"LEARNING IS NOT ALWAYS FUN, BUT IT IS FINE" EFFECTS OF RATIONALE GENERATION ON AUTONOMOUS MOTIVATION AND LEARNING IN UNINTERESTING BUT REQUIRED ACADEMIC ACTIVITIES

by

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A Dissertation

Submitted to the Faculty of Purdue University

In Partial Fulfillment of the Requirements for the degree of

Doctor of Philosophy
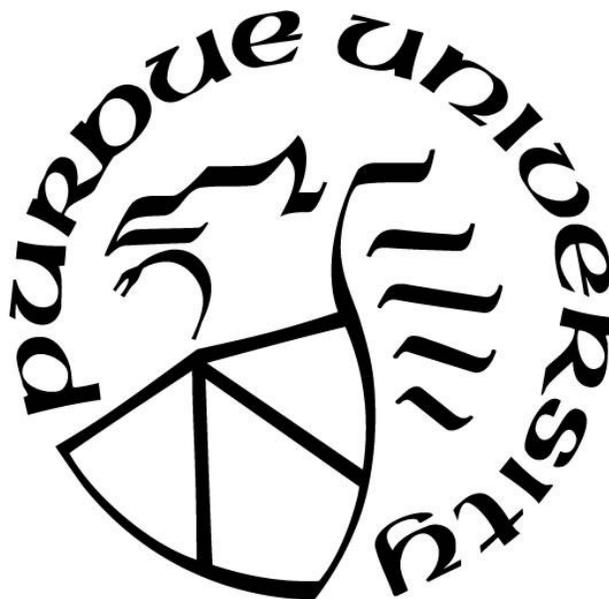
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West Lafayette, Indiana

December 2019

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I dedicate this work to my father, Zhenfeng Wang, and my mother, Xu Yang.

献给我的父亲王振锋，我的母亲杨旭

ACKNOWLEDGMENTS

First and foremost, I would like to express my deepest gratitude to my advisor, *Dr. Chantal Levesque-Bristol*. Thank you for offering me the great opportunity to come to Purdue University and study with you; thank you for your personal and professional guidance and support through each stage of my doctoral journey; thank you for opening my eyes up to the world of self-determination theory. The completion of my dissertation would not have been possible without your valuable advice and unwavering support. You have impacted my life in the most positive way and set a great example for me to follow and look up to. I will always remember all the assistance that I have received from you and pay it forward.

I would like to extend my sincere thanks to *Dr. Toni Kempler Rogat*, *Dr. David A. Sears*, and *Dr. Wayne Wright*, who have provided me with extensive help over the past two years as I moved from an idea to a completed study. Your constructive criticism and practical suggestions on my dissertation are important to my completion of this work. I will be forever grateful for your time and efforts.

I am also grateful to my labmates, *Horane Holgate*, *Shi Yu*, *Dongyao Tan*, and *Karen S. Neubauer*, for listening to me talk about my research and providing valuable insights. I must thank *Dr. Hyun Jin Cho* for your relentless support and encouragement. I will always cherish our friendship and the wonderful time we have spent together. Thanks should also go to my writing group members, *Qian Li* and *Yaheng Lu*. Thank you for your constructive feedback on my research and writing. Attending our weekly writing group was one of my most rewarding experiences at Purdue. Many thanks to my dear colleagues and friends at the Center for Instructional Excellence. You have created an autonomy-supportive and warm environment for me to grow. I have the great pleasure of working with you all.

To my close friend, *Dr. Hui-Ching Kayla Hsu*, I hope you know how much I appreciate everything that you have done for me. When I first arrived at Purdue, you took me under your wing, giving me advice and helping me adjust to the new place. Thanks also to *Dr. Jennifer D. Moss*, who has been my mentor over the past several years. I am very grateful to have the opportunity to work with you on the STEAM project. You have played a significant role in helping me grow as a researcher.

For my former advisor at Beijing Normal University, *Dr. Meilin Yao*, you continued supporting and nurturing me despite being thousands of miles away. Thank you for always being my biggest support, *Dr. Yao*. You know I would do the same for you. I would also like to acknowledge *Dr. Rude Liu*, *Dr. Wenfan Yan*, and *Dr. Yongjie Chen*. Thank you for writing on my behalf for my graduate school application. I could not have gotten into my doctoral program without your support. I would like to recognize the assistance that I received from *Dr. Laura Cayon* and *Dr. Jun Xie* in the department of statistics at Purdue. The teaching opportunity that you have offered me is essential to my future career.

Sincere appreciation goes to my participants. Thank you for taking the time to participate in my research and sharing your experiences and perspectives with me. I very much appreciate my students in EDPS632, my friends in the College of Education, my colleagues in the Department of Statistics, and the Office of Registrar for helping me recruit participants. I would also like to acknowledge the support of the COE Dean's Graduate Student Support Program.

Lastly, I want to devote part of this section to my family, who have been a source of encouragement and support during my whole studies. This dissertation is dedicated to my parents, *Zhenfeng Wang* and *Xu Yang*, as without your love and support, I would not have been where I am today. I have been fortunate to have you as parents. You know that you are the most

special people in my life. Thanks for giving me everything you could. I love you very much. I also wish to thank my parents-in-law, *Rongchao Cheng* and *Mingui Lin,* for supporting *Qingdong* and me move to the United States to pursue our dreams and helping us take care of *Michael* during school time. Thanks to my aunt, *Guifang Wang*, for giving me so much love and encouraging me to study abroad. I would also like to thank my cousin, *Ying Zhang*, for sharing important moments and experiences with me. I know we always have each other's back. Special thanks to my husband, *Qingdong Cheng*, and my son, *Michael W. Cheng*. You have been the impetus I needed to succeed. I love you beyond what words can express, and I hope you will always feel that.

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ABSTRACT

Extrinsic motivation is often considered undesirable; however, it is essential in driving students to engage in learning, because learning is not always fun in the real-world of school-related tasks. In my dissertation, I investigated how college students adjusted motivation when they engaged in uninteresting but required activities using a self-determination theory (SDT) framework. According to SDT, people have an inherent tendency to integrate socially-valued regulations that are initially perceived as being external. This process is called internalization, which enhances autonomous motivation and performance. There is substantial evidence in terms of what teachers could do to facilitate students' internalization. However, recently, researchers proposed that more work is needed to explore the role of the characteristics of the learners in the process of internalization, because it could help explain why people are differently healthy, effective, and happy even when they are in the same social context. This dissertation aimed to study the effects of rationale generation on college students' autonomous motivation. Specific research questions were: (1) to investigate the relations among rationale generation, motivation, and learning through the lens of SDT; (2) to examine the causal effects of rationale generation on autonomous motivation and learning performance; and (3) to understand students' perceptions of successful motivation strategies during uninteresting but required academic activity. An explanatory sequential mixed method design was used to answer these questions.

In Study 1, I demonstrated that rationale generation orientation, including rationale generation tendency and rationale generation quality, is a learner-related factor that influenced basic psychological needs, motivation, and learning outcomes. Rationale generation quality plays a more important role than rationale generation tendency. In Study 2, I developed and successfully tested a rationale generation intervention to enhance students' identification,

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although no significant differences in learning have been found between the rationale generation group and the control group. To gain more insight into students experience in uninteresting but required academic activities within the context of higher education, in Study 3 I interviewed 11 graduate students regarding their uninteresting learning experiences and motivational strategies. Students generally perceive uninteresting but required learning activities as boring and disappointing and have low motivation to engage in such activities. The most common strategy that the students use is enhancing personal significance. Many students believe that having a high-quality rationale that is related to identification could enhance motivation. Taken together, my findings indicate that providing students with opportunities to generate rationales for the uninteresting but required academic activities may open the door to discovering personal significance for completing such activities. Autonomous motivation, especially identification, will be enhanced if students can recognize the significance of learning for their personal interests and lives. A study focusing on these research questions contributed to a theoretical understanding of extrinsic motivation and motivational adjustment. The results were beneficial for higher education researchers and practitioners to implement strategies fostering college students' autonomous motivation.

CHAPTER 1: INTRODUCTION

School learning is not always fun. In order to function effectively at school, students will have to get involved in the activities that are not inherently interesting but are valued by teachers, programs, or societies. When a person is asked to do something that does not interest him or her, the motivation can range from unwillingness, to passive compliance, and to active personal commitment (Ryan & Deci, 2000). In this study, I used self-determination theory (SDT; Deci & Ryan, 2000) as my guiding framework to investigate what students can do to keep themselves motivated during uninteresting but required academic activities.

1.1 Statement of the Problem

I am interested in studying uninteresting but required academic activities because in the real-world of school-related tasks, a lot of academic activities that contribute most to the development of valuable skills are experienced as uninteresting and tedious (Yeager et al., 2014). For example, an engineering freshman may not like solving mathematical problems; however, he or she has to take the calculus course to meet the requirement for more advanced engineering courses. It seems that the most obvious approach to address the motivation issues in such situations is to make the learning tasks interesting. Unfortunately, even though the educational researchers and practitioners have put in much effort to design interesting learning activities, students may differ in the extent to which they find the activities interesting and enjoyable (Ryan & Deci, 2017). It is important for students to learn to deal with these motivational obstacles on their own, especially for college students since studying is unsupervised most of the time in college.

Though sometimes undesirable, extrinsic motivation is essential in driving students to engage in learning, especially when intrinsic motivation is unattainable. Extrinsic motivation refers to the state of doing activities for instrumental reasons. As one of the sub-theories of the SDT, the organismic integration theory (OIT) addresses the topic of extrinsically motivated behaviors by introducing the concept of internalization (Ryan & Deci, 2017). According to OIT, people have an inherent tendency to integrate socially-valued regulations that are initially perceived as being external (Koestner & Losier, 2002). SDT researchers conceptualized this process as internalization. Based on the degrees of internalization, there are four regulatory styles: external regulation, introjection, identification, and integration. These regulatory styles fall along a continuum of internalization that reflects the degree of autonomy (Deci & Ryan, 2002; See Figure 1.1). Through internalization students' motivation moves from external regulation to internal regulation, from controlled motivation to autonomous ones. In SDT, identification and integration are autonomous types of extrinsic motivation, while introjection and external regulation are controlled types of extrinsic motivation. Although students still are extrinsically motivated because the behaviors are done not because of enjoyment, the internalized behaviors are experienced as autonomous because they are self-endorsed. In SDT, abundant research has demonstrated that students who have developed more autonomous regulatory styles are more likely to achieve (Grolnick & Ryan, 1989; Kusurkar, Ten Cate, Vos, Westers, & Croiset, 2013; Taylor et al., 2014), to evidence conceptual understanding (Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005), and to adjust (Grolnick & Ryan, 1989; Kusurkar et al., 2013), compared to their peers.
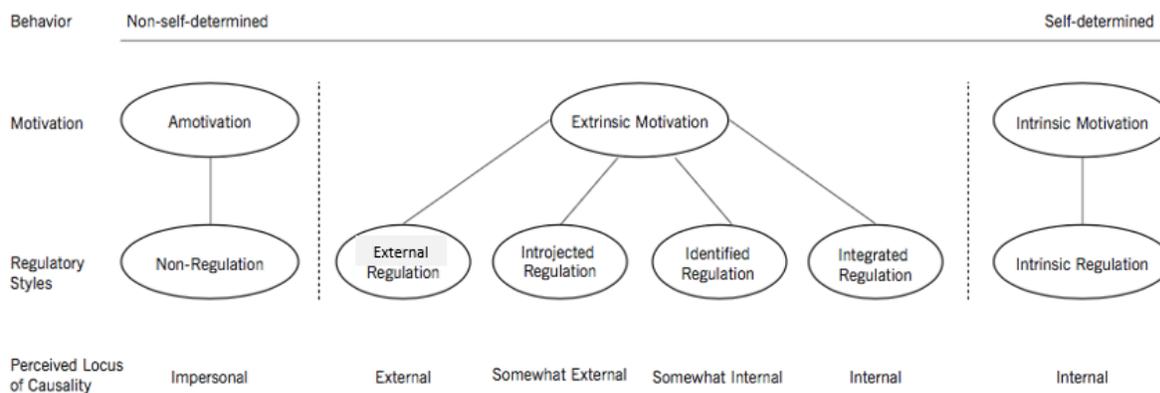
Figure 1.1 The taxonomy of regulatory styles. Adapted from Ryan and Deci (2000).

Then, how can we promote the process of internalization to foster autonomous types of extrinsic motivation? Generally speaking, factors in the social environment that satisfy individuals' needs for autonomy, competence, and relatedness are assumed to facilitate the internalization of non-intrinsically motivated behaviors (Ryan & Deci, 2017). There is substantial evidence in terms of what teachers could do to facilitate students' internalization (Deci, Eghrari, Patrick, & Leone, 1994; Jang, 2008; Reeve, Jang, Hardre, & Omura, 2002; Savard, Joussemet, Pelletier, & Mageau, 2013; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). Recently, researchers propose that more work is needed to explore the role of the characteristics of the learners in the process of internalization (Vansteenkiste, Aelterman, De Muynck, Haerens, Patall, & Reeve, 2018). Because in addition to the contextual factors, students bring their own influential characteristics into the classroom, which explains why people are differentially healthy, effective, and happy even when they are in the same social context. In response to this call, the current work investigated individual factors that affect the process of internalization.

One important individual factor that promotes autonomous types of extrinsic motivation is autonomy orientation, which is one type of causality orientation. According to SDT, causality orientation refers to personality orientations that reflect differences in the extent to which individuals tend to be self-determined in their ongoing interactions with their social surrounds. Deci and Ryan (1985) proposed three general causality orientations (GCO): the autonomy orientation, the controlled orientation, and the impersonal orientation. When people are high in the autonomy orientation, they are more open to their experiences and are more able to process their negative emotions. Thus, autonomy-oriented people tend to have the identified and integrated styles of regulation. On the contrary, when people are high in the controlled orientation, they are more defensive and tend to use the external and introjected forms of regulation.

Another individual influential factor fostering autonomous types of extrinsic motivation could be rationale generation. A number of studies have demonstrated that receiving rationales in an autonomy-supportive way could promote self-determined extrinsic motivation (Deci et al., 1994; Jang, 2008; Reeve et al., 2002; Savard et al., 2013). For a rationale to be functioning, the rationale provider needs to assure that the rationales are meaningful from the recipients' perspective (Vansteenkiste et al., 2018). Compared to externally offered rationales, self-generated rationales are more likely to provoke perceptions of self-relevance (Vansteenkiste et al., 2018). A number of researchers have demonstrated the effects of self-generated rationales on engagement (Harackiewicz, Canning, Tibbetts, Priniski, & Hyde, 2016), academic performance (Harackiewicz, et al., 2016; Hulleman, Godes, Hendricks, & Harackiewicz, 2011; Hulleman & Harackiewicz, 2009), retention (Canning et al., 2018), course interest (Hulleman & Harackiewicz, 2009; Hulleman et al., 2011), positivity and future career motivation (Brown,

Smith, Thoman, Allen, & Muragishi, 2015). So far, rationale generation has only been investigated as an intervention approach, mostly from the perspective of expectance-value theory. However, it can also be a personality orientation that reflects differences in people's tendency to generate rationales for external demands. There are no existing self-report questionnaire measures this construct. Therefore, one of the tasks of the current work is to create a scale to measure rationale generation orientation, so researchers will be able to examine the relations between rationale generation orientation and other constructs. To my best knowledge, no one has studied the effects of rationale generation orientation on types of motivation. Therefore, the current research examined the relations between rationale generation orientation and various types of motivation, aiming to provide evidence on the individual influential factors of internalization.

Although numerous studies have shown that autonomous motivation is crucial for academic success (e.g., Taylor, et al., 2014), a lack of evidence on the relation between autonomous motivation and college students' learning outcomes has also been reported, especially when learning outcomes are measured by course grade and/or GPA (e.g., Conti, 2000). According to SDT, autonomous types of motivation have stronger predictive power to explain difficult or complex actions (Ryan & Deci, 2017). Transfer of learning, as a prototype of deep understanding and application, could be a more effective indicator to examine the effects of self-determined motivation on learning. Unfortunately, empirical evidence on the effect of self-determined motivation on students' transfer of learning is quite limited. Levesque-Bristol (2006) and colleagues developed the integrative model for learning and motivation (IMLM) model to explain how student motivation contributes to engagement, meta-cognition, and knowledge transfer. Recently, they demonstrated the positive associations between self-determined

motivation and transfer in a large-scale study (Levesque-Bristol et al., under review). However, in those studies, self-determined motivation was calculated as a composite score, so it is difficult to identify the differences in the effects of individual motivation styles on transfer. Moreover, transfer was assessed with self-report questionnaires which may account for the stronger relationship between motivation and transfer. To date, no researcher, if any, has systematically investigated the role of autonomous motivation in transfer of learning within higher education contexts.

1.2 Purpose and Research Questions

The purpose of the current research is to use SDT as the framework to identify and examine individual factors that affect students' motivation and learning outcomes during uninteresting but required academic activities. Specifically, I investigated the effects of rationale generation orientation and rationale generation intervention on students' autonomous motivation and academic performance. Specific research objectives are: (1) to investigate the effects of rationale generation orientation on student motivation and learning outcomes through the lens of SDT; (2) to examine whether reflecting on the purpose of doing an activity, an approach to prompt students to generate rationales, can promote students' situational autonomous motivation, rote learning, and transfer of learning; and (3) to understand students' perspectives on uninteresting learning experiences and successful motivational strategies in the context of higher education. A study focusing on these contributes to a theoretical understanding of extrinsic motivation and motivational adjustment. The results could be beneficial for higher education researchers and practitioners to implement strategies fostering college students' academic motivation in uninteresting but required academic activities.

1.3 Definition of Terms

Amotivation: Individuals with amotivation are not motivated. They have low self-efficacies and do not see value in completing tasks (Ryan & Deci, 2017).

Autonomous Motivation: Refers to a type of motivation that people act because they find it either interesting, or consistent with their integrated values. When people are autonomously motivated, they experience a full sense of willingness and volition (Deci & Ryan, 2015). It consists of intrinsic motivation, integration, and identification.

Autonomous Orientation: Describe the degree to which people orient toward their environments by treating them as sources of relevant information, as they take interest in both external events and the accompanying inner experiences (Ryan & Deci, 2017). When people are high in the autonomy orientation, they tend to use the identified and integrated styles of regulation.

Autonomy Satisfaction: Refers to the volition to self-regulate one's experiences or actions (Ryan & Deci, 2017). In educational contexts, autonomy is satisfied when students are provided with opportunities to make choices within a classroom structure established by the instructor (Hsu, Wang, & Levesque-Bristol, 2019).

Autonomy Frustration: Involves feeling controlled through externally enforced or self-imposed pressures (Chen et al., 2015).

Causality Orientation: Refers to personality orientations that reflect differences in the extent to which individuals tend to be self-determined in their ongoing interactions with their social surrounds (Ryan & Deci, 2017).

Competence Satisfaction: Refers to the experience of ability to effectively accomplish tasks (Ryan & Deci, 2017). In the context of school learning, it describes students' beliefs that they have mastered content or are able to perform well academically (Hsu et al., 2019).

Competence Frustration: Refers to the experience of failure and doubts about one's efficacy (Chen et al., 2015).

Controlled Motivation: Refers to a type of motivation that people act for externally referenced reasons, such as to gain rewards or approval from others, or to avoid punishment or guilt (Ryan & Deci, 2017). With controlled motivation, people tend to experience pressure and compulsion (Deci & Ryan, 2015). It comprises introjection and external regulation.

Controlled Orientation: Describes the degree to which people's attention and concerns tend to be oriented toward external contingencies and controls (Ryan & Deci, 2017). When people are high in the controlled orientation, they tend to use the external and introjected styles of regulation.

External Regulation: People with external regulation behave because of external contingencies, such as rewards and punishments, have not been internalized (Deci & Ryan, 2015). The source of regulation is external.

Extrinsic Motivation: Involves a contingency between the target behavior and some separable consequence desired by the individual (Deci & Ryan, 2015). The sources of extrinsic motivation can be both internal and external; however, the behaviors are instrumental. That is, the aims of doing activities are separable from the action itself.

Identification: People with identification behave because they identify with the personal value and importance of the behavior for themselves and accept it as their own (Deci & Ryan, 2015).

Integration: People with integration behave because the behavior is an expression of who the person is (Deci, Vallerand, Pelletier, & Ryan, 1991). It involves people having integrated new identifications with other aspects of their own integrated sense of self (Deci & Ryan, 2015). People with integration act with a full sense of volition and choice.

Internalization: Internalization is the internal psychological process that people integrate socially-valued regulations that are initially perceived as being external and transform them into their own (Koestner & Losier, 2002; Ryan & Deci, 2017). It reflects the natural growth process through which extrinsic behaviors become an established aspect of people's minds and motives (Ryan & Deci, 2017).

Intrinsic Motivation: Refers to the state of doing an activity out of interest and enjoyment. Individuals with intrinsic motivation are motivated by the satisfactions of doing activities for their own sake (Deci & Ryan, 2002).

Introjection: Refers to a type of extrinsic motivation that people do activities to avoid guilt and shame, or to please others. With introjection, people partially take in external contingencies but not fully accepted it as their own (Deci & Ryan, 2015).

Organismic Integration Theory: Is concerned with extrinsic motivation. It describes people's inherent tendencies to integrate their ongoing experiences, assuming they have the necessary nutriments to do so (Deci & Ryan, 2002).

Rationale Generation Intervention: Refers to a condition in which people are provided with the opportunities to reflect on the reasons for doing an activity.

Rationale generation orientation: Is defined as people' tendency to generate autonomous types of rationales for their behaviors, which includes two constructs: rationale generation tendency and rationale generation quality.

Relatedness Satisfaction: Refers to the feelings of being connected with others (Ryan & Deci, 2017). In educational settings, the sense of connection can come from interactions with classmates, professors, or with the learning materials (Hsu et al., 2019).

Relatedness Frustration: Refers to the experience of relational exclusion and loneliness (Chen et al., 2015).

Self-determination Theory: Self-determination Theory is a theory of human motivation that examines how social contexts and individual differences facilitate different types of motivation, which in turn, predict learning, performance, experience, and well-being (Deci & Ryan, 2015).

Situational Motivation: Refers to people's immediate or current reactions toward a specific activity in which they are engaged (Guay, Vallerand, & Blanchard, 2000).

Perceived Knowledge Transferability: Refers to student perceptions of how relevant the knowledge learned in the target course will be for future courses and their career paths (Levesque-Bristol, Richards, Zissimopoulos, Wang, & Yu, under reivew).

Transfer of Learning: Refers to the capability of applying prior knowledge and skills in a new situation (Belenky & Nokes-Malach, 2012; Bransford & Schwartz, 1999).

1.4 Limitations

Several limitations were identified prior to the start of the study that must be taken into consideration when interpreting the results. They included:

1. Participants in this research were recruited from only one institution in the American Midwest. This has potential implications for generalizing the results to students of other institutions with backgrounds dissimilar to the one in the present study.

2. The causal effect of rationale generation intervention on motivation and learning was examined in a lab setting with experimental manipulation. Therefore, the findings obtained in the study cannot be generalized to real-life classrooms.

3. I used volunteer sampling technique to recruit participants in all studies, which increased the changes of yielding unrepresentative samples. People who have

volunteered to be in the studies may have stronger feelings towards uninteresting but required academic activities than people who have not. Thus, the participants may not represent a true population.

1.5 Significance of the Study

The present dissertation contributes to a theoretical understanding of extrinsic motivation and internalization. It provides new evidence about the role of the characteristics of the learners in the process of internalization, which explains why students are differentially motivated even when they sit in the same classroom and study with the same teacher. This research also opens new lines of research related to the impact of rationale generation on different types of motivation. The creation and validation of the rationale generation orientation scale is an important step forward for research investigating rationale generation, because prior to this study there is no scale to investigate the relations between rationale generation and other constructs. Furthermore, it provides a more comprehensive understanding of students' experiences in doing uninteresting but required academic activities and the effectiveness of rationale generation. Pervious research in rationale has mostly been done with quantitative research method (e.g., Canning et al., 2018; Davis, Kelley, Kim, Tang, & Hicks, 2016; Deci et al., 1994; Harackiewicz et al., 2016; Jang, 2008; Reeve et al., 2002). In the current research, I adopt the sequential explanatory mixed method design, which offsets the weaknesses of quantitative and qualitative research and allows me to collect comprehensive data. The findings also bear important practical implications for higher education researchers and practitioners to implement strategies fostering college students' academic motivation in uninteresting but required academic activities.

1.6 Overview of the Dissertation

This dissertation has been written in a combination of traditional and nontraditional format. It includes six chapters, a reference list, appendices, and vita. Chapter 1 introduces the rationale of the research, questions, terms, limitations, and significance of the study. Chapter 2 summarizes an in-depth review of the relevant literature on extrinsic motivation as well as its antecedents and consequences. Chapter 3 includes the general methods for the entire dissertation study, including research design, hypotheses and research questions, participants, measures and materials, research procedures, and data analysis. Chapter 4 is written as a standalone academic manuscript, which is based on Study 1, a cross-sectional correlational study that used to examine the relations between rationale generation orientation, motivation, and learning. Chapter 5 is another manuscript, which is written based on Study 2 and 3. Specifically, Study 2 investigates the causal effect of rationale generation on motivation and learning with a lab experiment. Study 3 is a qualitative study, which is conducted to gain more insights into students' experiences of uninteresting but required learning and perspectives on rationale generation and to seek the explanations related to the findings of Study 2. Chapter 6 draws conclusions across the three studies and discusses the implications and limitations of the dissertation study. A comprehensive list of references, appendices, and vita are provided at the end of the dissertation.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Extrinsic Motivation and Internalization

According to SDT, there are three types of motivation, which includes amotivation, extrinsic motivation, and intrinsic motivation. Qualitative differences exist among them. Individuals with amotivation are not motivated. They have low self-efficacies and do not see value in completing tasks. Individuals with extrinsic motivation are motivated. It involves a contingency between the target behavior and some separable consequence desired by the individual (Deci & Ryan, 2015). The sources of extrinsic motivation can be both internal and external; however, the behaviors are instrumental. That is, the aims of doing activities are separable from the action itself. Unlike the instrumental feature of extrinsic motivation, intrinsic motivation refers to the state of doing an activity out of interest and enjoyment. Individuals with intrinsic motivation are motivated by the satisfactions of doing activities for their own sake. Intrinsic motivation represents the optimal type of motivation and leads to most adaptive consequences (Koestner & Losier, 2002).

However, in order to function effectively within schools, students will have to get involved in the activities that are not inherently interesting but are valued by teachers, programs, or societies. For example, an engineering freshman may not enjoy solving mathematical problems; however, he has to take the calculus course to meet the requirement for more advanced engineering courses. When the external environment fails to pique students' interests, extrinsic motivation becomes particularly important in driving students to engage and persist in learning. According to SDT, people have an inherent tendency to integrate socially-valued regulations that are initially perceived as being external (Koestner & Losier, 2002). We call this process internalization. Researchers have found that in education domain whether or not students

successfully internalize the value of school participation is a more important predictor of later adaptation than whether they find school activities interesting and enjoyable (Koestner & Losier, 2002). Successful internalization seems to be an essential capacity for long-term success in the academic domain.

Internalization refers to "the process of taking in values, beliefs, or behavioral regulations from external sources and transforming them into one's own (Ryan & Deci, 2017, p.182)." Internalization is not merely compliance but rather an active internal psychological process through which people actively integrate external regulation into true self-regulation (Ryan & Deci, 2017). Within SDT, it is viewed in terms of a continuum. The more regulation is internalized, the more it becomes part of the self. Based on the degrees of internalization success, there are four regulatory styles: external regulation, introjection, identification, and integration. These regulatory styles fall along a continuum of internalization that reflects the degree of autonomy (Deci & Ryan, 2002).

External regulation is on the far left side of the continuum. There is no self-determination in external regulation. People with external regulation behave because of external contingencies, such as rewards and punishments, have not been internalized (Deci & Ryan, 2015). The source of regulation is external. An example of external regulation is a college student who does homework assignments every week, but only because homework assignments count as part of the final grade. When the homework assignment is separated from the final grade, the student is not likely to do homework anymore since he no longer has a reason to do it. Although external regulation can seduce people into action and achieve the short-term goals, it is often associated with poor maintenance (Ryan & Deci, 2008). When speaking of school education, if a student's study behavior is merely instrumental, then the student is likely to study in the least effortful

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way, which often leads to poor quality. Benware and Deci (1984) conducted an experiment to compare the effects of external regulation and intrinsic motivation on students' rote memorization and conceptual understanding. They found that students in the intrinsic motivation group demonstrated better conceptual understanding than students who learned in order to take an exam; however, rote memorization did not differ between the two groups.

