or write an outline summary).

After the end of the intervention part, the students were asked to complete the measures of performance, utility value, and situational interest online. The instructions and procedure were identical to those received online during the pre-test. The only difference was the addition of the autonomy scale.

Two weeks later, the students accessed and completed online the same measures of interest, utility value, autonomy, and performance again. The procedure and instructions were identical to those of the post-test.

Scoring of the Open-ended Question

Three of the performance test items were open-ended questions designed to measure deeper learning (e.g., synthesis, application). One-third of the answers were scored blindly by two raters and the inter-rater reliability coefficient (Pearson's *r*) was high, .93, indicating high consistency, and thus agreement, among raters. The raters followed a rubric with very specific scoring criteria. Three points were assigned to "excellent" responses, two points to "good"

responses, one point to "satisfactory" responses, and zero points to poor responses. There were examples for each type of response. For instance, one question asked "Why would an “evaluativist” think that argument and critical thinking are very important in learning?". The criteria for an "excellent" response were the following: Mentions specific characteristics of evaluativists (e.g., belief in knowledge construction; use of evidence; some opinions have more merit than others). Explains why evaluativists value argument and critical thinking.

An example of "excellent" response is the following: An evaluativist would think that argument and critical thinking are very important in learning because they believe *learning is self-constructed* and *gradual process*. They believe that *knowledge is based in opinions*, but these opinions must be critically evaluated to see which has *more merit*. An evaluativist thinker would value argument and critical thinking when it comes to learning because these force the learner to *consider the validity* of *multiple perspectives* on the same issue. When students must listen to opposing arguments and the *evidence* to support those arguments, they are more likely to reconsider their source of knowledge or at least to strengthen the evidence that they used to support their knowledge. Critical thinking and argument are all part of the learning process because *they utilize both the objective and the subjective aspects of learning*, which help a learner to have more sophisticated, evaluativist beliefs. The response covers 8 important pieces of information (in italics) discussed in the lesson. It mentions characteristics of evaluativists and links them to argument and critical thinking.

Statistical Analyses

Descriptive statistics, correlations, and mixed model analyses of variance were used to answer the research questions of the study. The data were tested for equality among the three groups in terms of basic demographic factors and the dependent variables (DVs). No differences

among the groups were found among pre-test baseline measures (i.e., performance, interest, and utility value) when conducting a series of one-way ANOVAs.

The following analyses were conducted to answer the four research questions. A series of 3 (treatment type: teacher-generated, student-generated, control) x 3 (time: pre-test, immediate post-test, and delayed post-test) factorial mixed (between-subjects and within-subjects) ANOVAs, with interest, performance, and utility value serving as outcomes in each model respectively. These analyses answered the first three research questions. Subsequently, to evaluate the mediation effect of autonomy between treatment type and performance, a series of ordinary least squares (OLS) regressions were conducted following Baron and Kenny's (1986) steps for establishing mediation. Mediation is present when a given variable accounts for the relation between the independent variable (IV) and the DV. Three conditions have to be met for establishing mediation: "(a) variations in levels of the IV significantly account for variations in the presumed mediator (i.e., Path *a*), (b) variations in the mediator significantly account for variations in the DV (i.e., Path *b*), (c) when Paths *a* and *b* are controlled, a previously significant relation between IV and the DV is no longer significant, with the strongest demonstration of mediation occurring when Path *c* is zero" (Barron & Kenny, 1986, p. 1176). The IV (type of intervention) was dummy coded with utility value intervention being assigned 1 and the control group 0.

Barron and Kenny's (1986) instructions for using regression for testing for mediation effects were used as guidance in the current study. In the first series of analyses, the student-generated utility value intervention was compared to the control group. In the second series of analyses, the teacher-generated utility value intervention was compared to the control group. Each analysis consisted of three steps. In the first regression equation, the mediator (sense of

autonomy) was regressed on the IV (type of intervention). In the second regression equation, the DV (performance) was regressed on the IV. In the third regression equation, the DV was regressed on both the IV and the mediator. Separate coefficients for each equation were estimated and tested. Three conditions must be present in order for mediation to be established: the IV must influence the mediator in the first equation, the IV must influence the DV in the second equation, and the mediator must influence the DV in the third equation. If these condition are satisfied, the effect of the IV on the DV must disappear or drop in the third equation compared to the second (Barron & Kenny, 1986). Sobel's (1982) test for the indirect effect of the IV on the DV via the mediator was conducted to estimate if the drop was significant.

A missing values analysis on the original sample of 132 participants using IBM SPSS version 22 (IBM, 2015) demonstrated that 5 cases (5.3%) had missing data. Systematic bias in the pattern of missing data could pose a problem to the trustworthiness and accuracy of the data, and hence, the validity of the inferences and conclusions drawn from such data. Thus, Little's MCAR χ^2 was requested from the missing values analysis to ascertain if the pattern of missing data were missing at random (Little & Rubin, 1989; Schaeffer & Graham, 2002). A significant χ^2 (i.e., $p < .05$) would suggest that the pattern of missing data is missing not at random (MNAR), which poses a problem for interpretation of results because they may be biased due to systematic differences in non-responses. However, the result of this test was non-significant, Little's MCAR χ^2 (78) = 82.36, $p = .36$, suggesting that the missingness pattern in the data was missing at random.

Data were first tested for univariate normality using histograms with the normal curve overlay and skewness and kurtosis statistics. Data approximated normality as all skew and kurtosis values were less than the absolute value of 2. Furthermore, data were evaluated for

assumptions including multicollinearity (all correlation coefficients were less than .85), homoscedasticity (a scatterplot of variables demonstrated a funnel shape), linearity (no quadratic or cubic trends were significant), homogeneity of variance (all *p*-values of Levene's Test were greater than .05), and homogeneity of regression coefficients (no treatment type x covariate interactions reached significance) (Tabachnick & Fidell, 2013). All of the aforementioned assumptions were met, and thus, data analysis proceeded as planned.

The results from the omnibus ANOVA tests were analyzed with the relevant follow-up tests. In the cases where no significant interactions were found, simple main effect follow-up tests were conducted.

CHAPTER 4: RESULTS

Descriptive Statistics

Descriptive statistics for the variables can be found in Table 2 and zero-order correlations are presented in Tables 3 and 4.

Table 2

Descriptive Statistics and Internal Consistency Reliability Coefficients of Performance, Interest, Autonomy, and Utility Value

Variable	Pretest			Immediate Posttest			Delayed Posttest		
	M	*SD*	α	*M*	*SD*	α	*M*	*SD*	α
Interest	4.54	0.96	0.84	5.50	1.14	0.93	5.33	0.97	0.92
Utility Value	4.63	1.00	0.92	5.96	1.00	0.91	5.58	1.03	0.93
Autonomy	-	-	-	0.96	0.78	0.93	1.15	0.70	0.80
Performance	8.32	2.24	0.31	12.04	2.55	0.63	11.90	2.58	0.60

Note. Autonomy was measured only at post-test and delayed post-test.
N = 88

Table 3

Zero-Order Correlations of Pre-test and Immediate Post-test Variables

Variable	1	2	3	4
1. Performance	-	.07	.05	-
2. Interest	.46**	-	.79**	-
3. Utility Value	.42**	.76**	-	-
4. Autonomy	.17	.54**	.48**	-

Note. Correlation coefficients above the diagonal are for pre-test variables and those below the diagonal are for immediate post-test variables.
N = 88

Table 4

Zero-Order Correlations of Delayed Post-test Variables

Variable	1	2	3	4
1. Performance	-	.27**	.33**	.25*
2. Interest		-	.53**	.46**
3. Utility Value			-	.74**
4. Autonomy				-

N = 88

Correlation coefficients across all waves and variables were within range and statistically significant, with the exception being the correlation between performance and interest and performance and utility value at pre-test. All correlations were in the expected theoretical direction (i.e., positive).

3x3 Analyses of Variance

Table 5 presents the means of each of the groups separately and Table 6 contains the results of across time. The first three research questions were answered by conducting a series of factorial analyses of variance (ANOVAs) with performance, utility value, and interest serving as outcomes in each analysis respectively.

Table 5

Descriptive Statistics by Group for Immediate Post-test Variables

Variable	Teacher-generated Group		Student-generated Group		Control Group	
	M	*SD*	*M*	*SD*	*M*	*SD*
Performance	11.59	2.59	10.59	2.19	10.15	2.39
Utility Value	5.59	0.84	5.53	0.87	5.06	1.20
Situational Interest	5.20	1.01	5.26	0.90	5.01	1.03

N = 88

Table 6

Descriptive Statistics of Each Wave for Performance, Utility Value, and Situational Interest

Variable	Pre-test		Immediate Post-test		Delayed Post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*
Performance	8.40	2.19	12.03	2.61	11.97	2.58
Utility Value	4.61	1.01	5.97	0.99	5.57	1.05
Situational Interest	4.56	0.98	5.53	1.09	5.36	0.98

N = 88

Performance (Multiple-choice Test)

The ANOVA with performance as the outcome found no statistically significant treatment type x time interaction, $p = .18$. However, the main effects of treatment type, $F_{(2, 85)} = 4.19$, $p = .02$, $\eta^2_p = .090$, and time, $F_{(2, 85)} = 126.09$, $p = .001$, $\eta^2_p = .597$, reached statistical significance. Post hoc comparisons of treatment type with the Bonferroni adjustment, revealed a significant difference between the teacher-generated group (1) and the control group (3), with the teacher-generated group outperforming the control. Post hoc comparisons of time indicated there were differences in performance between pre-test and immediate post-test and between pre-test and delayed post-test, with increased performance at immediate and delayed post-tests when compared to pre-test.

Table 7

Descriptive Statistics of Performance by Treatment Type

Wave	Teacher-Generated (*n* = 27)		Student-Generated (*n* = 29)		Control (*n* = 32)		α
	M	*SD*	*M*	*SD*	*M*	*SD*	
Initial	8.89	2.41	8.45	2.11	7.97	2.06	0.31
Immediate Posttest	12.82	2.80	11.69	2.27	11.69	2.68	0.63
Delayed Posttest	13.30	2.60	11.83	2.17	11.00	2.50	0.60

N = 88

Open-ended Performance Items

Results of the open-ended performance items revealed that the treatment type x time interaction was not statistically significant, $p = .07$. However, both main effects reached statistical significance. Table 7 contains the descriptive statistics of the open-ended performance items and Table 8 presents the omnibus results of the three open-ended questions. Post hoc comparisons with the Bonferroni adjustment showed that there were significant differences in performance between the teacher-generated (1) and the control group (3) for Item 1; the teacher-generated (1) and the student-generated group (2) and the teacher-generated (1) and the control group (3) for Item 2; and the teacher-generated (1) and the control group (3) for Item 3. For time, there were significant differences between pre-test and immediate post-test and pre-test and delayed post-test as well as between immediate and delayed post-test for all three items.

Table 8

Descriptive Statistics of Each Wave for the Three Open-Ended Performance Items

Variable	Pre-test		Immediate Post-test		Delayed Post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*
Open-ended question 1	0.73	0.78	1.85	0.83	1.48	0.89
Open-ended question 2	0.91	0.80	1.48	0.84	1.24	0.83
Open-ended question 3	0.59	0.84	1.54	1.05	1.28	0.99

$N = 88$

Table 9

Results of the Three Open-ended Performance Items

Variable	Item 1		Item 2		Item 3	
	F	η^2_p	*F*	η^2_p	*F*	η^2_p
Group	5.76*	.120	9.60*	.184	4.56*	.097
Time	60.19*	.415	17.96*	.174	40.43**	.322

$N = 88$ * $p < .01$ ** $p < .05$

Interest

The factorial ANOVA with interest as the outcome demonstrated that neither the treatment type x time interaction, $p = .91$, nor the main effect for treatment type, $p = .39$, reached statistical significance. However, there was a significant main effect for time, $F_{(2, 85)} = 35.64$, $p = .001$, $\eta^2_p = .295$. Post hoc comparisons with the Bonferroni adjustment showed that there were significant differences in interest between pre-test and post-test and pre-test and delayed post-test, with interest being higher at immediate and delayed post-tests when compared to the pre-test.

Table 10

Descriptive Statistics of Interest by Treatment Type

Wave	Teacher-Generated (n = 27)		Student-Generated (n = 29)		Control (n = 32)		α
	M	*SD*	*M*	*SD*	*M*	*SD*	
Initial	4.58	0.89	4.64	1.04	4.47	1.03	0.84
Immediate Posttest	5.55	1.19	5.73	0.97	5.33	1.12	0.93
Delayed Posttest	5.47	0.98	5.43	0.72	5.21	1.17	0.92

$N = 88$

Utility Value

Finally, the factorial ANOVA with utility value as dependent variable suggested that the treatment type x time interaction was not significant, $p = .97$. Nonetheless, the main effects of treatment type, $F_{(2, 85)} = 4.38$, $p = .02$, $\eta^2_p = .093$, and time, $F_{(2, 85)} = 68.29$, $p = .001$, $\eta^2_p = .445$, reached statistical significance. Post hoc comparisons with the Bonferroni adjustment for treatment type revealed a significant difference between the teacher-generated (1) and the control group (3), and between the student-generated (2) and the control group (3), with the teacher- and student-generated groups reporting significantly higher utility value than the control. Post hoc comparisons for time demonstrated significant differences in perceptions of utility value between

pre-test and immediate post-test, pre-test to delayed post-test, and immediate post-test and delayed post-test, with participants reporting greater utility value at immediate and delayed post-tests when compared to the pre-test, and greater utility value at immediate post-test when compared to the delayed post-test.

Table 11

Descriptive Statistics of Utility Value by Treatment Type

Wave	Teacher-Generated (n = 27)		Student-Generated (n = 29)		Control (n = 32)		α
	M	*SD*	*M*	*SD*	*M*	*SD*	
Initial	4.84	0.88	4.71	0.93	4.31	1.14	0.92
Immediate Posttest	6.14	0.88	6.18	0.83	5.65	1.15	0.91
Delayed Posttest	5.82	0.75	5.71	0.86	5.24	1.34	0.93

N = 88

Mediation Analysis

Results of the mediation analysis found that treatment type had a significant effect on immediate performance (β = -.21, p = .04), indicating that performance was generally better for the treatments when compared to the control group. However, treatment type did not have a significant association with immediate autonomy (β = .02, p = .89). Likewise, immediate autonomy did not have a significant association with immediate performance (β = .17, p = .09), although it was approaching significance. The Sobel Test for mediation was not significant for this analysis (Z = 1.12), and hence, immediate autonomy did not mediate the relation between treatment type and immediate performance.

CHAPTER 5: DISCUSSION

This chapter briefly summarizes the study's findings and discusses the results within the context of the four research questions, the initial hypotheses, and past research. Next, it presents some practical implications of the results to scholars and educators as well as discusses the study's limitations. Finally, the chapter recommends directions for future research in the field.