Introjection is at the next level of extrinsic motivation. People do activities to avoid guilt and shame, or to please others. With introjection, people partially take in external contingencies but not fully accepted it as their own (Deci & Ryan, 2015). For example, students complete assignments because they may feel that the instructor might be disappointed by them if they do not. Through introjection, a person accepts the values of their significant others without discriminating how these values fit with his or her own values. The source of motivation is somewhat internal since introjection involves adopting a regulation or value; however, it is still not fully self-determined because the regulation or value does not become integrated to a person's holistic self-representation. Introjection behaviors are partially internalized since these internal feelings are controlled by external factors (e.g., teachers, parents). For example, researchers have found that for college students, introjection was significantly negatively associated with adjustment (Koestner & Losier, 2002). However, introjection is a bit more adaptive than external regulation since the introjection is dependent on affective and evaluative contingencies within a person rather than being based on the direct presence of external contingencies.

The third level of extrinsic motivation is identification. People with identification behave because they identify with the personal value and importance of the behavior for themselves and accept it as their own (Deci & Ryan, 2015). Schreiber (2016) suggested that the best indicator of

identification is when you find yourself agreeing with the reward system and embracing it. For example, a student does extra exercises in mathematics because the student feels that working on those problems can help them master the knowledge and skills. Identification is the first type of extrinsic motivation that is self-determined. People with identification consciously decide to pursue certain goals that are important to themselves. The perceived locus of causality becomes internal to the self since people act out of a belief in the personal importance (Ryan & Deci, 2017). Compared to introjection, identification involves the experience of greater volition and demonstrate more functional advantages in terms of stability and persistence. In the educational domain, identification is extremely important. Some researcher found that identification had even stronger positive effects on students' academic engagement, persistence in school, and successful adaption than intrinsic motivation did (Koestner & Losier, 2002).

The move from identification to integration occurs when the extrinsic motivation aligns with other aspects of individuals' values, goals, needs, and beliefs (Schreiber, 2016). Integration is the most advanced form of extrinsic motivation. People with integration behave because the behavior is an expression of who the person is (Deci et al., 1991). It involves people having integrated new identifications with other aspects of their own integrated sense of self (Deci & Ryan, 2015). People with integration act with a full sense of volition and choice. For example, a student may not be interested in studying mathematics; however, being a good student is one of the student's identifications, so he/she may still work very hard in the mathematics course. When the behavior or value conflicts with other abiding identifications the student may need to modify the value or attitudes one has previously held to make all identifications compatible. For example, the student may also think himself/herself is not a math person. Studying very hard in a math class may conflict with this identification. Integration cannot be achieved unless the student

makes some modifications. For example, the student may accommodate the "not a math person" identification and starts to believe that he or she can succeed in math class if he or she puts great effort into it. Integration is fully self-determined and is the most autonomous form of extrinsic motivation.

Internalization is a proactive process through which people transform an external regulation into an internal regulation (Schafer, 1968). For example, an engineering freshman who is not interested in learning mathematics would not be intrinsically motivated to take the calculus course, and the student's learning would require contingent consequences such as requirement from the program. At this moment, the regulation is fully external. The problem of external regulation is lack of maintenance. The student will stop studying mathematics without the external demand. Internalization is the process through which the students' learning could become internal and no longer require external contingencies. For example, if the student realizes that knowing mathematics is very important for continuing to succeed at more advanced engineering courses (i.e., the student reach the level of identification), then the student may take another mathematics course which is not required by his or her program. The student's learning motivation becomes more autonomous than it was under external regulation, and the student's behavior becomes more stable and more persistent. Numerous studies have demonstrated that students who have developed more self-determined regulatory styles are more likely to stay in school, to achieve, to evidence conceptual understanding, and to be well adjusted than the students with less self-determined types of motivation (e.g., Kusurkar et al., 2013; Vallerand & Blssonnette, 1992). Although intrinsic motivation appears at the right end of the relative autonomy continuum, extrinsic motivation is not typically transformed into intrinsic motivation

because it retains its instrumental nature (Ryan & Deci, 2017). In other words, the process of internalization ends at the point of integration.

Ryan and Connell (1989) suggested that students do schoolwork for varied reasons, including introjection (e.g., they think they should study and will feel guilty if they do not) and identification (e.g., they think the material is important for them to know). Although introjection and identification were both positively associated with students' self-ratings of behavioral engagement and other-ratings of being motivated, they had different relations with emotional and cognitive outcomes. For example, introjection was correlated with school anxiety and maladaptive coping with failure, whereas identification was associated with school enjoyment and proactive coping (Ryan & Connell, 1989). In order to predict overall quality of motivation, researchers have often looked at various combinations of subscale scores. One common approach is to calculate the individuals' relative autonomy index (RAI) with respect to a target behavior. The RAI combines the subscale scores of the regulatory styles in a way which gives positive weights to autonomous or self-determined motivation, negative weights to controlled or non-self-determined motivation, and larger weights to those reflecting more of the quality (Grolnick & Ryan, 1987). Another approach is to calculate a contrast between autonomous and controlled subscales. This approach implies that the highest quality of motivation is represented by high autonomous and low controlled forms of regulation. Both combination approaches are very predictive of motivational outcomes; however, they obscure specific profile configurations of importance within an activity and raise the psychometric issues associated with weighted scores. Recently, researchers found that compared to the combination scores, using the four motivational types provided more differentiated and meaningful description of perceived locus of causality (Wang, Morin, Ryan, & Liu, 2016). Ryan and Deci (2017) suggested that which

approach is used should depend on what questions are being asked. Despite variability in content and structure, all approaches have generally been highly predictive and shown extensive validity (Ryan & Deci, 2017).

Compared to intrinsic motivation, internalized regulations focus more on future goals and outcomes. People with intrinsic motivation experience the rewards of interest and satisfaction as they engage in the activity itself. The aim of the intrinsically motivated behaviors is to experience the spontaneous satisfaction while doing the activity. Thus, the focus is on the present experience rather than future goals. However, with internalized regulations, the focus is more on future goals and outcomes for this instrumental nature, regardless of how self-determined one has become. When doing an activity that is not intrinsically interesting, the individual must bring the future into the present so that he or she will experience not only the satisfaction of being self-regulating but also the satisfaction of making progress toward an important goal (Ryan & Deci, 2017). For example, a college student who would enjoy hanging out with his friends during the weekend (i.e., intrinsic motivation), but instead spends his time in the library preparing for an exam, because getting a good grade on the exam can help him achieve his long-term goals, such as getting a decent job after college (i.e., identification). Being mindful of the future provides a rationale that supports the student's identification.

2.2 Factors Fostering Internalization

According to SDT, humans seek to satisfy three basic psychological needs: Autonomy, competence, and relatedness (Deci & Ryan, 1985). Autonomy is experienced when students are given choices and options about how to perform or present their work. Competence refers to students' perception of mastery with the content material while relatedness refers to the degree to which students feel connected to their instructor as well as other students in the class. Generally

speaking, factors in the social environment that satisfy individuals' needs for autonomy, competence, and relatedness will facilitate the internalization of non-intrinsically motivated behaviors (Ryan & Deci, 2017). People are more likely to adopt attitudes and act in ways that are endorsed by significant others or social groups if they have or desire connections with those people or groups (relatedness). Competence is also important because people will fail to internalize what they observe or are taught unless they can efficaciously enact. The need for autonomy becomes salient if people want to internalize beyond the level of introjection to the levels of identification or integration.

2.2.1 Autonomy-supportive Contexts and Rationale Provision

Autonomy-support is important for promoting internalization. In autonomy-supportive contexts, instructors provide the students with choices, acknowledge students' perspectives, provide meaningful rationales if the choice is constrained, and give timely positive feedback. In contrast, controlling contexts tend to include the use of coercive strategies, such as salient reward contingencies, deadlines, and overtly controlling language (e.g., "should", "must", "have to"). Internalization that occurs within a controlling environment tends to lead to introjection, whereas when the environment is autonomy-supportive, identification or integration tend to occur. Many studies have documented the positive relations between autonomy-supportive contexts and greater internalization.

Deci et al. (1994) conducted an experiment to examine three contextual factors' effects on internalization. They hypothesized that (a) providing a meaningful rationale, (b) acknowledging the behaver's perspective, and (c) conveying choice rather than control could facilitate individuals' internalization process which entails accepting a value or belief as one's own. When people are asked to do an activity that is not intrinsically motivated, they tend to

experience an internal conflict with their inclinations. In this situation, a meaningful rationale allows people to understand that the external demands can coexist with their inclinations. An acknowledgement of people's feelings conveys respect for their inclinations and help alleviate the conflicting perceptions. Conveying choice which is theorized to support autonomy can facilitate identified and integrations. If rationale and acknowledgment are presented in a controlling environment and pressuring way, the internalization process would stop at the level of introjection rather than more advanced ones. Deci et al. (1994) employed a 2*2*2 factorial design to examine the main effects of rationale, acknowledgement, and choice on college students' internalization. The findings supported their hypotheses. They found that these three facilitating contextual factors promoted internalization as evidenced by the subsequent self-regulation of behavior and affective self-reports. When external contexts are autonomy-supportive contexts integration tends to occur, whereas when the contexts are controlling, introjection tends to occur. This study is one of the earliest studies exploring the influential factors of college students' internalization.

Reeve et al. (2002) used a more academically authentic task to examine the effect of an externally provided rationale on college students' internalized regulations. They hypothesized that when doing an uninteresting activity (i.e., asking preservice teachers to learn conversational Chinese), offering different external contingencies associated with external regulation (i.e., study to pass a test), introjection (i.e., it is what a good teacher ought to do), and identification (i.e., it is useful) to engage in the same uninteresting activity would facilitate different types of extrinsic motivation. Their findings confirmed the hypothesis. The provision of a rationale communicated in an autonomy-supportive way (e.g., the reason we are asking you to try hard is for the benefit of all the Chinese-speaking students you will one day very soon have in your classes) promoted

identification. Compared to students who received interventions associated with external regulation and introjection and the students who received no intervention, students who received the intervention associated with identification (i.e., rationales communicated in an autonomy-supportive way) demonstrated more self-determined regulation and more efforts. Furthermore, they examined a motivational mediation model to explain why providing rationales could facilitate engagement. According to SDT, they hypothesized that rationales facilitate engagement and learning because a rationale communicated in an autonomy-supportive way reveals an activity's value and personal benefit (Ryan & Deci, 2000). Such personal relevance information helps students internalize the value of the task, and the identification promote students to engage volitionally in learning. The finding supports their hypothesis. They found that identification mediated the relation between providing rationales and effort.

In extending Reeve et al.'s (2002) study, Jang (2008) examined three theoretical models to explain why an externally provided rationale could support college students' identification during uninteresting learning activities. Specifically, Jang (2008) examined an identification model based on SDT, an interest regulation model based on interest-enhancing strategies research, and an additive model that combined both models. The findings supported the identification model and highlighted the role that externally provided rationales can help students develop the self-determined motivation they need to engage in and learn from uninteresting but personally important activities. The results demonstrated that providing rationale can promote both identification and interest regulation; however, only identification has significant effect on students' engagement.

Furthermore, Legault, Gutsell, and Inzlicht (2011) reported two experimental studies that demonstrated the causal influence of autonomy-supportive strategies on internalization. In the

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first study, emphasizing choice and providing rationale were chosen as autonomy-supportive strategies to create an autonomy-supportive condition, whereas urging the participants to comply with social norms was chosen as a controlling strategy to create a controlling condition. Moreover, a no-intervention group was included as well. They found that the participants in the autonomy-supportive condition demonstrated more self-determined regulations than the participants in the controlling condition and no-intervention condition. When people see the value, they are more likely to internalize it and sustain it. Ironically, the participants in the controlling group demonstrated less self-determined regulations than the participants in the no-intervention group, which indicated that urging people to follow the social norms not only does not work but also produced the opposite of the intended effects. In the second study, they found the consistent results with the priming manipulation.

2.2.2 Autonomy Orientation

The concept of causality orientation helps to explain why different people are differentially healthy, effective, and happy even when they are in the same social context (Ryan & Deci, 2017). According to SDT, causality orientation refers to personality orientations that reflect differences in the extent to which individuals tend to be self-determined in their ongoing interactions with their social surrounds.

Deci and Ryan (1985) proposed three general causality orientations (GCO): the autonomy orientation, the controlled orientation, and the impersonal orientation. The autonomy orientation describes the degree to which people orient toward their environments by treating them as sources of relevant information, as they take interest in both external events and the accompanying inner experiences. When people are high in the autonomy orientation, they tend to use the identified and integrated styles of regulation. The controlled orientation describes the

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degree to which people's attention and concerns tend to be oriented toward external

contingencies and controls. When people are high in the controlled orientation, they tend to use

the external and introjected styles of regulation. Autonomy orientation comprises the tendencies

toward integration, and identification; controlled orientation comprises the tendencies toward

introjection and external regulation.

Causality orientations explain variance in regulatory styles, over and above that explained

by the quality of social contexts. Ryan and Deci (2017) point out that causality orientations could

affect people's interpretations of the external contexts. Compared to a strong controlled-oriented

person, a strong autonomy-oriented person tends to engage in the situations more congruently

and openly and with less defensive responding. Weinstein and Hodgins (2009) examined the

moderating role of causality orientations on the benefits of written emotional expression.

According to previous studies on emotion regulation, Weinstein and Hodgins (2009) believed

that written expression of one's reactions to aversive emotional material facilitates regulation and

promotes positive outcomes. However, they suggested that this strategy not be equally effective

for all individuals. They hypothesized that the strategy of written emotional expression would be

more efficacious for autonomous individuals because they are better equipped to handle or

process negative emotions and therefore more fully utilize the regulation strategy. They used a

Hiroshima-Nagasaki documentary to induce the negative emotion. While watching the

documentary, participants were asked to write about their thoughts and reactions. After the

writing, they completed a series of questionnaires and tasks. Two groups (i.e., autonomy-

oriented vs. controlled-oriented) were constructed based on the participants' scores on General

Causality Orientation Scale (GCOS; Deci & Ryan, 1985). The findings demonstrated that only

autonomy-oriented participants benefited from the expression intervention. Weinstein and

Hodgins (2009) asserted that the autonomy-oriented participants were more open to their experiences and were better able to process their negative emotions. Through a series of studies, Weinstein, Przybylski, and Ryan (2012) developed and validated the Index of Autonomous Functioning (IAF) scale, which provides a measure of dispositional autonomy. In Weinstein's et al. (2012) studies, they demonstrated positive associations between IAF and satisfaction of basic psychological needs, autonomous engagement, and well-being.

In educational settings, students are likely to perceive negative emotion when they are asked to do non-intrinsically motivated activities. However, some students might be very self-supportive and self-motivated, even for activities that might not be intrinsically interesting. Causality orientation is one of the determinants of students' motivation. Vallerand (1997) presented a hierarchical model to address the difference in the level of generality of the motivational concepts within causality orientations and regulatory styles. The model suggests that motivation at a particular level is determined by social-contextual factors at the same level and by motivation at the next higher (i.e., more general) level. For example, Williams and Deci (1996) found that medical students' motivation for learning depended on the autonomy support provided by the teacher (i.e., social-contextual factors at the same level) and students' own causality orientations (i.e., a more general level of motivation). Specifically, students who perceived the instructors as autonomy-supportive became more autonomous in learning, and students with a more autonomy orientation reported more self-determined regulations in learning.

2.2.3 Rationale Generation

Since extrinsically motivated activities are often initially promoted by external conditions or authorities, self-generated rationales would allow people to view their behaviors in terms of

their values and goals rather than in terms of imposition. Vansteenkiste et al. (2018) propose that personalized, learner-centered rationales are more likely to foster self-determined extrinsic motivation in comparison with externally offered rationales. A number of correlational and experimental studies, within the expectancy-value theory literature, have indicated that self-generated rationales promote engagement (Harackiewicz, et al., 2016), academic performance (Harackiewicz, et al., 2016; Hulleman et al., 2011; Hulleman & Harackiewicz, 2009), retention (Canning et al., 2018), course interest (Hulleman et al., 2011; Hulleman & Harackiewicz, 2009), positivity and future career motivation (Brown et al., 2015). In those studies, the intervention is manipulated through a writing task in which participants are asked to explain either how the learning materials are relevant to their lives or why the learning tasks are important or useful to them. Although many positive outcomes have been found through those interventions, it is also possible that participants may perceive such interventions as controlling because they are forced to identify the utility-value of learning. Studies within SDT have found that externally provided rationales, when communicated in a controlling way, failed to promote motivation and learning (Deci et al., 1994; Reeve et al., 2002). In addition, researchers under the guidance of the expectancy-value theory barely associate learners' self-generated rationales with their types of motivation, let alone different types of extrinsic motivation.

So far, there has been little discussion about the effects of rationale generation from the perspective of SDT. In a recent experimental study, Davis et al. (2016) investigated whether self-generated rationales could foster more sense of meaning, as well as more integrated motivation for engaging in goal-relevant behaviors. In their studies, they used the approach of motivation-oriented reflections to prompt students to generate rationales for their academic goals. Specifically, they randomly assigned participants to think about a specific academic goal in

either a motivation-oriented manner (i.e., why do you pursue that goal?) or strategy-oriented manner (i.e., how do you pursue that goal?) and assessed their self-concordance and motivation. They found that participants who did the motivation-oriented reflections reported greater self-concordance and motivation relative to those who did the strategy-oriented reflection. Their findings supported the idea that reflecting on "why" one pursues a goal and generating rationales for pursuing that goal can enhance self-congruent and induce more motivation. Davis et al. (2016) claims that a motivation-oriented reflection on the academic goals can enhance perceived meaningfulness. Furthermore, the perceived meaningfulness of goals can make the students feel more self-concordant, which in turn, lead to more motivation. Although Davis et al. (2016) took the first step in studying the role of rationale generation using the lens of SDT, the research context was different from the current one. In their experiments, participants generated rationales for academic goals, whereas the current research focuses on an uninteresting but required academic activity. Furthermore, Davis et al. (2016) did not differentiate between different types of rationales.

Theoretically, there should be four types of rationales corresponding to the four types of extrinsic motivation (Reeve et al., 2002). Reflecting on the purpose of doing a task and generating rationales may increase the chances of recognizing the importance of the task, but not necessarily the case. For example, an engineering student takes a calculus course because it is required by his or her program. When he/she is asked to generate rationales for attending the classes, he/she might generate various rationales, from "fulfilling the attendance requirement" to "preparing for advanced engineering courses." I argue that students who generate self-determined types of rationales are more likely to develop self-determined types of extrinsic motivation in comparison with those who generate non-self-determined types of rationales.

Rationale generation may have positive effects on autonomous motivation because having opportunities to reflect and generate rationales for required activities tend to increase the likelihood of generating high-quality rationales that associated with integration and identification. Thus far, there is little empirical evidence on the causal effects of self-generated rationales on self-determined extrinsic motivation. Moreover, the distinct effects of various types of self-generated rationales has not been investigated.

2.3 Autonomous Motivation and Learning Outcomes

Numerous studies in SDT have demonstrated that students who have developed more self-determined types of motivation are more likely to stay in school, to achieve, to evidence conceptual understanding, and to be well adjusted (e.g., Grolnick & Ryan, 1989; Kusurkar et al., 2013; Taylor, et al., 2014; Vansteenkiste et al., 2005). Here, I will review several empirical studies using college students as research subjects.

Burton, Lydon, D'Alessandro, and Koestner (2006) examined whether identification and intrinsic self-regulation would predict college students' academic performance, as measured by their final examination grades. They found that implicit measures of identification predicted students' academic performance. The students who had high level identification achieved higher grades on the final exam than did those with low level identification. Jang (2008) compared three theoretical models to explain why an externally provided rationale could support college students' engagement and academic performance. Specifically, Jang (2008) examined an identification model based on SDT, an interest regulation model based on interest-enhancing strategies research, and an additive model that combined both models. The findings supported the identification model showing that identification fostered students' engagement and hence their conceptual learning. Kusurkar et al.'s (2013) surveyed 383 medical students to explore the

relationship between motivation, study strategy, effort, and academic performance. They found

that self-determined motivation positively affected students' study strategy and effort, which in

turn enhance students' GPA. A recent large-scale study using a diverse, broad sample

demonstrated the positive relationships between self-determined motivation and students'

learning outcomes (Levesque-Bristol et al., under review). They tested a general SDT model in

educational settings with a large, diverse sample which included 6,461 college students enrolled

in over 100 foundational courses that vary by discipline (e.g., liberal arts, STEM), instructor type

(e.g., continuing lecturers, full professors), and teaching format (e.g., flipped, face-to-face). This

study has shown that self-determined motivation is positively associated with perceived learning

gains, course grades, and perceived knowledge transferability. Taylor et al. (2014) conducted a

meta-analysis study to examine the relations of different types of motivation to academic

achievement. A total of 18 studies were obtained. The result showed that self-determined

motivation (i.e., intrinsic motivation and identification) have a moderately strong, positive

relation with academic achievement. Non-self-determined motivation (i.e., introjection and

external regulation) had a weak, negative relation with academic achievement. Amotivation had

a strong, negative relation to academic achievement.

2.3.1 Autonomous Motivation and GPA/Course Grade

In the contemporary higher education system, grading schema relies on overall numeric

or letter grades. In the U.S., most universities adopt the alphabetical grading system, which uses

the letter grades A, B, C, D, and F to evaluate student academic performance. Schools or

instructors may also give "plus" or "minus" letter grades, such as A-, or B+. The most common

grading frameworks in higher education are criteria-referenced grading and norm-referenced

grading (Sadler, 2005). Norm-referenced grading separates students by comparing their

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academic achievement to other students'. Criteria-referenced grading compares students' work to predetermined standards which are set by the instructors (Aviles, 2001). In recent years, more and more universities and instructors desire to adopt the criteria-referenced grading because they believe students' grades should not be depended on how other students perform and students deserve to know how their work will be graded at the beginning of the semester (Sadler, 2005). A grade point average (GPA) is a number representing the average value of the course grades earned over time. The most common form of GPA is based on a 4.0 scale calculated using the following formula: A = 4.0, A- = 3.7, B+ = 3.3, B = 3.0, B- = 2.7, C+ = 2.3, C = 2.0, C- = 1.7, D+ = 1.3, D = 1.0, D- = 0.7, and F = 0.0 (e.g., Purdue University Senate Document 96-8, April 28, 1997). GPA is one of the most important indicators of student success within higher education contexts, potentially influencing financial aid, academic honors, and career prospects.

However, course grade and GPA were found to have weak or no correlations with self-determined motivation (e.g., Svanum & Aigner, 2011). Although previous findings showed that self-determined motivation is crucial for academic success, a lack of relationship between self-determined motivation and college students' learning outcomes has also been reported, especially when learning outcomes are measured by course grade and/or GPA (e.g., Baker, 2004; Black & Deci, 2000; Conti, 2000). For example, Black and Deci (2000) examined the relation between self-determined motivation and course grade in a sample of 137 college chemistry students. They found that self-determined motivation was not related to students' final grades. Conti (2000) studied 328 first-year college students to test the relationships among autonomous goals, motivation, GPA, and academic adjustment. GPA was not associated with intrinsic motivation or extrinsic motivation. Baker (2004) used a sample of 91 second-year psychology undergraduates to assess the predictive effects of motivational orientations on academic

performance. The findings showed that neither self-determined motivation, non-self-determined motivation, nor amotivation were associated with students' GPAs. Although Burton et al. (2006) found that implicit measures of identification predicted students' final examination grades, they failed to find the relationship between intrinsic motivation and students' final examination grades. Drawing on SDT, Chen and Jang (2010) examined an SDT-based model for online learner motivation. In their hypothesized model, contextual support positively predicts basic psychological needs, which in turn, positively predicts more self-determined motivation. Moreover, self-determined motivation is hypothesized to result in better learning outcomes. Specifically, they assessed six learning outcomes: hours per week studying, number of hits on the course materials, expected grade, final grade, perceived learning, and course satisfaction. Participants were 267 online students from two online certificate programs. The results of structural equation modeling (SEM) which were performed on the six separate models found that self-determined motivation failed to predict any of the learning outcomes.

The lack of relationship, or at least inconsistent findings, could be explained by the limitations of using GPA/course grades to measure college students' learning outcomes. Course grades could represent quite different things in different contexts. There are multiple grading models (Sadler, 2005), and different universities or department may adopt different models. We do not know if the examinations test the lower levels of Bloom's taxonomy of educational objectives (i.e., knowledge, comprehension) or test the higher levels that constitute critical thinking (i.e., application, analysis, synthesis, evaluation). We do not know if the examinations assess near transfer of knowledge (e.g., repeating what was taught in class) or far transfer (e.g., applying principles to real-life situations). We do not know if the instructors use multiple-choice tests or essay tests. As a proxy for rote memorization and recognition, a certain part of course

grades may be determined by rote memorization. If so, high course grades do not necessarily indicate student learning. For example, Entwistle (2000) found that a surface strategic approach to studying can result in high grades despite the absence of deep learning and individual meaning-making. According to SDT, if a student's study behavior is merely instrumental, then the student is likely to study in the least effortful way. Benware and Deci (1984) conducted an experiment to compare the effects of external regulation and intrinsic motivation on students' rote memorization and conceptual understanding. They found that students in the intrinsic motivation group demonstrated better conceptual understanding than students in the external regulation group; however, rote memorization did not differ between the two groups. Vansteenkiste et al. (2005) also found that self-determined motivation was positively associated with conceptual learning but not rote learning. Moreover, researchers pointed out that course grades and GPA become less effective as a measure of mastery of subject matter due to grade inflation (Waldman & Korbar, 2004). The pervasiveness grade inflation also reduces the variance of course grades and GPA, which makes it more difficult to correlate with other variables (Waldman & Korbar, 2004). A GPA over a semester, year, or school tenure can misrepresent student learning, particularly learning growth over time.

In sum, there are too many confounding variables account for variances of course grades/GPA and make it difficult to reveal the real relation between motivation and student learning. Thus, in addition to course grade and GPA, researchers started to look for alternatives to evaluate student learning outcomes. Bransford and Schwartz (1999) suggested that transfer of learning is an important indicator to evaluate college students' educational success. Compared to course grade or GPA, the value of transfer of learning is that it emphasizes deep understanding rather than rote memorization (Sears, 2017).

2.3.2 Autonomous Motivation and Transfer of Learning

An important goal of higher education is to prepare graduates with the knowledge and skills for success in the workforce. Bransford and Schwartz (1999) suggested that transfer of learning is an important indicator to evaluate college students' educational success. The traditional definition of transfer emphasizes the direct replication and application of prior knowledge and skills in a new situation (Belenky & Nokes-Malach, 2012; Bransford & Schwartz, 1999). Studies under this classical view of transfer often adopt the sequestered problem solving (SPS) paradigm to assess transfer. Under the SPS paradigm, participants took some pretests and then were given the opportunities to learn. Next, participants were tested on a transfer task. Participants are sequestered from possible exposure to helpful resources when they are doing transfer tasks (Bransford & Schwartz, 1999). Transfer of learning was assessed based on how well and/or fast the participants complete the transfer tasks. This traditional view of transfer emphasizes on "transferring out" of situations and treats transfer as something happens after learning (Schwartz, Bransford, & Sears, 2005). Although researchers who take this traditional perspective of transfer have found many important factors that affect transfer, such as the degree of initial learning, using concrete examples, and problem representations, they have worried that it is too hard to find the evidence of transfer (Bransford & Schwartz, 1999). Schwartz et al. (2005) argue that people do poorly in the SPS transfer tests because for many new situations, people do not have sufficient memories, schemas, or procedures to solve a problem. For example, students may rapidly forget the mathematics formula they learned from a calculus course, hence they could not solve the transfer problems correctly. Other students who have never taken a calculus course before cannot solve the transfer problems either because they have no idea about which formula they need to use to solve the problems. From the SPS perspective, the former and the latter students are at the same level regarding transfer of learning.

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Do the former students learn nothing from the calculus course? Instead of seeing schooling as a failure, researchers suggest reconsidering how we should evaluate transfer (Bransford & Schwartz, 1999).

Bransford and Schwartz (1999) expanded the classical definition of transfer to include "the ability to learn in knowledge-rich environments." They developed the preparation for future learning (PFL) paradigm to assess transfer. Unlike SPS measures of transfer, PFL allows people to seek help from other resources, receive feedback, and get opportunities to revise (Bransford & Schwartz, 1999). From the PFL perspective, people not only transfer out of learning, they bring in their prior knowledge and skills as they begin learning. Researchers refer to the latter as "transferring in" of situations (Schwartz et al., 2005). Unlike SPS focusing on "transfer out" exclusively, PFL emphasizes both "transfer in" and "transfer out" processes and measures transfer with a dynamic assessment called double transfer design (Schwartz et al., 2005). It usually contains three phases. In Phase 1, participants study under various conditions (e.g., experimental condition vs. control condition). In Phase 2, they all receive opportunities to learn from a new resource. In Phase 3, participants are asked to solve a transfer problem, which is related to the material included in Phase 2. The value of double transfer design has been demonstrated in Schwartz and Martin's (2004) work. At the beginning of their studies, they assigned half of the participants to an invention condition and half to a "tell-and-practice" condition. Next, within each condition, half of the participants were given a learning resource (i.e., a worked example). Then, all participants were asked to solve the target transfer problem. The results showed that without learning resources, participants in the two instructional conditions demonstrated the same level of transfer. However, the participants in the invention

condition performed better than the participants in the "tell-and-practice" condition on the transfer task when a worked example was embedded in the assessment.

According to SDT literature, self-determined types of motivation are associated with constructive and reflective cognitive processes and active learning. Bereby-Meyer and Kaplan (2005) state that transfer is enhanced when people are actively involved in the learning process. It seems that self-determined motivation can enhance transfer through high-quality engagement; however, empirical evidence on effects of different types of motivation on students' transfer of learning is quite limited. Levesque-Bristol (2006) and colleagues developed the integrative model for learning and motivation (IMLM) to explain how student motivation contributes to engagement, meta-cognition, and knowledge transfer. According to this model, knowledge transfer is more likely if students have more self-regulated forms of motivation. Several recent studies testing the IMLM demonstrated the positive relationships between self-determined motivation and students' perceived knowledge transfer (e.g., Hsu et al., 2019; Levesque-Bristol et al., under review; Wang, Hsu et al., 2019). Furthermore, the correlation between self-determined motivation and perceived knowledge transfer was much stronger than the correlation between self-determined motivation and course grades (Hsu et al., 2019; Levesque-Bristol et al., under review; Wang Hsu et al., 2019). Those researchers took a first step in examining the relationship between motivation and transfer based on SDT framework; however, in those studies, self-determined motivation was calculated as a composite score, so we don't know how individual motivation styles influence transfer. Moreover, the assessment of transfer might be questionable in those studies (Hsu et al., 2019; Wang, Hsu et al., 2019) because it relied solely on students' self-reports, which may account for the stronger relationship between motivation and transfer (Wang, Zhang, & Yao, 2019).

Although there is not much direct evidence, studies on the effects of intrinsic motivation and extrinsic motivation may shed some light on the relation between self-determined motivation and transfer. In Trace, Tannebaum, and Kavanagh's (1995) study, both extrinsic reinforcement and intrinsic reinforcement have significant positive correlations with transfer behavior. Taylor, Russ-Eft, and Chan's (2005) found that transfer was greatest when extrinsic components were involved in trainees' work environments. Bransford, Brown, and Cocking (2000) mentioned that although extrinsic rewards affect behavior, people work hard for intrinsic reasons as well. Burke and Hutchins (2007) reviewed literature on training transfer and pointed that both extrinsic and intrinsic factors have influences on transfer, and findings appear to favor intrinsic factors. Overall, the findings of the effects of intrinsic and extrinsic motivation on transfer are mixed (Burke & Hutchins, 2007). In these studies, motivation is viewed as a dichotomy. However, according to SDT, people can still perceive autonomy even when enacting extrinsically motivated behavior (Deci & Ryan, 2002). As previously stated, integration and identification are extrinsic motivation; however, they are self-determined as well. I believe the relationship between motivation and transfer should be stronger when we view motivation in terms of a continuum of self-determination rather than a dichotomy.

Evidence from transfer literature on the effects of other motivational constructs on transfer might have implications as well. Much of the traditional transfer research focused on the cognitive factors (e.g., Chen, Mo, & Honomichl, 2004; Day & Goldstone, 2012; Holyoak & Koh, 1987), and overlooked the motivational influences (Burke & Hutchins, 2007; Perkins & Salomon, 2012). Recently, researchers started to link transfer of learning with motivational factors, such as achievement goals (e.g., Belenky & Nokes-Malach, 2012; Bereby-Meyer & Kaplan, 2005), and subjective task values (e.g., Axtell, Maitlis, & Yearta, 1997). Consistent with

other studies on the effects of achievement goals on learning, learners with mastery goals performed better on a transfer task than the ones with performance goals (e.g., Bereby-Meyer & Kaplan, 2005; Bereby-Meyer, Moran, & Unger-Aviram, 2004). For example, Belenky and Nokes-Malach (2012) studied 104 undergraduates to investigate how students' achievement goals interact with different forms of instruction to enhance transfer. They adopted the PFL paradigm and found the main effect of achievement goals on transfer. Specifically, students with a high mastery-approach goal orientation were more likely to transfer than the ones with a low mastery-approach goal orientation. People may adopt different learning strategies due to different goal orientations. Performance-oriented students may implement mechanically memorizing strategy in order to gain high grades, while mastery-oriented students may use deep processing approach to understand the learning material. Adopting deep learning strategies could help the students form mental representations of the information they learned, which would further promote transfer ability.

Transfer is also influenced by subjective task values (Burke & Hutchins, 2007). People who believe in the value of knowledge/skills are more likely to apply the knowledge/skills. Axtell et al. (1997) examined multiple influential factors on trainees' skill transfer, including perceived relevance/usefulness of the course, self-efficacy, motivation to transfer, management support, and autonomy. They found that people who perceived training as relevant had higher levels of skill transfer. This finding suggests that perception of the relevance and usefulness of the learning is a key variable in determining the level of transfer. Lim and Morris (2006) studied 181 Korean employees and found that people's immediate learning needs significantly affected their perceived learning transfer. Perceived value may affect transfer through engagement and transfer propensity. As one of the self-determined types of motivation, identification is closely

related to subjective task values. People with identification do an activity because it is personally important to them. Thus, students with a high-level identification are more likely to see the value of learning than the ones with a low-level identification.

The effects of motivation on learning outcomes can be quite different depending on the characteristics of the assessment task. According to SDT, self-determined types of motivation have more advantages in light of difficult or complex actions (Ryan & Deci, 2017). Benware and Deci (1984) compared the effects of external regulation and intrinsic motivation on students' rote memorization and conceptual understanding. They found that students in intrinsic motivation group demonstrated better conceptual understanding than students who learned in order to take an exam (i.e., external regulation); however, rote memorization did not differ between the two groups. Recent research suggests that transfer of learning, as a prototype of deep understanding and application, can be a more effective indicator to examine the effects of autonomous motivation on learning (Hsu et al., 2019; Wang, Hsu et al., 2019). Thus, I hypothesize that when the assessment task focuses on the rote memorization or recognition, non-self-determined motivation may work as well as self-determined motivation. However, when assessment tasks focus on deep understanding and application, self-determined motivation will demonstrate advantages over non-self-determined motivation. In the present research, I examined the relations between motivation and various types of learning outcomes, including perceived learning, rote learning, and transfer of learning. In the current work, transfer of learning is defined as the capability of applying prior knowledge and skills in a new situation (Belenky & Nokes-Malach, 2012; Bransford & Schwartz, 1999). I used both self-reports and actual performance on transfer tasks to measure transfer of learning. Based on the empirical evidence and the essence of rote learning and transfer of learning, I hypothesize that the relationship

between self-determined motivation and transfer is stronger than the relationship between self-

determined motivation and rote learning.

CHAPTER 3: GENERAL METHODS

This chapter outlines the general methods used to conduct the current research. Chapter 3 broadly overviews the research questions and hypotheses, participants, measures and materials, research procedures, and data analysis methods. Specific method sections are also presented in the standalone academic manuscripts in Chapter 4 and Chapter 5.

3.1 Overview of the Research Design

The purpose of the current research is to use SDT as the framework to identify and examine individual factors that affect students' motivation and learning outcomes during uninteresting but required academic activities. Specific research objectives are: (1) to investigate the effects of rationale generation orientation on student motivation and learning outcomes through the lens of self-determination theory; (2) to examine whether reflecting on the purpose of doing an activity, an approach to prompt students to generate rationales, can promote students' situational autonomous motivation, rote learning, and transfer of learning; and (3) to understand students' perspectives on uninteresting learning experiences and successful motivational strategies in the context of higher education.

To answer these questions, an explanatory sequential mixed method design was conducted. In Study 1, a cross-sectional correlational study, I used structural equation modeling (SEM) to examine the relations among rationale generation orientation, motivation, and learning outcomes. Extending Study 1, Study 2 used experimental manipulation of rationale generation to demonstrate the causal effects of rationale generation on students' situational motivation and performance. The hypothesis of Study 2 is that, compared to the control group, participants in the rationale generation intervention group have higher scores in autonomous types of motivation,

rote learning, and transfer of learning. In addition, the effects of rationale generation would be

stronger on transfer of learning than on rote learning. Study 3 sought to gain students'

perspectives on rationale generation and other successful motivational strategies and to seek the

explanations related to studies 1 and 2's findings. Semi-structured interviews were conducted

with students regarding their experiences of doing uninteresting but required academic activities

and the motivational strategies they used.

3.2 Hypotheses and Research Questions

In Study 1, I examined the relations among rationale generation orientation, basic

psychological needs, motivation, and learning outcomes in the context of doing uninteresting but

required academic courses. Hypothesis 1: rationale generation tendency and quality influence

whether participants perceive their basic psychological needs are fulfilled. This, in turn, would

affect perceptions of autonomous extrinsic motivation and controlled extrinsic motivation, which

then would influence students learning outcomes, including perceptions of learning satisfactions

and perceived transferability. Hypothesis 2: Rationale generation quality has stronger

associations with the related constructs than the rationale generation tendency. The hypothesized

SEM model is depicted in Figure 3.1.
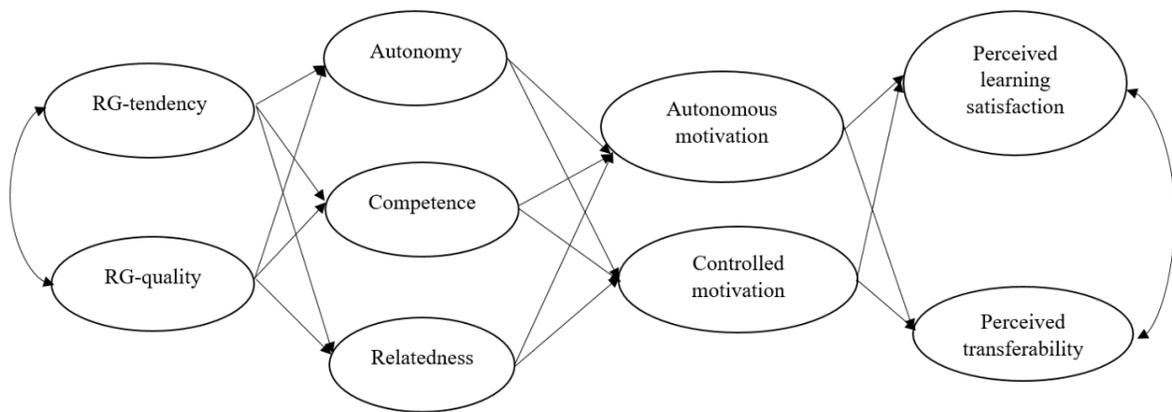
Figure 3.1 The hypothesized SEM model.

In Study 2, I examined the role of rationale generation for promoting autonomous motivation and learning outcomes. Hypothesis 1: compared to the control group, participants in the rationale generation group would have higher scores in autonomous types of motivation, rote learning, and transfer of learning. Hypothesis 2: the effects of rationale generation would be stronger on transfer of learning than on rote learning.

In Study 3, I had two research questions:

1. How do students perceive uninteresting but required academic activities?

2. What are the common strategies that students use to motivate themselves when they are involved in uninteresting but required academic activities?

3.3 Participants

In Study 1, 263 undergraduate and graduate students were recruited from a large research-intensive university in the Midwestern United States via email (see Appendix A). Forty-four participants completed only part of the survey because they failed to recall any uninteresting but required academic courses in the past year. Thus, the analytic dataset for the SEM included 219 students (133 females and 82 males). About 48% of the participants were between 18 and 20, 36% of the participants were between 21 and 25, and 16% of the participants were 26 or older. Approximate 78% of the participants reported being White.

In Study 2, 82 (49 females and 33 males) graduate students from a large research-intensive university in the Midwestern United States participated in the experiment. Participants were recruited via paper flyers (see Appendix B) and emails (see Appendix C). Twenty-four participants were between 21 and 25, and 58 participants were 26 or older. Forty participants reported being Asian, 22 participants reported being White, five participants reported being African American, seven participants reported being Hispanic or Latino, and seven participants

reported being others. These participants were from various academic disciplines, including education ($n = 23$), engineering ($n = 15$), liberal arts ($n = 14$), science ($n = 12$), technology ($n = 6$), agriculture ($n = 4$), management ($n = 3$), pharmacy ($n = 3$), and others ($n = 2$). Participation in this study was voluntary, and participants received \$5 for their time and participation. The responses of 12 participants were eliminated from the dataset because they thought the learning task in the experiment was definitely interesting.

Participants in Study 3 were recruited from the students who have participated in my Study 2 and permitted me to contact them for follow-up studies. I sent recruitment emails (see Appendix D) to them, and 11 students (five females and six males) volunteered to participate in the interview. One participant was between 21 and 25, and ten participants were 26 or older. Four participants reported being Asian, two participants reported being White, two participants reported being African American, two participants reported being Hispanic or Latino, and one participant reported being other. These participants were from various academic disciplines, including education ($n = 7$), engineering ($n = 2$), psychology ($n = 1$), and science ($n = 1$). Participation in this study was voluntary, and participants received \$5 for their time and participation.

3.4 Measures and Materials

3.4.1 Rationale Generation Orientation Scale (RGOS)

The RGOS measures people' tendency to generate rationales for their learning behaviors and inclinations to produce autonomous rationales. An initial pool of the RGOS consisted of 15 items (see Appendix E). Three items were adopted from an existing instrument, enhancement of personal significance, which is a subscale of the Motivational Regulation Questionnaire (MRQ; Schwinger, Steinmayr, & Spinath, 2009). Twelve items were created by the author based on the

conception of rationale generation orientation, six items for rationale generation tendency and six items for rationale generation quality. These statements were constructed by referring to the MRQ, the IAF, and the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). The RGOS contains two subscales: tendency (e.g., "I tend to think about reasons for studying while I study.") and quality (e.g., "I tend to see connections between learning and my professional goals."). The RGOS uses a 5-point Likert scale ranging from 1("rarely") to 5 ("very often"). The validity and reliability of the RGOS were demonstrated in the present study. The RGOS was used in both Study 1 and Study 2.

3.4.2 The Index of Autonomous Functioning (IAF)

The IAF (Weinstein et al., 2012) is a measure of dispositional autonomy. It contains three subscales, namely, Authorship/Self-congruence (e.g., "My decisions represent my most important values and feelings"), Susceptibility to Control (e.g., "I do things in order to avoid feeling badly about myself"), and Interest-taking (e.g., "I often reflect on why I react the way I do"). Each subscale includes five items rated on a 5-point Likert scale ranging from 1 ("not at all true") to 5 ("completely true"). The internal reliabilities were satisfactory for all subscales, $\alpha =$ .85 for Authorship/Self-congruence, $\alpha = .90$ for Interest-taking, and $\alpha = .77$ for Susceptibility to Control in Study 1. The items of IAF are shown in Appendix F. The IAF was only used in Study 1.

3.4.3 Basic Psychological Need Satisfaction and Frustration Scale (BPNSFP)

The Basic Psychological Need Satisfaction and Frustration Scale (Chen et al., 2015) was used as a measure of students' satisfaction and frustration of autonomy, competence, and relatedness. The BPNSFP contains 24 items which correspond to six subscales: autonomy

satisfaction (e.g., "I feel a sense of choice and freedom in the things I undertake."), autonomy frustration (e.g., "I feel forced to do many things I wouldn't choose to do."), competence satisfaction (e.g., "I feel confident that I can do things well."), competence frustration (e.g., "I have serious doubts about whether I can do things well."), relatedness satisfaction (e.g., "I feel that the people I care about also care about me."), and relatedness frustration (e.g., "I feel excluded from the group I want to belong to."). The validity and reliability of the scale have been supported by Chen et al.'s (2015) work. Each subscale is comprised of four items. Students respond to the questions on a five-point Likert scale from 1 ("not true at all") to 5 ("completely true"). The internal reliabilities were satisfactory in Study 1, although autonomy satisfaction was a bit low, $\alpha = .69$ for autonomy satisfaction, $\alpha = .76$ for autonomy frustration, $\alpha = .90$ for competence satisfaction, $\alpha = .81$ for competence frustration, $\alpha = .85$ for relatedness satisfaction, and $\alpha = .72$ for relatedness frustration. All items of BPNSFP are shown in Appendix G. This scale was only used in Study 1.

3.4.4 Situational Motivation Scale (SIMS)

Participants' perceptions of their reasons for engaging in uninteresting but required academic courses/activities were measured using a modified version of SIMS (Guay, Vallerand, & Blanchard, 2000; Levesque-Bristol, Knapp, & Fisher, 2010; see Appendix H). The scale includes 18 items, all of which use a 7-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Within the SIMS, there are six subscales, which measure the six types of motivation proposed by Deci and Ryan (1985, 2000). Each subscale is comprised of three items per subscale: intrinsic motivation (IM; e.g., "Because I really enjoy it"), integration (INTEG; e.g., "Because learning all I can about academic work is really essential for me"), identification (IDEN; e.g., "Because it allows me to develop skills that are important to me"), introjection

(INTRO; e.g., "Because I would feel bad if I didn't"), external motivation (EM; e.g., "Because I feel I have to"), and amotivation (AM; e.g., "Because I don't know. I have the impression I'm wasting my time"). Only the four types of extrinsic motivation were included in the current research. Internal consistency was acceptable in Study 1 for all subscales, although external regulation was a bit low: integration ($\alpha = .86$), identification ($\alpha = .79$), introjection ($\alpha = .87$), and external regulation ($\alpha = .64$). An overall level of autonomous motivation was calculated by averaging integration and identification, while an overall level of controlled motivation was calculated by averaging introjection and external regulation. This scale was used in both Study 1 and Study 2.

3.4.5 Perceived Knowledge Transferability Scale (PKTS)

Student perceptions of how relevant the knowledge learned in the target course will be for future courses and their career paths were measured using the PKTS (Levesque-Bristol, Richards et al., under review). The PKTS includes eight statements, all of which used a 7-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Two examples of statements from the PKTS are "I understand how I will use the information learned in this class in my professional life" and "I feel confident in my ability to apply the course material in other classes that I have." Internal consistency coefficient of the PKTS in Study 1 was high ($\alpha = .92$). The items are shown in Appendix I. This scale was used for both Study 1 and Study 2. The whole scale was used in Study 1. Three items of the scale were used in Study 2 (see Appendix I) to measure participants' perceptions of how relevant the knowledge learned in the experiment would be useful for their career paths.

3.4.6 Perceived Learning Satisfaction (PLS)

Students' perceptions of learning satisfaction were assessed using the Perceived Learning Satisfaction Scale (Kim, Kwon, & Cho, 2011). It is composed of seven items, which are from two separate subscales, including perceived learning achievement and class satisfaction. The perceived learning achievement scale measures how students perceive their learning (e.g., "I feel that this course served my needs well," Sun, Tsai, Finger, Chen, & Yeh, 2008, p.1199). The class satisfaction scale measures how satisfied students are with the course (e.g., "I would like to recommend this course to others," Eom, Wen, & Ashill, 2006, Sun et al., 2008, p. 233). All items were modified to be fit into this study in terms of language and assessed using a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The Perceived Learning Satisfaction Scale showed high internal reliability ($\alpha = .92$) in Study 1. The full modified scale is presented in Appendix J. This scale was used in both Study 1 and Study 2. In Study 1, I used six items from the scale, whereas in Study 2, four items were chosen to assess participants' perceptions of learning satisfactions.

3.4.7 Uninteresting but Required Academic Activity

I developed an uninteresting learning activity for Study 2. It is about APA formatting. I selected this activity based on the criteria proposed by Jang (2008): (a) Students generally perceive it to be uninteresting, (b) it holds ecological validity, and (c) it possesses hidden value and relevance. I created a one-minute introduction video, a ten-minute lesson video, and a three-minute lesson video. The lesson videos cover the following topics: numbers and in-text citations, and reference list. The lessons were presented in an uninteresting format. That is, the speaker used a monotonous tone, devoid of interest-enhancing embellishments (following Jang, 2008).

3.4.8 Manipulation Check

To ensure that participants perceive the experimental material as uninteresting, I asked participants to rate the APA formatting tutorial on a 5-point Likert scale with 1 = definitely interesting and 5 = definitely not interesting.

3.4.9 Rote Learning

I created eight multiple-choice items (See Appendix K for the items) to measure participants' recognition of facts. Each multiple-choice items were scored as correct (1) or incorrect (0). These scores were added up to obtain an overall score of rote learning. The possible score of rote learning was from 0 to 8. To avoid guessing, I put I don't know as one of the options and told the participants not to choose the answers at random. The content validity of the items has been supported by one faculty member and two doctoral students in educational psychology who are very familiar with APA formatting. This measure was only used in Study 2.

3.4.10 Transfer of Learning

I created two transfer tasks to assess participants' performance on transfer of learning in Study 2. Transfer task 1 was used to measure participants' transfer of learning in the main study of Study 2 (see Appendix L). It consisted of 11 formatting errors related to in-text citation and numbers, which were covered in the ten-minute video of the main study of Study 2. Each formatting errors were scored as successfully identified (1) or missed (0). These scores were summarized to obtain an overall score of transfer of learning. Therefore, the possible score of transfer task 1 was from 0 to 11. Transfer task 2 was created to measure participants' transfer of learning in the follow-up study of Study 2 (see Appendix M). It consisted of five formatting errors related to reference lists, which was covered in the three-minute video of the follow-up

study of Study 2. Similar to the coding rule of transfer task 1, each formatting errors were scored

as successfully identified (1) or missed (0). A summarized score was used to represent transfer of

learning in the follow-up experiment. The scores of transfer task 2 ranged from 0 to 5. The

content validity of the materials has been supported by one faculty and one doctoral student in

educational psychology who are very familiar with APA formatting. These two tasks were only

used in Study 2.

3.4.11 Interview Protocol Development

The interview protocol was designed to elicit participants' perceptions of uninteresting

but required academic activities, how they felt and reacted in such situation, and what strategies

they used to keep themselves motivated to engage in such activities. The interview questions

were developed from Wolters' (1998) open-ended questionnaire. The original protocol was

revised after consulting with two faculty members in Educational Psychology. I conducted three

pilot interviews with two graduate students from Education and one graduate student from

Technology to clarify unclear terms in the statement and estimate the length of the interview.

The final version of the interview protocol was used for individual interviews (see Appendix N).

The interview protocol was only used in Study 3.

3.5 Research Procedures

Study 1 was conducted solely online using the Qualtrics survey software, which took

about 10-15 minutes. The Office of the Registrar sent a recruitment email to students who were

enrolled as full-time students at a large Midwest university in the 2019 spring semester.

Participation was voluntary. Participants went to the online Qualtrics survey link and took the

survey, which consisted of 81 items from the aforementioned assessments. Participants were first

asked to complete the RGOS and the IAF. Then, they were asked about whether they have prior experiences (less than 1 year) in participating in uninteresting but required courses? If the participants failed to recall such experiences, then they were directed to the end of the survey. Participants who were able to recall such experiences were asked to select one recent uninteresting but required course and respond to all the remaining items regarding that course. The uninteresting but required courses that recalled by the participants spanned various academic disciplines. A summary of the courses is shown in Appendix O.

Study 2 was conducted in labs. Graduate students who are over 18 years old were invited to join the experiment. The total time commitment for this experiment is 30 minutes, and eligible participants received $5 for completing the study. All materials, including the lesson videos, were presented in Qualtrics. During the experimental session, the experimenter first briefly introduced the procedure of the experiment and then collected the signed consent forms from the participants. The participants were randomly assigned to either the rationale generation group or the control group. The experiment consists of three phases. Phases 1 and 2 take place inside the computer lab while phase 3 occurs outside the computer lab. In phase 1, all participants watched a one-minute video introducing APA formatting. Following this introduction, the rationale generation group was asked to write a short paragraph explaining why they would learn APA formatting while the control group was asked to type a few sentences regarding the confidentiality of the experiment. In phase 2, all participants were asked to watch a ten-minute video regarding the knowledge of APA formatting, which possesses hidden value and relevance but is presented in an uninteresting format. Then, they were given eight multiple-choice questions to check for rote learning. After that, all participants were asked to complete a survey, a manipulation check of the uninteresting activity, and transfer task 1. At the end of the

experiment, they were asked to leave their email addresses if they are interested in participating

in the follow-up experiment (i.e., phase 3), which was conducted to assess the lasting effect of

the intervention on transfer of learning over one week as educational intervention might result in

improved performance on a delayed assessment but not on an immediate assessment (McLaren,

Adams, & Mayer, 2015). The experiment in phase 3 was done solely online, so participants did

not need to come to the computer lab. The time commitment for phase 3 is eight minutes or less.

Participants watched a three-minute video regarding APA reference style and then completed

transfer task 2. Participation in phase 3 is voluntary without any incentive. Figure 3.2 displays

the diagram of the experimental procedure of Study 2.
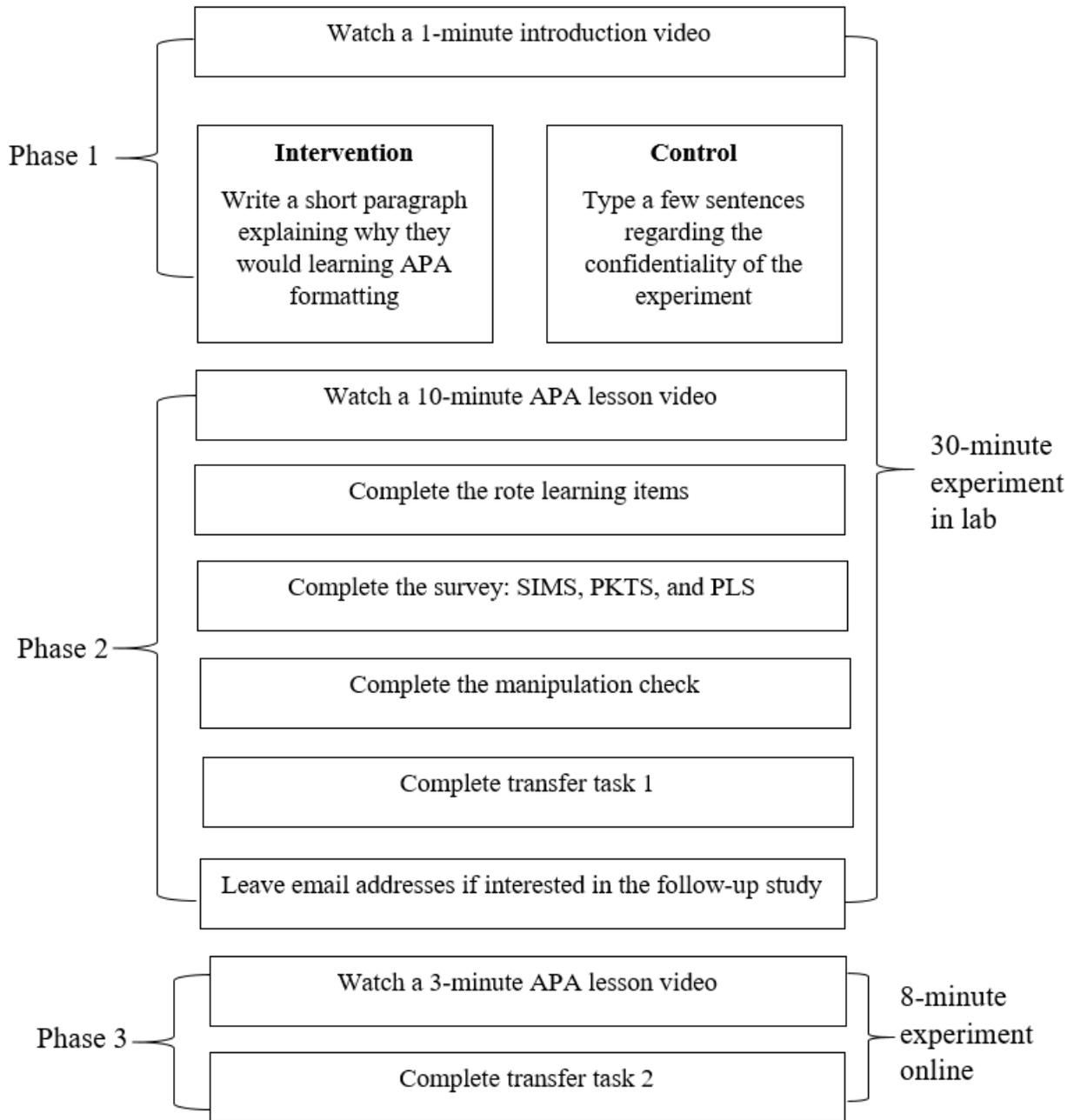
Figure 3.2 The diagram of the experimental procedure of Study 2

Study 3 was conducted in the researcher's office. Individual interviews were conducted with participants who volunteered to participate in the interview. When participants came to the interview room, they would be directed to sign the consent form, and then I introduced the interview procedure to them. In the introduction of the interview, participants were oriented to

select and recall one uninteresting but required academic activity that is closely related to their

majors, one uninteresting but required academic activity that is not related to their majors, and

one interesting academic activity they have participated in that is closely related to their majors.