Summary and Interpretation of the Findings

The goal of this study was to compare the immediate and delayed effects of teacher- vs. student-generated utility value interventions on graduate students' interest, performance, and perceptions of utility value. In particular, it aimed to determine if one method was more effective than the other in the context of a short, graduate level lesson on epistemic beliefs. Further, it examined the durability of the effects over time (immediate vs. delayed effects). Lastly, the study tested whether autonomy support mediated the relationship between intervention type and performance. Participants were randomly assigned to three conditions. Group 1 received a teacher-generated rationale for the utility of the lesson (teacher-generated condition), Group 2 generated their own rationale for the utility of the lesson (student-generated condition), and group 3 (control) wrote a summary of the lesson.

Based on previous research, it was expected that both treatment groups would outperform the control group on all three dependent variables on the immediate and the delayed post-test, with the delayed scores being lower that the immediate post-test scores. Another hypothesis stated that there would be a significant interaction between treatment and time, with type of intervention moderating the effect of time on students' performance, interest, and utility value. Furthermore, it was hypothesized that sense of autonomy would mediate the effect of type of intervention on performance.

Research question 1 asked whether the interventions would produce significant immediate and delayed effects on students' performance, interest, and perceptions of utility value. It was predicted that both interventions would produce significantly stronger effects than the control group for all dependent variables. The hypothesis (H1) received partial support from the data. The results revealed a significant main effect for type of intervention. However, there were significant differences only between the teacher-generated group (1) and the control group (3) for performance as well as between the teacher-generated group and the control group, and between the student-generated group (2) and the control group, for utility value.

The effect sizes for performance and utility value were medium to large. The main effect of treatment type on performance was medium in size, $\eta^2_p = .090$, which indicates that presenting students with an autonomy-supportive, meaningful rationale (even after the learning session) can improve their performance in a visible way. The effect sizes for the three additional (open-ended) performance questions were medium to large, $\eta^2_p = .120$, $\eta^2_p = .184$, and $\eta^2_p = .097$ respectively. These questions probed higher-level knowledge such as analysis and application. This means that the teacher-generated utility value intervention had even stronger effects on knowledge beyond simple memorization and comprehension. The effects of both interventions were moderate in terms of increasing students' utility value as evident by the medium effect size, $\eta^2_p = .093$.

The findings that the teacher-generated intervention promoted performance and utility value are in line with previous research (e.g., Deci et al., 1994; Hulleman & Harackiewicz, 2009; Jang, 2008; Reeve et al., 2002). They are supported by theoretical and empirical claims that when utility value is promoted, students internalize the value of a lesson as part of their identity

and self-concept which, in turn, enhances their performance (Jang, 2008; Hulleman et al., 2010; Pugh, 2004; Pugh et al., 2010b).

The results somewhat expand findings from the research of Reeve, Jang and colleagues (e.g., Deci et al., 1994; Jang, 2008; Reeve et al., 2002). In their interventions, a rationale for the utility value of the material was presented before the learning session, whereas in this study, the participants were presented with a rationale after the learning session. The fact that this produced improved performance may be due to improved consolidation of knowledge effected by improved utility value perceptions. However, it may be due simply to the additional exposure to the material. The provided rationale was a five-page text that repeated some of the major points of the main lesson and gave concrete examples. The reiteration or the concreteness of the text may have caused the improved retention. Future studies should experiment with different lengths and concreteness of the presented rationale.

The finding that the student-generated condition did not lead to a significant increase in the score on any of the dependent variables is somewhat incongruent with research conducted by Hulleman, Harackiewicz and associates (Durik & Harackiewicz, 2007; Harackiewicz et al., 2012; Hulleman et al., 2010; Hulleman & Harackiewicz, 2009) who found that asking students to come up with their own reasons for the utility of the material improved their performance, interest, and utility value. The reason for the lack of significant results remains unclear. One possible explanation is the inauthentic setting of the experiment. The current study was similar to a one-time lab experiment. In contrast, previous studies used students enrolled in a semester-long course. This issue is discussed in more detail in the limitations section.

Another possible reason is that the student-generated intervention occurred after the learning session so students could not apply its potential benefits *during* learning. In previous

studies, (Hulleman et al., 2010; Hulleman & Harackiewicz, 2009), the interventions were administered several weeks into the semester. This gave students the opportunity to apply the technique (looking for personal relevance) during their subsequent learning sessions.

Another surprising result was that there were no significant differences between the groups in terms of interest. One possible explanation is that this was caused by the moderately high initial interest scores (M = 4.54). This reduced the variance of the data and the potential for group differences. Another possibility is that the main lesson on epistemic beliefs provided students with enough interesting details so that their situational interest was enhanced even for those in the control condition (in the absence of the interventions). This hypothesis is supported by the fact that all group scores increased with about one point from pre- to post-test. Future research should establish the interestingness of the intervention materials. An independent group of students unfamiliar with the topic can be used to rate the main lesson for interestingness.

Research question 2 asked if time would have an effect on students' interest, performance, and perceptions of utility value. The hypothesis (H2) was that time would affect significantly all dependent variables. Specifically, it was expected that for all three groups both immediate and delayed post-test scores would be significantly higher than the initial scores. The hypothesis was confirmed by the mixed model ANOVAs which found a significant main effect for time. In particular, the immediate scores of all groups were significantly higher than the initial scores. Furthermore, the immediate scores for utility value were significantly higher than the delayed scores. These findings are in line with previous research on utility value interventions which found that such intervention lead to sustained interest and performance, (Hulleman et al., 2010; Hulleman & Harackiewicz, 2009).

Research question 3 asked if there would be a significant interaction between time and

treatment type. It was hypothesized that a significant interaction effect would be present. In particular, it was expected that there would be significant differences between the post-test effects of the two interventions and the control group (on both the immediate and delayed post-test) for all dependent variables. Furthermore, while the delayed scores of the intervention groups were hypothesized to remain significantly higher than the pre-test, the delayed scores of the control group were expected to drop significantly. These hypotheses were based on the expectation that the students in the intervention groups would internalize the value of epistemic beliefs as part of their identity, and in turn learn more effectively, whereas those in the control group would not.

The results from the mixed model ANOVAs revealed no significant interactions. Although no study has used similar design, these results are surprising. In the case of performance, this was possibly a result of the high initial knowledge that was exhibited on the pre-test. The high pre-test scores contributed to the high stability of the scores across sessions and for a low overall variance. Graduate students in educational psychology and other education majors may have already had the opportunity to cover the topic of epistemic beliefs in various undergraduate and graduate courses.

Another cause may be the lack of statistical power due to the small sample size. A review of the group means revealed that although not reaching significance, the group means followed the expected directions. The intervention groups (especially the teacher-generated condition) outperformed the control group. The difference between the means of the teacher-generated group (M = 13.3) and the control group (M = 11) were especially pronounced at the delayed post-test. Further, the scores of the intervention groups went up from immediate to delayed post-

test whereas the control group scores went down. The pattern of the means may suggest that if there were a larger sample size, statistically significant differences may have been detected.

In addition, the many instances of poor adherence to the instructions may have influenced the results of the study. As already discussed, in the context of the specific sample (full time teachers with full time enrolment in a master's program) and participating in the study in order to get research credits, some participants exhibited fatigue and low motivation to follow the instructions. Moreover, a portion of the participants enrolled in the study late in the semester because they were one credit short of fulfilling they three credit requirement. Some of these student did not finish the study (because they got one credit simply by completing session 1) and others rushed through sessions 2 and 3 (with their session 3 coinciding with finals week).

A special case of the effects of the artificial nature of the experiment is related to the possible inflation of initial scores. On the pre-test, the students indicated that they were more interested than not in the topic and found it somewhat important. A review of the questionnaires revealed that 14% of the participants had lower immediate post-test interest scores compared to their initial interest scores. The situation was similar with utility value. This finding implies that some students may have given inflated ratings of initial interest and utility value (in the absence of knowledge of the subject) which biased the results of the study (the only alternative explanation that comes to mind is that the intervention reduced their interest and utility value, which is unlikely). The inflated scores hypothesis is supported by the very low correlations (close to 0) between initial knowledge and interest and utility value. If it is correct, the inflated scores may be due to some sort of a Hawthorn effect or "positive self-image" effect. It is possible that some students gave inflated ratings of interest and utility value just because they wanted to

appear interested or academically conscientious. Furthermore, the inflated ratings may have been caused by the novelty effect of participating in a research study.

Finally, design issues may have influenced the outcome of the study. In previous experiments, the interventions (both teacher- and student-generated utility value) have been administered before the learning process. For example, Reeve et al. (2002) used an authentic task where pre-service teachers were asked to participate in a lesson of conversational Chinese. Some of the students were provided with a meaningful rationale why this lesson can benefit their future work as teachers. These students experienced increased interest and utility value which enhanced their motivation to engage with the material and make extra effort (Jang, 2008; Reeve et al. 2002). In the current study, the interventions were administered after the learning session without the opportunity to apply the new knowledge or increased motivation to subsequent learning. Future studies should explicitly compare the effects of interventions administered before vs. after the learning session.

Overall, considering the differences in design, the findings of this study are consistent with past research which found only small to moderate effects from teacher-generated utility value interventions. For example, Jang (2008) found that providing a rationale significantly improved only conceptual learning (d = 0.39) but not factual learning, Reeve et al. (2002) found only a marginal positive effect on effort (p = .06), and Deci et al. (1994) found moderate positive effects on engagement. Only Jang's (2008) study measured performance directly and the results were mixed. It is noteworthy that all these studies used much larger sample sizes (between 136 and 190) than the current study.

Research question 4 concerned the mediation effect of autonomy on performance. The finding that autonomy did not mediate the effect of intervention type on performance runs

counter to the research of Reeve, Jang, and their colleagues (Jang, 2008; Reeve et al., 2002), who found the opposite effect in the context of a teacher-generated utility value intervention. However, there are some differences between this study and theirs, which may be the source of the inconsistency in the findings. In Jang's (2008) and Reeve et al.'s (2002) studies, the researchers always had a control group which did not receive autonomy support. Unlike that, the current study provided all students with two of the three elements of autonomy support (non-controlling language and acknowledgement of students' feelings). These elements were embedded in this study's main lesson that everyone read. Past studies have revealed that any two (out of the three) autonomy support elements were enough to increase students' sense of autonomy (Reeve et al., 2002). Therefore, it is possible that this was why all students felt a similar degree of autonomy support.

In addition, the nature of the intervention was such that some inevitable controlling factors were present that may have reduced the effectiveness of the autonomy-supportive elements of the intervention groups (receiving or generating a meaningful rationale). For example, mentioning that students will be tested has been recognized as a controlling factor (Deci et al., 1994; Jang, 2008). Another one is imposing deadlines and strict procedures. Due to those factors, the students may have felt less autonomy in terms of freedom, choice, and self-initiative.

It is important to note that the lack of mediation effect does not contradict the presence of a positive effect of the teacher-generated utility value intervention on performance. Previous research has found that such positive effects can be caused either by high perceived autonomy or by a sense of high utility value (perceived importance) (Jang, 2008). The current study's finding of significant main effects for type of intervention on performance and utility value can be

explained by the link between perceptions of high importance and performance.

Finally, it is worth noting that whereas all previous studies (presented above) used undergraduate students, the current study utilized graduate students. Thus, a potential cause for the inconsistent results could be the nature of the population. There are qualitative differences between graduate and undergraduate students in terms of age and maturity, years of education, prior knowledge, procrastination, self-regulation, and motivation (Cao, 2012; Lindner, 1996). It is possible that more mature and experienced students perceive autonomy support and reasons for the importance of a lesson differently than younger students. For example, they may be more vulnerable to an inauthentic setting than undergraduates and find no meaning in writing a hypothetical letter to a significant other. Also, considering that most of these students were practicing teachers, the inauthentic setting may be a reason for reduce perceptions of autonomy. Further, graduate students may be more perceptive than undergraduate students in terms of picking up the relevant passages in the main text that imply potential applications to personal and professional life. In sum, utility value interventions may have smaller or idiosyncratic effects on graduate students compared to undergraduates due to specific features of the population.

Overall, considering the effects of the interventions on the motivation and performance outcomes together, the results corroborate previous findings that teacher-generated interventions promote students' perceptions of utility value and performance. It seems that in the context of brief interventions, it is utility value but not interest that makes students learn better. This was confirmed by Reeve et al. (2002) and Jang (2008) who used structural equation modeling analyses to establish the factors that mediate the relationship between a teacher-generated intervention and performance. When students internalize the value of the material into their system of goals and beliefs, they are willing to put more effort, engage with the material, and

learn on a deeper level (try to understand the topic).

Limitations of the Study

The study involved a convenience sample of graduate students enrolled in a research methods course. Therefore, the sample of students was not randomly selected from the target population and does not represent the entire graduate student population. Furthermore, graduate students do not represent the entire student population. They are qualitative different from undergraduate (as mentioned above, Cao, 2012; Lindner, 1996) so the results may not generalize to populations other than graduate students.

In addition, participant attrition may have influenced the results, as 44 (33%) of the participants did not complete the study (20 of which were removed due to a technical error that made their responses unavailable). A plausible explanation for this is that some students only needed one credit in order to complete their three research credits requirement and therefore were not motivated to complete all three sessions or do it properly.

Bias may also have been introduced in measurement. Even though the performance assessment was objective in nature, the self-report questionnaires may have introduced bias because students may have overestimated their interest and utility value. A review of the interest questionnaire responses revealed that some students may have inflated their initial scores (e.g., indicating high interest without any knowledge of the topic) due to the novelty of the topic or some other reason. Furthermore, there was a tendency that students strived to get high scores on the performance pre-test, with some of them looking up the topic on the internet (those were removed) or spending inadequately long time on the pre-test (in the apparent absence of prior knowledge of the subject). Some students even admitted in the open-ended questions that they had made an effort to gather knowledge from the test questions in order to give better answers in

the absence of any subject knowledge (e.g., I had no knowledge of the subject prior to taking this quiz. However, after carefully going through the questions presented in this quiz, I can say that…). A possible explanation is that those students were trying to maintain a positive academic self-image through high scores. The novelty of the test may have been another reason for the extra effort. The same effort was not evident on the subsequent tests probably due to the fact that they were identical to the pre-test (less novel). Students took much less time to complete the immediate post-test and the delayed test, with many of them rushing through the test in just a few minutes.

Next, the suboptimal quality of the performance test is another limiting factor in this study and may have contributed to the lack of significant interaction for performance may. The large standard deviations point in that direction. This test was designed specifically for the study with the help of a subject matter expert. It was pilot tested for clarity and 10 out of 17 of the questions were selected from the tests banks accompanying the books used to design the lesson. Despite the effort, the reliability of the test was low. This being a dissertation study, time constraints prevented the researcher from developing a stronger test. Future studies should use an established test with high reliability or develop a more robust performance measure.

Another limiting aspect of the performance test was that the open-ended questions were presented after the multiple-choice questions on the performance pre-test. Thus, some students were able to glean enough information from the multiple choice questions to answer the essay questions adequately without any previous knowledge of the topic. This may have resulted in inflating the initial performance scores. This hypothesis is aligned with the fact that the pre-test performance mean score was high (M = 8.32, or 49% correct answers).

In addition, this study did not include other potential variables that may affect performance, interest, and utility value. For example, some previous studies accounted for the effects of achievement goals and outcome expectations (Hulleman et al., 2008; Hulleman & Harackiewicz, 2009; Simons, et al., 2004). As such, the effects of these confounding variables on the outcomes relevant to this investigation could be neither ascertained nor controlled.