During the interview, the participants shared their experiences and perspectives based on the

questions in the interview protocol. The interviews were audiotaped and lasted approximately

20-30 minutes.

3.6 Data Analysis Methods

Data analysis of Study 1 involved two stages. First, I identified and validated the

structure of the RGOS with exploratory factor analysis (EFA), and confirmatory factor analysis

(CFA). To address this question, the dataset was randomly split into two pieces: the calibration

dataset ($n = 131$), and the confirmation dataset ($n = 132$). An EFA using SPSS 25.0 was

conducted on the calibration dataset to identify an underlying factor structure for the initial

RGOS items. Then, a CFA using LISREL 8.80 (Jöreskog & Sörbom, 2006) was conducted on

the confirmation dataset to examine the reliability and validity of the factor structure emerging

from the EFA. To examine the convergent validity of RGOS, I tested the correlations between

RGOS and IAF. Based on the SDT, these two constructs should be positively correlated. Before

testing the SEM model, I investigated the associations between RGOS and whether the students

were able to recall uninteresting but required learning experiences using cross-tabulation chi-

square tests. A significant result indicates that these two variables were correlated. In the second

stage, the hypothesized measurement model (see Figure 3.1) was examined with structural

equation modeling (SEM). The following commonly used goodness-of-fit indices were

examined to evaluate model fit in the CFA and SEM: the root mean square error of

approximation (RMSEA), the non-normed fit index (NNFI), the incremental fit index (IFI), and

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the comparative fit index (CFI). The NNFI, IFI, and CFI values range from 0 to 1, and values above .90 are indicative of acceptable fit. RMSEA value also ranges between 0 and 1, but values closer to 0 are indicative of a better fitting model. Values below .08 indicate a good fitting model (Hu & Bentler, 1999). A significant factor loading, as determined by a standardized coefficient of .30 or above, indicates that the item is a good measure of the underlying factor (Hatcher, 1994).

For Study 2, I first eliminated the data of the participants ($n = 12$) who had a score of one ($1 =$ "definitely interesting") on the manipulation check of uninteresting activity because this study focuses on students' uninteresting learning experiences. Then I used an independent samples t-test to compare the situational motivation, perceived learning satisfaction, perceived knowledge transferability, rote learning, and transfer of learning between the experimental group and the control group. Cohen's d is used as a measure of effect size. A Cohen's d between 0.15 and 0.40 is considered as a small effect, between 0.40 and 0.75 is a medium effect, and above 0.75 is a large effect (Cohen, 1992). The assumptions of independent samples t-test, including normality, and independence were checked. I conducted a cross-tabulation chi-square test to check whether there was an association in the population between experimental condition and participation in the follow-up. Next, I ran another independent samples t-test to compare the follow-up transfer of learning between the rationale generation group and the control group. To explore the effect of the rationale quality on motivation and learning, I coded the rationale generation group into two subgroups: the high-quality group and the low-quality group, based on the content analysis on the rationales they generated. If participants list only rationales related to external regulation or introjection, which are considered as low-quality rationales, then they are coded into the low-quality group. An example of a low-quality rationale is that "The reason why

I learn APA style is because my dissertation is required to follow APA standard." If participants list at least one rationale related to integration or identification, which are considered as high-quality rationales, then they are coded into the high-quality group. An example of a high-quality rationale is that "I have never used APA style of writing, but after watching the video, I think it would be useful for my academic work." Examples of coding is shown in Appendix P. A multivariate analyses of variance (MANOVA) was carried out to examine condition differences in the target dependent variables since I had three groups in total, including the low-quality rationale group, the high-quality rationale group, and the control group. For each significant F test, multiple comparisons were conducted to compare between groups. η^2 is used as a measure of effect size for the MANOVA. A η^2 between 0.01 and 0.06 is considered as a small effect, between 0.06 and 0.14 is a medium effect, and above 0.14 is a large effect (Cohen, Miles & Shevlin, 2001).

The audiotaped interviews were transcribed using the rev.com transcription service. The researcher compared the transcripts to the original recordings and modified the transcripts to ensure the accuracy of the transcribed interview data. For data analysis, an exploratory content analysis was used to find common themes about students' experiences in uninteresting but required academic activities and their motivational strategies. Content analysis refers to "the process of organizing and quantifying the contents of the data into pre-determined categories relevant to the central research question(s) in a systematic, replicable and objective manner." (Mackieson, Shlonsky, & Connolly, 2018, p 5) First, the meaning units were coded by open codes. Then I created categories by grouping the open codes that share a commonality. Finally, I elicited themes by using selective categories. For example, the open codes for participants' feelings toward uninteresting but required major-related academic activities were disappointing,

uninteresting, important, and challenging. Three categories were created to summarize the open

codes. All participants felt that the uninteresting but required major-related academic activities

were uninteresting. Two of participants stated that the activities were also important. Only one

participant mentioned the challenging aspect of such activities. The theme I extracted was that

participants had negative feelings towards uninteresting but required major-related academic

activities; however, occasionally, they could also see the importance of doing them. The category

of challenging was not included in extracting the theme as it was only mentioned by one

participant. Appendix Q displays the open codes, the categorizations, and the themes.

3.7 Summary of the General Methods

Table 3.1

Summary of the Research Methods for the Whole Dissertation Studies

	Study 1	Study 2	Study 3
Research Design	Quantitative: a cross-sectional correlational study	Quantitative: a manipulative lab experiment	Qualitative: one-on-one interviews
Research Questions	What are the relations between rationale generation orientation, motivation, and learning in uninteresting but required learning contexts?	Can rationale generation intervention enhance autonomous motivation and learning performance?	1) How do students perceive uninteresting but required academic activities? 2) What are the common strategies that students use to motivate themselves when they are involved in uninteresting but required academic activities?
Hypotheses	Hypothesis 1: Rationale generation tendency and quality influence basic psychological needs, which in turn, affect motivation and learning outcomes. Hypothesis 2: Rationale generation quality has stronger associations with the related constructs than the rationale generation tendency.	Hypothesis 1: Compared to the control group, participants in the rationale generation group would have higher scores in autonomous types of motivation, rote learning, and transfer of learning. Hypothesis 2: The effects of rationale generation would be stronger on transfer of learning than on rote learning.	
Participants	263 undergraduate and graduate students	82 graduate students	11 graduate students

(continued)

Measures	RGOS, IAF, BPNSF, SIMS, PKTS, PLS	RGOS, SIMS, PKTS (3 items), PLS (4 items)	
Materials		Uninteresting but required academic activity, manipulation check, rote learning, transfer of learning	Interview protocol development
Research Settings	Online via Qualtrics	Main study: laboratories Follow-up: online via Qualtrics	In-person interviews in the researcher's office
Data Analyses	EFA, CFA, correlation, cross-tabulation, SEM	Independent samples t-test, cross-tabulation, MANOVA, correlation	Content analysis

CHAPTER 4: MANUSCRIPT 1-STUDY 1

This chapter is written based on Study 1.

Title: Roles of Rationale generation orientation in Uninteresting but Required Academic Activities

4.1 Introduction

School learning is not always fun. In the real-world of school-related tasks, a lot of academic activities that contribute most to the development of valuable skills are experienced as uninteresting and tedious (Yeager et al., 2014). In order to function effectively at school, students have to participate in activities that are not inherently interesting but are valued by teachers, programs, or societies. For example, an engineering freshman may not like solving mathematical problems; however, he or she has to take a calculus course to meet the requirement for more advanced engineering courses. When a person is asked to do something that does not interest him or her, the motivation can range from unwillingness, to passive compliance, and to active personal commitment.

Though sometimes undesirable, extrinsic motivation is essential in driving students to engage in learning, especially when intrinsic motivation is unattainable. Extrinsic motivation refers to the state of doing activities for instrumental reasons. As one of the sub-theories of the self-determination theory (SDT; Deci & Ryan, 2000), the organismic integration theory (OIT) addresses the topic of extrinsically motivated behaviors by introducing the concept of internalization (Ryan & Deci, 2017). According to OIT, people have an inherent tendency to integrate socially-valued regulations that are initially perceived as being external (Koestner & Losier, 2002). Based on the degrees of internalization, there are four regulatory styles: external

regulation, introjection, identification, and integration. In SDT, identification and integration are autonomous types of extrinsic motivation, while introjection and external regulation are controlled types of extrinsic motivation. In SDT, abundant research has demonstrated that students who have developed more self-determined regulatory styles are more likely to achieve (e.g., Grolnick & Ryan, 1989; Kusurkar, Ten Cate, Vos, Westers, & Croiset, 2013; Taylor et al., 2014), to evidence conceptual understanding (e.g., Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005), and to adjust (e.g., Grolnick & Ryan, 1989; Kusurkar et al., 2013), compared to their peers.

How can we foster autonomous types of extrinsic motivation? Generally speaking, factors in the social environment that satisfy individuals' needs for autonomy, competence, and relatedness are assumed to facilitate the internalization of non-intrinsically motivated behaviors (Ryan & Deci, 2017). There is substantial evidence in terms of what teachers could do to facilitate students' internalization (Deci, Eghrari, Patrick, & Leone, 1994; Jang, 2008; Reeve, Jang, Hardre, & Omura, 2002; Savard, Joussemet, Pelletier, & Mageau, 2013; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). Recently, researchers propose that more work is needed to explore the role of the characteristics of the learners in the process of internalization (Vansteenkiste et al., 2018). In addition to the contextual factors, students bring their own influential characteristics into the classroom, which explains why people are differentially healthy, effective, and happy even when they are in the same social context. It is especially important for college students to learn to deal with these motivational obstacles on their own because studying is unsupervised most of the time in college.

In the present study, I use SDT as my guiding framework to investigate what students can do to keep themselves motivated during uninteresting but required academic activities. One

important individual factor fostering autonomous motivation could be rationale generation. Compared to externally offered rationales, self-generated rationales are more likely to provoke perceptions of self-relevance (Vansteenkiste et al., 2018), which tends to foster autonomous motivation. A number of correlational and experimental studies, within the expectancy-value theory literature, have indicated that self-generated rationales promote engagement (Harackiewicz, Canning, Tibbetts, Priniski, & Hyde, 2016), academic performance (Harackiewicz, et al., 2016; Hulleman & Harackiewicz, 2009; Hulleman, Godes, Hendricks, & Harackiewicz, 2011), retention (Canning et al., 2018), course interest (Hulleman & Harackiewicz, 2009; Hulleman et al., 2011), positivity and future career motivation (Brown, Smith, Thoman, Allen, & Muragishi, 2015). Thus far, rationale generation has only been investigated as an intervention approach, mostly from the perspective of expectance-value theory. However, it can also be a personal orientation that reflects differences in people's tendency to generate rationales for external demands. There is no existing self-report questionnaire for measuring this construct. Therefore, one of the tasks of the current work is to create a scale to measure rationale generation orientation, so researchers will be able to examine the relations between rationale generation orientation and other constructs.

To my best knowledge, no one has studied the effects of rationale generation, as a chronic orientation, on autonomous extrinsic motivation. This study aims to investigate the effects of rationale generation orientation on college students' autonomous motivation and academic performance through the lens of SDT. A study focusing on this contributes to a theoretical understanding of extrinsic motivation and motivational adjustment.

4.1.1 Extrinsic Motivation and Internalization

According to SDT, there are three types of motivation, which includes amotivation, extrinsic motivation, and intrinsic motivation. Qualitative differences exist among them. Individuals with amotivation are not motivated. They have low self-efficacies and do not see value in completing tasks. Individuals with extrinsic motivation are motivated. It involves a contingency between the target behavior and some separable consequence desired by the individual (Deci & Ryan, 2015). The sources of extrinsic motivation can be both internal and external; however, the behaviors are instrumental. That is, the aims of doing activities are separable from the action itself. Unlike the instrumental feature of extrinsic motivation, intrinsic motivation refers to the state of doing an activity out of interest and enjoyment. Individuals with intrinsic motivation are motivated by the satisfactions of doing activities for their own sake. Intrinsic motivation represents the optimal type of motivation and leads to the most adaptive consequences (Koestner & Losier, 2002). However, in order to function effectively within schools, students will have to get involved in the activities that are not inherently interesting but are valued by teachers, programs, or societies. When the external environment fails to pique students' interests, extrinsic motivation becomes particularly important in driving students to engage and persist in learning. According to SDT, people have an inherent tendency to integrate socially-valued regulations that are initially perceived as being external (Koestner & Losier, 2002). We call this process internalization. Researchers have found that in education domain whether or not students successfully internalize the value of school participation is a more important predictor of later adaptation than whether they find school activities interesting and enjoyable (Koestner & Losier, 2002). Successful internalization seems to be an essential capacity for long-term success in the academic domain.

Internalization refers to "the process of taking in values, beliefs, or behavioral regulations from external sources and transforming them into one's own (Ryan & Deci, 2017, p.182)." Internalization is not merely compliance but rather an active internal psychological process through which people actively integrate external regulation into true self-regulation (Ryan & Deci, 2017). Within SDT, it is viewed in terms of a continuum. The more regulation is internalized, the more it becomes part of the self. Based on the degrees of internalization success, there are four regulatory styles: external regulation, introjection, identification, and integration. These regulatory styles fall along a continuum of internalization that reflects the degree of autonomy (Deci & Ryan, 2002).

External regulation is on the far left side of the continuum. There is no autonomy in external regulation. People with external regulation behave because of external contingencies, such as rewards and punishments, have not been internalized (Deci & Ryan, 2015). The source of regulation is external. Although external regulation can seduce people into action and achieve short-term goals, it is often associated with poor maintenance (Ryan & Deci, 2008). Introjection is at the next level of extrinsic motivation. It refers to a type of extrinsic motivation that people do activities to avoid guilt and shame, or to please others. With introjection, people partially take in external contingencies but not fully accepted it as their own (Deci & Ryan, 2015). The source of motivation is somewhat internal since introjection involves adopting a regulation or value; however, it is still not fully self-determined because the regulation or value does not become integrated to a person's holistic self-representation. Introjection behaviors are partially internalized since these internal feelings are controlled by external factors (e.g., teachers, parents). The third level of extrinsic motivation is identification. People with identification behave because they identify with the personal value and importance of the behavior for

themselves and accept it as their own (Deci & Ryan, 2015). Identification is the first type of extrinsic motivation that is autonomous. People with identification consciously decide to pursue certain goals that are important to themselves. The perceived locus of causality becomes internal to the self since people act out of a belief in personal importance (Ryan & Deci, 2017). Compared to introjection, identification involves the experience of greater volition and demonstrates more functional advantages in terms of stability and persistence. In the educational domain, identification is extremely important. Some researcher found that identification had even stronger positive effects on students' academic engagement, persistence in school, and successful adaption than intrinsic motivation did (Koestner & Losier, 2002). The move from identification to integration occurs when the extrinsic motivation aligns with other aspects of individuals' values, goals, needs, and beliefs (Schreiber, 2016). Integration is the most advanced form of extrinsic motivation. People with integration behave because the behavior is an expression of who the person is (Deci, Vallerand, Pelletier, & Ryan, 1991). It involves people having integrated new identifications with other aspects of their own integrated sense of self (Deci & Ryan, 2015). People with integration act with a full sense of volition and choice.

Internalization is a proactive process through which the students' learning could become internal and no longer require external contingencies. For example, if a student realizes that knowing mathematics is very important for continuing to succeed at more advanced engineering courses (i.e., the student reach the level of identification), then the student may take another mathematics course which is not required by his or her program. The student's learning motivation becomes more autonomous than it was under external regulation, and the student's behavior becomes more stable and more persistent. Numerous studies have demonstrated that students who have developed more autonomous regulatory styles are more likely to stay in

school, to achieve, to evidence conceptual understanding, and to be well adjusted than the students with less autonomous types of motivation (e.g., Kusurkar et al., 2013; Vallerand & Blssonnette, 1992).

4.1.2 Factors Fostering Internalization

According to SDT, humans seek to satisfy three basic psychological needs: Autonomy, competence, and relatedness (Deci & Ryan, 1985). Autonomy is experienced when students are given choices and options about how to perform or present their work. Competence refers to students' perceptions of mastery with the content material, while relatedness refers to the degree to which students feel connected to their instructor as well as other students in the class. Generally speaking, factors in the social environment that satisfy individuals' needs for autonomy, competence, and relatedness will facilitate the internalization of non-intrinsically motivated behaviors (Ryan & Deci, 2017). People are more likely to adopt attitudes and act in ways that are endorsed by significant others or social groups if they have or desire connections with those people or groups (relatedness). Competence is also important because people will fail to internalize what they observe or are taught unless they can efficaciously enact. The need for autonomy becomes salient if people want to internalize beyond the level of introjection to the levels of identification or integration.

Rationale Provision

When people have to do some activities that are not intrinsically motivated, they tend to experience internal conflicts with their inclinations. In this situation, a meaningful rationale allows people to understand that external demands can coexist with their inclinations. The positive effect of rationale provision on internalization had been demonstrated repeatedly (Deci

et al., 1994; Jang, 2008; Legault, Gutsell, & Inzlicht, 2011; Reeve et al., 2002). One of the earliest experiments was conducted by Deci and his colleagues (1994). They found that providing meaningful rationales could effectively promote internalization, as evidenced by the subsequent self-regulatory behaviors and affective self-reports. Reeve et al. (2002) reexamined the effect of rationale provision on college students' internalization with a more academically authentic task. They asked preservice teachers to learn an uninteresting task and provided them with different external contingencies. They found the contingency associated with identification led to more self-determined regulation and more efforts, compared to the ones associated with external regulation and introjection. Furthermore, to explain the mechanism of the effect of rationale provision on engagement, they tested a motivational mediation model and found that identification mediated the relation between rationale provision and effort. A meaningful rationale reveals the value of an activity and personal benefits, which helps people internalize the value of the task and promote people to engage volitionally in learning. In extending Reeve et al.'s (2002) study, Jang (2008) examined three theoretical models to explain why an externally provided rationale could support college students' identification during uninteresting learning activities. The results demonstrated that externally provided rationales can promote both identification and interest regulation; however, only identification has a significant effect on students' engagement.

Not all kinds of rationales work the same. Deci et al. (1994) pointed out that when rationales are presented in a controlling environment and pressuring way, the internalization process would stop at the level of introjection rather than more advanced ones. Similarly, in Reeve et al.'s (2002) study, the rationales associated with external regulation and introjection failed to facilitate internalization. Vansteenkiste et al. (2018) propose that personalized, learner-

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centered rationales are more effective in fostering autonomous extrinsic motivation in comparison with general rationales.

Rationale Generation

Since extrinsically motivated activities are often initiated by external conditions or authorities, self-generated rationales would allow people to view their behaviors in terms of their values and goals rather than in terms of the imposition. Compared to externally offered rationales, self-generated rationales are more likely to be personalized and learner-centered. A number of correlational and experimental studies, within the expectancy-value theory literature, have indicated that reflecting on the importance or relevance of a task could promote engagement (Harackiewicz, et al., 2016), academic performance (Harackiewicz et al., 2016; Hulleman et al., 2011; Hulleman & Harackiewicz, 2009), retention (Canning et al., 2018), course interest (Hulleman et al., 2011; Hulleman & Harackiewicz, 2009), positivity and future career motivation (Brown et al., 2015).

Thus far, rationale generation has only been investigated as an intervention approach, mostly from the perspective of expectance-value theory. However, it can also be a chronic orientation that reflects differences in people's tendency to generate rationales for external demands and inclinations to produce autonomous rationales. For example, if individuals repeatedly perceive positive associations between autonomous types of rationales and greater motivation, they are likely to develop a chronic orientation of generating rationales over time. Such orientation represented in memory can be triggered automatically and applied into various contexts (Bargh, 1990; Levesque & Pelletier, 2003). In the present research, rationale generation orientation is defined as people' tendency to generate rationales for their behaviors and inclinations to produce autonomous types of rationales, which includes two constructs: rationale

generation tendency and rationale generation quality. People who score high in rationale generation orientation would consistently and frequently engage in generating autonomous types of rationales to motivate themselves. In concordance with Vallerand's (1997) hierarchical model of motivation (see also Vallerand & Ratelle, 2002), I propose that rationale generation orientation is represented within the individual at three hierarchical levels of generality: the global, the contextual, and the situational levels. To demonstrate the existence and functional significance of rationale generation orientation, I first created and validated a self-report scale to measure individuals' rationale generation orientations at the global level. Then, I examined the relations between rationale generation orientation and other constructs. Based on the past research conducted in SDT, I hypothesized that individuals' global rationale generation orientations would be associated with SDT-related constructs including basic psychological needs and self-regulated motivation at the contextual level. Furthermore, according to previous research in rationale provision (Deci et al., 1994; Reeve et al., 2002), the quality of the rationale matters more than the quantity of the rationale. Therefore, in the current study, I hypothesized that rationale generation quality would have a stronger association with the related SDT constructs than the rationale generation tendency.

Autonomy Orientation

The concept of causality orientation helps to explain why different people are differentially healthy, effective, and happy even when they are in the same social context (Ryan & Deci, 2017). According to SDT, causality orientation refers to personality orientations that reflect differences in the extent to which individuals tend to be self-determined in their ongoing interactions with their social surrounds.

Deci and Ryan (1985) proposed three general causality orientations (GCO): the autonomy orientation, the controlled orientation, and the impersonal orientation. The autonomy orientation describes the degree to which people orient toward their environments by treating them as sources of relevant information, as they take interests in both external events and the accompanying inner experiences. When people are high in autonomy orientation, they tend to use the identified and integrated styles of regulation. The controlled orientation describes the degree to which people's attention and concerns tend to be oriented toward external contingencies and controls. When people are high in controlled orientation, they tend to use the external and introjected styles of regulation. Autonomy orientation comprises the tendencies toward integration, and identification; controlled orientation comprises the tendencies toward introjection and external regulation.

Causality orientations explain variance in regulatory styles, over and above that explained by the quality of social contexts. Ryan and Deci (2017) point out that causality orientations could affect people's interpretations of external contexts. Compared to a strong controlled-oriented person, a strong autonomy-oriented person tends to engage in the situations more congruently and openly and with less defensive responding. In the present research, I used autonomy orientation to evaluate the convergent validity of the self-developed rationale generation orientation scale because these two constructs are theoretically related. Through a series of studies, Weinstein, Przybylski, and Ryan (2012) developed and validated the Index of Autonomous Functioning (IAF) scale, which provides a measure of dispositional autonomy. It contains three subscales, namely, Authorship/Self-congruence, Susceptibility to Control, and Interest-taking. In Weinstein's et al. (2012) studies, they demonstrated positive associations between IAF and satisfaction of basic psychological needs, autonomous engagement, and well-

being. I hypothesized that rationale generation orientation positively correlated with Authorship/Self-congruence and Interest-taking, and negatively correlated with Susceptibility to Control.

4.1.3 Overview of the Study

The purpose of the present research is to use SDT as a guiding framework to identify and examine individual factors that affect students' autonomous motivation and learning outcomes in uninteresting but required academic courses. I conducted the present study in two phases. In phase 1, I developed and validated a new-developed scale to assess students' rationale generation orientation. Fifteen items were created to measure two sub-constructs: rationale generation tendency and rationale generation quality. A series of factor analyses and correlational analyses were employed to examine the validity and reliability of the scale. In phase 2, I examined the relations between students' rationale generation orientations, basic psychological needs, motivation, and learning outcomes in the context of taking uninteresting but required courses using structural equation modeling (SEM). Hypothesis 1: Rationale generation tendency and quality influence whether participants perceive their basic psychological needs are fulfilled. This, in turn, would affect perceptions of autonomous extrinsic motivation and controlled extrinsic motivation via facilitating the process of internalization, which then would influence students learning outcomes, including perceptions of learning satisfactions and perceived transferability. Hypothesis 2: Rationale generation quality has stronger associations with the related constructs than rationale generation tendency. The hypothesized SEM model is depicted in Figure 4.1. Two models were tested: one with basic psychological needs satisfaction and another one with basic psychological needs frustration.
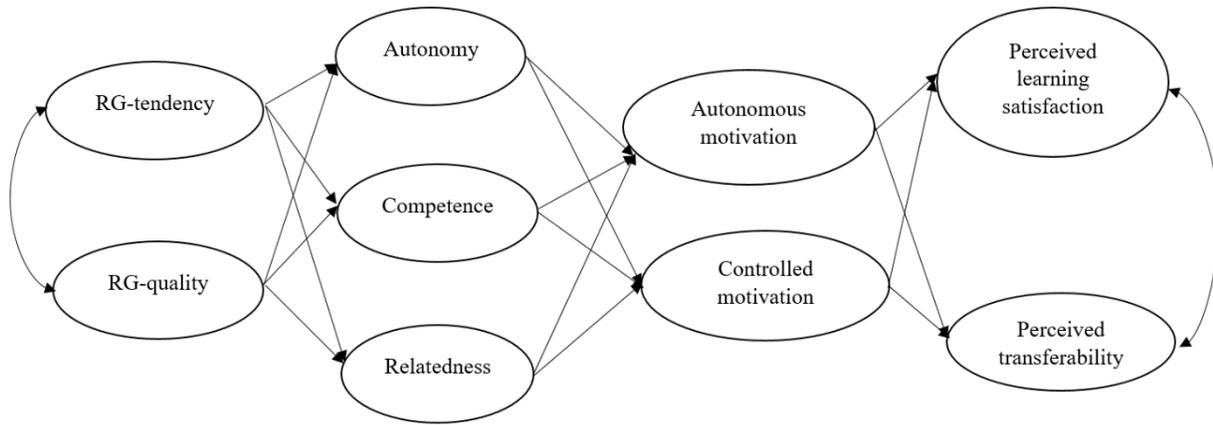
Figure 4.1 The hypothesized SEM model.

4.2 Method

4.2.1 Participants

Participants were recruited via email (see Appendix A). A total of 263 undergraduate and graduate students from a large research-intensive university in the Midwestern United States responded to the online survey. Forty-four participants completed only part of the survey because they failed to recall any uninteresting but required academic courses in the past year. Thus, the analytic dataset for the SEM included 219 students (133 females and 82 males). About 48% of the participants were between 18 and 20, 36% of the participants were between 21 and 25, and 16% of the participants were 26 or older. Approximate 78% of the participants reported being White.