Furthermore, the artificial nature of the experiment, quite different from the natural learning conditions during a regular semester, may have contributed to the attrition, inattention (contradictory responses on the questionnaires), lack of motivation (e.g., to take the full time for the activities, as suggested), and lack of significant increase in knowledge for some of the participants. It may be that the inauthentic setting and the extrinsic motivation (getting research credits) made the students go through the motions (e.g., of writing a rationale) without thinking deeply about the material. An examination of the letters (in which students generated a rationale for the importance of the lesson) indicated that more than half of them (60%) were brief (half a page or less) or too general (e.g., epistemic beliefs support learning). In addition, a large amount of the students (about 30%) did not take the full time to think and write while working on their summary or letter (although explicitly instructed to do so). Specifically, a review of the times taken to complete the summary of the lesson or write the letter revealed that close to one third of the participants took less than fifteen minutes to do their assignment (in twelve cases under ten minutes).

Finally, a confounding factor may have been the nature of this particular population. The majority of the participants were full time teachers taking a heavy load of master's level classes. For example, several individuals complained that they had not had enough free time to do the sessions adequately (when not tired and in appropriate hours) due to their already full schedule

as in-service teachers and full time students. This may be the reason why some of the sessions were completed in the hours between 10 pm and 6 am (although the instructions asked otherwise) and why many participants rushed through their sessions.

Despite these limitations, the present study offers new insights to the scientific inquiry regarding the role of different types of utility value interventions. Its contributions are mainly to practical application in educational courses differing in duration and type of material (see the section below).

Contributions to Research

The study findings suggest that brief, one-time autonomy supportive teacher-generated utility value interventions can improve students' performance and perceptions of utility value. Hence, this study contributes to the literature by providing additional evidence as to the influence of such interventions, corroborating existing research on their effectiveness. Another contribution of this study is generating preliminary evidence for the superiority of teacher-generated utility value interventions over student-generated utility value interventions in the context of a brief, one-time lesson. Student-generated interventions may be more appropriate in contexts where students have had enough time to accumulate sufficient knowledge on the topic and have opportunities to learn following the intervention (e.g., during a regular semester). Past studies have found student-generated interventions to be effective in such contexts (Hulleman et al., 2010; Hulleman & Harackiewicz, 2009).

Another contribution of the study comes from the finding that a teacher-generated intervention can be effective even when administered after the learning session. Providing students with reasons for the importance of a topic even after the lesson has the potential to consolidate and deepen their knowledge as well as increase their perceptions of the utility of the

material. This can be important in contexts where the topic is new and it is hard to explain its relevance to students in the absence of background knowledge (something to relate it to).

Theoretical Implications

The results of this study are relevant to self-determination theory and expectancy-value theory in several important ways. First, the lack of significant mediation effect implies that giving students autonomy in the form of autonomy-supportive rationale and self-generated rationale may not be enough for increasing their perceived sense of autonomy. Sense of autonomy may result from a combination of factors where a critical number of components may need to be present simultaneously in order for sense of autonomy to increase. For example, giving students freedom and choices may improve autonomy only when students possess sufficient background knowledge to generate reasons independently. If this is not the case, they may feel overwhelmed or lost without proper support. This hypothesis suggests that some of the so called autonomy-supportive factors may be somewhat context dependent rather than universally effective for promoting autonomy. In other words, they may work only when given in certain degree (moderate freedom vs. total freedom) or in specific proportions (e.g., an optimal ratio of freedom/choices to structure/support).

Second, the style of presentation of a meaningful rationale or the context of self-generating a rationale may affect one's sense of autonomy. For instance, online presentation may be less effective than face-to-face presentation. The current study was conducted online and the interventions produced no positive effect on students' autonomy. These results are consistent with such an interpretation.

Finally, the results imply that increasing utility value does not guarantee better learning. Students who generated their own reasons for the importance of the lesson had significantly

higher perceptions of utility value than the control group but did not perform better on the post-tests. Consequently, researcher should look for factors that moderate the relationship between utility value and learning.

Educational Implications

This study indicates the potential benefits of providing graduate students with a meaningful rational for the importance of a lesson. In particular, after presenting a lesson or discussing suggested readings, university professors can point out relevant implications of the material to daily life and professional goals. This should increase students' perceptions of utility value and improve their learning of the material. Specifically, the benefits may be in constructing more consolidated knowledge that will remain stable in the long run.

In addition, textbook writers can use the results from this study to improve the quality of their materials. Specifically, at the end of each chapter, they can include additional segments discussing the utility value of the covered knowledge. This could serve to improve students' perceptions of utility value as well as to summarize the major points of the lesson in more concrete and engaging terms via examples and relevant context.

Implications for Future Research and Concluding Thoughts

A number of studies (Durik & Harackiewicz, 2007; Harackiewicz et al., 2012; Hulleman et al., 2010; Hulleman & Harackiewicz, 2009; Jang, 2008; Reeve et al., 2002) provide a growing body of evidence supporting the importance of improving students' perceptions of utility value. This study adds further empirical evidence that teacher-generated utility value interventions can lead to improved performance. However, there is a need of further testing of components of utility value interventions within a wide range of settings and populations.

For example, future research can test how sustained teacher- and student-generated

interventions (multiple sessions within a semester) compare in terms of motivation and performance effects. It may be that there are cumulative effects from one or both of these types of interventions. More needs to be understood about the interaction between type of intervention and duration.

Also, future research should examine the short-term vs. long-term effects of student-generated utility value interventions so that they can establish the underlying mechanism of their success (when present). For example, researchers can build on the studies conducted by Hulleman et al. (2010) and Hulleman and Harackiewicz (2009), who asked students enrolled in a semester-long course to generate reasons for the utility of the material (student-generated utility value intervention). Those interventions were administered several weeks into the semester so the students were already familiar with the topic (in order to generate a rationale). Final grades were used as a measure of student performance (dependent variable). From this design it is not clear if the intervention had immediate effect and/or long-term effects due to students adopting this technique during learning sessions for the remains of the semester. It may be that such interventions improve learning by creating a useful habit to elaborate on the material (that improves with practice) rather than by promoting students' sense of autonomy or immediate learning. If this is the case, it would explain why the current study did not find significant results for the student-generated intervention.

Another possible avenue for future research is to look at how utility value interventions work in terms of topic familiarity. For example, there may be differences between the effects of such intervention on familiar vs. unfamiliar topics. Students' preexisting perceptions of a subject such as math (e.g., I am not a math person) can affect the success of an intervention as suggested by Durik and Harackiewicz (2007). Therefore, a type of intervention that works for unfamiliar

topics may not be effective for familiar topics where students hold negative beliefs. Furthermore, future studies should compare the effects of utility value interventions on students with high initial knowledge vs. low or no initial knowledge. Prior knowledge has been established to influence learning and interest in a topic (Chen & Darst, 2002).

A third avenue for future research may be comparing the effects of interventions administered before vs. after the learning session. It makes more sense to present a meaningful rationale before a lesson so that the increased sense of importance can improve students' attention and depth of processing (e.g., making elaborative connections to personal goals and daily applications). However, it is challenging how to do that if students don't have any prior knowledge on the topic so that they cannot relate the rationale to their prior knowledge. Researchers should explore ways to resolve that issue.

In sum, improving students' perceptions of utility value is an important area of research because educators need to find ways to make their students learn in a deep and meaningful way. Much needs to be done in order to illuminate the details of effective utility value interventions. The current study provided a unique comparison of two utility value interventions that have been found to affect positively students' learning. Along with past research by Jang, Reeve, and colleagues (Deci et al., 1994; Jang, 2008; Reeve et al., 2002) and Hulleman, Harackievitz, and associates (Durik & Harackiewicz, 2007; Harackiewicz et al., 2012; Hulleman et al., 2010; Hulleman & Harackiewicz, 2009), it offers some valuable starting points in this field.

APPENDIX A

Academic Autonomy

Please respond to this self-report survey on 4-point Likert-type scale from 1 (strongly disagree) to 4 (strongly agree).

Autonomy Scale

1. Why do I do this test? Because I'll get in trouble if I don't. 1 2 3 4
2. Why do I do this assignment? So that the researcher won't yell at me. 1 2 3 4
3. Why do I work on this assignment? Because that's the rule. 1 2 3 4
4. Why do I work on this assignment? Because the researcher says we have to. 1 2 3 4
5. Why do I do this assignment? Because I'll feel bad about myself if I don't do it. 1 2 3 4
6. Why do I work on this test? Because I'll be ashamed of myself if it doesn't get done. 1 2 3 4
7. Why do I try to do well on this test? Because I'll feel really bad about myself if I don't do well. 1 2 3 4
8. Why do I try to do well on this test? Because I feel guilty when I don't do as well as I should. 1 2 3 4
9. Why do I do this assignment? Because I want to understand the subject. 1 2 3 4
10. Why do I do this assignment? Because I want to learn new things. 1 2 3 4
11. Why do I work on this assignment? Because I think it is important for my learning. 1 2 3 4
12. Why do I try to do well on the test? Because I enjoy doing well on important tests. 1 2 3 4
13. Why do I try to do well on the test? Because doing well on it is important to me. 1 2 3 4
14. I thought the lesson was fun. 1 2 3 4
15. I enjoyed the lesson and found it pleasant. 1 2 3 4

16. Why do I work on this test? Because it’s fun. 1 2 3 4

17. Why do I work on this test? Because I enjoy doing it. 1 2 3 4

APPENDIX B

Interest and Utility Value Scale Items for the Study (adapted from Hulleman et al., 2010)

Initial Interest

Participants will respond to all self-report items in this study on a 7-point Likert-type scale from 1 (strongly disagree) to 7 (strongly agree).

1. I think the topic of epistemic beliefs is an interesting subject.

2. I am not interested in the topic of epistemic beliefs.

3. I think I will like learning about epistemic beliefs in this lesson.

4. I think the topic of epistemic beliefs will be interesting.

5. I've always wanted to learn more about epistemic beliefs.

Situational Interest

Participants will respond to all self-report items in this study on a 7-point Likert-type scale from 1 (strongly disagree) to 7 (strongly agree).

1. I think the topic of epistemic beliefs is very interesting.

2. I think what we're learning in this lesson is fascinating.

3. To be honest, I just don't find the topic of epistemic beliefs interesting. (Reversed)

4. I think the material in this lesson is boring. (Reversed)

5. The topic of epistemic beliefs fascinates me.

Utility Value

Please respond to all following self-report items on a **7**-point scale from 1 (strongly disagree) to 7 (strongly agree).

1. What I am learning in this lesson is relevant to my life. 1 2 3 4 5 6 7

2. I think what we are studying in this lesson is useful for me to know. 1 2 3 4 5 6 7

3. I find the content of this lesson to be personally meaningful. 1 2 3 4 5 6 7

APPENDIX C

Main Lesson

Today you have the opportunity to learn a lesson about epistemic beliefs (EB). These are our beliefs about knowledge and learning. The information in the lesson is complex and dry at times so it is understandable if you feel bored or overwhelmed. You can take up to 40 minutes to read the text (the window will close automatically). Please try to remember as much as possible from the lesson as if you are preparing for an exam but do not take notes. You will be tested on your recall of the lesson afterwards.

EPISTEMIC BELIEFS

Here is a conversation between an 11th grader, Jeff, and his mom, about the Canadian studies program at a local university. Jeff's comments reveal a simplistic view of what history is.

Jeff: The Canadians don't have as much history as we [Americans] do.

His mom: Of course they do.

Jeff: No, they don't. They haven't had as many wars.

His mom: History is more than wars.

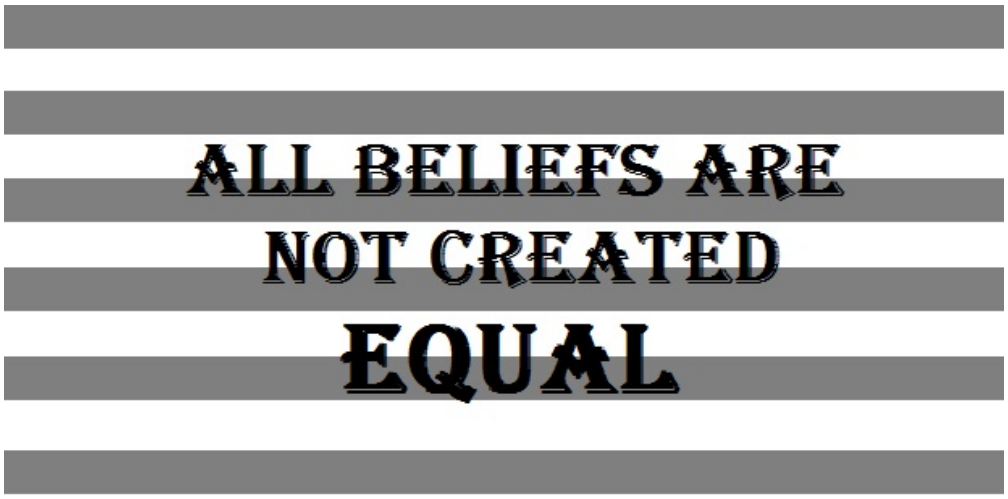
Jeff: Yeah, but the rest of that stuff is really boring.

Once Jeff reached college, he discovered that history is a lot more than wars and other "really boring" stuff. In fact, he majored in history, with a minor in art history. But it's unfortunate that he had to wait until college to discover the true nature of history as an academic discipline (Ormrod, 2006).

Children and adolescents have many misconceptions about academic disciplines. For instance, many students think that mathematics consists of nothing more than a collection of procedures that yield "right" answers. Most young learners have misconceptions about the nature

of learning as well. For example, some students think they should be able to learn math concepts quickly and easily, with little or no effort on their part, as long as their teacher does her job (Ormrod, 2006).

As someone who learns new things every day, you undoubtedly have ideas about what "knowledge" and "learning" are. Such ideas are collectively known as **epistemic beliefs**. Your understanding of what constitutes knowledge can make you answer differently to questions such as: Is an opinion knowledge? Are there certain facts? What is evidence? Furthermore, it affects the way you make and justify your judgments about different issues.



Epistemic beliefs play a significant role in education because they influence our studying and learning. For example, when learners believe that learning happens quickly in an all-or-none fashion, they are apt to believe that they have mastered something before they really have. Furthermore, they tend to give up quickly in the face of failure and express discouragement or dislike regarding the topic they are studying. In contrast, when learners believe that learning is a gradual process that often takes time and effort, they are likely to use a wide variety of learning strategies as they study and to persist until they have made sense of the material (Ormrod, 2006).

As another example, some learners believe that when they read a textbook, they are passively absorbing information - often in the form of isolated facts - directly from the page to their minds. Such learners tend to study superficially by memorizing facts and definitions. In contrast, other learners believe that learning from reading requires them to construct their own meanings by actively interpreting, organizing, and applying the information. Learners who realize that reading is a constructive, integrative process are more likely to engage in deep, meaningful learning as they read and more likely to undergo conceptual change when they encounter ideas that contradict their existing beliefs (Ormrod, 2006).