4.2.2 Measures

Rationale Generation Orientation Scale (RGOS).

The Rationale Generation Orientation Scale measures people' tendency to generate rationales for their learning behaviors and inclinations to produce autonomous types of rationales. An initial pool of the RGOS consisted of 15 items (see Appendix E). Three items

were adopted from an existing instrument, enhancement of personal significance, which is a subscale of the Motivational Regulation Questionnaire (MRQ; Schwinger, Steinmayr, & Spinath, 2009). Twelve items were created by the author based on the conception of rationale generation orientation, six items for rationale generation tendency and six items for rationale generation quality. These statements were constructed by referring to the MRQ, the IAF, and the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). The RGOS contains two subscales: tendency (e.g., "I tend to think about reasons for studying while I study.") and quality ("I tend to see connections between learning and my professional goals."). The RGOS uses a 5-point Likert scale ranging from 1("rarely") to 5 ("very often"). The validity and reliability of the RGOS were demonstrated in the present study.

The Index of Autonomous Functioning (IAF).

The IAF (Weinstein et al., 2012) is a measure of dispositional autonomy. It contains three subscales, namely, Authorship/Self-congruence (e.g., "My decisions represent my most important values and feelings"), Susceptibility to Control (e.g., "I do things in order to avoid feeling badly about myself"), and Interest-taking (e.g., "I often reflect on why I react the way I do"). Each subscale includes five items rated on a 5-point Likert scale ranging from 1 ("not at all true") to 5 ("completely true"). The internal reliabilities were satisfactory for all subscales, $\alpha =$ .85 for Authorship/Self-congruence, $\alpha = .90$ for Interest-taking, and $\alpha = .77$ for Susceptibility to Control in the present study. The items of IAF are shown in Appendix F.

Basic Psychological Needs.

The Basic Psychological Need Satisfaction and Frustration Scale (BPNSFP; Chen et al., 2015) was used as a measure of students' satisfaction and frustration of autonomy, competence,

and relatedness. The BPNSFP contains 24 items which correspond to six subscales: autonomy satisfaction (e.g., "I feel a sense of choice and freedom in the things I undertake."), autonomy frustration (e.g., "I feel forced to do many things I wouldn't choose to do."), competence satisfaction (e.g., "I feel confident that I can do things well."), competence frustration (e.g., "I have serious doubts about whether I can do things well."), relatedness satisfaction (e.g., "I feel that the people I care about also care about me."), and relatedness frustration (e.g., "I feel excluded from the group I want to belong to."). The validity and reliability of the scale have been supported by Chen et al.'s (2015) work. Each subscale is comprised of four items. Students respond to the questions on a five-point Likert scale from 1 ("not true at all") to 5 ("completely true"). The internal reliabilities were satisfactory in the present study, although autonomy satisfaction was a bit low, $\alpha = .69$ for autonomy satisfaction, $\alpha = .76$ for autonomy frustration, $\alpha = .90$ for competence satisfaction, $\alpha = .81$ for competence frustration, $\alpha = .85$ for relatedness satisfaction, and $\alpha = .72$ for relatedness frustration. All items of BPNSFP are shown in Appendix G.

Situational Motivation Scale (SIMS).

Participants' perceptions of their reasons for engaging in uninteresting but required academic courses were measured using a modified version of SIMS (Guay, Vallerand, & Blanchard, 2000; Levesque-Bristol, Knapp, & Fisher, 2010; see Appendix H). The scale includes 18 items, all of which use a 7-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Within the SIMS, there are six subscales, which measure the six types of motivation proposed by Deci and Ryan (1985, 2000). Each subscale is comprised of three items per subscale: intrinsic motivation (e.g., "Because I really enjoy it"), integration (e.g., "Because learning all I can about academic work is really essential for me"), identification (e.g., "Because

it allows me to develop skills that are important to me"), introjection (e.g., "Because I would feel bad if I didn't"), external motivation (e.g., "Because I feel I have to"), and amotivation (e.g., "Because I don't know. I have the impression I'm wasting my time"). Only the four types of extrinsic motivation were included in the study. Internal consistency was acceptable for all subscales, although external regulation was a bit low: integration ($\alpha = .86$), identification ($\alpha = .79$), introjection ($\alpha = .87$), and external regulation ($\alpha = .64$). An overall level of autonomous motivation was calculated by averaging integration and identification, while an overall level of controlled motivation was calculated by averaging introjection and external regulation.

Perceived Knowledge Transferability Scale (PKTS).

Student perceptions of how relevant the knowledge learned in the target course will be for future courses and their career paths were measured using the PKTS (Levesque-Bristol, Richards, Zissimopoulos, Wang, & Yu, under review). The PKTS includes eight statements, all of which used a 7-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Two examples of statements from the PKTS are "I understand how I will use the information learned in this class in my professional life" and "I feel confident in my ability to apply the course material in other classes that I have." Internal consistency coefficient of the PKTS in this study was high ($\alpha = .92$). The items are shown in Appendix I.

Perceived Learning Satisfaction.

Students' perceptions of learning satisfaction were assessed using the Perceived Learning Satisfaction Scale (Kim, Kwon, & Cho, 2011). It is composed of seven items, which are from two separate subscales, including perceived learning achievement and class satisfaction. The perceived learning achievement scale measures how students perceive their learning (e.g., "I feel

that this course served my needs well," Sun, Tsai, Finger, Chen, & Yeh, 2008, p.1199). The class

satisfaction scale measures how satisfied students are with the course (e.g., "I would like to

recommend this course to others," Eom, Wen, & Ashill, 2006, Sun et al., 2008, p. 233). All items

were modified to be fit into this study in terms of language and assessed using a five-point Likert

scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The Perceived Learning

Satisfaction Scale showed high internal reliability ($\alpha = .92$). The full modified scale is presented

in Appendix J.

4.2.3 Procedures

This study was conducted solely online using the Qualtrics survey software, which took

about 10-15 minutes. The Office of the Registrar sent a recruitment email to students who were

enrolled as full-time students at a large Midwest university in the 2019 spring semester.

Participation was voluntary. Participants went to the online Qualtrics survey link and took the

survey, which consisted of 81 items from the aforementioned assessments. Participants were first

asked to complete the RGOS and the IAF. Then, they were asked about whether they have prior

experiences (less than 1 year) in participating in uninteresting but required courses? If the

participants failed to recall such experiences, then they were directed to the end of the survey.

Participants who were able to recall such experiences were asked to select one recent

uninteresting but required course and respond to all the remaining items regarding that course.

4.2.4 Data Analysis

Data analysis involved two stages. First, I identified and validated the structure of the

RGOS with exploratory factor analysis (EFA), and confirmatory factor analysis (CFA). To

address this question, the dataset was randomly split into two pieces: the calibration dataset ($n =$

131), and the confirmation dataset ($n = 132$). An EFA using SPSS 25.0 was conducted on the calibration dataset to identify an underlying factor structure for the initial RGOS items. Then, a CFA using LISREL 8.80 (Jöreskog & Sörbom, 2006) was conducted on the confirmation dataset to examine the reliability and validity of the factor structure emerging from the EFA. To examine the convergent validity of RGOS, I tested the correlations between RGOS and IAF. Based on the SDT, these two constructs should be positively correlated. Before testing the SEM model, I investigated the associations between RGOS and whether the students were able to recall uninteresting but required learning experiences using cross-tabulation chi-square tests. A significant result indicates that these two variables were correlated.

In the second stage, the hypothesized model (see Figure 4.1) was examined with structural equation modeling (SEM). The following commonly used goodness-of-fit indices were examined to evaluate model fit in the CFA and SEM: the root mean square error of approximation (RMSEA), the non-normed fit index (NNFI), the incremental fit index (IFI), and the comparative fit index (CFI). The NNFI, IFI, and CFI values range from 0 to 1, and values above .90 are indicative of acceptable fit. RMSEA value also ranges between 0 and 1, but values closer to 0 are indicative of a better fitting model. Values below .08 indicate a good fitting model (Hu & Bentler, 1999). A significant factor loading, as determined by a standardized coefficient of .30 or above, indicates that the item is a good measure of the underlying factor (Hatcher, 1994).

4.3 Results

4.3.1 Results of Exploratory Factor Analysis

The EFA was performed on the randomly selected calibration dataset. The Kaiser-Meyer-Olkin (KMO) sampling adequacy was .88. A value closer to one indicates that patterns of

correlations are relatively compact. Bartlett's test of sphericity was significant at the .001 level, which indicated the correlation matrix was not an identity matrix. KMO index and the result of Bartlett's test of sphericity demonstrated that the dataset was appropriate for conducting an EFA. The bivariate correlation matrix among the items is shown in Table 4.1. Most of the correlation coefficients were between moderate (.30) to large (.60) and all of them were significant at the .01 level, which indicated the factorability of the RGOS. I used the principle axis factoring method to extract the factors. A direct Oblimin rotation was specified to rotate the factors since I presumed the factors should be correlated. The number of factors extracted was determined based on the eigenvalues and theoretical interpretations. I expected to have a two-factor solution because the RGOS incorporates two constructs: rationale generation tendency and rationale generation quality.

Pattern matrix coefficients, means, standard deviations, and initial communalities are presented in Table 4.2. Loadings in bold were values above .30. In line with my prediction, two factors were extracted with eigenvalues greater than one. The first factor had an extracted eigenvalue of 6.02 and explained 40.16% of the variance. It contained items that describe rationale generation quality. The Cronbach's alpha for the first factor was .86. The second factor captured the rationale generation tendency, which had an extracted eigenvalue of 1.49 and accounted for an additional 9.95% of the variance. The Cronbach's alpha for the second factor was .90. The correlation coefficient between the two factors was .50. These results indicated that the proposed two-factor structure provided a clear model for explaining the relationships among the items.

Table 4.1

The Correlation Matrix Between the RGOS Items

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Item 1	-														
Item 2	.59	-													
Item 3	.57	.62	-												
Item 4	.47	.54	.68	-											
Item 5	.33	.40	.37	.37	-										
Item 6	.54	.51	.55	.52	.37	-									
Item 7	.16	.27	.32	.28	.27	.22	-								
Item 8	.16	.40	.34	.37	.17	.23	.43	-							
Item 9	.31	.47	.44	.45	.50	.40	.44	.48	-						
Item 10	.25	.43	.48	.44	.30	.37	.50	.48	.57	-					
Item 11	.21	.42	.38	.34	.26	.24	.50	.42	.50	.68	-				
Item 12	.16	.41	.36	.40	.25	.22	.52	.51	.52	.61	.74	-			
Item 13	.24	.32	.32	.39	.22	.27	.47	.45	.49	.54	.52	.57	-		
Item 14	.23	.38	.38	.47	.18	.34	.47	.56	.45	.49	.44	.53	.67	-	
Item 15	.24	.38	.37	.38	.27	.25	.37	.45	.44	.44	.45	.49	.48	.50	-

Table 4.2

Results of the Exploratory Factor Analysis

Item	F1	F2	Mean	SD	h^2
I try to bring more value to learning.	**.89**	-.13	3.39	1.12	.71
I consider a way to make learning more relevant.	**.77**	-.04	3.26	1.10	.68
When I study, I look for a way to make it meaningful.	**.74**	.05	3.37	1.19	.60
I look for connections between learning tasks and my life.	**.74**	.06	3.66	1.09	.63
I try to make whatever I am learning as useful as possible.	**.66**	-.03	3.61	1.10	.43
I tend to see connections between learning and my professional goals.	**.65**	-.03	3.70	1.04	.44
I strive to relate the learning tasks to my goals.	**.63**	.10	3.59	1.16	.61
I try to establish relations between work and my personal interests.	**.59**	.08	3.66	1.12	.41
I tend to think about the meaning of things I do.	**.57**	.24	3.76	1.06	.59
I tend to think about reasons for studying while I study.	-.15	**.81**	2.76	1.15	.53
I pay attention to my reasons for studying.	.11	**.71**	2.95	1.14	.59
I frequently take time to think about why I study.	-.09	**.68**	2.53	1.13	.38
When I learn something, I think about the reasons for studying it.	.19	**.62**	3.01	1.09	.55
I strive to think about my purpose for studying.	.19	**.61**	3.02	1.31	.56
I look for reasons before I do a thing.	.17	**.40**	3.48	1.22	.40

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4.3.2 Results of Confirmatory Factor Analysis

Based on the EFA result, a two-factor model was specified, and a CFA was conducted on the confirmation dataset. Results of the CFA indicated that the model fit was good, χ^2 (89) = 166.35, $p < .001$, RMSEA = .08, NNFI = .97, IFI = .97, CFI = .97. While the χ^2 test was significant, this test is very sensitive, especially when the sample size is large, and a significant χ^2 statistic is expected in most CFA models (Brown, 2006). The t-values for the factor loadings ranged from 7.32 to 11.75, indicating that they were significant at $p < .001$ (Hatcher, 1994). The completely standardized factor loadings were strong and ranged from .49 to .83. In sum, the results of the CFA indicated a good fit between the proposed two-factor model and the observed data. The completely standardized solution for the CFA is depicted in Figure 4.2.
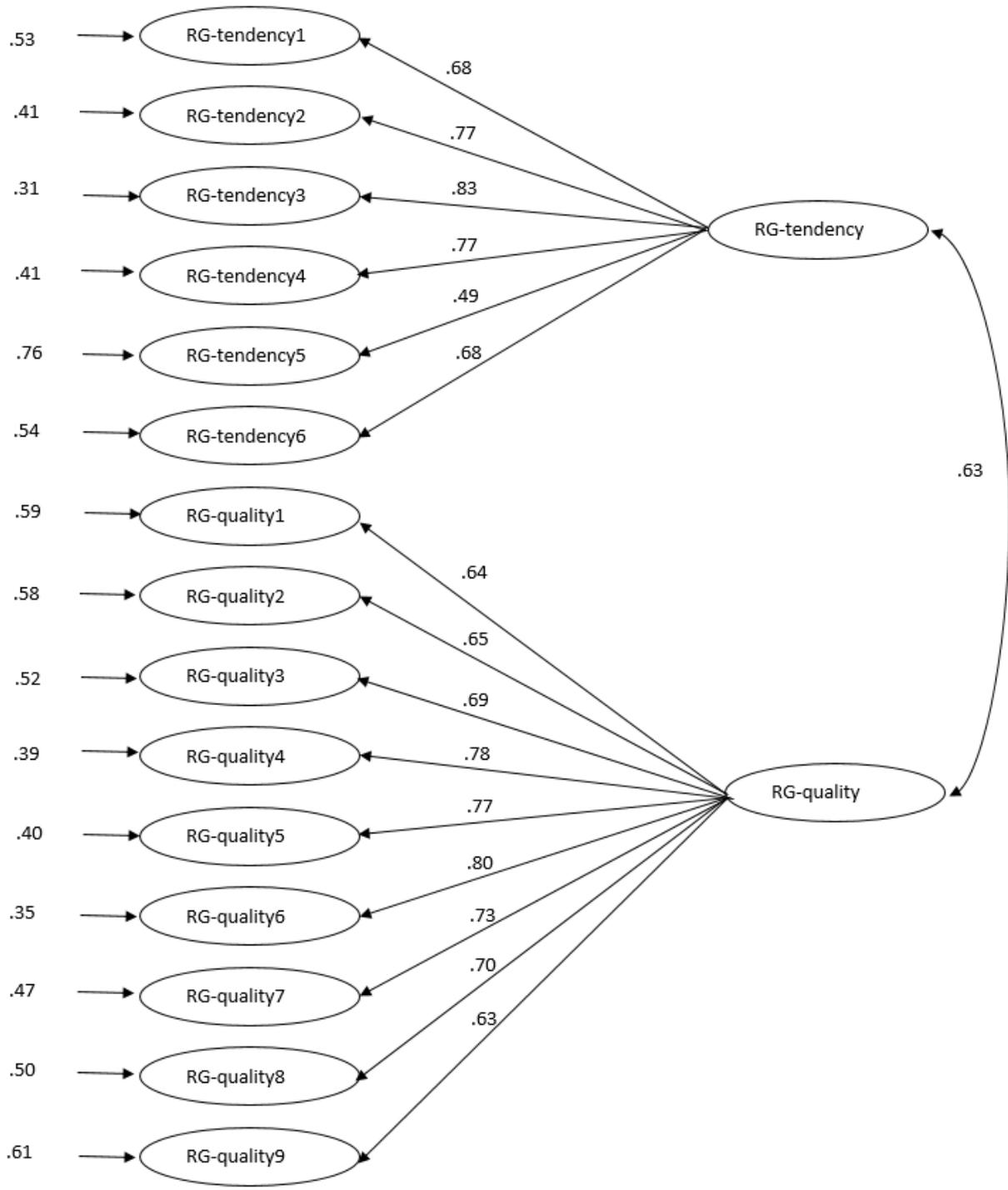
Figure 4.2 The standardized factor loadings following CFA.

4.3.3 Convergent Validity of RGOS

According to the literature, RGOS, as a measure of people's tendency to generate rationales and inclinations to produce autonomous rationales, is expected to associate with IAF, a measure of dispositional autonomy. Therefore, correlation coefficients between the RGOS and IAF were calculated to assess the convergent validity of RGOS. Overall, rationale generation orientation was positively correlated with autonomy disposition ($r = .43, p < .001$). The correlation coefficients among the subscales are displayed in Table 4.3. These results provide further evidence in support of the validity of the RGOS.

Table 4.3

Correlation Coefficients Between the Subscales of RGOS and IAF (N = 263)

	1	2	3	4	5
1. RG-tendency	-				
2. RG-quality	.57**	-			
3. IAF-self-congruence	.25**	.37**	-		
4. IAF-susceptibility to control	.11	-.05	-.14*	-	
5. IAF-interest-taking	.43**	.35**	.17**	.22**	-

4.3.4 Relations between Rationale Generation Tendency, Rationale Generation Quality, and Uninteresting Learning Experiences

Before testing the SEM model, I conducted a cross-tabulation Chi-square analysis to explore the associations between rationale generation tendency (RGT), rationale generation quality (RGQ), and students' uninteresting learning experiences. The two continuous variables, RGT and RGQ, were transformed into two categorical variables using the following rule. First, I computed the Z scores for RGT and RGQ. Participants who had RGT Z scores greater than 0.5 were coded as the high RGT group while participants who had RGT Z scores less than -0.5 were coded as the low RGT group. The same rule was applied to RGQ. The results of cross-tabulation

analyses indicated that both RGT (χ^2 = 4.64, p = .031) and RGQ (χ^2 = 11.36, p = .001) were associated with students' uninteresting learning experience. According to the Table 4.4, 25% of the participants in the high RGT group reported that they did not have uninteresting but required courses in the past year, while 12% of the participants in the low RGT group reported not having such experiences. According to the Table 4.5, 30% of the participants in the high RGQ group reported that they did not have uninteresting but required courses in the past year, while only 9% of the participants in the low RGQ group reported not having such experiences. Compared to RGT, RGQ had a stronger association with uninteresting learning experience.

Table 4.4

The Cross-tabulation Table for the RGT

		RGT		
		Low	High	Total
Do you have prior experience (less than 1 year) in participating in uninteresting but required courses?	Yes	72	62	134
	No	10	21	31
	Total	82	83	165

Table 4.5

The Cross-tabulation Table for the RGQ

		RGQ		
		Low	High	Total
Do you have prior experience (less than 1 year) in participating in uninteresting but required courses?	Yes	77	61	138
	No	8	26	34
	Total	85	87	172

4.3.5 Testing the Hypothesized SDT Model

Table 4.6 presents the means, standard deviations, and correlations for all constructs included in the hypothesized model. Rationale generation tendency had a moderate positive correlation with rationale generation quality; however, it had weak or no correlation with other variables of interest. Rationale generation quality was positively correlated with autonomy

satisfaction, competence satisfaction, and autonomous motivation, and was negatively correlated

with competence frustration and relatedness frustration. The correlations among basic

psychological needs, motivation, and learning outcomes were in the predicted direction, and

most of them were significant. The correlation coefficient matrix indicated that the data was

appropriate for running SEM. I then moved on to test the hypothesized model.

Table 4.6

Means, Standard Deviations, and Correlation Coefficients for all Variables Included in Hypothesized Models (n = 219)

	RGT	RGQ	AS	CS	RS	AF	CF	RF	AM	CM	PKT	PL
RGT	-	.58**	.02	.11	-.02	.06	-.03	-.04	.12*	.06	.00	-.10
RGQ		-	.14*	.16*	.04	-.10	-.12*	-.14*	.16*	.02	.10	-.04
AS			-	.52**	.42**	-.56**	-.34**	-.31**	.33**	-.11*	.24**	.29**
CS				-	.31**	-.28**	-.68**	-.31**	.15*	-.15*	.26**	.18**
RS					-	-.26**	-.17**	-.50**	.18**	-.04	.11	.17**
AF						-	.41**	.43**	-.23**	.22**	-.18**	-.29**
CF							-	.48**	-.07	.22**	-.15*	-.12*
RF								-	-.11	.15*	-.13*	-.12*
AM									-	.14*	.56**	.53**
CM										-	-.19**	-.29**
PKT											-	.66**
PL												-
Mean	2.90	3.42	2.97	3.64	3.70	3.50	2.84	2.22	3.04	4.32	3.50	2.63
SD	0.89	0.83	0.90	1.00	0.94	0.98	1.09	0.86	1.36	0.95	1.47	1.32

Note: RGT represents rationale generation tendency, RGQ represents rationale generation quality, AS represents autonomy satisfaction, CS represents competence satisfaction, RS represents relatedness satisfaction, AF represents autonomy frustration, CF represents competence frustration, RF represents relatedness frustration, AM represents autonomous motivation, CM represents controlled motivation, PKT represents perceived knowledge transferability, and PL represents perceived learning satisfaction.

Because need satisfaction and need frustration constitute different constructs relating distinctively to motivation and learning outcomes (Haerens, Aelterman, Vansteenkiste, Soenens, & Petegem, 2015; Wang, Hsu et al., 2019), I tested two SEM models separately, one with need satisfaction constructs (Model 1) and another with need frustration constructs (Model 2). The test of Model 1 indicated that it was a good fit to the data. χ^2 (306) = 641.46, $p < .001$, RMSEA = .07, NNFI = .90, IFI = .91, CFI = .91. All of the factor loadings in the measurement model were significant at the $p = .001$ level, with associated t-values ranging from 8.60 to 18.53. Figure 4.3 displays the model with standardized path coefficients. Rationale generation quality positively predicted autonomy satisfaction and competence satisfaction, which in turn, was associated with autonomous motivation and perceived learning outcomes. Rationale generation tendency failed to predict needs satisfaction.
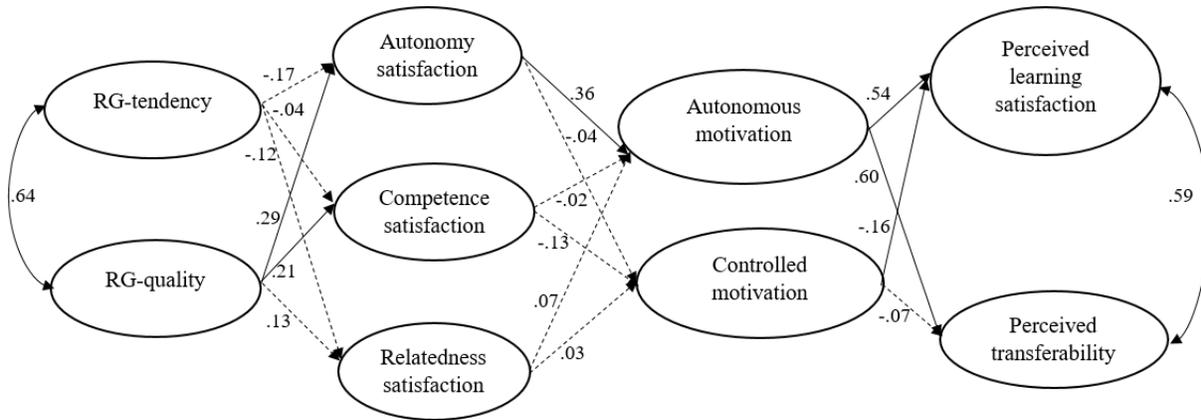
Figure 4.3. Model 1 with standardized path coefficients. Lines in dash represent non-significant paths.

The test of Model 2 indicated that it was a good fit to the data. χ^2 (306) = 636.55, $p <$ .001, RMSEA = .07, NNFI = .89, IFI = .91, CFI = .91. All of the factor loadings in the measurement model were significant at the $p = .001$ level, with associated t-values ranging from 7.08 to 18.61. Figure 4.4 displays the model with standardized path coefficients. Rationale

generation quality negatively predicted autonomy frustration, competence frustration and

relatedness frustration, which in turn, was associated with autonomous and controlled

motivation, and perceived learning outcomes. Rationale generation tendency positively predicted

autonomy frustration, which was somewhat surprising. Two possible explanations for this

unexpected finding were discussed in the following section.
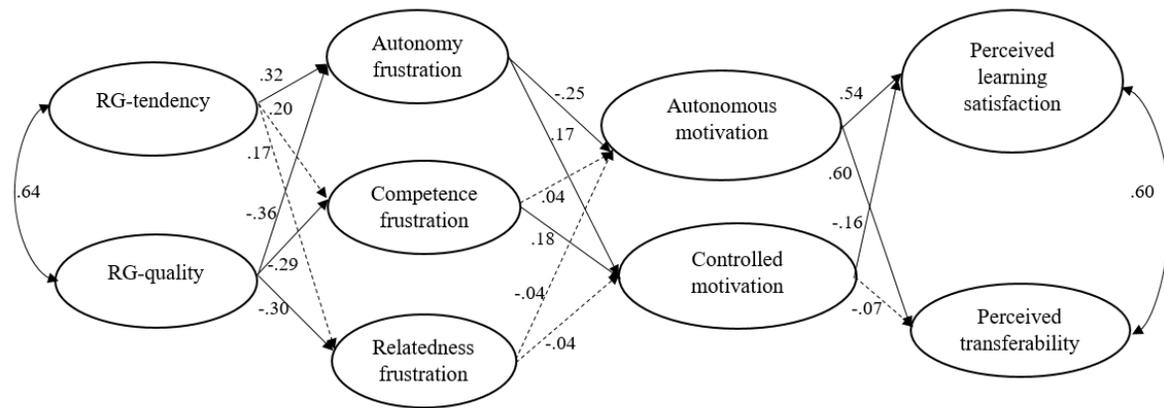
Figure 4.4 Model 2 with standardized path coefficients. Lines in dash represent non-significant paths.

4.4 Discussion

Study 1 examined the role of rationale generation orientation played in students'

motivation and learning in the context of taking uninteresting but required academic courses. To

answer the question, I first developed and validated a self-report scale, RGOS, via a series of

factor analyses and correlation analysis. Then, I explored the relations between rationale

generation orientation and students' uninteresting learning experiences. Participants who had

lower scores on RGT and RGQ were more likely to report that they had uninteresting but

required courses in the past year than participants who scored higher. This result suggests that

rationale generation orientation might help students view uninteresting but required learning

activities more positively. Next, I tested the hypothesized SEM model. The findings partially

supported the hypothesized model. Rationale generation quality positively predicted needs satisfaction and negatively predicted needs frustration, which in turn was associated with autonomous motivation, controlled motivation, and perceived learning outcomes. However, the expected influences of rationale generation tendency in basic psychological needs were not supported.

The result of the SEMs showed that rationale generation quality positively predicted autonomy satisfaction ($\beta = .29$), competence satisfaction ($\beta = .21$), and negatively predicted autonomy frustration ($\beta = -.36$), competence frustration ($\beta = -.29$), and relatedness frustration ($\beta = -.30$). This result is in line with those of previous studies in rationale provision (Deci et al., 1994; Legault et al., 2011; Reeve et al., 2002). Previous research demonstrated that when external contexts are controlling, rationales tend to foster controlled motivation, whereas when the contexts are autonomy-supportive, rationales tend to lead to autonomous motivation. Consistent with the literature, this research found that students who reported being able to bring value to learning and make learning more relevant tended to perceive needs satisfaction and show autonomous motivation. Extending prior work on needs satisfaction (Deci et al., 1994; Reeve et al., 2002), Study 1 examined the relation between rationale generation and needs frustration. As I expected, rationale generation quality negatively predicted autonomy frustration, competence frustration, and relatedness frustration, which indicated that rationale generation quality could protect people against feeling frustrated when engaging in uninteresting but required academic courses.