Furthermore, epistemic beliefs have a significant influence on our reasoning and problem solving processes. Research shows that while performance on well-defined problems (i. e. those with a single, guaranteed solution) is not affected by our epistemic beliefs, when solving ill-defined problems (i. e. those with multiple, non-guaranteed solutions) such beliefs can have a large impact on our thinking and decision-making. In particular, epistemic beliefs affect how individuals define, assess, and analyze ill-defined problems (Schraw, Dunkle, & Bendixen, 1995).

There are many other aspects of academic and daily life that are affected by our beliefs about knowledge and learning. They influence our capacity to argue constructively in a dialogue, the degree to which we are engaged in self-regulatory activities, and what academic discipline we enter (Muis, 2008; Schraw, 2001). These topics will be examined in more detail further in this lesson.

DIMENSIONS OF EPISTEMIC BELIEFS

Researchers have proposed that people hold extremely complex beliefs about knowledge and learning that vary across six separate dimensions (Ormrod, 2008). These dimensions are:

1. **Certainty of knowledge** - People with naïve epistemic beliefs think that absolute knowledge exists and will eventually be known as well as that it consists of a stock of unchanging, certain facts whose truth is absolute and eternal. Such facts, once found, mirror the world unambiguously. In learning contexts, students who believe in certain knowledge assume that there is a correct, clear-cut answer for every question or problem that, once known, does not change. In contrast, people with sophisticated epistemic beliefs view knowledge as socially constructed, tentative (uncertain and subject to revision in the light of new evidence), and context dependent. They understand that knowledge of a topic evolves as scholars conduct further inquiries and experiments.
2. **Simplicity and structure of knowledge** - People with naïve epistemic beliefs view knowledge as consisting of discrete and isolated facts (which are related to each other additively). They believe that learning is equivalent to accumulating a vast amount of factual knowledge in an encyclopedic fashion.In contrast, those with sophisticated epistemic beliefs view knowledge as complex (a continuum of interrelated elements).
3. **Source of knowledge (omniscient authority)** - People with less developed epistemic thinking believe that authorities have access to otherwise inaccessible knowledge. For them knowledge is transmitted from authorities without questioning and critical examination of information. On the other hand, people with sophisticated epistemic beliefs tend to evaluate information based on sound logic and available evidence. They have a more balanced view of authorities as a source of information and while valuing experts' knowledge on a subject, they understand that even experts have their blind spots and subjective interpretations.
4. **Speed of learning(quick learning)** - People with naïve epistemic beliefs think that learning occurs quickly or not-at-all (because we either know something or we don't). In contrast, those

with sophisticated epistemic beliefs view learning as a slow and gradual process that takes time and effort (in which case learners can partially know something).

5. **Justification of knowledge(criteria for determining truth)** - Beliefs on that dimension range from naïve, where observation, authorities, or "what feels right" are valid sources of knowledge, to more sophisticated, where knowledge can be justified by using sound logic and evaluating evidence.
6. **The nature of learning ability** - It ranges from the naïve belief that people's ability to learn is fixed (i. e. inherited) to the more mature belief thatabilitycan be improved over time with practice and use of better strategies (Ormrod, 2008).

In sum, people with naïve epistemic beliefs view knowledge as simple and certain, learning as quick, and ability as fixed. People with sophisticated epistemic beliefs view knowledge as complex and uncertain, learning as gradual, and ability as malleable.

DEVELOPMENTAL SEQUENCE IN EPISTEMIC BELIEFS

There is a developmental process in people's thinking, which matures from childhood to adolescence to adulthood. This is especially true for learner’s epistemic beliefs which may change dramatically over time. All people go through the same sequence of stages of epistemic development but while everyone has the potential to reach the highest stage, not everyone does.

Young children are *realists* - they assume that what they see and believe is what everyone else sees and believes because knowledge is just a copy of what is real and everyone experiences what is real the same way - "I can know what I see and you see the same thing." Critical thinking is unnecessary because "everybody knows."

Elementary school children tend to be *absolutists*. They typically believe in the certainty of knowledge - that for any topic, there is an absolute truth "out there" somewhere and that a fact

can be either correct or not correct; some outside authority knows what is true ("The expert knows what is right"). Critical thinking helps to sort out the right facts from the wrong ones (Astington & Pelletie, 1996; Hofer & Pintrich, 1997; Kuhn & Weinstock, 2002).

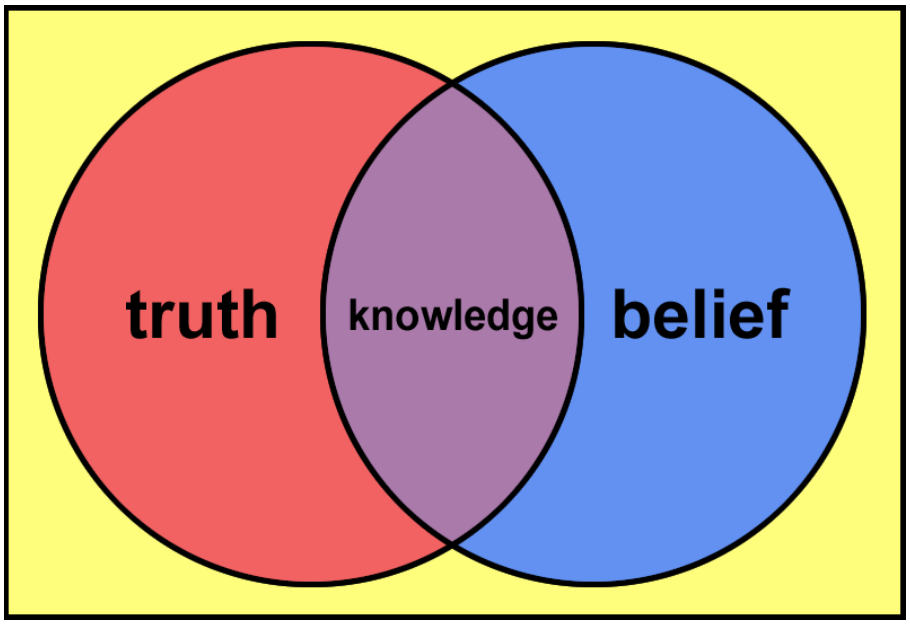
As children reach the middle school and high school years, some (but by no means all) of them begin to realize that knowledge is a subjective entity and that different perspectives on a topic may be equally valid (Kuhn & Weinstock, 2002; Perry, 1968; Schommer, 1997). This stage of epistemic development is called *relativism.* The adolescent's discovery that knowledge is not absolute and external - that experts can disagree - leads to a radical change. Now everyone is right and "whatever" is the appropriate response to, well, whatever. Adolescents fall hard and deep into a well of whatever and not all of them make it back out (Chandler & Lalonde, 2003). The relativist thinking of many adolescents explains in part why argument and inquiry don't come naturally. If experts disagree and all knowledge is just opinion, then why apply criteria to test a hypothesis? Why listen and respond to an opponent's argument? Argument and critical thinking are just irrelevant - it's all opinion (Woolfolk & Perry, 2011).

Other changes may also occur at the high school level. For example, students in the 12th grade are more likely than 9th graders to believe that knowledge consists of complex interrelationships (rather than discrete facts), that learning happens slowly (rather than quickly) and that learning ability can improve with practice (rather than being fixed at birth) (Schommer, 1997).

Finally, during early adulthood, some people - especially those who pursue higher education - come to an *evaluativist* (from evaluation) view of knowledge and “truth” as tentative, uncertain entities. And particularly if they continue on to graduate school, these people begin to appreciate the need for analyzing and evaluating other people’s claims and arguments (even

those of experts) using logic and solid evidence - "the weight of the evidence is on the side of…" (Baxter Magolda, 2002, 2004; Hofer & Pintrich, 1997; Kuhn, 2001a; Kuhn & Park, 2005). With the move to mature evaluativist view of knowledge, some older adolescents and adults realize that everyone has the right to a personal opinion, but some positions are better supported by evidence. Inquiry, argument, and critical thinking become central and valued processes of knowing (Kuhn, 2005; Woolfolk & Perry, 2011).

If you think about it, the mature stance of the evaluativist (there are multiple perspectives, but some fit the evidence better than others) is *a combination* of the absolutist's child belief that there are right and wrong ideas and the relativist adolescent's appreciation of multiple perspectives. In other words, mature epistemic understanding requires the integration of the objective and the subjective dimensions of knowing. Initially, the objective dimension dominates, to the exclusion of subjectivity (realism, absolutism). Subsequently, in a radical shift, the subjective dimension assumes a central position and the objective is abandoned (relativism). Finally, the two are integrated, with a balance achieved in which neither overpowers the other (evaluativism).



Although the acquisition of abstract thought is almost certainly a prerequisite for more advanced epistemic beliefs, environmental factors also play a role in their development. Even young children may hear adults contradict one another - for instance, a teacher might contradict something a parent has said - and so must begin to ponder the credibility of different authority figures (Hofer, 2004). By early adolescence, children show considerable variability in their epistemic beliefs, apparently at least partly as a result of exposure to others' beliefs about the certainty and origins of knowledge and related issues (Haerle, 2004; Kuhn, Daniels, & Krishnan, 2003).

Table 7-1 Levels of Epistemological Understanding				
Level	**Assertions**	**Reality**	**Knowledge**	**Critical Thinking**
Realist	Assertions are COPIES of an external reality.	Reality is directly knowable.	Knowledge comes from external source and is certain.	Critical thinking is unnecessary.
Absolutist	Assertions are FACTS that are correct or incorrect in their representation of reality (possibility of false belief).	Reality is directly knowable.	Knowledge comes from external source and is certain.	Critical thinking is a vehicle for comparing assertions to reality and determining their truth or falsehood.
Multiplist	Assertions are OPINIONS freely chosen by and accountable only to their owners.	Reality is not directly knowable.	Knowledge is generated by human minds and is uncertain.	Critical thinking is irrelevant.
Evaluativist	Assertions are JUDGMENTS that can be evaluated and compared according to criteria of argument and evidence.	Reality is not directly knowable.	Knowledge is generated by human minds and is uncertain.	Critical thinking is valued as a vehicle that promotes sound assertions and enhances understanding.

CULTURAL DIFFERENCES IN EPISTEMIC BELIEFS

Researchers have also begun to uncover cultural differences in learners' epistemic beliefs. For instance, beginning in middle school, students in the US are more likely to question the validity of an authority figure's claims than are students in the Far East. In contrast, students in Far Eastern countries (e.g. Japan and Korea) are likely to believe that knowledge is cut and dried and can be effectively gained from authority figures (Kuhn & Park, 2005; Qian & Pan, 2002). Yet Asian learners appear to have the advantage in another respect: Compared to their American counterparts (who sometimes expect quick results with little work), Asian college students are more likely to believe that mastering complex academic topics is often slow,

effortful process requiring diligence, persistence, and a combination of rote and meaningful learning (Dahlin & Watkins, 2000; Li, 2005; Li & Fischer, 2004). Some differences exist even among Western cultures. For example, college students in Ireland are more likely than American students to view learning as a complex and constructive process that results in somewhat tentative understandings of a topic. Their peers in the US are more likely to view learning as a process of attending carefully to presented information and memorizing it as a set of isolated facts (McDevitt, Sheehan, Cooney, Smith, & Walker, 1994).

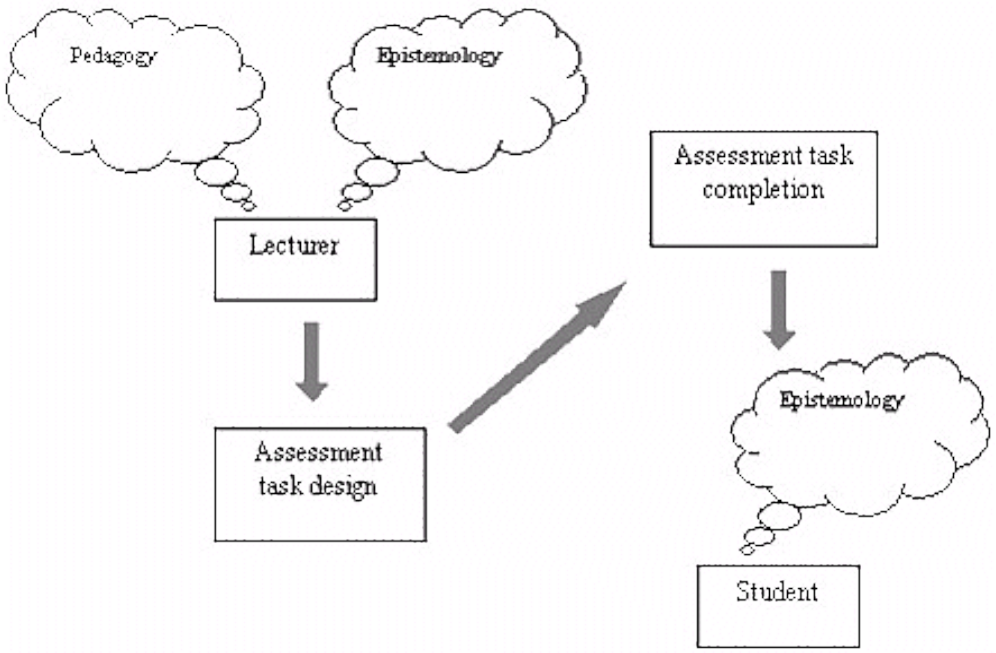
TEACHERS' EPISTEMIC BELIEFS

It is important to note that students are not the only ones who can have relatively naïve beliefs about the nature of knowledge and learning. Some teachers appear to have naïve beliefs as well. They seem to believe that knowledge about a particular subject matter is a fixed and well-defined entity, that students need to "absorb" this knowledge in isolated bits and pieces, and that learning is a process of mindless memorization and rehearsal (L. M. Anderson, 1997; Patrick & Pintrich, 2001). Such beliefs are likely to influence the ways that teachers teach and assess their students. For example, teachers holding these beliefs will be more likely to focus on lower-level skills in their instructional objectives, classroom activities, assignments, and tests (Grossman, 1990; Ormrod, 2008).

In one study, teachers with more sophisticated epistemic beliefs and worldviews were more likely to endorse student-centered instructional practices. Student-centered instruction emphasizes critical thinking, group discussion, asking students questions, and other techniques that promote active learning. In contrast, teachers with less sophisticated epistemic beliefs were more likely to focus on traditional curriculum, student testing, and mastery of basic science concepts (Kang & Wallace, 2004). These findings were supported by Lidar, Lundqvist, and

Ostman (2005) who found that teachers with more sophisticated epistemic beliefs used a greater number of classroom activities designed to promote deeper learning and reflection (Bruning, Schraw, & Norby, 2010).

Teachers' epistemic beliefs may also have an impact on students' epistemic development and learning (Johnson, Woodside-Jiron, & Day, 2001; Marra, 2005). In their study of two contrasting classrooms, Johnson et al. (2001) found that students held different views of what it meant to be competent in literacy, and that students' literacy-related epistemic beliefs can be traced from teacher to student.



Although we already discussed some of the ways in which epistemic beliefs affect learning and academic outcomes, here we focus explicitly on this topic. There is substantial evidence that students' epistemic beliefs influence how they study and learn. Following are some specific effects that different beliefs are likely to have:

- ***Beliefs regarding the certainty of knowledge***: Epistemic beliefs tend to affect the critical interpretation of knowledge. That is, naive epistemic beliefs do not so much affect the recall of information but rather determine what students conclude from the information. When encountering content material that is tentative, strong beliefs in the certainty of knowledge appear to lead to distortion of information in order to be consistent with students' initial beliefs. A similar finding is that beliefs in certain knowledge result in radical and partial positions when reading a controversial text; students tend to jump to quick and potentially inaccurate conclusions or deal with the anomalous information by ignoring or rejecting it. In contrast, when students view knowledge as something that continues to evolve and doesn't necessarily include definitive right and wrong answers, they are apt to enjoy cognitively challenging tasks, engage in meaningful learning, read course material critically, undergo conceptual change when it is warranted, and recognize that some issues are controversial and not easily resolved (Kardash & Howell, 2000; Kardash & Scholes, 1996; Mason, 2003; Patrick & Pintrich, 2001).

Furthermore, when asked what their criteria were for determining if they had comprehended a textbook chapter, absolutists reported using fact-oriented standards, such as recall of facts, whereas relativists reported using context-oriented standards, such as paraphrasing and application (Schommer, 1990).

- ***Beliefs regarding the simplicity and structure of knowledge***: Students who believe that knowledge is a collection of discrete facts are apt to use rote-learning processes when they study and to hold on to their misconceptions about a topic. They also tend to believe that they "know" the material they are studying if they can recall basic facts and definitions. In contrast, students who believe that knowledge is a complex set of interrelated ideas are likely to engage in meaningful learning, organization, and elaboration when they study and likely to evaluate the success of their learning efforts in terms of how well they understand and can apply what they've learned (Hammer, 1994; Hoffer & Pintrich, 1997; Mason, 2003; Purdue & Hattie, 1996; Schommer-Atkins, 2002).
- ***Beliefs regarding the source of knowledge***: Students who believe that knowledge originates outside of the learner and is passed along directly by authority figures are apt to be fairly passive learners, perhaps listening quietly to explanations without trying to clarify confusing ideas, or perhaps exerting little effort when lessons consist of discovery activities and class discussions rather than lectures. In contrast, students who believe that knowledge is something that one constructs for oneself are apt to be cognitively engaged in learning activities, make interconnections among ideas, read and listen critically, work to make sense of seemingly contradictory pieces of information, undergo conceptual change, and get emotionally involved with the things they are studying (Chan et al.,1997; Haseman, 1999; Hogan 1997; McDevitt et al., 1990; Schraw & Bruning, 1995).
- ***Beliefs regarding the criteria for determining truth***: When students believe that something is probably true if it comes from an "expert" of some sort, they are likely to accept information from authority figures without question. But when they believe that ideas should be judged on their logical and scientific merit (rather than on their source), they are likely to critically evaluate

new information on the basis of available evidence (King & Kitchener, 2002). The following interview with a student, concerning the belief that the Egyptians (rather than, say, an earlier civilization or extraterrestrials) built the pyramids, illustrates the latter perspective:

Interviewer: Can you ever say you know for sure about this issue?

Student: It … is very far along the continuum of what is probable.

Interviewer: Can you say that one point of view is right and one is wrong?

Student: Right and wrong are not comfortable categories to assign to this kind of item. It's more or less likely or reasonable, more or less in keeping with what the facts seem to be. (dialogue from King & Kitchener, 1994, p. 72).

As students grow older, and especially as they move into higher levels of education (e.g. graduate school), they become increasingly adept at distinguishing between weak and strong evidence for a particular idea or point of view (Kuhn, 2001a).

- ***Beliefs regarding speed of learning****:* When students believe that learning happens quickly in an all-or-none fashion, they are likely to believe that they have learned something before they really have, perhaps after only a single reading of their textbooks. They are also likely to give up quickly in the face of failure and to express discouragement or dislike regarding the topic they are studying. In contrast, when students believe that learning is a gradual process that often takes time and effort, they are likely to use a wide variety of learning strategies as they study and to persist until they have made sense of the ideas presented (Butler & Winne, 1995; Kardash & Howell, 2000; Schommer 1990, 1994b).
- ***Beliefs regarding the nature of learning ability***: As you might guess, students' beliefs about the nature of learning ability are correlated with their persistence in learning. If they think that learning ability is a fixed commodity, they will quickly give up on challenging tasks. In contrast,

if they think that their ability to learn something is under their control, they will pursue a variety of supportive learning activities and try, try again until they have mastered the subject matter (Hartley & Bendixen, 2001; Schommer, 1994a, 1994b).

Not surprisingly, students with developmentally more advanced epistemic beliefs - for example, those who believe that knowledge is complex and uncertain and that learning is often a slow, gradual process - achieve at higher levels in the classroom (Buehl & Alexander, 2005; Kardash & Sinatra, 2003; Schommer, 1994a). Furthermore, higher levels of academic achievement may bring about more advanced views about knowledge and learning (Schommer, 1994b; Strike & Posner, 1992). The more students can get beyond the “basics” and explore the far reaches of a discipline - whether it be science, mathematics, history, literature, or some other domain - the more they will discover that learning involves acquiring an integrated and cohesive set of ideas, that even experts don’t know everything about a topic, and that truly complete and accurate “knowledge” of how the world operates may ultimately be an unattainable goal.

These findings apply to college students as well. For example, students in a teacher education program who believed that learning occurred quickly or not at all were less likely to focus on how to master a task and improve one's competence and were more likely to focus on getting as high a grade as possible while not revealing any academic weakness than peers who believed that learning occurs gradually (Braten & Stromso, 2004).

CHANGING STUDENTS' EPISTEMIC BELIEFS

If they are to achieve high levels in the high school and college years, young people must become aware that knowledge is not merely cut-and-dried set of facts and that effective learning is not simply a process of mindlessly repeating those facts over and over. One way to foster more advanced epistemic beliefs is to talk specifically about the nature of knowledge and learning - for

example, to describe learning as an active, ongoing process of making connections among ideas (Schommer, 1994b). Connections and interrelations among ideas can take the form of cause and effect, hierarchical structures (how one concept subsumes another), and similarities and differences.

An even more effective approach is to provide experiences that lead students to discover for themselves that knowledge is dynamic rather than static, that multiple perspectives on an issue may all have some validity, and that successful learning sometimes occurs only through effort and persistence. For example, teachers might give their students complex problems that have no clear-cut right or wrong answers, have students read conflicting accounts and interpretations of historical events, or ask students to compare several different explanations of a particular scientific phenomenon (Britt, Rouet, Georgi, & Perfetti, 1994; Leinhardt, 1994).

In addition, discussions about controversial topics (e.g., various interpretations of a classic work of literature) can help students gain an increased understanding that there is not always a simple "right" answer to a question or issue (Kuhn, Shaw, & Felton, 1997; C. L. Smith, Maclin, Houghton, & Hennesey, 2000). Furthermore, by struggling as a group with difficult subject matter, students may begin to understand that one's knowledge about a topic is likely to evolve and improve gradually over time. And when students have opportunities to formulate questions and problems, discuss and critique one another's explanations and analyses, and compare and evaluate potential solutions, they gain practice in these all-important skills (P. Bell & Linn, 2002; Kuhn & Weinstock, 2002; Muis et al., 2006).

Social issues are multidimensional and rarely have clear-cut solutions. They require the consideration of multiple perspectives and factors as well as coming up with nuanced in-between solutions that satisfy multiple interests.

Epistemic beliefs and reasoning.

Although the importance of reasoning skills in daily life is widely recognized, researchers have revealed that adults often do not have adequate abilities to make reasoned arguments regarding social issues (Kuhn, 1991). This is partially due to holding naïve epistemic beliefs. For example, levels of epistemic understanding of jurors were predictive of the kinds of verdicts they choose and the reasoning that underlies them (Kuhn, Cheney, & Weinstock, 2002). Naïve beliefs about the certainty of knowledge were also related to biased reasoning regarding controversial issues such as the relationship between HIV and AIDS, especially when people had extreme initial positions about the issue (Kardash & Sholes, 1996).

Furthermore, people with sophisticated epistemic beliefs have been found to produce two-sided (integrating two position) and functional (offering a solution) arguments in their reasoning. In contrast, people with naïve believes produced more one-sided and non-functional arguments (Andriessen, 2006; Kuhn, Shaw, & Felton, 1999). One reason for that may be that people with naïve beliefs are not good at distinguishing evidence from theory and sometimes fail to consider alternative positions (Kuhn & Pearsall, 2000).

Kuhn and colleagues (Kuhn, 1991, 1992; Kuhn et al., 2000) found that epistemic beliefs are related to one's ability to argue persuasively. In one study individuals were classified as an *absolutist* (one who believes that knowledge is absolutely right or wrong), a *multiplist (*one who believes that knowledge is completely relative), or an *evaluative* theorist (one who believes that

knowledge, though relative, is constrained by situational factors such as commonly accepted rules) on the basis of their beliefs about the certainty of knowledge. Evaluative thinkers were more likely than absolutists to provide legitimate evidence of support of an argument. In addition, compared with absolutists, evaluative theorists generated a greater number of plausible alternative theories and provided better counterarguments.

In sum, naïve epistemic beliefs may cause lack of recognition of the complexity of controversial issues such as abortion, genetically modified food, and global warming as well as make those holding them simplify such problems to biased or quick, one-sided solutions.

Epistemic beliefs and flexible thinking.

Research on epistemic beliefs indicates that people with objectivistic view of knowledge as simple and certain are fact-oriented, whereas more developed, evaluativist thinkers are more relativistic and context-oriented in their thinking (Schommer, 1993). In other words, people with naïve beliefs tend to focus on absolute principles which they think are written in stone ("once something is believed to be true, it remains true forever"), whereas sophisticated epistemic thinkers tend to see knowledge as tentative *within a particular context* (King & Kitchener, 1994; Kuhn, 1991; Perry, 1970; Schommer, 1993).

Considering the specific context and situation when forming an opinion makes evaluativists more flexible in their judgment (Bromme, Pieschl, & Stahl, 2010). This claim was supported in a study by Bendixen, Schraw, and Dunkle (1998) who found that epistemic beliefs were related to moral reasoning among adults. Individuals adopting beliefs in complex, incremental knowledge reasoned at a higher level on a moral reasoning test. Higher level moral reasoning is more contextual and situation specific than lower level moral reasoning. Here is an example:

"I need to go to the office for a moment," Amanda announces as her students work on a seatwork assignment. "Work quietly until I get back. I'll only be gone for a few minutes."

A shuffling of papers can be heard for a few moments, and then Gary whispers,

"Psst, what math problems are we supposed to do?"

"Shh! No talking," Talitha says, pointing to the rules posted on the bulletin board.

"But he needs to know so he can do his work," Kristal says. "It's the evens on page 79." (Eggen & Kauchak, 2013).

In this example, you can see how Talitha fails to consider the context of Gary's question and blindly follows the rule ("No talking"). For her, that rule is an absolute principle. Kristal, on the other hand, is more flexible and can apply the rule *when* it is appropriate. Kristal illustrates both higher level moral reasoning and more sophisticated epistemic beliefs.

Epistemic beliefs and critical thinking.

Critical thinking is "the ability to recognize the possible falsehood of a theory, and the identification of evidence capable of disconfirming it" (Kuhn, 1993, p. 100).Today, it is one of education's primary goals to produce students capable of critical evaluation of information. This is largely due to the complex nature of contemporary life, where it is easy to be misguided by false claims and misleading information from the internet and the mass media.

Scholars agree that sophisticated epistemic beliefs contribute to the development of critical thinking skills (Kuhn & Weinstock, 2002; Ormrod, 2006). Learners are more likely to look analytically and critically at new information if they have the sophisticated epistemic belief that even experts' understanding of a topic continues to evolve as new evidence accumulates. They are less likely to engage in critical thinking if they believe that knowledge is an absolute, unchanging entity. Those learners who think critically and evaluate information

tend to show more advanced reasoning capabilities and are more likely to undergo conceptual change when it's warranted (Ormrod, 2006).

Epistemic beliefs and decision-making.

Epistemic beliefs influence our everyday decision-making in multiple ways. Some examples of complex decisions are choosing a partner, buying a home, making an investment, picking a career, selecting appropriate educational institution, and making parenting decisions. All these can be viewed as ill-defined problems that have multiple, non-guaranteed solutions. As mentioned earlier, research shows that our level of epistemic development affects our capacity to effectively define, assess, analyze, and solve such problems (Schraw et al.,1995). For example, the capacity of epistemically developed people to view a problem from multiple perspectives may help them make better decisions.

In sum, our epistemic beliefs have a significant impact on our academic and daily life. They influence how we study, what we learn, how we perform in school, how we reason about complex issues, how we interpret controversial information, how we make decisions, and generally how we see the world around us. People go through a specific developmental sequence from naïve to sophisticated epistemic beliefs, although not everyone reaches the highest level. Teachers can improve the sophistication of their students' epistemic beliefs in multiple ways. However, it is not uncommon for teachers themselves to have naïve epistemic beliefs which affects their instruction and assessment practices.

APPENDIX D

Activity 1 Additional Lesson

Take 15 minutes to read this additional lesson relating the information here to the main lesson. In it, we will examine the benefits of understanding and applying the knowledge of epistemic beliefs that was presented to you in the main lesson. You will learn how this knowledge can benefit you as an educator as well as how it can improve your daily functioning and quality of life.

Epistemic beliefs and teaching

What are the implications of epistemic beliefs for education? Raising your own understanding of the nature of knowledge and learning may have a significant impact on the effectiveness of your teaching. In addition, helping your students to understand epistemic beliefs and raising their level of epistemic thinking can have an immense impact on the quality of their learning and on their academic performance.

There is consensus among educators that an advanced level of epistemic thinking is necessary in order to master the intellectual skills of inquiry, analysis, and argument that are widely accepted as the most important objectives of education (Kuhn, 1999). Thus, understanding epistemic beliefs is essential for you as an educator if you want to make a difference and move students from simple memorization of facts to deep learning and critical thinking. To achieve this, you should be able to show your students that knowledge is integrated and that many times there is more than one right answer to a complex problem. You should also be able to help your students to compare, integrate, or accommodate new information in ways that produce deeper learning. These processes can improve their epistemic thinking as well as make them more successful academically.

What does it mean to have integrated knowledge? It means to learn ideas and concepts in a meaningful, interconnected way. For example, instead of making students memorize history facts, you, as a teacher, can describe the context of a historic event and explain how it is connected to other events. If students have to learn about Marco Polo's visit to the Far East, the names of Portuguese explorers such as Prince Henry and navigator Vasco DaGama, and Columbus' trip to the new world in 1492, you can show them how these things are not isolated facts but are actually closely connected. Because of Marco Polo's travels and the influential book he wrote afterward, many merchants and traders, including the Portuguese explorers, wanted to get to the Far East. The passage around the tip of Africa and through the Indian ocean was dangerous, so Columbus seized on the idea of getting to the Far East by travelling west (not realizing, of course, that he would run into the Americas instead). Understanding the connections between Marco Polo's travels, the Portuguese navigators, and Columbus' voyage makes this information much more meaningful (Eggens & Kauchak, 2013). In sum, having sophisticated epistemic beliefs grants you the capacity to present information in a more complex and integrated way which, in turn, can make students learn better.