However, the expected influences of rationale generation tendency in basic psychological needs were not supported. Rationale generation tendency was not associated with most basic psychological needs constructs and had an unexpected association with autonomy frustration (β

= .32). One possible interpretation of the unexpected finding concerns the high correlation between rationale generation tendency and rationale generation quality that resulted in suppression effects in the SEM (Tabachnik & Fidell, 2012). Another plausible interpretation concerns the research context. In the current research, I only investigated people's uninteresting but required learning experiences. People with high rationale generation tendency might perceive strong feelings of frustration when they fail to come up with meaningful reasons to act. However, it does not mean that rationale generation tendency is undesired. In both factor analyses and SEM analyses, I found a strong positive correlation between rationale generation tendency and rationale generation quality. It aligns with my presumption that the more people reflect on the reasons, the more likely people can come up with meaningful reasons. However, this cannot be answered in the present study. More experimental manipulation research is needed to test the causal effect. One conclusion I can make from these findings is rationale generation quality plays a more important role than rationale generation tendency. Hypothesis 2 was supported by the findings.

In addition to investigating the effects of rationale generation orientation on motivation and learning, I also tested the classical SDT model, the Needs-Motives-Outcomes model (see Figure 4.1), in a context of taking uninteresting but required academic courses. It is interesting to note that autonomy plays a dominant role in predicting autonomous motivation and controlled motivation. Autonomy satisfaction was the sole factor predicting autonomous motivation, and autonomy frustration was the only factor predicting both autonomous motivation and controlled motivation. This finding has not previously been described. Several SDT studies focusing on higher education have found that competence has a dominant contribution to students' self-determined motivation (Hsu, Wang, & Levesque-Bristol, 2019; Levesque-Bristol et al., 2010;

Levesque-Bristol, Richards et al., under review). In contrast to those findings, autonomy plays a critical role in autonomous motivation and controlled motivation in the current study. This inconsistency may be due to the differences in research contexts. Classic tests in SDT (e.g., Deci & Ryan, 2000; Ryan & Deci, 2017) have highlighted the finding that some needs are more salient in certain situations. Previous research examines students' general learning experiences in higher education (e.g., Hsu et al., 2019; Levesque-Bristol, Richards et al., under review), whereas in the current research, I only focus on the experiences regarding uninteresting but required academic courses, in which students generally perceive little autonomy. When taking uninteresting but required academic courses, students are mainly being deprived of autonomy. Therefore, autonomy becomes more salient in such situation. Wolters (1998) has documented a similar finding regarding motivational strategies. In that study, Wolters (1998) examined motivational strategies across various learning situations, including irrelevant tasks, difficult tasks, and boring tasks, and found that when faced with boring course material, students were more likely to adopt interest-related strategies to maintain their efforts. It is possible to hypothesize that the significance of basic psychological needs is somewhat influenced by the scarcities of the needs. The more deficient in a need, the more important the need is. Another possible explanation for the dominant role of autonomy is that autonomy might be primed during Study 1 where participants were oriented to recall uninteresting but required courses and asked to complete the basic psychological needs and motivation surveys regarding such experiences. Participants were likely to focus more on the causes of their behaviors than the performance. The priming effect has been found in previous studies (e.g., Levesque & Pelletier, 2003). Further work is required to investigate these interpretations.

The present study contributes to a theoretical understanding of extrinsic motivation and internalization. First, this research provides new evidence about the role of the characteristics of the learners in the process of internalization. I demonstrated that rationale generation orientation, especially rationale generation quality, was associated with basic psychological needs satisfaction and frustration, which in turn, was correlated with autonomous motivation, controlled motivation, and perceived learning outcomes. This finding explains why students are differentially motivated even when they sit in the same classroom and study with the same teacher. Students who are able to bring value to learning and make learning more relevant tend to perceive more satisfaction and less frustration in basic psychological needs, compared to students who fail to do so. A next step in line with the current research is to investigate the antecedents of college students' rationale generation orientations. In concordance with past research in Auto-Motive Model (Bargh, 1990; Levesque & Pelletier) and with SDT, I propose that individuals' prior experiences in receiving or generating rationales and perceptions of autonomy, competence and relatedness may affect the development of rationale generation orientation. Further analyses of the factors associated with rationale generation orientation may provide information for intervention efforts. A note of caution is due here since the bivariate correlations between SDT-related constructs and rationale generation tendency and quality were relatively small. It may be that in the current study rationale generation orientation was measured at the global level whereas the SDT-related constructs were measured at the contextual level. Stronger correlations between the constructs are expected if measured at the same level. Second, the creation and validation of the rationale generation orientation scale is an important step forward for research investigating rationale generation. Prior to this study it was difficult to investigate the relations between rationale generation and other constructs. Third, this

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dissertation has gone some way towards enhancing our understanding of students' experiences in learning uninteresting but required tasks from the perspective of SDT. According to the SDT, autonomous motivation and controlled motivation should be negatively correlated. However, I found a small positive correlation ($r = .14$) between them in the current study. Before suggestions are introduced, I suggest that more studies should be carried out on examining the functions of different types of motivation in uninteresting but required learning contexts.

Even though this current work is the first of its kind to test the effects of rationale generation orientation on college students' autonomous motivation in the context of doing uninteresting but required academic activities, there are some limitations worth discussing. First, I used half of the dataset to run EFA and another half to run CFA, which is not an ideal approach to validate a scale. Although I believe it is acceptable as the focus of my study is to examine the relations among all variables not to develop a scale, more data is needed to test the viability of the findings. Second, I only obtained one-time self-report data to investigate the relations between rationale generation orientation and other constructs. Thus, the correlational results cannot demonstrate causal relations among the variables. Future research may use experiment and other methods to replicate the current findings. Third, participants in this research were recruited from only one institution in the American Midwest. This has potential implications for generalizing the results to students of other institutions with backgrounds dissimilar to the one in the present study.

4.5 Conclusion

The present research extends SDT work on internalization by exploring the role of the characteristics of the learners in the process of internalization. A self-report scale was created and validated via a series of factor analyses and correlational analyses to assess students'

rationale generation orientation. Rationale generation orientation was found to be associated with students' uninteresting but required learning experiences. The SEM results revealed that rationale generation orientation, including rationale generation tendency and rationale generation quality, is one learner-related factor influencing basic psychological needs, motivation, and learning outcomes. Rationale generation quality plays a more important role than rationale generation tendency.

CHAPTER 5: MANUSCRIPT 2-STUDY 2 AND STUDY 3

This chapter is written based on Study 2 and Study 3.

Title: Effects of Rationale Generation on Motivation and Learning during Uninteresting but Required Academic Activities

5.1 Introduction

In the real-world of school-related tasks, a lot of academic activities that students are asked to do are not fun. To function effectively at school, students have to participate in activities that are not enjoyable to them but are valued by the authorities. The theory of self-determination (SDT; Deci & Ryan, 2000) provides a useful account of how to move students' motivation from unwillingness, to passive compliance, and to active personal commitment. Though sometimes undesirable, extrinsic motivation plays a critical role in driving students to engage in activities that are not inherently interesting. The organismic integration theory (OIT), a sub-theory of SDT, addresses the topic of extrinsic motivation by introducing the concept of internalization, which refers to the internal psychological process that people integrate socially-valued regulations that are initially perceived as being external and transform them into their own (Koestner & Losier, 2002; Ryan & Deci, 2017). Although it is a natural growth process, internalization can be facilitated by various social and personal factors. Studies over the past two decades have provided important evidence in terms of what teachers could do to facilitate students' internalization and promote autonomous types of motivation (Deci, Eghrari, Patrick, & Leone, 1994; Jang, 2008; Reeve, Jang, Hardre, & Omura, 2002; Savard, Joussemet, Pelletier, & Mageau, 2013; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004).

Even though the educational researchers and practitioners have put in much effort to design interesting learning activities and to create autonomy-supportive learning environments, students may differ in the extent to which they find the activities interesting and perceive the environments as autonomy-supportive (Ryan & Deci, 2017). Recently, researchers propose that more work is needed to explore the role of the characteristics of the learners in the process of internalization (Vansteenkiste et al., 2018), which helps understand why students are differentially motivated despite sitting in the same classroom. In the present research, I use SDT as my guiding framework to investigate the effects of rationale generation on students' motivation and learning during uninteresting but required activities.

5.1.1 Extrinsic Motivation

According to SDT, there are three types of motivation, which includes amotivation, extrinsic motivation, and intrinsic motivation. Extrinsic motivation involves a contingency between the target behavior and some separable consequence desired by the individual (Deci & Ryan, 2015). The sources of extrinsic motivation can be both internal and external; however, the behaviors are instrumental. That is, the aims of doing activities are separable from the action itself. Among the three types of motivation, extrinsic motivation is the one associated with uninteresting but required learning experiences. According to SDT, people have an inherent tendency to integrate socially-valued regulations that are initially perceived as being external (Koestner & Losier, 2002). We call this process internalization, which is viewed in terms of a continuum. Based on the degrees of internalization success, there are four regulatory styles: external regulation, introjection, identification, and integration (Deci & Ryan, 2002).

People with external regulation behave because of external contingencies, such as rewards and punishments, have not been internalized (Deci & Ryan, 2015). The source of

regulation is external. Although external regulation can seduce people into action and achieve short-term goals, it is often associated with poor maintenance (Ryan & Deci, 2008). Introjection refers to a type of extrinsic motivation that people do activities to avoid guilt and shame, or to please others. With introjection, people partially take in external contingencies but not fully accepted it as their own (Deci & Ryan, 2015). The source of motivation is somewhat internal since introjection involves adopting a regulation or value; however, it is still not fully self-determined because the regulation or value does not become integrated to a person's holistic self-representation. People with identification behave because they identify with the personal value and importance of the behavior for themselves and accept it as their own (Deci & Ryan, 2015). Identification is the first type of extrinsic motivation that is autonomous. People with identification consciously decide to pursue certain goals that are important to themselves. The perceived locus of causality becomes internal to the self since people act out of a belief in personal importance (Ryan & Deci, 2017). In the educational domain, identification is extremely important. Some researcher found that identification had even stronger positive effects on students' academic engagement, persistence in school, and successful adaption than intrinsic motivation did (Koestner & Losier, 2002). The move from identification to integration occurs when the extrinsic motivation aligns with other aspects of individuals' values, goals, needs, and beliefs (Schreiber, 2016). Integration is the most autonomous form of extrinsic motivation. People with integration behave because the behavior is an expression of who the person is (Deci, Vallerand, Pelletier, & Ryan, 1991). It involves people having integrated new identifications with other aspects of their own integrated sense of self (Deci & Ryan, 2015). People with integration act with a full sense of volition and choice.

5.1.2 Rationale Generation

Previous research has repeatedly demonstrated the positive effects of rationale provision on motivation, affection, and engagement (Deci et al., 1994; Jang, 2008; Legault, Gutsell, & Inzlicht, 2011; Reeve et al., 2002). Compared to externally offered rationales, self-generated rationales are more likely to provoke perceptions of self-relevance (Vansteenkiste et al., 2018), which tends to foster autonomous motivation. A number of correlational and experimental studies, within the expectancy-value theory literature, have documented the positive effects of rationale generation on engagement (Harackiewicz, Canning, Tibbetts, Priniski, & Hyde, 2016), academic performance (Harackiewicz, et al., 2016; Hulleman & Harackiewicz, 2009; Hulleman, Godes, Hendricks, & Harackiewicz, 2011), retention (Canning et al., 2018), course interest (Hulleman & Harackiewicz, 2009; Hulleman et al., 2011), positivity and future career motivation (Brown, Smith, Thoman, Allen, & Muragishi, 2015). In those studies, the intervention is manipulated through a writing task in which participants are asked to explain either how the learning materials are relevant to their lives or why the learning tasks are important or useful to them. Although many positive outcomes have been found through those interventions, a problem with this kind of intervention is that participants are restricted to generating a specific type of rationale, which is the utility-value of learning. It is possible that participants may perceive such interventions as controlling, especially in the contexts of uninteresting but required learning. Studies within SDT have found that externally provided rationales, when communicated in a controlling way, failed to promote motivation and learning (Deci et al., 1994; Reeve et al., 2002). In addition, researchers under the guidance of the expectancy-value theory barely associate learners' self-generated rationales with their types of motivation, let alone different types of extrinsic motivation.

Thus far, there has been little discussion about the effects of rationale generation from the perspective of SDT. In a recent experimental study, Davis, Kelly, Kim, Tang, and Hicks (2016) investigated whether self-generated rationales could foster more sense of meaning, as well as more integrated motivation for engaging in goal-relevant behaviors. In their studies, they used the approach of motivation-oriented reflections to prompt students to generate rationales for their academic goals. Specifically, they randomly assigned participants to think about a specific academic goal in either a motivation-oriented manner (i.e., why do you pursue that goal?) or strategy-oriented manner (i.e., how do you pursue that goal?) and assessed their self-concordance and motivation. They found that participants who did the motivation-oriented reflections reported greater self-concordance and motivation relative to those who did the strategy-oriented reflection. Their findings supported the idea that reflecting on "why" one pursues a goal and generating rationales for pursuing that goal can enhance self-congruent and induce more motivation. Davis et al. (2016) claim that a motivation-oriented reflection on academic goals can enhance perceived meaningfulness. Furthermore, the perceived meaningfulness of goals can make the students feel more self-concordant, which in turn, lead to more motivation.

Although Davis et al. (2016) took the first step in studying the role of rationale generation using the lens of SDT, the research context was different from the current one. In their experiments, participants generated rationales for academic goals, whereas the current research focuses on an uninteresting but required academic activity. Furthermore, Davis et al. (2016) did not differentiate between different types of rationales. Theoretically, there should be four types of rationales corresponding to the four types of extrinsic motivation (Reeve et al., 2002). Reflecting on the purpose of doing a task and generating rationales may increase the chances of recognizing the importance of the task, but not necessarily the case. For example, an engineering

student takes a calculus course because it is required by his or her program. When he/she is asked to generate rationales for attending the classes, he/she might generate various rationales, from "fulfilling the attendance requirement" to "preparing for advanced engineering courses." I argue that students who generate autonomous types of rationales are more likely to develop autonomous types of extrinsic motivation in comparison with those who generate controlled types of rationales. Rationale generation may have positive effects on autonomous motivation because having opportunities to reflect and generate rationales for required activities tend to increase the likelihood of generating high-quality rationales that associated with integration and identification. So far, little is known about the effects of rationale generation intervention on different types of extrinsic motivation, let alone the influences of types of rationales. The current investigation aims to provide empirical evidence for the causal effects of rationale generation on autonomous motivation and academic performance during uninteresting but required learning activities.

5.1.3 Autonomous Motivation and Learning Outcomes

In SDT, abundant research has demonstrated that students who have developed more autonomous types of motivation are more likely to achieve (Grolnick & Ryan, 1989; Kusurkar, Ten Cate, Vos, Westers, & Croiset, 2013; Taylor et al., 2014), to evidence conceptual understanding (Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005), and to adjust (Grolnick & Ryan, 1989; Kusurkar et al., 2013), compared to their peers. However, a lack of evidence on the relations between autonomous motivation and students' learning outcomes has also been reported in higher education contexts, especially when learning outcomes are measured by course grade and GPA (e.g., Conti, 2000; Wang, Hsu et al., 2019). According to SDT, autonomous types of motivation have stronger predictive power to explain difficult or complex

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actions (Ryan & Deci, 2017). Recent research suggests that transfer of learning, as a prototype of deep understanding and application, can be a more effective indicator in examining the effects of autonomous motivation on learning (Hsu et al., 2019; Wang, Hsu et al., 2019). In the current work, transfer of learning is defined as the capability of applying prior knowledge and skills in a new situation (Belenky & Nokes-Malach, 2012; Bransford & Schwartz, 1999). Empirical evidence on the effects of different types of motivation on students' transfer of learning is quite limited. Levesque-Bristol (2006) and colleagues developed the integrative model for learning and motivation (IMLM) model to explain how student motivation contributes to engagement, meta-cognition, and knowledge transfer. Recently, they demonstrated the positive associations between self-determined index and transfer in various contexts of higher education (Hsu et al., 2019; Levesque-Bristol, Bonem et al., under review; Levesque-Bristol, Richards, Zissimopoulos, Wang, & Yu, under review). However, in those studies, self-determined index was calculated as a composite score, so it is unclear about the relations between different types of motivation and transfer of learning. Moreover, the assessment of transfer might be questionable in those studies (Hsu et al., 2019; Levesque-Bristol, Richards et al., under review; Wang, Hsu et al., 2019) because it relied solely on students' self-reports, which may account for the stronger relationship between motivation and transfer (Wang, Zhang, & Yao, 2019). In the present research, I examined the relations between motivation and various types of learning outcomes, including perceived learning, rote learning, and transfer of learning. Transfer of learning was measured with both self-reports and performance on the transfer tasks.

Furthermore, previous research in both rationale and relations between motivation and learning outcomes has mostly been done with quantitative research method (e.g., Canning et al., 2018; Davis et al., 2016; Deci et al., 1994; Harackiewicz et al., 2016; Jang, 2008; Reeve et al.,

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2002; Hsu et al., 2019). In the current research, I adopt the sequential explanatory mixed method design, which offsets the weaknesses of quantitative and qualitative research and allows me to collect comprehensive data.

5.1.4 Overview of the Research

The purpose of the current research is to investigate the effects of rationale generation intervention on students' motivation and learning outcomes through the lens of SDT. Specific research questions are: (1) to examine whether reflecting on the purpose of doing an activity, an approach to prompt students to generate rationales, can promote students' situational autonomous motivation, perceived learning, rote learning, and transfer of learning; and (2) to understand students' perspectives on uninteresting learning experiences and successful motivational strategies in the context of higher education.

To answer these questions, an explanatory sequential mixed method design was conducted. In Study 2, I investigated the causal effects of rationale generation on students' situational motivation and learning outcomes with experimental manipulation. The hypothesis of Study 2 is that, compared to the control group, participants in the rationale generation intervention group have higher scores in autonomous types of motivation, perceived learning, rote learning, and transfer of learning. In addition, the effects of rationale generation would be stronger on transfer of learning than on rote learning. Study 3 sought to gain students' perspectives on rationale generation and other successful motivational strategies and to seek the explanations related to the findings of Study 2. Semi-structured interviews were conducted with students regarding their experiences of doing uninteresting but required academic activities and the motivational strategies they used.

5.2 Study 2: The Causal Effects of the Rationale Generation Intervention on Motivation and Learning in Uninteresting but Required Academic Activities

5.2.1 Research Questions and Hypotheses

In this study, I examined the role of rationale generation for promoting autonomous motivation and learning outcomes. Hypothesis 1: compared to the control group, participants in the rationale generation group would have higher scores in autonomous types of motivation, rote learning, and transfer of learning. Hypothesis 2: the effects of rationale generation would be stronger on transfer of learning than on rote learning.

5.2.2 Participants

Participants were 82 (49 females and 33 males) graduate students from a large research-intensive university in the Midwestern United States. Twenty-four participants were between 21 and 25, and 58 participants were 26 or older. Forty participants reported being Asian, 22 participants reported being White, five participants reported being African American, seven participants reported being Hispanic or Latino, and seven participants reported being others. These participants were from various academic disciplines, including education ($n = 23$), engineering ($n = 15$), liberal arts ($n = 14$), science ($n = 12$), technology ($n = 6$), agriculture ($n = 4$), management ($n = 3$), pharmacy ($n = 3$), and others ($n = 2$). Participation in this study was voluntary, and participants received \$5 for their time and participation.

5.2.3 Measures and Materials

Rationale Generation Orientation Scale (RGOS).

The RGOS measures people' tendency to generate rationales for their learning behaviors and inclinations to produce autonomous types of rationales. It consisted of 15 items (see Appendix

E). The RGOS uses a 5-point Likert scale ranging from 1("rarely") to 5 ("very often"). The validity and reliability of the RGOS were demonstrated in Study 1. Internal consistency was good for rationale generation tendency ($\alpha = .88$) and rationale generation quality ($\alpha = .86$) in the current study.

Situational Motivation Scale (SIMS).

Participants' perceptions of their reasons for engaging in uninteresting but required academic activities were measured using a modified version of SIMS (Guay, Vallerand, & Blanchard, 2000; Levesque-Bristol, Knapp, & Fisher, 2010; see Appendix H). The scale includes 18 items, all of which use a 7-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Within the SIMS, there are six subscales, which measure the six types of motivation proposed by Deci and Ryan (1985, 2000). Each subscale is comprised of three items per subscale: intrinsic motivation (e.g., "Because I really enjoy it"), integration (e.g., "Because learning all I can about academic work is really essential for me"), identification (e.g., "Because it allows me to develop skills that are important to me"), introjection (e.g., "Because I would feel bad if I didn't"), external motivation (e.g., "Because I feel I have to"), and amotivation (e.g., "Because I don't know. I have the impression I'm wasting my time"). Only the four types of extrinsic motivation were included in the study. Internal consistency was acceptable for all subscales, although integration was a bit low: integration ($\alpha = .56$), identification ($\alpha = .71$), introjection ($\alpha = .89$), and external regulation ($\alpha = .78$). An overall level of autonomous motivation was calculated by averaging integration and identification, while an overall level of controlled motivation was calculated by averaging introjection and external regulation.

Perceived Knowledge Transferability Scale (PKTS).

Student perceptions of how relevant the knowledge learned in the target course will be for future courses and their career paths were measured using the PKTS (Levesque-Bristol, Richards et al., under review). The PKTS includes eight statements, all of which used a 7-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). Two examples of statements from the PKTS are "I understand how I will use the information learned in this class in my professional life" and "I feel confident in my ability to apply the course material in other classes that I have." Three items of the scale was used in Study 2 (see Appendix I) to measure participants' perceptions of knowledge transfer. Internal consistency coefficient of the three items was acceptable ($\alpha = .74$) in the current study.

Perceived Learning Satisfaction.

Students' perceptions of learning satisfaction were assessed using the Perceived Learning Satisfaction Scale (Kim, Kwon, & Cho, 2011). Four items were chosen from the scale to assess participants' perceptions of learning satisfactions. All items were modified to be fit into this study in terms of language and assessed using a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Internal consistency coefficient of the four items was satisfactory ($\alpha = .77$) in the present study.

Uninteresting but Required Academic Activity.

The learning activity is about APA formatting. I selected this activity based on the criteria proposed by Jang (2008): (a) Students generally perceive it to be uninteresting, (b) it holds ecological validity, and (c) it possesses hidden value and relevance. I created a one-minute introduction video, a ten-minute lesson video, and a three-minute lesson video. The lesson videos

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cover the following topics: numbers and in-text citations, and reference list. The lessons were presented in an uninteresting format. That is, the speaker used a monotonous tone, devoid of interest-enhancing embellishments (following Jang, 2008).

Manipulation Check.

To ensure that participants perceive the experimental material as uninteresting, I asked participants to rate the APA formatting tutorial on a 5-point Likert scale with 1 = definitely interesting and 5 = definitely not interesting.

Rote Learning.

I created eight multiple-choice items (See Appendix K for the items) to measure participants' recognition of facts. Each multiple-choice items were scored as correct (1) or incorrect (0). These scores were added up to obtain an overall score of rote learning. The possible score of rote learning was from 0 to 8. To avoid guessing, I put I don't know as one of the options and told the participants not to choose the answers at random. The content validity of the items has been supported by one faculty member and two doctoral students in educational psychology who are very familiar with APA formatting.

Transfer of learning.

I created two transfer tasks to assess participants' performance on transfer of learning in Study 2. Transfer task 1 was used to measure participants' transfer of learning in the main experiment of Study 2 (see Appendix L). It consisted of 11 formatting errors related to in-text citation and numbers, which were covered in the ten-minute video of the main experiment of Study 2. Each formatting errors were scored as successfully identified (1) or missed (0). These

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scores were summarized to obtain an overall score of transfer of learning. Therefore, the possible

score of transfer task 1 was from 0 to 11. Transfer task 2 was created to measure participants'

transfer of learning in the follow-up experiment of Study 2 (see Appendix M). It consisted of

five formatting errors related to reference lists, which was covered in the three-minute video of

the follow-up experiment of Study 2. Similar to the coding rule of transfer task 1, each

formatting errors were scored as successfully identified (1) or missed (0). A summarized score

was used to represent transfer of learning in the follow-up experiment. The scores of transfer task

2 ranged from 0 to 5. The content validity of the materials has been supported by one faculty and

one doctoral student in educational psychology who are very familiar with APA formatting.

5.2.4 Procedures

Participants were recruited via paper flyers and emails (see Appendix B and C). Graduate

students who are over 18 years old were invited to join the experiment. The total time

commitment for this experiment is 30 minutes, and eligible participants received $5 for

completing the study. All materials, including the lesson videos, were presented in Qualtrics.

During the experimental session, the experimenter first briefly introduced the procedure of the

experiment and then collected the signed consent forms from the participants. The participants

were randomly assigned to either the rationale generation group or the control group. The

experiment consists of three phases. Phases 1 and 2 take place inside the computer lab while

phase 3 occurs outside the computer lab. In phase 1, all participants watched a one-minute video

introducing APA formatting. Following this introduction, the rationale generation group was

asked to write a short paragraph explaining why they would learn APA formatting while the

control group was asked to type a few sentences regarding the confidentiality of the experiment.

In phase 2, all participants were asked to watch a ten-minute video regarding the knowledge of

APA formatting, which possesses hidden value and relevance but is presented in an uninteresting format. Then, they were given eight multiple-choice questions to check for rote learning. After that, all participants were asked to complete a survey, a manipulation check of the uninteresting activity, and transfer task 1. At the end of the experiment, they were asked to leave their email addresses if they are interested in participating in the follow-up experiment (i.e., phase 3), which was conducted to assess the lasting effect of the intervention on transfer of learning over one week as educational intervention might result in improved performance on a delayed assessment but not on an immediate assessment (McLaren, Adams, & Mayer, 2015). The experiment in phase 3 was done solely online, so participants did not need to come to the computer lab. The time commitment for phase 3 is eight minutes or less. Participants watched a three-minute video regarding APA reference style and then completed transfer task 2. Participation in phase 3 is voluntary without any incentive. Figure 5.1 shows the diagram of the experimental procedure of Study 2.

```
                Watch a 1-minute introduction video

Phase 1              Intervention                    Control

                Write a short paragraph        Type a few sentences
                explaining why they            regarding the
                would learning APA             confidentiality of the
                formatting                     experiment


                Watch a 10-minute APA lesson video
                                                        30-minute
                Complete the rote learning items        experiment
                                                        in lab
                Complete the survey: SIMS, PKTS, and PLS

Phase 2
                Complete the manipulation check

                Complete transfer task 1

                Leave email addresses if interested in the follow-up study


                Watch a 3-minute APA lesson video      8-minute
Phase 3                                                experiment
                Complete transfer task 2               online
```

Figure 5.1 The diagram of the experimental procedure of Study 2.

5.2.5 Data Analysis

First, I eliminated the data of the participants ($n = 12$) who had a score of one (1 = "definitely interesting") on the manipulation check of uninteresting activity because this study focuses on students' uninteresting learning experience. Then I used an independent samples *t*-test to compare the situational motivation, perceived learning, perceived knowledge transferability, rote learning, and transfer of learning between the experimental group and the control group.

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Cohen's *d* is used as a measure of effect size. A Cohen's *d* between 0.15 and 0.40 is considered as a small effect, between 0.40 and 0.75 is a medium effect, and above 0.75 is a large effect (Cohen, 1992). The assumptions of independent samples *t*-test, including normality, and independence were checked. I conducted a Chi-Square test to check whether there was an association in the population between experimental condition and participation in the follow-up. Next, I ran another independent samples *t*-test to compare the follow-up transfer of learning between the rationale generation group and the control group.