In addition, knowledge of epistemic beliefs can help you improve teaching skills such as organizing instruction, recognizing students' learning needs, and endorsing student-centered instructional practices (Ormrod, 2008). For example, teachers with naive epistemic beliefs tend to have a misconception view of learning as a way to arrive at correct answers (Andre & Windschitl, 2003). They design instruction in a simplistic way where the memorization of facts and finding the single correct answer is the goal for students. In contrast, teachers with sophisticated epistemic beliefs emphasize the process of leaning rather than the product (the answer). They adopt instruction designs that promote more complex learning outcomes such as

application, synthesis, and creativity. In such classrooms, students are less afraid to make mistakes because they understand that knowledge is constantly constructed and is subject to revisions (Ormrod, 2006, 2008).

When I was in high school, my literature teacher wanted us to be able to memorize how different critics interpreted classic works of literature. Her assessment was based on making us reproduce famous critics' opinions and analyses (especially those of the critics she liked). This practice lead to superficial learning because those opinions did not make sense to us students. They were too abstract, pompous, and often contradictory to our take on a novel so we simply memorized them. Consequently, no one liked that teacher and we as a class actually signed a petition to get a new one. In contrast, my college professor in classic literature stressed the idea that critics' analyses are subjective interpretations that are influenced by theoretical perspectives and personal biases. He underscored the importance of such analyses for providing different perspectives on a piece of literature, but in the same time he encouraged us to examine them critically and to keep in mind their partiality. In that college class, the accent was not so much on remembering facts or interpretations rather than on constructing our own interpretations based on the integration of different perspectives (a focus on the process rather than the product). Everybody loved that teacher and I still remember those classic novels we read and discussed in class.

In summary, if you, as a teacher, have sophisticated epistemic beliefs, you will be more successful in your teaching because you will be able to: a) employ complex methods such as student-centered instructional practices that emphasize students' perspectives and interpretations (students will love you for that), and b) produce more successful students which will help you successfully meet educational objectives. In the era of performance standards, teachers whose

students are successful academically enjoy more professional benefits (respect, rewards, better pay) and experience less work-related stress. On top of that, students like them more which is a reward in itself.

Relevance for daily life

It is worth noting that the effects of epistemic beliefs are not limited to teaching and learning. They are relevant to reasoning, decision-making, and other aspects of daily functioning. The epistemic beliefs of jurors, for example, are predictive of the kinds of verdicts they choose and the reasoning that underlies them.

In the main lesson, you learned that epistemic beliefs influence our reasoning skills (Kuhn, 1991) and our problem-solving skills, especially when we encounter ill-defined problems (those with no clear goal or a single, guaranteed solution). Making complex decisions often entails solving ill-defined problems and requires that we gather sufficient information about a certain topic. For example, if you want to buy a house, you need to find information about the real estate market, type of houses, locations, the expected state of the economy, and so on. In gathering such information, people with more sophisticated beliefs would be more prone to evaluate the information critically, look for different sources of information, and make a decision based on evidence rather than on opinion. When consulting with an expert, they would be more willing to reflect logically on the expert's suggestion as well as to look for additional evidence that supports it (rather than accept it uncritically).

Similarly, researchers have found that epistemic beliefs are related to confirmation bias (looking for information that confirms our beliefs but not for disconfirming evidence, Stanovich & West, 1997) which is often attributed to the tendency to gather information about only one hypothesis at a time (Tweney, 1984). Thus, understanding the nature of epistemic beliefs can

help you avoid confirmation bias in your daily decisions. For example, if you smoke and believe that smoking is not harmful, holding sophisticated epistemic beliefs can make you re-evaluate your belief if you read a scientific article presenting evidence that smoking can damage your health. In contrast, if you hold naïve beliefs about knowledge, you will tend to ignore or reject the information that contradicts your belief and look for examples that support it ("My granddad smoked a pack per day and lived to be 95").

Further, as you can recall from the main lesson, people with more developed epistemic beliefs are more flexible and context-oriented in their thinking (Kuhn, 1991; Schommer, 1993; Schommer-Aikins, 2011). Schommer-Aikins (2011) defines cognitive flexibility (flexible thinking) as the capacity for considering alternative perspectives and choices in a balanced and mindful way. "Balanced" implies making a decision based on the consideration of a wide range of options as opposed to a quick and impulsive decision, whereas "mindful" means reflective monitoring of the decision-making process. People with flexible thinking can more easily adapt to the demands of the situation, can see alternative choices, consider positions that contradict their own, have higher tolerance for uncertainty, and adapt to others' style of communication. For example, because their flexibility allows them to detect changes in the demands of the situation, they can change a public presentation at the last minute when they discover that the audience is different than they expected (Schommer-Aikins, 2011).

Furthermore, flexibility of thought can affect the quality of your moral judgment and decision-making. Blindly and inflexibly following a rule or a perspective may rob you of many opportunities in life. For example, if you constantly plan the future, you will not be able to enjoy the present. If you focus excessively on enjoying the present, you will not be able to account for long term consequences of your actions (eating too much sweets brings immediate pleasure but

can make you fat in the future). Balancing present and future time orientation requires flexibility (Zimbardo & Boyd, 2008). In sum, if you understand epistemic beliefs and increase your epistemic sophistication, you will reap the benefits of being more flexible in your thinking.

Another section of the main lesson concerned the link between epistemic beliefs and the capacity for reasoned arguments. People with naive epistemic beliefs tend to have trouble arguing persuasively (Kuhn, 1991). They may be less adept at distinguishing evidence from theory, and often fail to consider alternative positions (Kuhn et al., 2000). Although there is no research on the topic, such deficiencies can potentially harm your capacity to communicate effectively in a dialogue with others. It also means that it is likely not to be able to win many arguments (e.g., with your partner, boss, sales people, or business partners) and defend your position. This may disadvantage you in many ways (lose money, respect, and opportunities). Scholars and educators agree that critical thinking is an essential skill for a person to function productively and successfully in our complex society. If people don't evaluate information critically, it is easy to be misguided by false claims and misleading information from the internet and the mass media. There is consensus that sophisticated epistemic beliefs contribute to the development of critical thinking skills (Kuhn & Weinstock, 2002; Ormrod, 2006). People with naïve epistemic beliefs may believe that what they hear on TV/radio or read in the newspapers is objectively true. People with sophisticated epistemic beliefs, on the other hand, may understand that there is a certain amount of bias in the media due to subjective interpretation of events or to political/economic interests. They tend to be more capable of screening the enormous amount of information they receive daily and select only those pieces that are based on evidence and come from reliable sources.

The same distinction is true for people's acceptance of scientific findings and the opinions of authority figures (experts such as historians, economists, and educators). People with naïve epistemic beliefs tend to take the positions of such figures as certainly true whereas more developed people understand that even scientists come from different theoretical perspectives and subjectively interpret data so that their positions are constructed and may be incomplete.

As a consequence, if you have sophisticated beliefs, your evaluation of information will become more critical. Potentially, this can make you less gullible and vulnerable to manipulations by businesses and politicians, Also, it makes you a better decision maker in areas where information needs to be examined critically on the basis of evidence and from multiple perspectives. For example, if you need to decide whether to go for a surgery or rely on a specific drug, your epistemic beliefs may have a significant effect on your decision. If you hold naïve epistemic beliefs, you may follow uncritically your doctor's suggestion to go for a surgery (which may be based on the doctor's financial interest from the surgery). If you hold more sophisticated beliefs, you will probably read more on the subjects (scholarly articles, reviews from other patients) as well as consult with other specialists. Thus, holding sophisticated epistemic beliefs may have tremendous consequences for your health and quality of life.

This short presentation pointed to you some of the benefits of understanding what you learned in the main lesson, namely, the nature of epistemic beliefs and how they relate to education and everyday life. Such understanding can make you a better educator as well as increase the quality of your reasoning, decision-making, and everyday functioning.

APPENDIX E

Session Instructions

Session 1 Instructions

Find a quiet place with no distractions where you can work continuously without being interrupted. Please switch off your phone (or leave it in another room with the ringer off) for that time period because it can easily break your focus. Please read the questions carefully. Once you start, **complete the sessions in one sitting**.

This session takes between 20 and 45 minutes.

1. Open **the Pre-test Questionnaires file**, complete it, and email it to me at ivanovi2@unlv.nevada.edu.

2.Open, complete, and submit **the Pre-test**. This test measures your topic knowledge and **it's ok if you don't have any**. Please don't google the topic or try to guess the correct answer if you don't have a clue.

If you have issues with the system, please give me a call (562-618-9072).

Session 2 Instructions

For sessions 2, you will be assigned to GROUP 1, 2 or 3 which will determine which intervention activity you will complete. You will get your assigned group number in an email. Find a quiet place with no distractions where you can work continuously without being interrupted. Please switch off your phone (or leave it in another room with the ringer off) for that time period because it can easily break your focus. **Please read the questions carefully and give your best effort.** This should be similar to when you take an exam. Once you start, **complete the session in one sitting** (no video games or chatting in between :)

Please start the session before 8 PM so that you are not too tired.

1.Open the document "**MAIN LESSON**" and read it (15 double-space pages). Please read the lesson instructions carefully. It takes about 30 minutes on average to read the lesson but you can take up to 40.

ONCE YOU READ THE LESSON, PLEASE DO NOT LOOK BACK AT IT FOR HINTS DURING THE SUBSEQUENT ACTIVITIES AND TESTS! IT WOULD JEOPARDIZE THE VALIDITY OF THE STUDY.

2. Then open **ONLY your assigned group activity folder** (Activity 1, 2, **OR** 3) and complete the activity there. You have **ONLY**15 minutes to do it.

3. Open **the Immediate Post-test Questionnaires file (including the autonomy, situational Interest, and utility value questionnaires)**, complete it, and email it to me at ivanovi2@unlv.nevada.edu.

4. Open, complete, and submit the **Immediate Post-test.**

If you have issues with the system, please give me a call (562-618-9072).

Session 3 Instructions

Find a quiet place with no distractions where you can work continuously without being interrupted. Please switch off your phone (or leave it in another room with the ringer off) for that time period because it can easily break your focus. **Please read the questions carefully and give your best effort.** This should be similar to when you take an exam. Once you start, **complete the session in one sitting** (no video games or chatting in between :)

Please start the session before 8 PM so that you are not too tired.

PLEASE DO NOT LOOK BACK AT THE LESSON FOR HINTS DURING THE TEST! IT WOULD JEOPARDIZE THE VALIDITY OF THE STUDY.

1. Open the Delayed Post-tests questionnaires file, complete the three questionnaires there (Autonomy, Situational Interest, and Utility Value) and email it to me at ivanovi2@unlv.nevada.edu.

2. Open, complete, and submit the **Delayed Post-test.**

If you have issues with the system, please give me a call (562-618-9072).

APPENDIX F

Demographic Questionnaire

Please answer the following demographic questions (type in or underline the answer):

Gender (underline/circle one): Male Female

Age:

Race/Ethnicity (underline only one):

White/Caucasian

Black/African-American

Hispanic/Latino

Asian/Pacific Islander

American Indian/Alaskan Native

Other

Academic major:

What is the class affiliated with your participation in this study?

Type of course you are enrolled in: Online Face to face

Are you a volunteer or you get research credit for participation?

Volunteer Research credit

Are you a pre-service teacher, an in-service teacher, or none of these?

Pre-service In-service None

APPENDIX G

Performance Items

MULTIPLE CHOICE QUESTIONS

1. Jake is invited to attend his sister's wedding. He has two issues: One concerns his being overweight. Recently, he started reading a lot of internet articles about weight loss and is determined to get back in shape for the wedding. The other problem is that he has to remember the names of all forty in-laws and he has to be able to relate each name to a certain biography. Jake is at the absolutist stage of epistemic development. Which of the two problems will be more affected by his epistemic beliefs?

a) Weight loss problem

b) Names problem

c) They will be affected equally

d) None of them will be affected

2. Which one of the following pairs of students best illustrates a difference with respect to students' epistemic beliefs?

a) Irene thinks that doing well in high school is important for getting into a good college, but Isabelle thinks that she can get into college with mediocre grades as long as she has high SAT scores.

b) Julie likes going to school because that's where she sees her friends every day, but Janette likes going to school because of all the new things she learns there.

c) Keith thinks that learning chemistry is a process of memorizing symbols and formulas, but Kareem thinks that chemistry involves trying to understand the nature of elements and compounds.

d) Loren is well aware of the criteria his teacher is using to evaluate his classroom performance, but Luke is clueless about why he's doing poorly in the same teacher's class.

3. Three of the following examples are consistent with how epistemic beliefs typically change as learners grow older. Which one is NOT consistent with typical developmental trends in epistemic beliefs?

a) Anna used to think that studying history involved memorizing facts—names, dates, places, etc. She now believes that studying history involves learning interrelationships among historical events—how one event led to another, and so on.

b) Beatrice used to think that scientists might have different but possibly equally valid views of how the world operates. She now believes that there is probably only one correct explanation—one that scientists will eventually determine.

c) Charmaine used to think that if she was going to learn a particular mathematical concept, she would learn it either quickly or not at all. She now believes that her understanding of particularly difficult math concepts may evolve slowly over time and require considerable effort on her part.

d) Delores used to think that people were naturally either "good at" or "not good at" learning a foreign language. She now believes that successful learning results more from persistence and hard work.

4. Three of the following statements accurately describe environmental influences on the development of epistemic beliefs. Which statement is NOT accurate?

a) As students observe experts disagreeing about a particular topic, they increasingly realize that even authority figures aren't always reliable sources of what is true and accurate.

b) The extent to which students accept what authority figures tell them is partly a function of the culture in which they have grown up.

c) Classroom demands for word-for-word memorization increase as students move through the secondary grades and post-secondary education.

d) Students who have grown up in Asian cultures are apt to believe that knowledge is the result of hard work, whereas students who have grown up in the United States are apt to believe that knowledge should come quickly and easily.

5. If we are relativistic thinkers, which area of our thinking will be affected THE MOST?

a) Interpretations of works of art

b) Interpretations of scientific theories

c) Interpretations of different opinions

d) Relationships with others

6. Which statement is true about absolutist thinkers in regards to evidence?

a) They don't believe in evidence

b) They tend to examine information critically on the basis of evidence

c) They have hard time distinguishing evidence from theory

d) They think evidence is just an opinion

7. Which one of the following illustrates how classroom assessment practices might affect students' epistemic beliefs*?*

a) Susan thinks that "art appreciation" means memorizing paintings and their artists because every test in her art appreciation class asks her to label a series of paintings and identify the painter of each one.

b) Because Geraldine consistently receives low marks on assignments in her history class, she is convinced that her teacher is "out to get her."

c) Duncan mistakenly believes that how well he does on his weekly spelling tests will be the determining factor in whether he gets promoted to fourth grade.

d) Martin has heard that "Mr. Stewart's tests are really picky," so he is very anxious when he prepares for his first test in Mr. Stewart's class.