To explore the effect of the rationale quality on motivation and learning, I coded the rationale generation group into two subgroups: the high-quality group and the low-quality group, based on the content analysis on the rationales they generated. If participants list only rationales related to external regulation or introjection, which are considered as low-quality rationales, then they are coded into the low-quality group. An example of a low-quality rationale is that "The reason why I learn APA style is because my dissertation is required to follow APA standard." If participants list at least one rationale related to integration or identification, which are considered as high-quality rationales, then they are coded into the high-quality group. An example of a high-quality rationale is that "I have never used APA style of writing, but after watching the video, I think it would be useful for my academic work." Examples of coding is shown in Appendix P. A multivariate analyses of variance (MANOVA) was carried out to examine condition differences in the target dependent variables since I had three groups in total, including the low-quality rationale group, the high-quality rationale group, and the control group. For each significant *F* test, multiple comparisons were conducted to compare between groups. η^2 is used as a measure of effect size for the MANOVA. A η^2 between 0.01 and 0.06 is considered as a small effect,

between 0.06 and 0.14 is a medium effect, and above 0.14 is a large effect (Cohen, Miles & Shevlin, 2001).

5.2.6 Results

Effects of Rationale Generation Intervention on Motivation and Learning

An independent samples *t*-test was conducted to compare the mean scores of motivation between the rationale generation group and the control group. The results (see Table 5.1) showed that there was a statistically significant difference in identification. Compared with the control group, the rationale generation group reported higher levels of identification. The effect size was medium. No significant differences were found in other measures. Closer inspection of the table showed small effect sizes on introjection, autonomous motivation, and perceived knowledge transferability. The mean scores for autonomous motivation was marginal significant at the *p* = .10 level with one-tailed test.

Since identification was found significantly enhanced by the rationale generation intervention, I further examined the correlations among rationale generation intervention, identification, and various learning outcomes to check whether there were potential mediating effects of identification. The results of bivariate correlations (see Table 5.2) demonstrated significant correlations between perceived knowledge transferability, perceived learning satisfaction, and identification. Thus, I conducted a path analysis to examine the mediating effects of identification on the relations between rationale generation intervention and perceived learning outcomes. The mediation model proposed that rationale generation would enhance participants' identification, which would increase participants' perceived knowledge transferability and perceived learning satisfaction (see Figure 5.2). The model fit the observed data well, χ^2 (2) = 0.88, *p* = .645, RMSEA = .00, NNFI = 1.05, IFI = 1.02, CFI = 1.00. As shown

in Figure 5.2, all paths within the mediation model were significant and in the predicted direction, as the rationale generation intervention predicted identification ($\beta = .25$, $p = .033$), and identification predicted perceived knowledge transferability ($\beta = .55$, $p < .001$) and perceived learning satisfaction ($\beta = .57$, $p < .001$). The direct path from rationale generation was not significant to neither perceived knowledge transferability ($\beta = .13$, $p = .274$) nor perceived learning satisfaction ($\beta = .06$, $p = .633$), suggesting that identification, rather than rationale generation per se, explained extend of perceived learning outcomes.

Table 5.1

Comparisons in Motivation and Learning Between the Rationale Generation Group and the Control Group

	Possible range	Rationale generation (n = 36)		Control (n = 34)		t	p2-tailed	p1-tailed	Cohen's d
		M	SD	M	SD				
Integration	1-7	4.82	0.99	4.75	0.99	0.33	.740	.370	0.07
Identification	1-7	4.86	0.91	4.36	1.07	2.11	.039	.020	0.50
Introjection	1-7	2.82	1.51	2.53	1.22	0.90	.374	.187	0.21
External regulation	1-7	3.87	1.73	4.05	1.37	-0.48	.634	.317	0.12
Autonomous motivation	1-7	4.84	0.78	4.55	0.92	1.42	.160	.080	0.34
Controlled motivation	1-7	3.35	1.46	3.29	1.11	0.19	.853	.427	0.05
Perceived learning satisfaction	1-7	5.15	0.78	5.07	0.75	0.47	.640	.320	0.10
Perceived knowledge transferability	1-7	5.36	0.95	5.10	1.09	1.08	.284	.142	0.25
Rote learning	0-8	4.69	1.35	4.85	1.16	-0.53	.601	.301	0.13
Transfer of learning	0-11	4.56	2.41	4.50	2.06	0.10	.918	.459	0.03

Table 5.2

Correlation Coefficients for Rationale Generation Intervention, Identification, and Various Learning Outcomes (n = 70)

	1	2	3	4	5	6
1.Rationale Generation	-	.27*	.06	.13	-.06	.01
2.Identification		-	.57**	.55**	-.13	.03
3.PLS			-	.56**	-.11	-.06
4.PKT				-	.07	.01
5.Rote Learning					-	.47**
6.Transfer						-

Note: * represents $p < .05$, ** represents $p < .01$. Rationale Generation was coded as 0 (the control group) or 1 (the intervention group), PLS represents perceived learning satisfaction, PKT represents perceived knowledge transferability.
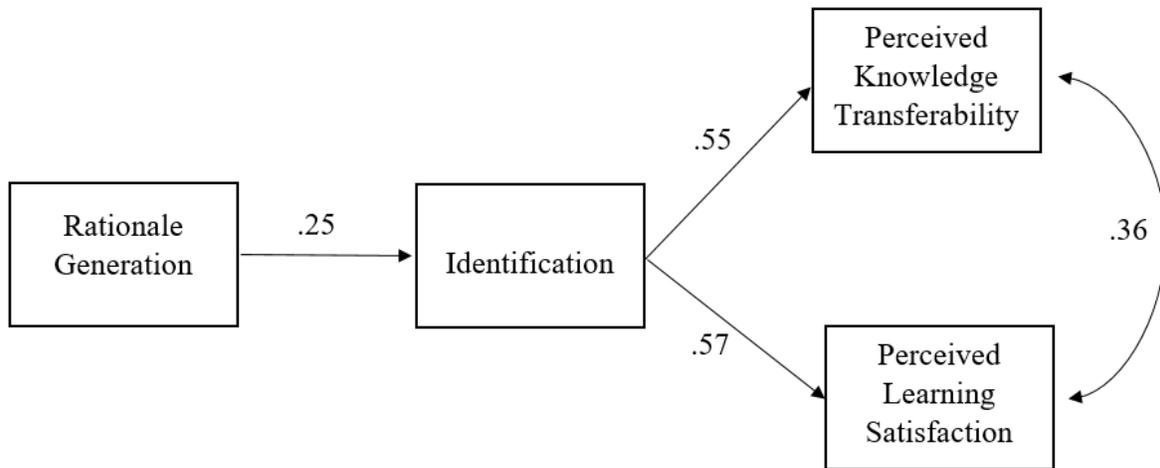
Figure 5.2 Standardized parameter estimates for the mediating model.

Effects of Rationale Generation on the Follow-up Study

Twelve participants from the controlled group and 15 participants from the rationale generation group participated in the follow-up study. The Chi-Square test ($\chi^2 = 0.30$, $p = .584$) indicated that there was no association between the experimental conditions and participation in

the follow-up study. The independent samples *t*-test indicated no significant difference ($t = -0.70$, $p = .491$, Cohen's $d = 0.27$) in transfer of learning between the rationale generation group ($M = 3.93$, $SD = 1.49$) and the control group ($M = 3.50$, $SD = 1.73$), but the rationale generation group scored higher than the control group with a small effect size. The nonsignificant result might be due to the small sample sizes.

The Quality of the Rationales

Among the 36 participants in the intervention group, 29 participants listed at least one rationale related to integration or identification, while seven participants did not. The results of the Levene's test showed that the variances were not quite equal among the three groups in external regulation ($p = .08$) and controlled motivation ($p = .06$). Therefore, I conducted MANOVA on the remaining dependent variables. The results of MANOVA were mixed across four test statistics (Pillai's trace $V^{(s)} = .29$, $p = .113$; Wilks' Lambda $\Lambda = .72$, $p = .100$; Hotelling's Trace $T^2 = .37$, $p = .089$; Roy's Largest Root $\phi_{max} = .32$, $p = .013$). Since the statistical tests of MANOVA were either significant or marginal significant, I further reported the results of ANOVA for each dependent variable (see Table 5.3).

Table 5.3

Comparisons in Motivation and Learning Among the High-Quality Rationale Group, the Low-Quality Rationale Group, and the Control Group.

	High (n = 29)		Low (n = 7)		Control (n = 34)					
	M	SD	M	SD	M	SD	F	$p_{2\text{-tailed}}$	$p_{1\text{-tailed}}$	η^2
Integration	4.91	0.94	4.48	1.20	4.75	0.99	0.59	.555	.278	0.02
Identification	5.07[a]	0.77	4.00[b]	0.96	4.36[b]	1.07	6.01	.004	.002	0.15
Introjection	2.77	1.38	3.05	2.07	2.53	1.22	0.51	.604	.302	0.02
Autonomous motivation	4.99[a]	0.70	4.24[b]	0.84	4.55[b]	0.92	3.38	.040	.020	0.09
Perceived learning satisfaction	5.26	0.77	4.71	0.74	5.07	0.75	1.56	.217	.109	0.05
Perceived knowledge transferability	5.37	0.86	5.33	1.35	5.10	1.09	0.58	.564	.282	0.02
Rote learning	4.66	1.37	4.86	1.35	4.85	1.16	0.21	.813	.407	0.01
Transfer of learning	4.90	2.35	3.14	2.27	4.50	2.06	1.79	.175	.088	0.05

Note: Means sharing a letter in their superscript are not significantly different at the .05 level according to a LSD test.

The main effect for identification was significant (F (2, 67) = 6.01, p = .004, η^2 = .15). The effect size was large. Follow-up analysis showed that participants in the high-quality rationale group, compared with the other two groups, reported significantly higher scores on identification (vs. control p = .004; vs. low p =.009). There was no significant difference in identification between the low-quality rationale group and the control group (p = .360). The main effect for autonomous motivation was also significant (F (2, 67) = 3.38, p = .040, η^2 = .09). The effect size was medium. The result of multiple comparisons showed that participants in the high-quality rationale group, compared with the other two groups, reported significantly higher scores on autonomous motivation (vs. control p = .042; vs. low p =.035). There was no significant difference in autonomous motivation between the low-quality rationale group and the control group (p = .361). No significant main effects were found in other variables. However, from the table, it can be seen that small effect sizes have been achieved for integration, introjection, perceived learning satisfaction, perceived knowledge transferability, and transfer of learning. Moreover, the main effect of the three groups on transfer of learning was marginal significant at the p = .10 level with one-tailed test.

The Effect of Rationale Generation Intervention on the Relations among Rationale generation orientation, Motivation, and Learning

Extending previous research on rationale generation orientation (i.e., Study 1), I examined whether the relations among rationale generation orientation, motivation, and learning vary between the intervention group and the control group. Table 5.4 displays the correlation coefficients between the RGT, RGQ, and target dependent variables for the intervention group and the control group. For rationale generation tendency, the correlation coefficients in the intervention condition were generally stronger than those in the control condition. Rationale

generation tendency was positively correlated with perceived learning satisfaction ($r = .51$, $p = .001$) in the intervention group, whereas it was not significant ($r = .15$, $p = .402$) in the control group. Rationale generation tendency was found negatively correlated with transfer performance ($r = -.39$, $p = .023$) in the control group, but not ($r = -.22$, $p = .204$) in the intervention group.

Similarly, the correlation between rationale generation quality and the dependent variables tended to be stronger in the intervention group than the control group. Rationale generation quality was found positively correlated with integration ($r = .43$, $p = .009$), autonomous motivation ($r = .37$, $p = .025$), and perceived learning satisfaction ($r = .44$, $p = .008$) in the intervention group. However, rationale generation quality was not correlated with any dependent variables in the control group. The findings indicated that rationale generation orientation would have stronger associations with motivation and learning when participants were offered rationale generation opportunities. Interestingly, the correlation coefficients among types of motivation were also different between the rationale generation group and the control group. Identification was positively correlated with introjection ($r = .43$, $p = .005$) and external regulation ($r = .41$, $p = .006$) in the rationale generation group, whereas it was not correlated with introjection ($r = .12$, $p = .252$) or external regulation ($r = -.02$, $p = .446$) in the control group.

Table 5.4

Correlation Coefficients Between RGT, RGQ, Motivation and Learning for the Rationale Generation Group and the Control Group.

	1	2	3	4	5	6	7	8	9	10	11	12
1. RGT	-	.60*	.20	.13	.25	.10	.24	.19	.51*	.11	-.20	-.22
2. RGQ	.77*	-	.43*	.17	.27	.17	.37*	.24	.44*	.23	-.00	-.01
3. Integration	-.07	-.06	-	.34*	.23	.04	.84*	.14	.43*	.29*	-.31*	-.22
4. Identification	.03	.00	.60*	-	.43*	.41*	.80*	.47*	.56*	.58*	-.19	-.03
5. Introjection	.10	.06	-.09	.12	-	.62*	.39*	.89*	.28*	.36*	-.27	-.29*
6. External regulation	-.02	-.06	-.10	-.02	.48*	-	.27	.91*	.10	.10	-.16	.03
7. Autonomous motivation	-.02	-.03	.89*	.90*	.02	-.07	-	.36*	.60*	.52*	-.31*	-.16
8. Controlled motivation	.04	-.01	-.11	.05	.84*	.88*	-.03	-	.20	.24	-.23	-.13
9. Perceived satisfaction	.15	.29	.56*	.60*	.01	.05	.65*	.04	-	.59*	-.18	-.15
10. Perceived transferability	.09	.17	.23	.52*	.06	.23	.42*	.17	.53*	-	-.07	-.11
11. Rote learning	.08	.16	-.29*	-.05	-.13	-.13	-.18	-.15	.00	.23	-	.66*
12. Transfer	-.39*	-.28	.11	.08	-.08	.12	.11	.03	.04	.14	.21	-

Note: * represents $p < .05$; correlation coefficients for the intervention group ($n = 36$) are presented above the diagonal, and correlation coefficients for the control group ($n = 34$) are presented below the diagonal.

5.2.7 Discussion

The purpose of Study 2 was to examine the causal effect of rationale generation intervention on situational motivation and learning. The results showed that the rationale generation intervention successfully enhanced students' identification, although independent samples *t*-test did not find significant differences in other motivational and learning outcomes. The results partially supported my hypothesis 1. The result that only identification was found different between the intervention and the control group was not surprising. The unique role of identification in rationale has been noted in previous literature (Davis et al., 2016; Jang, 2008; Reeve et al., 2002). Reeve et al. (2002) found that providing participants with identified reasons could enhance their perceived importance, perceived self-determination, and effort during uninteresting learning activities. Jang (2008) and Reeve et al. (2002) have further demonstrated the mediating role of identification between rationale and engagement in uninteresting learning contexts. In both studies, rationales were provided by external authorities (Jang, 2008; Reeve et al., 2002). Davis et al. (2016) took the first attempt to examine rationale generation using the lens of SDT and found that the rationale generation intervention can enhance perceived meaningfulness, motivation, and self-concordance. In Davis et al.'s (2016) experiments, the objectives of the rationales were academic goals. In extending previous studies of rationale provision (Davis et al., 2016; Jang, 2008; Reeve et al., 2002), Study 2 used an uninteresting learning activity to experimentally test whether rationale generation can enhance autonomous motivation and learning. The finding match those observed in earlier studies. The effect size of rationale generation intervention in the current study (Cohen's $d = 0.50$) is lower than the effect size of autonomy-supportive rationale provision in Jang's (2008) experiment (Cohen's $d = 0.71$) but similar to the one of identified rationale provision in Reeve et al.'s (2002) experiment

(Cohen's $d = 0.53$), whereas the effect size of high-quality rationale in the current study (Cohen's $d = 0.76$) is larger than all effect sizes as mentioned previously (Jang, 2008; Reeve et al., 2002). This finding suggests that having the opportunities to reflect on the reasons for doing an externally motivated activity can be as effective as receiving identified rationales from authorities in fostering identification. Rationale generation intervention allows participants to view their behaviors in terms of their values and volitions rather than in terms of the imposition. Compared with receiving identified rationales from others, people are likely to benefit more from coming up with autonomous rationales on their own. This finding supports that self-generated rationales are more likely to provoke perceptions of self-relevance than externally offered rationales (Vansteenkiste et al., 2018).

No significant evidence was found for supporting my hypothesis 2. However, a small effect size (Cohen's $d = 0.25$) was obtained for perceived knowledge transferability between the rationale generation group and the control group in the main experiment of Study 2. The rationale generation group had a higher score in perceived knowledge transfer than the control group. Also, I found the rationale generation group scored higher than the control group with a small effect size (Cohen's $d = 0.27$) for the follow-up transfer task. After breaking the intervention group into the high-quality rationale group and the low-quality rationale group, a larger effect size was found in the transfer of learning ($\eta^2 = 0.05$) than the rote learning ($\eta^2 = 0.01$). According to these findings, it is likely that the current experiment was underpowered as the current sample size did not allow me to detect the small effect sizes for the variables related to learning outcomes.

Another interesting finding was that identification was positively associated with introjection and external regulation for the rationale generation group. This is somewhat against

the theory. It may be that participants generated various types of rationales in the experiment, which promotes the corresponding types of motivation simultaneously. This argument has been supported by the data since 13 out of 36 participants in the rationale generation group listed both autonomous and controlled types of motivation. For example, one participant listed three reasons for learning APA formatting, which included "to communicate effectively in academic settings; to allow others to understand and reference by resources; and because it is required in my field and education." The first two rationales were related to identification while the third rationale was related to external regulation. The unexpected positive correlations between autonomous types of motivation and controlled types of motivation are also likely to be related to the research context. In the current study, I investigated participants' motivation and learning within the context of an uninteresting but required academic activity. Participants were meant to have high scores on controlled types of motivation, including introjection and external regulation. Rationale generation intervention successfully enhanced participants' identification. Thus, I found identification was positively associated with introjection and external regulation for the rationale generation group, but not for the control group.

5.3 Study 3: Students' Perspectives on Uninteresting but Required Academic Activities and Motivational Strategies

5.3.1 Research Questions

Although the causal effect of rationale generation on identification has been demonstrated in Study 2, the experiment was not carried out within real classrooms. Thus, Study 2 was limited by the lack of ecological validity. Qualitative data was collected in Study 3 to help elaborate on the results obtained in Study 2 and explore students' views in more depth (Ivankova, Creswell, & Stick, 2006). The purpose of this study is to gain more insight into

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students experience in uninteresting but required academic activities within the real context of higher education. Specifically, I had two research questions:

    1. How do students perceive uninteresting but required academic activities?

    2. What are the common strategies that students use to motivate themselves when they are involved in uninteresting but required academic activities?

5.3.2 Participants

I sent a recruitment email (see Appendix D) to the students who have participated in my Study 2 and permitted me to contact them for follow-up studies. Eleven students (five females and six males) volunteered to participate in the interview. One participant was between 21 and 25, and ten participants were 26 or older. Four participants reported being Asian, two participants reported being White, two participants reported being African American, two participants reported being Hispanic or Latino, and one participant reported being other. These participants were from various academic disciplines, including education ($n = 7$), engineering ($n = 2$), psychology ($n = 1$), and science ($n = 1$). Participation in this study was voluntary, and participants received \$5 for their time and participation.

5.3.3 Interview Protocol Development

The interview protocol was designed to elicit participants' perceptions of uninteresting but required academic activities, how they felt and reacted in such situation, and what strategies they used to keep themselves motivated to engage in such activities. The interview questions were developed from Wolters' (1998) open-ended questionnaire. The original protocol was revised after consulting with two faculty members in Educational Psychology. I conducted three pilot interviews with two graduate students from Education and one graduate student from

Technology to clarify unclear terms in the statement and estimate the length of the interview. The final version of the interview protocol was used for individual interviews (see Appendix N for the semi-structured interview protocol).

5.3.4 Procedure

Individual interviews were conducted with participants who volunteered to participate in the interview. When participants came to the interview room, they would be directed to sign the consent form, and then I introduced the interview procedure to them. In the introduction of the interview, participants were oriented to select and recall three different learning experiences, including one uninteresting but required major-related academic activity, one uninteresting but required nonmajor-related academic activity, and one interesting major-related academic activity. During the interview, the participants shared their experiences and perspectives based on the questions in the interview protocol. The interviews were audiotaped and lasted approximately 20-30 minutes.

5.3.5 Data Analysis

The audiotaped interviews were transcribed using the rev.com transcription service. The researcher compared the transcripts to the original recordings and modified the transcripts to ensure the accuracy of the transcribed interview data. For data analysis, an exploratory content analysis was used to find common themes about students' experience in uninteresting but required academic activities and their motivational strategies. Content analysis refers to "the process of organizing and quantifying the contents of the data into pre-determined categories relevant to the central research question(s) in a systematic, replicable and objective manner." (Mackieson, Shlonsky, & Connolly, 2018, p 5) First, the meaning units were coded by open

codes. Then I created categories by grouping the open codes that share a commonality. Finally, I elicited themes by using selective categories. For example, the open codes for participants' feelings toward uninteresting but required major-related academic activities were disappointing, uninteresting, important, and challenging. Three categories were created to summarize the open codes. All participants felt that the uninteresting but required major-related academic activities were uninteresting. Two of participants stated that the activities were also important. Only one participant mentioned the challenging aspect of such activities. The theme I extracted was that participants had negative feelings towards uninteresting but required major-related academic activities; however, occasionally, they could also see the importance of doing them. The category of challenge was not included in extracting the theme as it was only mentioned by one participant. Appendix Q displays the open codes, the categorizations, and the themes.

5.3.6 Results

The first question I sought to answer with Study 3 was: How students perceived uninteresting but required academic activities. Two themes were generated to address this question.

Theme 1. Students had negative emotions towards uninteresting but required academic activities. Occasionally they could also see the importance of doing such activities.

For both major-related and nonmajor-related uninteresting but required academic activities, students expressed strong negative feelings, such as boring, painful, awful, and disappointing, which was anticipated. Besides, students noted that these activities could also embrace personal importance, especially in the case of major-related activities. Two students mentioned that the major-related academic activities were important to them. For example, one participant said, "even though it's not interesting, I still paid attention to that because it's related

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to my safety, my life." Another participant thought about qualify exam as an uninteresting but required academic activity and stated "(The qualify exam) did not interest me. But I knew I should do that. I wouldn't say I was low motivated because you know it is highly correlated with whether you can continue in the program or not." For the nonmajor-related academic activities, one participant thought about a language course and said, "I would say, to be honest, the course was really really helpful. But I feel it's pretty time-consuming. It was really helpful, but sometimes I feel like it can be more efficient. I mean the course organization." Although most uninteresting academic activities that mentioned in the interviews should be useful to the students as those activities were suggested by the programs or curriculums, only a few (2/11) participants were able to see the value of doing such activities, which was a little disappointing.

Theme 2. There were substantial differences in students' motivation, engagement, and learning between interesting and uninteresting learning experiences.

To have an inclusive understanding of students' uninteresting learning experiences, I compared it with students' interesting learning experiences and found differences in the following aspects. First, self-motivating strategies were not needed for interesting learning because the motivation was already very high, whereas participants felt they need to make efforts to keep themselves motivated in uninteresting learning situations. For example, one participant said, "Well, when it's interesting, it's motivating. Right? And when it's uninteresting, then I have to come up with my own reasons to be motivated." Another participant stated:

*There are times when you're not motivated. And so you have to make an effort to be motivated in the class. That is how I would talk about the ** class that I found uninteresting. And then there are times where you don't have to think about your motivation because you just do it.*

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Second, students showed more behavioral and cognitive engagement in interesting learning situations in comparison to uninteresting learning situations. For example, one participant stated:

*[For the uninteresting class], I would always do it the last minute. I completed the four sentences that the professor wanted, and that was enough. I wouldn't tell anybody what I was learning. But for the ** [interesting] class, I would read in advance, and even sometimes I would read additional articles. I really felt like I wanted to contribute to the discussion in the classroom. I would do extra work. Or even I would talk to other people about it. I would tell my roommate at least twice or three times a week, 'I am learning this, what do you think about this…'*

Another participant mentioned:

*In ** [the uninteresting class], I was just sitting in the class asking lists of questions like, lots of questions that I was not sure whether they were stupid questions or not? And I don't want to do that. But in that other course [the interesting class], I took it last year, and it was very different. I was even like sometimes debate with the teacher.*

Third, most participants (10/11) achieved good grades in both interesting and uninteresting courses; however, four participants said they learned little from the uninteresting courses. For example, one participant said, "If you ask me about ** [the uninteresting course], there is so little I remember. I remember what I did in my paper because I like it, but I didn't pay much attention." Another participant stated, "I don't remember anything from the class, and I got

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a good grade, but I don't remember because I wasn't interested. I didn't pay attention to."

Another participant expressed a similar case "I don't remember anything at all from that course. I still got an A because I did submit all the homework." This finding indicated that course grade might not be an effective indicator of learning. One of the participants said, "In my opinion, grade has never been a good indicator of learning, but it is a necessary thing in graduate school and in life."

Another interesting comment regarding the difference between interesting and uninteresting learning was about the locus of control. One participant stated that the most different thing between the two situations was whether the behaviors were chosen by the person itself or others. The participant enjoyed doing research and said:

Even though I didn't choose the research topic, but the first thing is that I choose to come to graduate school. So that's my choice. But for the training, I have to; somebody helped me to choose that so I think the most difference will be who chooses first.

The second question that I sought to address in Study 3 was: What the common strategies that students use to motivate themselves are when engaging in uninteresting but required academic activities. I generated theme 3 and theme 4 to answer this question.

Theme 3. The most common strategy that students used to motivate themselves was enhancing personal significance.

Seven participants mentioned connecting the uninteresting learning activities with their research or personal lives as a way to motivate themselves. For example, one participant stated,

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"I tried to find some ways to connect with the uninteresting course and the actual work that I was involved in." Another participant said:

I'd take advantage of the opportunity to develop a scale. So that it could feel like it was useful to me. I guess that's what I would do [to motivate myself]. And I mean, yeah, I guess if I needed to develop a scale for like my dissertation or something or to test out different components of a scale, then I could have used that as a motivation so that the outcome of the class isn't just that I submitted this assignment for the class, but I have something useful for my own research at the end of the class.

Another participant stated:

That was a required course for my program, for my department too. And one of the assignments for that class was participating in the ** conference. I was actually working on a paper for my advisor, and I asked him if I could submit the proposal to the conference so that I could get the opportunity to practice. To get into the conference, I did some reading. I guess that's how I tried to motivate myself.

Some participants mentioned strategies that were similar to rationale generation. For example, one participant said:

If I could choose. I would try to reflect more on my research and the needs that my research has. If I am going to work more with, let's say children or adolescents or adults, I would be more mindful that there is some value in the content of the class, such as to understand the populations that you study.

Theme 4. Students believed that generating rationales related to identification would enhance motivation.

About half of the participants (5/11) believed that generating a high-quality rationale that was related to identification could enhance motivation. For example, one participant said that "I always think about these things [rationales] at the beginning. I would say thinking of your initial aims [is] definitely helpful." Another participant stated, "if the course is going to help me build my career, build skills I need in the future, of course, that's going to help [with motivation]." Another participant thought doing IRB was an uninteresting academic activity and said:

If you can think deeply, for example, IRB can protect those vulnerable subjects and then you think, oh yeah, I would get to this procedure. So if I can do research as properly as I can, then I can protect those people. If I can think in this way. Yeah, probably you can't be more motivated.

A few participants (2/11) were not sure about the effectiveness of rationale generation in promoting motivation; however, they believe, to some extents, it might help with learning. One participant said, "I don't know if I will be more engaging, but at least you know that this is very important, I have to study hard." One participant stated, "Reflecting on the reasons can help, absolutely. It [the uninteresting but required activity] may not be interesting, and it certainly isn't motivating, but you need it for the grade. So suck it up and do it." One participant thought seeing the value of doing an activity was very helpful; however, an individual would need guidance to achieve this. The participant said, "I need someone to guide me. It is important to have a mentor to guide me or tell me what the good thing of doing this is."

5.3.7 Discussion

This study investigated students' perspectives on successful motivational strategies during uninteresting but required academic activity. Four themes were generated to address the two research questions (see Table 5.5). Students generally perceived uninteresting but required learning activities as boring and disappointing and had low motivation to engage in such activities. Students undertook great efforts to maintain minimum behavioral and cognitive engagement. Although students were able to obtain satisfactory grades in the uninteresting courses, they felt that they learned very little from the course and couldn't remember anything afterward. This helps explain why the effects of rationale generation were not presented in the learning outcomes in Study 2.