8. What kind of approach does research show that teachers with more sophisticated epistemic beliefs are more likely to use in their classrooms?

a) Teacher-centered

b) Rule-centered

c) Student-centered

d) Choice-centered

9. How are student epistemic beliefs related to problem solving?

a) They affect well-structured problem solving the most

b) They affect ill-structured problem solving the most

c) They have no effect on problem solving

d) They affect all types of problem solving equally

10. Three of the following are accurate statements about epistemic beliefs. Which statement is NOT accurate?

a) Students who view learning as an active, constructive process are more likely to undergo conceptual change when it is warranted.

b) Students who believe that learning is a slow, gradual process are more likely to persist in their efforts to understand classroom material.

c) Young children are apt to believe that conflicting points of view on a topic may be equally valid; as they get older, they become increasingly convinced that one perspective is almost invariably more valid than others.

d) As students move through the high school years, some of them increasingly begin to realize that mastering academic subject matter involves understanding concepts and their interrelationships rather than memorizing discrete facts.

11. Students who believe in quick, all-or-none learning, are likely to:

a) Integrate information inappropriately

b) Write tentative conclusions

c) Believe that they have learned something before they really have

d) Use appropriate standards for goal setting and monitoring of learning

e) Underestimate their learning of a text passage

12. A high school student who studies primarily by memorizing textbook definitions word for word is most likely to have which one of the following epistemic beliefs?

a) Knowledge is a collection of discrete facts.

b) Some things about the world may ultimately be unknowable.

c) Knowledge doesn't just come from experts, it can also be self-constructed.

d) Experts' understanding of a topic continues to change as new research results come in.

13. Conceptual change entails replacing an existing misconception with the correct understanding of a phenomenon. Absolutists have a hard time undergoing conceptual change because:

    a) They usually lack sufficient knowledge of the phenomenon

    b) They enjoy working in an atmosphere of uncertainty

    c) They view knowledge as fixed and not open to negotiation

    d) a and c

14. Jeremy is an evaluativist thinker who is faced with the important decision to choose a college major and a future career. He wants to become a lawyer because he believes that lawyers are rich and popular (his uncle is a successful lawyer and drives an expensive car). However, an older friend who dropped out of law school told him that law school is very tough and that many students don't make it because of the demand for hard work, the stress, and the perseverance required to pass the bar exam. In making his decision, Jeremy most likely will:

    a) Disregard his friend's advice because everybody is entitled to have an opinion.

    b) Weigh the positive and negative aspects of becoming a lawyer.

c) Look for examples that confirm his belief about lawyers (his uncle) and ignore disconfirming evidence (his friend).

d) Change his mind if he finds out that law school is expensive.

15. Teachers can BEST improve students' epistemic beliefs if they:

a) Make them solve complex problems where they should find the single possible solution.

b) Have them read conflicting accounts and interpretations of historical events.

c) Make them summarize complex book chapters.

d) Make them speak in public about complex issues.

16. Mr. Collins is a biology teacher who teaches a lesson about evolution. However, some of his students don't accept Darwin's theory of evolution that is studied in class but rather believe that God created the world in seven days. If Mr. Collins wants to make his students experience conceptual change and accept the theory of evolution, he should:

a) Tell them that there is no evidence that God exists.

b) Make them read scientific articles supporting the theory of evolution with sound arguments and strong evidence.

c) Make them write an essay where they take a position of a scientist and argue for the theory of evolution.

d) We don't know the stage of students' epistemic development in order to make a decision.

17. Ms. Garrett is a social science teacher who gave her students a complex text on abortion including pro-choice and pro-life positions. She asked them to take a stand and come up with a

solution to this problem. However, many of her students have naive epistemic beliefs and this makes them simplify the complex problem to black and white, absolutist solutions. If Ms. Garrett wants to help these students understand the issue better and produce more complex solutions, she should:

a) Simplify the text and make them read it again.

b) Make them read more articles on the issue.

c) Organize a class discussion where they can discuss and critique one another's explanations.

d) Bring to class a woman who had abortion and let her tell her story.

ESSAY QUESTIONS

1. How can particular epistemic beliefs help students learn? Please pick two specific epistemic beliefs to include in your answer.
2. Why would an “evaluativist” think that argument and critical thinking are very important in learning?
3. What would be an example of an “everyday, ill-defined” problem? How can more sophisticated epistemic beliefs help solve this problem? Please explain.

APPENDIX H

Scoring Rubric for Open-ended Questions

Q1: How can particular epistemic beliefs help students learn? Please pick two specific epistemic beliefs to include in your answer.

Excellent answer (3 points):	**Explains why two specific epistemic beliefs can helps students learn (concrete examples). Discusses explicitly or implicitly the epistemic dimensions** (e.g., beliefs in quick learning and certain knowledge).
Good but partial answer (2 points):	**Explains why more developed epistemic beliefs can helps students learn (one concrete example). Or explains how students learn at different developmental stages** (absolutism, relativism, and evaluativism).
Satisfactory answer - Correct but brief and/or general (1 point):	**Explains why more developed epistemic beliefs can helps students learn (no concrete examples). Or gives concrete examples but no clear explanation.**
Poor answer	Incorrect, too vague, or very brief and overly general answer.

(0 points):

Excellent answer (Example):

One epistemic belief that helps students learn is the speed of which learning occurs. If students believe learning occurs over time, they are more likely to stick to a subject even if they don't learn it immediately. Another belief is how knowledge is acquired. If a student believes that knowledge is discovered and not passed from one person to another, they will be more likely to be independent and not rely on a teachers assistance to help them. They will work to find the solution on their own.

…

Epistemic beliefs can help students stick to a challenging or difficult learning task as well as engage them more in the learning topic. For example, students who are absolutists tend to think intelligence is fixed and they either know the concept or don't. Students with this belief may give up quicker and believe they are unable to learn certain topics. On the other hand, evaluatists believe that learning is an ongoing process and that ideas are created using multiple viewpoints. Students will this belief are more likely to forge ahead in the face of difficulties and be more engaged since they are able to bring in their own opinion and thinking when deciding on the best arguments for the truth of topics.

Good Answer (Example):

Having more sophisticated epistemic beliefs can help students learn because this can help them to be more flexible in their interpretations of the information that they receive. An evaluativist thinker will be a critical consumer of information and will not simply accept one right answer but will rather consider both the pros and cons of a particular issue before they come to some sort of an understanding. Having an absolutist belief can help students with rote memorization learning activities where they see that there is only one right, absolute correct answer. This absolutist belief, however, would definitely limit the learner when it comes to more complex tasks that require more interpretation, skepticism, and critical thinking from the learner.

More sophisticated epistemic beliefs allow for long-term in-depth learning, discouraging an all/nothing interaction with knowledge and skills. Students can also encounter many unexpected things when they spend the time with materials.

…

Satisfactory

Students who develop into more advanced epistemic beliefs are more likel

answer - Correct but brief and/or general (Example):	y to see that multiple experts are disagreeing about the 'truth' of an issue. This allows for rich use of critical thinking to spark personal meaning mak ing as student's decide what they believe to be most true. A second belief t hat can help students learning is that learning does not always happen all a t once. This can help students hone their perseverance as they strive for m astery in any subject. Evaluativist is an epistemic belief that help students learn because they us e their critical thinking skills and consider multiple options. Relativist are good at factual learning. ……
Poor answer (Example):	1. A student's understanding of math can help them grow by enhancing the ir study habits and understanding concepts. 2. A students interest in a particular subject can help develop their underst anding of a particular subject or unit school. For example a student's under standing of butterflies, right or wrong, can help the student understand the life cycle.

Q2: What would be an example of an “everyday, ill-defined” problem? How can more

sophisticated epistemic beliefs help solve this problem? Please explain.

Excellent answer (3 points):	**Mentions a specific and well-chosen ill-defined problem. Explains in detail how sophisticated epistemic beliefs can help students solve it** (provides a concrete example and a mechanism of how EB help; mentions that there is no objectively best solution but one that is optimal within the circumstances; mentions viewing the problem from different perspectives or/and weighing the pros and cons).
Good but partial answer (2 points):	**Mentions a specific but not optimal ill-defined problem. Explains briefly or partially how sophisticated epistemic beliefs can help students solve it. Or provides a good example but the explanation is partial (mentions only one factor, e.g., weighing the pros and cons).**
Satisfactory answer - Correct but brief and/or general (1 point):	**Gives a general explanation of how more sophisticated epistemic beliefs can help students solve an ill-defined problem (no concrete examples). Gives a good example but no explanation (or too general).**
Poor answer (0 points):	Incorrect, too vague, or very brief and general answer that does not answer the question directly.

Excellent answer (Example): An example of an "everyday, ill-defined" problem would be buying a house. Having sophisticated epistemic beliefs helps solve this problem because there is no correct answer to solving it and the person understands that solving the problem depends on the integration of multiple factors (both subjective preferences and objective ones such as budget). Also, an individual would be able to critically evaluate the information presented to them to form their own opinion on if buying the house is a good idea rather than blindly believing the information told to them by the realtor, previous owners, etc. is truth.

…

Good Answer (Example): An everyday ill-defined problem might be something such as how to navigate a conflict with a co-worker. This is something that comes up on a regular basis but does not have a clearly defined procedure on how to resolve the problem. Having more sophisticated epistemic beliefs would help someone to solve this problem because they would be more willing to listen to and consider the perspective of another person. They would also be more prepared to conduct research and consider multiple perspectives with a willingness to reconsider their own perspective. Someone with sophisticated epistemic beliefs would also see an issue such as this one as

having more than one "right" answer.

Still not sure what an everyday, ill-defined problem. However, a sophisticated epistemic belief will consider previous knowledge of the subject and evidence from other's in terms of how they overcame the everyday, ill-defined problem to figure the best possible solution for the problem. However, they will believe that this solution is not the absolute best, as the solution may change over time. Depending on the resources at hand and the knowledge at hand, the solution may vary.…

An everyday ill defined problem would be buying a house or deciding how to raise children. When raising children some thinkers might believe that there is one fixed way to raising children and that is how they are going to raise their kids. Another way could be to look at a variety of childrearing books and take from each one. Another way is to raise children how the adults were raised. Some might even make it up as they go. A more epistemic belief would be to take from a variety of those suggestions in order to decide how to raise a child because there is no absolute right way to raise a child.

…..

Satisfactory

An everyday ill-defined problem would be like predicting what would be need for a trip, or trying to figure out what coworker is upset about.

answer - Correct but brief and/or general (Example):	Someone who has more sophisticated epistemic beliefs would solve this problem by asking questions, weighing the pros and cons, and looking at all pieces of evidence. (Poor examples) Ill-defined problems are problems that do not have just one known answers, there can be many answers. The more sophisticated your beliefs are the better you are solving problems that have more than one answer or are not as easy to navigate. Everyday, ill-defined problem could be an instance where students are required to answer an open ended question about a controversial topic. A sophisticated epistemic belief would allow students to consider multiple viewpoints before establishing a conclusion. An everyday, ill-defined problem would be a complex problem with no clear answer. A person who can see the advantages and disadvantages of many sides of the die will be able to choose the side that has the best solution. …. An everyday ill defined problem is like buying a house which has multiple solutions. A sophisticated epistemic belief would help solve this problem because it involves having a higher capacity to analyze, assess and solve such problems.

Q3: Why would an "evaluativist" think that argument and critical thinking are very important in learning?

Excellent answer (3 points):	**Mentions specific characteristics of evaluativists (e.g., belief in knowledge construction; use of evidence; some opinions have more merit). Explains in detail why evaluativists value argument and critical thinking (mentions three factors).**
Good but partial answer (2 points):	**Mentions specific characteristics of evaluativists. Explains partially why evaluativists value argument and critical thinking (gives only one reason). Or gives specific reasons without mentioning characteristics of evaluativists (mentions two factors).**
Satisfactory answer - Correct but brief and/or general (1 point):	No mention of specific characteristics of evaluativists. Gives a brief/general explanation of why evaluativists value argument and critical thinking **(mentions one factor, e.g., weighing pros and cons).**
Poor answer	Incorrect, too vague, or very brief and overly general answer.

(0 points):

Excellent answer (Example):

An evaluativist would think that argument and critical thinking are very important in learning because they believe learning is self-constructed and gradual process. They believe that knowledge is based in opinions, but these opinions must be critically evaluated to see which has more merit. Evaluativists are also flexible in their construction of knowledge so their knowledge, opinions, and beliefs may change based upon their arguments presented to them. Mentioned 5 factors discussed in the lesson.

…

Good Answer (Example):

An evaluativist thinker would value argument and critical thinking when it comes to learning because these force the learner to consider the validity of multiple perspectives on the same issue. When students must listen to opposing arguments and the evidence to support those arguments, they are more likely to reconsider their source of knowledge or at least to strengthen the evidence that they used to support their knowledge. Critical thinking and argument are all part of the learning process because they utilize both the objective and the subjective aspects of learning, which help a learner to have more sophisticated, evaluativist beliefs.

Evaluativists realize that there are usually multiple solutions to an issue and there may never be a "right" answer. However, through argument and critical thinking, the evaluativist is able to best decide on their solution based on all the information they have acquired.

Argument exposes a person to multiple points of view and critical thinking makes a person think about more than one point of view. The evaluativist can take in multiple points of view at once and make a decision, so the more points of view, the better the final answer (or learned material).

An “evaluativist” will think that argument and critical thinking are very important in learning because they do not accept information as they come. For them, to learn is to critique the information piece by piece. In order to completely learn the particular topic or information or at the very least form an opinion, they will need to study the information well and they will need to "think outside the box" to either affirm what they're learned or find alternate solutions or explanations.

…….

Satisfactory Because they view learning as a progressive process, open to revision and

answer - Correct but brief and/or general	limitless. …
(Example):	Because without argument and critical thinking there is no 'evaluation' going on, i.e., no possibility of judging the information that is being learned. (TOO VAGUE AND GENERAL)
Poor answer (Example):	Evaluativist would think that argument and critical thinking are very important in learning because they evaluate the knowledge and information which requires critical thinking skills and discussions (CIRCULAR ANSWER).

REFERENCES

Ainley, M. D., Hidi, S., & Berndorff, D. (2002). Interest, learning and the psychological processes that mediate their relationship. *Journal of Educational Psychology, 94*, 1–17.

Alexander, P. A., & Jetton, T. L. (1996). The role of importance and interest in the processing of text. *Educational Psychology Review, 8*, 89–121.

Anderson, R. C., Shirey, L. L., Wilson, P. T., & Fielding, L. G. (1987). Interestingness of children's reading material. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, learning, and instruction: Vol. III. Cognitive and affective process analyses* (pp. 287–299). Hillsdale, NJ: Erlbaum.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality & Social Psychology, 51,* 1173-1182.

Bong, M. (2001). Role of self-efficacy and task-value in predicting college students' course performance and future enrollment intentions. *Contemporary Educational Psychology, 26*, 553-570.

Brophy, J. (1999). Toward a model of the value aspects of motivation in education: Developing appreciation for particular learning domains and activities. *Educational Psychologist, 34*, 75-85.

Bruning, R. H., Schraw, J. G., Norby, M. M., & Ronning, R. R. (2004). *Cognitive psychology and instruction.* Columbus, OH: Pearson.

Cao, L. (2012). Differences in procrastination and motivation between undergraduate and graduate students. *Journal of the Scholarship of Teaching and Learning, 12*(2), 2012, 39-64.

Chen, E., & Darst, P. W. (2002). Individual and situational interest: The role of gender and skill. *Contemporary Educational Psychology, 27,* 250–269.

Csikszentmihalyi, M. (1990). *Flow*. New York: Harper & Row.

Davis, E. A. (2003). Prompting middle school science students for productive reflection: Generic and directed prompts. *Journal of the Learning Sciences, 12*(1), 91–142.

deCharms, R. (1968). *Personal causation*. New York: Academic.

Deci, E. L., Connell, J. P., & Ryan, R. M. (1989). Self-determination in a work organization. *Journal of Applied Psychology, 74,* 580-590

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality, 62,* 119–142.

Deci, E. L., & Ryan, R. M. (1980). The empirical exploration of intrinsic motivational processes. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 13, pp. 39–80). New York: Academic.

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

Deci, E. L., & Ryan, R. M. (1991). A motivational approach to self: Integration in personality. In R. Dienstbier (Ed.), *Nebraska symposium on motivation: Vol. 38, Perspectives on motivation* (pp. 237-288). Lincoln: University of Nebraska Press.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuit: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268

Durik, A. M., & Harackiewicz, J. M. (2007). Different strokes for different folks: How personal interest moderates the effects of situational factors on task interest. *Journal of Educational Psychology, 99,* 597-610.

Durik, A. M., Vida, M., & Eccles, J. S. (2006). Task values and ability beliefs as predictors of high school literacy choices: A developmental analysis. *Journal of Educational Psychology, 98,* 382-393.

Eccles, J. S. (2009). Who am I and what am I going to do with my life? Personal and collective identities as motivators of action. *Educational Psychologist, 44,* 78–89.

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

Eccles, J. S., & Harold, R. D. (1991). Gender differences in sport involvement: Applying the Eccles' expectancy-value model. *Journal of Applied Sport Psychology, 3*(1), 1533-1571.

Eccles, J., & Wigfield, A. (1995). In the mind of the achiever: The structure of adolescents' achievement task values and expectancy-related beliefs. *Personality and Social Psychology Bulletin, 21*, 215-225.

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

Eccles, J. S., Wigfield, A., Harold, R., & Blumenfeld, P. B. (1993). Age and gender differences in children's self- and task perceptions during elementary school. *Child Development. 64*, 830-847.

Garner, R. (1992). Learning from school texts. *Educational Psychologist, 27*, 53–63.

Garner, R., Brown, R., Sanders, S., & Menke, D. J. (1992). "Seductive details" and learning from text. In A. Renninger, S. Hidi, & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 239–254). Hillsdale, NJ: Erlbaum.

Garner, R., Gillingham, M. G., & White, C. S. (1989). Effects of “seductive details” on macroprocessing andmicroprocessing in adults and children. *Cognition and Instruction, 6*, 41–57.

Girod, M. (2001). *Teaching 5th grade science for aesthetic understanding*. Unpublished doctoral dissertation, Michigan State University, East Lansing.

Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). The inner resources for school achievement: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology, 83,* 508-517.

Grolnick, W. S., Gehl, K., & Manzo, C. (1997). *Longitudinal effects of parental involvement and autonomy support on children’s motivation and school performance.* Paper presented at the biennial meeting of the Society for Research in Child Development, Washington, DC.

Grolnick, W. S., Gurland, S. T., Jacob, K. F., & Decourcey, W. (2002). The development of self-determination in middle childhood and adolescence. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation,* (pp. 147-171). San Diego, CA: Academic Press.

Harackiewicz, J. M., Barron, K. E., Tauer, J. M., & Elliot, A. J. (2002). Predicting success in college: A longitudinal study of achievement goalsand ability measuresas predictors of Interest and performance from freshman year through graduation. *Journal of Educational Psychology, 94,* 562-575.

Harackiewicz, J. M., Rozek, C. S., Hulleman, C. S., & Hyde, J. S. (2012). Helping parents motivate adolescents in mathematics and science: An experimental test. *Psychological Science, 40,* 809-906. DOI: 10.1177/0956797611435530

Hidi, S. (1990). Interest and its contribution as a mental resource for learning. *Review of Educational Research, 60,* 549–572.

Hidi, S. (1995). A re-examination of the role of attention in learning from text. *Educational Psychology Review, 7,* 323–350.

Hidi, S., & Harackiewicz, J. (2000). Motivating the academically unmotivated: A critical issue for the twenty-first century. *Review of Educational Research, 70*, 151–180.

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

Hidi, S., Renninger, K. A., & Krapp, A. (1992). The present state of interest research. In A. Renninger, S. Hidi, & A. Krapp (Eds.), *The Role of Interest in Learning and Development (*pp. 433–446.). Erlbaum, Hillsdale, NJ.

Huck, S.W., & McLean, R.A. (1975). Using a repeated measures ANOVA to analyze data from a pretest-post-test design: A potentially confusing task. *Psychological Bulletin, 82,* 511–518.

Hulleman, C. S., Durik, A. M., Schweigert, S., & Harackiewicz, J. M. (2008). The importance of utility value in predicting interest and performance in academics and sports. *Journal of Educational Psychology, 100,* 398-416.

Hulleman, C. S., Godes, O., Hendricks, G. L., & Harackiewicz, J. M. (2010). Enhancing interest and performance with a utility value intervention. *Journal of Educational Psychology, 102*(4), 880–895.

Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. *Science, 326,* 1410-1412.

IBM (2015). *Statistical Package for the Social Sciences 22*. International Business Machines.

Jackson, P. W. (1986). *The practice of teaching.* New York: Teachers College Press.

Jang, H, (2008). Supporting Students' Motivation, Engagement, and Learning During an Uninteresting Activity. *Journal of Educational Psychology, 100*(4), 798–811.

King, P., & Kitchener, K. S. (2004). Reflective judgment: Theory and research on the development of epistemic assumptions through adulthood. *Educational Psychologist, 39,* 5–18.

Kintsch, W. (1980). Learning from text, levels of comprehension, or: Why anyone would read a story anyway. *Poetics, 9,* 87–89.

Kuhn, D. (1991). *The Skills of Argument.* Cambridge University Press, Cambridge.

Lehman, S., & Schraw, G. (2002). Effects of coherence and relevance on shallow and deeper levels of text processing. *Journal of Educational Psychology, 94,* 738–750.

Lens, W., & Decruyenaere, M. (1991). Motivation and de-motivation in secondary education: Student characteristics. *Learning and Instruction, 1*, 145-159.

Lens, W., Simons, J., & Dewitte, S. (2001). Student motivation and self-regulation as a function of future time perspective and perceived instrumentality. In S. Volet & S. Järvelä (Eds.), *Motivation in learning contexts* (pp. 233-248). New York, NY: Pergamon.

Lepper, M. R., Corpus, J. H., Iyengar, S. S. (2005). Intrinsic and extrinsic motivational orientations in the classroom: Age differences and academic correlates. *Journal of Educational Psychology, 97,* 184-196.

Lindner, R. W., Harris, B. R., & Gordon, W. I. (1996). Are graduate students better self-regulated learners than undergraduates? A follow up study. Paper presented at the Annual Meeting of the American Education Research Association, New York, NY. (ERIC Document Reproduction Service No. ED396638)

Linnenbrink, E. A. (2005). The dilemma of performance-approach goals: The use of multiple goal contexts to promote students' motivation and learning. *Journal of Educational Psychology, 97,* 197–213.

Malka, A., & Covington, M. V. (2005). Perceiving school performance as instrumental to future goal attainment: Effects on graded performance. *Contemporary Educational Psychology, 30*, 60–80.

Marchand, G. (2008). *Developing a sense of academic ownership: A longitudinal analysis.* (Unpublished doctoral dissertation). Portland State University, Portland.

Martin, A. J. (2008). Enhancing student motivation and engagement: The effects of a multidimensional intervention. *Contemporary Educational Psychology, 33,* 239-269.

McCrudden, M. (2005). *The effect of specificity of relevance instructions on reading time and learning*. Doctoral dissertation, University of University of Nevada, Las Vegas. Retrieved from: http://proquest.umi.com/pqdlink?Ver=1&Exp=10-17-2014&FMT=7&DID=982812091&RQT=309&attempt=1

McCrudden, M. T., Schraw, G., & Kambe, G. (2005). The effect of relevance instructions on reading time and learning. *Journal of Educational Psychology, 97,* 88–102.

McDaniel, M. A., Waddill, P. J., Finstad, K., & Bourg, T. (2000). The effects of text-based interest on attention and recall. *Journal of Educational Psychology 92,* 492–502.

Mitchell, M. (1993). Situational Interest: Its multifaceted structure in the secondary school mathematics classroom. *Journal of Educational Psychology, 85*, 424–436.

Nicholls, J. G. (1984). Achievement motivation: Conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91*, 328–346.

Niemiec & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and Research in Education, 7*(2), 133-144.

Niemiec, C. P., Ryan, R. M. & Brown, K. W. (2008). The role of awareness and autonomy in quieting the ego: A self-determination theory perspective, in H. A. Wayment and J. J. Bauer (eds), *Transcending Self-interest: Psychological Explorations of the Quiet Ego*, (pp. 107–15). Washington, DC: APA Books.

Otis, N., Grouzet, F., & Pelletier, L. (2005). Latent motivational change in an academic setting: A 3-year longitudinal study. *Journal of Educational Psychology, 97*, 170-183.

Posner, G. J., Strike, K. A., Hewson, P. W., & Gertzog, W. A. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education, 66,* 211–27.

Pugh, K. J. (2004). Newton's laws beyond the classroom walls. *Science and Education, 88*, 182–196.

Pugh, K. J. (2011). Transformative Experience: An Integrative Construct in the Spirit of Deweyan Pragmatism, *Educational Psychologist, 46*(2), 107-121.

Pugh, K. J., Linnenbrink-Garcia, E. A., Koskey, K. L. K., Stewart, V. C., & Manzey, C. (2010a). Teaching for transformative experiences and conceptual change: A case study and evaluation of a high school biology teacher's experience. *Cognition and Instruction, 28*, 273–316.

Pugh, K. J., Linnenbrink-Garcia, L., Koskey, K. L. K., Stewart, V. C., & Manzey, C. (2010b). Motivation, learning, and transformative experience: A study of deep engagement in science. *Science Education, 94*, 1–28.

Reeve, J., Jang, H., Hardre, P., & Omura, M. (2002) 'Providing a rationale in an autonomy-supportive way as a strategy to motivate others during an uninteresting activity', *Motivation and Emotion, 26,* 183–207.

Renninger, K. A. (2000). Individual interest and its implications for understanding intrinsic motivation. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 375–407). New York: Academic.

Reynolds, R. E. (1992). Selective attention and prose learning: Theoretical and empirical research. *Educational Psychology Review, 4,* 345-391.

Ryan, R.M. (1982). Control and information in the intrapersonal sphere: An extension of cognitive evaluation theory, *Journal of Personality and Social Psychology 43,* 450–61.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68–78.

Ryan, R. M., & Connell, P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57,* 749-761.

Ryan, R. M. & Grolnick, W. S. (1986). Origins and pawns in the classroom: Self-report and projective assessments of individual differences in children's perceptions. *Journal of Personality and Social Psychology, 50,* 550-558.

Schank, R. C. (1979). Interestingness: Controlling influences. *Artificial Intelligence, 12,* 273-297.

Schiefele, U. (2001). The role of interest in motivation and learning. In J. M. Collis & S. Messick (Eds.), *Intelligence and personality: Bridging the gap in theory and measurement* (pp. 163–194). Mahwah, NJ: Erlbaum.

Schommer, M. (1990). Effects of beliefs about the nature of knowledge on comprehension. *Journal of Educational Psychology, 82,* 498–504.

Schraw, G., Bruning, R., & Svoboda, C. (1995). Sources of situational interest. *Journal of Reading Behavior, 27,* 1–17.

Schraw, G. & Dennison, R. S. (1994). The effect of reader purpose on interest and recall. *Journal of Reading Behavior, 26,* 1–18.

Schraw, G., & Lehman, S. (2001). Situational interest: A review of the literature and directions for future research. *Educational Psychology Review, 13,* 23–52.

Shechter, O. G., Durik, A. M., Miyamoto, Y., & Harackiewicz, J. M. (2011). The role of utility value in achievement behavior: The importance of culture. *Personality and Social Psychology Bulletin, 37,* 303–317.

Simons, J., Dewitte, S. & Lens, W. (2004). The role of different types of instrumentality in motivation, study strategies, and performance: Know why you learn, so you'll know what you learn! *British Journal of Educational Psychology, 74,* 343-360.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhart (Ed.), *Sociological methodology* (pp. 290-312). San Francisco: Jossey-Bass.

Tabachnick, B. G., & Fidell, L. S. (1996). Using multivariate statistics. Harper Collins Publishers, New York, NY.

Wigfield, A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review, 6*(1), 49-78.

Wigfield, A., & Cambria, J. (2010). Students' achievement values, goal orientations, and interest: Definitions, development, and relations to achievement outcomes. *Developmental Review, 30,* 1-35.

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

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

Wigfield, A., & Eccles, J. S. (2002). The development of competence beliefs, expectancies for success, and achievement values from childhood through adolescence. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 91-120). San Diego, CA: Academic Press.

Wigfield, A., Eccles, J. S., Roeser, R., & Schiefele, U. (2008). Development of achievement motivation. In W. Damon & R. M. Lerner (Eds.), *Child and adolescent development: An advanced course* (pp. 406-434). New York: Wiley.

Wigfield, A., Harold, R., Eccles, J. S., Blumenfeld, P. B., Aberbach, A., Freedman-Doan, C., & Yoon, K. S. (1992). *The Structure of Children's Ability Perceptions and Achievement Values: Age, Gender, and Domain Differences*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Wong, E. D., Pugh, K. J., & the Dewey Ideas Group at Michigan State University. (2001). Learning science: A Deweyan perspective. *The Journal of Research in Science Teaching, 38*, 317–336

CURRICULUM VITAE

Ivan Vladimirov Ivanov

3722 Las Vegas Blvd South, Apt. 605
Las Vegas, NV 89158
Phone: 562-618-9072
Email address: ivanovi2@unlv.nevada.edu

Education:

University of Nevada, Las Vegas
Master of Science in Educational Psychology, 2010

University of National and World Economy, Sofia
Bachelor of Science, International Business, 2005

Dissertation Title: Comparing the Effects of Two Utility Value Interventions on Graduate Students' Interest, Performance, and Perceptions of Utility Value

Dissertation Examination Committee:
Chairperson, Gwen Marchand, Ph. D.
Committee Member, CarolAnne Cardash, Ph. D.
Committee Member, Leann Putney, Ph. D.
Committee Member, Lisa Bendixen, Ph. D.
Graduate Faculty Representative, Shaoan Zhang, Ph. D.