Table 5.5

Summary of the Qualitative Results

Research questions	Themes
How do students perceive uninteresting but required academic activities?	Theme 1. Students had negative emotions towards uninteresting but required academic activities. Occasionally they could also see the importance of doing such activities.
	Theme 2. There were huge differences in students' motivation, engagement, and learning between interesting and uninteresting learning experiences.
What are the common strategies that students use to motivate themselves when they are involved in uninteresting but required academic activities?	Theme 3. The most common strategy that students used to motivate themselves was enhancing personal significance.
	Theme 4. Students believed that generating rationales related to identification would enhance motivation.

Occasionally students saw the value of doing the uninteresting but required activities, which helped with behavioral engagement. The fact that only two participants recognized the importance of doing the required uninteresting activities was a little disappointing because theoretically all of those activities should be useful to the participants since the activities were

required by the programs or curriculums. This finding has implications for course design and development. First, it is recommended that students are well-informed of the courses, especially for the required ones. For example, one participant mentioned that if she would take the uninteresting but required course again, she would do research beforehand so that when she started the class, she would be ready with an idea of what she wanted to get out of the class rather than just registering for a required class. Second, there might be some discrepancies between how the course is designed and how the course is implemented. A course might be developed with sound objectives; however, students may fail to recognize the significance of it due to the poor execution. For example, one of my interviewees mentioned that he/she had taken two courses that were identical. Even though he/she could see some value of taking the first course, it is hard to justify for the second one because everything in the second one was exactly the same as the first one, which made it a very boring course. He/she sensed that the instructors/course coordinators tried to change the assignments, but the assignments turned out to be just the same.

In terms of the motivational strategies, the most common one that the participants used was enhancing personal significance. They endeavored to personalize their learning by connecting the uninteresting but required academic activities with their personal research or lives. This finding supported the Vansteenkiste et al.'s (2018) argument that recognizing the self-relevance of learning tasks is an important pathway to learning. Compared with generic problems, personalized problems are more likely to be interesting and convey value (Priniski, Hecht, & Harackiewicz, 2018), which provides a motivational boost for completing the problems. According to SDT, when an activity carries personal meaning, the learners would be likely to come to self-endorse the reason for engaging in the activity (Vansteenkiste et al., 2018).

In the current study, I also asked the interviewees for their opinions on rationale generation. About half of the participants believed that having a high-quality rationale that was related to identification could enhance motivation, which once again highlighted the importance of the quality of the rationale. A few participants who focused on extrinsic goals (e.g., grade, requirement) had some doubts about the effectiveness of rationale generation on motivation; however, they believed knowing the importance of the activity could at least help with behavioral engagement. Two participants mentioned the timing of rationale generation, and they believed having students reflecting on the rationales in the middle of the learning process could remind students of their initial aims, which could help maintain motivation at a high level. Previous research in utility value intervention has demonstrated the interaction effect between intervention timing and prior performance (Canning et al., 2018). They found that low-performing students benefited more when the intervention was implemented early in the semester, whereas students with a history of high performance benefited more when the intervention was implemented at the end of the semester. More empirical work is needed to investigate the influence of rationale generating timing.

A note of caution is due here since the findings may be somewhat biased due to the following factors. First, I, as the single researcher, may introduce bias to the interview process as well as the data analysis process. I am a graduate student majoring in Educational Psychology with a focus on SDT. I might unintentionally encourage the expression of rationale generation or identification. To minimize my personal bias in the study, the interview protocol was carefully crafted to eliminate any leading questions. Throughout the data analysis, I cautiously monitored my biases by engaging in regular self-reflection (Johnson & Christensen, 2012). See self-reflection in Appendix R. The credibility of the findings was also verified by the fact that most

categories were mentioned by more than one participant (Zhang & Wildemuth, 2009). Second, participants might introduce bias. Compared to other research methods, participants may be more likely to give socially-acceptable responses in a face-to-face interview. In this study, seven participants were acquaintances of mine, so there is a chance that they are more likely to give me confirmative responses. Also, my sample was not a good representative of the population in the universities of U.S. More than half of the interviewees majored in Education and about 4/5 of the participants were international students. It is crucial to bear in mind the possible bias in the responses of these participants.

5.4 General Discussion

Extrinsic motivation is often considered as undesirable; however, it is essential in driving students to engage in learning, because learning is not always fun in the real-world of school-related tasks. There is substantial evidence in terms of what teachers could do to facilitate students' autonomous motivation from the perspective of SDT. However, recently, researchers propose that more work is needed to explore the role of learners, which explains individual differences in motivation and learning (Vansteenkiste et al., 2018). In response to this call for research, I conducted two studies to examine the effects of rationale generation on students' motivation and various learning outcomes.

In Study 2, I found that experimentally manipulated rationale generation enhanced students' identification, although no significant differences in learning were found between the rationale generation group and the control group. Furthermore, participants in the rationale generation group were divided into two groups based on the rationales they listed. Participants in the high-quality rationale group, compared with the participants in the low-quality rationale group and the control group, reported significantly higher scores on identification and

autonomous motivation. To extend previous research on rationale generation orientation (i.e., Study 1), the interaction of rationale generation intervention and rationale generation orientation has been investigated in Study 2. The findings indicated that when participants were provided with rationale generation opportunities, their rationale generation orientations would have strong associations with their motivation and learning, whereas when rationale generation opportunities were absent, participants' rationale generation orientation was negatively or not correlated with their motivation or learning. To gain more insight into students experience in uninteresting but required academic activities within the context of higher education, I interviewed 11 graduate students regarding their uninteresting learning experiences and motivational strategies. Students generally perceived uninteresting but required learning activities as boring and disappointing and had low motivation to engage in such activities. Students undertook great efforts to maintain minimum behavioral and cognitive engagement. Although students were able to obtain satisfactory grades in the uninteresting courses, they felt that they learned very little from the course and couldn't remember anything afterward. Occasionally students saw the value of doing the uninteresting but required activities, which helped with behavioral engagement. In terms of the motivational strategies, the most common one that the participants used was enhancing personal significance. They endeavored to personalize their learning by connecting the uninteresting but required academic activities with their personal research or personal lives. About half of the participants believed that having a high-quality rationale that was related to identification could enhance motivation. Taken together, my findings indicate that providing students with opportunities to generate rationales for the uninteresting but required academic activities may open the door to discovering personal significance for completing such activities.

Autonomous motivation, especially identification, will be enhanced if students can recognize the significance of learning for their personal interests and lives.

The positive impact of rationale generation quality on autonomous motivation has been repeatedly demonstrated in both studies. Study 2 extends Davis et al.'s (2016) experiments by differentiating between types of rationales and exploring the effects of rationale quality on motivation and learning. It is critical to investigate the quality of the rationale because reflecting on the purpose of doing a task and generating rationales may increase the chances to recognize the importance of the task, but not necessarily the case. I argue that students who generate autonomous types of rationales are more likely to develop autonomous types of extrinsic motivation in comparison with those who generate controlled types of rationales. The findings supported my argument. Participants in the current study generally generate rationales related to identification or external regulation or both. One participant had a rationale related to integration. Participants in the high-quality rationale group, compared with the participants in the low-quality rationale group and the control group, reported significantly higher scores on identification and autonomous motivation. A note of caution is due here since the sample size of the low-quality rationale group is quite small ($n = 7$). While it would have been ideal to have equal cell sizes across the groups, this was not the case. This could impact the analyses and should be acknowledged when interpreting the results.

In Study 3, I asked participants about the motivational strategies they used and their opinions on rationale generation. Most participants mentioned connecting the uninteresting learning activities with their research or personal lives as a way to motivate themselves, and about half of the participants believed that having a high-quality rationale that was related to identification could enhance motivation. This finding accords with our quantitative results in

Study 2. Taken together, both studies indicate that the quality of rationales matters more than the quantity of the rationales. These results are in agreement with those of previous studies in rationale provision (Deci et al., 1994; Legault et al., 2011; Reeve et al., 2002; Steingut, Patall, & Trimble, 2017) and rationale generation orientation. Previous research demonstrated that, autonomous rationales lead to stronger effects on autonomous motivation, engagement, and performance (Steingut et al., 2017; Vansteenkiste et al., 2018) than controlled rationales do. In another study of mine (i.e., Study 1), students who reported being able to bring value to learning and make learning more relevant tended to perceive needs satisfaction and show autonomous motivation.

Although no significant evidence was found in Study 2 for supporting the hypothesis that the effects of rationale generation would be stronger on transfer of learning than on rote learning, a small effect size (Cohen's $d = 0.25$) was obtained for perceived knowledge transferability between the rationale generation group and the control group in the main experiment of Study 2. The distinct effects on transfer of learning and rote learning showed up after I differentiated between high and low quality. A larger effect size was found in transfer of learning ($\eta^2 = 0.05$) than rote learning ($\eta^2 = 0.01$) in terms of the mean differences among the high-quality rationale group, the low-quality rationale group, and the control group. The high-quality rationale group scored higher than the other two groups in transfer of learning with a marginal significance ($p_{\text{one-tailed}} = .088$). In contrast, no evidence was found for mean differences in rote learning ($p_{\text{one-tailed}} = .407$). According to these findings, it is likely that the null effect on transfer of learning is due to the small sample and being underpowered. Study 3 supplement these findings with qualitative evidence. Discrepancies between course grade and learning have been mentioned by many participants. Most participants got satisfactory results from the academic activities, mostly were

embedded in courses; however, they felt that course grade could not represent how well they learn. For example, one participant said that "I don't remember anything from the class, and I got a good grade, but I don't remember because I wasn't interested. I didn't pay attention to." The interview data once again suggests that it is critical to assess students learning based on deep understanding rather than rote memorization.

The present research contributes to a theoretical understanding of extrinsic motivation and internalization. First, the causal effect of rationale generation on motivation was confirmed in Study 2 with experimental manipulation. Previous research in rationale provision has shown the mediating effect of identification on rationale and engagement (Reeve et al., 2002; Jang, 2008). The present research enriches it by providing additional evidence that generating rationales for required behaviors enhances identification. Second, this dissertation opens a new line of inquiry into the interaction effects between social contexts and personal dispositions. Study 2 revealed that when participants were provided with rationale generation opportunities, their rationale generation orientations would have strong associations with their motivation and learning, whereas when rationale generation opportunities were absent, participants' rationale generation orientation was negatively or not correlated with their motivation or learning. To my best knowledge, the present research is the first to explore the effects of rationale generation intervention on the relations between rationale generation orientation, motivation, and learning, which helps shed light on how rationale generation orientation and rationale generation intervention work together. Third, this work has gone some way towards enhancing our understanding of students' experiences in learning uninteresting but required tasks from the perspective of SDT. According to the SDT, autonomous motivation and controlled motivation should be negatively correlated. However, I found positive correlations between them in the

rationale generation group of Study 2. A possible explanation for these results may be that controlled motivation plays a more important role in uninteresting but required learning contexts than in general learning contexts. When students participate in uninteresting but required academic courses or activities, they are likely to have low and controlled types of motivation. Fostering the internalization by generating rationales for learning may move the motivation along the continuum from external to introjection, but it will still remain a controlled type of motivation. Also, multiple rationales may be generated during rationale generation, which could enhance the corresponding types of motivation simultaneously and lead to the positive correlations between autonomous types of motivation and controlled types of motivation. This finding extends our knowledge of the functions of different types of motivation in uninteresting but required contexts.

Pervious research in rationale has mostly been done with quantitative research method (e.g., Canning et al., 2018; Davis et al., 2016; Deci et al., 1994; Harackiewicz et al., 2016; Jang, 2008; Reeve et al., 2002). In the current research, I adopt the sequential explanatory mixed method design, which offsets the weaknesses of quantitative and qualitative research and allows me to collect comprehensive data. First, I collected quantitative data to address the "whether or not" question: whether rationale generation can enhance internalization, which laid the groundwork for the current research. Then, qualitative data was collected to explore the "how" and "what" questions: how students perceive the uninteresting but required learning and what the common motivational strategies are. Students' vivid first-hand experiences and perspectives allow me to explain the quantitative results of Study 2 in more depth. The current research provides a more comprehensive understanding of students' experiences in doing uninteresting

but required academic activities and the effectiveness of rationale generation than either quantitative or qualitative approaches alone.

The findings also bear important practical implications for higher education researchers and practitioners. Study 2 has provided evidence about the positive effect of rationale generation on identification. Therefore, more rationale generation opportunities should be made available to students. In the experiment of Study 2, participants in the intervention group spent, on average, 112 seconds on generating rationales, which significantly enhanced their identification with a decent effect size (Cohen's $d = 0.5$). It is feasible to conduct the same intervention in real classrooms. For example, instructors give students 3 minutes to write down their reasons for taking the class at the start of each lecture. This may help students discover personal significance for completing such activities. Another important practical implication is to facilitate students to generate high-quality rationales. The significance of rationale generation quality has been demonstrated across Study 2 and Study 3. It is recommended that students are well-informed of the courses prior to registering for them, especially for the required ones. Some participants in Study 3 stated that it was difficult for them to make the courses meaningful and relevant because they knew little about the course and they were not clear about what they wanted to get out of the courses. Even though this research focuses on rationale generation, I by no means devalue the importance of rationale provision. In fact, the qualitative results suggest that guidance from teachers or senior peers can help students see the value of taking required courses. It would also be helpful if we can make the learning/course objectives more explicit and more accessible to students.

Even though this current work is the first of its kind to test the causal effects of rationale generation on students' motivation and learning in the context of doing uninteresting but

required academic activities, there are some limitations worth discussing. The primary limitation of Study 2 is that this is not carried out within the real classroom environments. Thus, the findings obtained in the present study cannot be generalized to real-life classrooms. Another limitation of Study 2 is that the limited sample size did not allow me to detect small effect sizes. I did not obtain significant evidence to support the hypothesis related to learning outcomes due to this underpowered issue. Moreover, Study 2 cannot explain "why" rationale generation enhances identification. Additional research is needed to investigate the mechanism of the effect. Although my Study 3 provides more insight into students' experiences in real-life classrooms, it has a couple of methodological drawbacks. I, as the researcher, may introduce bias to the interview process as well as the data analysis process. For example, I may unintentionally encourage the expression of identification and rationale generation. Likewise, participants may introduce bias as well. For example, compared to other research methods, participants may be more likely to give socially-acceptable responses in a face-to-face interview. Furthermore, it is difficult to replicate and generalize the findings obtained from qualitative data. Another limitation is about the characteristics of the participants. In both studies, I recruited my participants from graduate students, because the experimental material in Study 2 is about APA formatting, which is more relevant to graduate students in comparison to undergraduates. Thus, it is important to bear in mind that the findings obtained in the current research may not reflect the experiences of undergraduates.

5.5 Conclusions

The present research extends SDT work on internalization by exploring the role of learners in the process of internalization. I conducted two studies to examine the effects of rationale generation on students' motivation and learning. In Study 2, I developed and

successfully tested a rationale generation intervention to enhance students' identification, although no significant differences in learning have been found between the rationale generation group and the control group. To gain more insight into students experience in uninteresting but required academic activities within the context of higher education, I interviewed 11 graduate students regarding their uninteresting learning experiences and motivational strategies. Students generally perceive uninteresting but required learning activities as boring and disappointing and have low motivation to engage in such activities. The most common strategy that the students use is enhancing personal significance. Many students believe that generating a high-quality rationale that is related to identification could enhance motivation. Taken together, my findings indicate that providing students with opportunities to generate rationales for the uninteresting but required academic activities may open the door to discovering personal significance for completing such activities. Autonomous motivation, especially identification, will be enhanced if students can recognize the significance of learning for their personal interests and lives.

CHAPTER 6: GENERAL DISCUSSION

The purpose of this dissertation was to use SDT as the guiding framework to identify and examine individual factors that affect students' autonomous motivation and learning outcomes in uninteresting but required academic activities. An explanatory sequential mixed method design, which includes three studies, was conducted to develop a comprehensive understanding of the relations among rationale generation orientation, rationale generation intervention, different types of motivation, and learning outcomes in the context of uninteresting but required academic activities. Chapter 4 and Chapter 5 provided the specific results and discussion sections related to each of the three studies. Building on the findings in Chapter 4 and Chapter 5, the current chapter provides a broad insight by looking across the totality of the research.

6.1 Summary of Major Findings

Study 1 investigated the relations among rationale generation orientation, basic psychological needs, situational motivation, and learning outcomes with cross-sectional survey data, which laid the groundwork of the whole research. I found rationale generation orientation, especially rationale generation quality, predicted needs satisfaction and negatively predicted needs frustration, which in turn was associated with autonomous motivation, controlled motivation, and perceived learning outcomes. Study 2 was then conducted to examine the causal relations between rationale generation, motivation, and learning. Experimentally manipulated rationale generation intervention successfully enhanced students' identification, although no significant differences in learning were detected due to the limited sample size. To gain more insight into the students' uninteresting learning experiences and the effectiveness of rationale generation, I interviewed 11 graduate students in Study 3. Students' first-hand experiences and

perspectives were in line with the quantitative evidence obtained from Study 1 and Study 2.

Table 6.1 highlights the major findings I obtained from the three studies.

Table 6.1

Summary of Major Findings From the Three Studies

	Main Purpose	Findings
Study 1	To examine the role of rationale generation orientation during uninteresting but required courses	RGOS is a valid scale to measure students' tendency to generate rationales for learning behaviors and inclinations to produce autonomous types of rationales, which consists of two constructs: RGT and RGQ.
		RGT and RGQ were negatively associated with students' uninteresting learning experiences.
		RGQ was the dominant predictor of basic psychological needs satisfaction and frustration, which in turn, influenced motivation and learning.
Study 2	To test the causal relations between rationale generation, motivation, and learning	Rationale generation intervention enhanced identification, but failed to enhance learning outcomes.
		The high-quality rationale group had higher scores on identification and autonomous motivation than the low-quality rationale group and the control group.
		The relations between RGT, RGQ, motivation, and learning were stronger for the rationale generation intervention group than the control group.
Study 3	To get students' first-hand experiences and perspectives	Students generally perceived uninteresting but required learning activities as boring and disappointing and had low motivation to engage in such activities.
		Students endeavored to personalize their learning by connecting the uninteresting but required academic activities with their personal research or personal lives.
		About half of the participants believed that having a high-quality rationale that was related to identification could enhance motivation.

Though specific insights can be collected from each individual study, significant discussion can also be made by looking across the totality of the research. First, the positive impact of rationale generation quality on autonomous motivation has been repeatedly demonstrated across the three studies. In Study 1, rationale generation quality positively

predicted needs satisfaction and negatively predicted needs frustration, which in turn was associated with autonomous motivation, controlled motivation, and perceived learning outcomes. In Study 2, participants who generated high-quality rationales reported significantly higher scores on identification and autonomous motivation, in comparison with participants who generated low-quality rationales and participants in the control group. In Study 3, most participants mentioned connecting the uninteresting learning activities with their research or personal lives as a way to motivate themselves, and about half of the participants believed that having a high-quality rationale that was related to identification could enhance motivation. Taken together, my findings indicate that the quality of rationales matters more than the quantity of the rationales.

These results are in agreement with those of previous studies in rationale provision (Deci et al., 1994; Legault et al., 2011; Reeve et al., 2002; Steingut et al., 2017). Previous research demonstrated that compared to controlling rationales, autonomous rationales lead to stronger effects on autonomous motivation, engagement, and performance (Steingut et al., 2017; Vansteenkiste et al., 2018), which revealed the significance of rationale quality. Consistent with the literature, this research found that students who reported being able to bring value to learning and make learning more relevant tended to perceive needs satisfaction and show autonomous motivation. Extending prior work on needs satisfaction (Deci et al., 1994; Reeve et al., 2002), I also examined the relation between rationale generation orientation and needs frustration. As I expected, rationale generation quality negatively predicted autonomy frustration, competence frustration, and relatedness frustration, which indicated that rationale generation quality could protect people against feeling frustrated when engaging in uninteresting but required courses. The causal effect of rationale generation on motivation, which was demonstrated in Study 2, can

be explained in part by the fact that most (29/36) participants in the rationale generation group have listed high-quality rationales that are related to integration or identification. Because further multiple comparisons analysis on the high-quality rationale group, the low-quality rationale group, and the control group indicated that there were no differences in motivation or performance between the control group and participants who generated low-quality rationales.

Another message I get from these studies is that autonomy is critical in the context of doing uninteresting but required academic activities. In addition to investigating the effects of rationale generation orientation and rationale generation intervention on motivation and learning, I also tested the classical SDT model, the Needs-Motives-Outcomes model (see Figure 4.1), in a context of participating in uninteresting but required academic courses. It is interesting to note that autonomy plays a dominant role in predicting autonomous motivation and controlled motivation. Study 1 showed that autonomy satisfaction was the sole factor predicting autonomous motivation, and autonomy frustration was the only factor predicting both autonomous motivation and controlled motivation. This finding has not previously been described. Many SDT studies focusing on higher education have found that competence has a dominant contribution to students' self-determined motivation (Levesque-Bristol et al., 2010; Levesque-Bristol, Richards et al., under review; Hsu et al., 2019). In contrast to those findings, autonomy plays a critical role in autonomous motivation and controlled motivation. This inconsistency may be due to the differences in research contexts. Classic tests in SDT (e.g., Deci & Ryan, 2000; Ryan & Deci, 2017) have highlighted the finding that some needs are more salient in certain situations. Previous research examines students' general learning experiences in higher education, whereas in the current research, I only focus on the experiences regarding uninteresting but required academic courses, in which students generally perceive little

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autonomy. When engaging in uninteresting but required academic courses, students are mainly being deprived of autonomy. Therefore, autonomy becomes more salient in such situation. This argument is supported by the findings in Study 3. For example, one participant in Study 3 stated that the most difference between the interesting and uninteresting learning situations was whether the behaviors were chosen by himself/herself or others. Another participant said he/she liked one required course because "it provided him/her with free will or independence" in working on the tasks. Wolters (1998) has documented a similar finding regarding motivational strategies. In that study, Wolters (1998) examined motivational strategies across various learning situations, including irrelevant tasks, difficult tasks, and boring tasks, and found that when faced with boring course material, students were more likely to adopt interest-related strategies to maintain their efforts. It is possible to hypothesize that the significance of basic psychological needs is somewhat influenced by the scarcities of the needs. The more deficient in a need, the more important the need is. Further work is required to test this hypothesis.

Although no significant evidence was found in Study 2 for supporting the hypothesis that the effects of rationale generation would be stronger on transfer of learning than on rote learning, a small effect size (Cohen's $d = 0.25$) was obtained for perceived knowledge transferability between the rationale generation group and the control group in the main experiment of Study 2. The distinct effects on transfer of learning and rote learning showed up after I differentiated between high and low quality. A larger effect size was found in transfer of learning ($\eta^2 = 0.05$) than rote learning ($\eta^2 = 0.01$) in terms of the mean differences among the high-quality rationale group, the low-quality rationale group, and the control group. The high-quality rationale group scored higher than the other two groups in transfer of learning with a marginal significance ($p_{\text{one-tailed}} = .088$). In contrast, no evidence was found for mean differences in rote learning ($p_{\text{one-tailed}} =$

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.407). According to these findings, it is likely that the null effect on transfer of learning is due to the small sample and being underpowered. Study 3 supplement these findings with qualitative evidence. Discrepancies between course grade and learning have been mentioned by many participants. Most participants got satisfactory results from the academic activities, mostly were embedded in courses; however, they felt that course grade could not represent how well they learn. For example, one participant said that "I don't remember anything from the class, and I got a good grade, but I don't remember because I wasn't interested. I didn't pay attention to." The interview data once again suggests that it is critical to assess students learning based on deep understanding rather than rote memorization.

6.2 Implications

The present dissertation contributes to a theoretical understanding of extrinsic motivation and internalization. First, this research provides new evidence about the role of the characteristics of the learners in the process of internalization. Study 1 demonstrated that rationale generation orientation, especially rationale generation quality, was associated with basic psychological needs satisfaction and frustration, which in turn, was correlated with autonomous motivation, controlled motivation, and perceived learning outcomes. This finding explains why students are differentially motivated even when they sit in the same classroom and study with the same teacher. Students who are able to bring value to learning and make learning more relevant tend to perceive more satisfaction and less frustration in basic psychological needs, compared to students who fail to do so. The creation and validation of the rationale generation orientation scale is an important step forward for research investigating rationale generation. Prior to this study it was difficult to investigate the relations between rationale generation and other constructs. The causal effect of rationale generation on motivation was

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confirmed in Study 2 with experimental manipulation. Previous research in rationale provision

has shown the mediating effect of identification on rationale and engagement (Reeve et al., 2002;

Jang, 2008). The effect size of rationale generation intervention in the current study (Cohen's d =

0.50) is similar to the one of identified rationale provision in Reeve et al.'s (2002) experiment

(Cohen's d = 0.53), which suggests that having the opportunities to reflect on the reasons for

doing an externally motivated activity is as effective as receiving identified rationales from

authorities in fostering identification. The present research enriches it by providing additional

evidence that generating rationales for required behaviors enhances identification. Moreover,

when further separate the rationale generation intervention into the high-quality rationale group

and the low-quality rationale group, the effect of rationale generation becomes more distinct and

clearer. Participants who generated high-quality rationales outperformed the low-quality

rationale group and the control group in motivation and transfer of learning, whereas there was

no significant differences between the low-quality rationale group and the control group. The

quality of rationales plays a more important role than the action of generating rationales itself.

Another encouraging finding related to the quality or rationale generation is that the effect size of

high-quality rationale in the current study (Cohen's d = 0.76) is larger than those of identified

rationale provision in Reeve et al.'s (2002) experiment and autonomy-supportive rationale

provision in Jang's (2008) experiment. Compared with receiving identified rationales from

others, people benefit more from coming up with autonomous rationales on their own. This

finding supports that self-generated rationales are more likely to provoke perceptions of self-

relevance than externally offered rationales (Vansteenkiste et al., 2018).

 Second, this dissertation opens a new line of inquiry into the interaction effects between

social contexts and personal dispositions. Study 2 revealed that when participants were provided

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with rationale generation opportunities, their rationale generation orientations would have strong associations with their motivation and learning, whereas when rationale generation opportunities were absent, participants' rationale generation orientation was negatively or not correlated with their motivation or learning. To my best knowledge, the present research is the first to explore the effects of rationale generation intervention on the relations between rationale generation orientation, motivation, and learning, which helps shed light on how rationale generation orientation and rationale generation intervention work together.

Third, this dissertation has gone some way towards enhancing our understanding of students' experiences in learning uninteresting but required tasks from the perspective of SDT. According to the SDT, autonomous motivation and controlled motivation should be negatively correlated. However, I found positive correlations between them in Study 1 and Study 2's rationale generation group. A possible explanation for these results may be that controlled motivation plays a more important role in uninteresting but required learning contexts than in general learning contexts. When students participate in uninteresting but required academic courses or activities, they are likely to have low and controlled types of motivation. Fostering the internalization by generating rationales for learning may move the motivation along the continuum from external to introjection, but it will still remain a controlled type of motivation. Also, multiple rationales may be generated during rationale generation, which could enhance the corresponding types of motivation simultaneously and lead to the positive correlations between autonomous types of motivation and controlled types of motivation. This finding extends our knowledge of the functions of different types of motivation in uninteresting but required contexts.

Pervious research in rationale has mostly been done with quantitative research method (e.g., Canning et al., 2018; Davis et al., 2016; Deci et al., 1994; Harackiewicz et al., 2016; Jang, 2008; Reeve et al., 2002). In the current research, I adopt the sequential explanatory mixed method design, which offsets the weaknesses of quantitative and qualitative research and allows me to collect comprehensive data. First, I collected quantitative data to address the "whether or not" questions: whether rationale generation orientation is associated with SDT-related variables and whether rationale generation can enhance internalization, which laid the groundwork for the current research. Then, qualitative data was collected to explore the "how" and "what" questions: how students perceive the uninteresting but required learning and what the common motivational strategies are. Students' vivid first-hand experiences and perspectives allow me to explain the quantitative results of Study 1 and Study 2 in more depth. The current research provides a more comprehensive understanding of students' experiences in doing uninteresting but required academic activities and the effectiveness of rationale generation than either quantitative or qualitative approaches alone.

The findings also bear important practical implications for higher education researchers and practitioners. Study 1 demonstrated that rationale generation orientation could assist college students to view the uninteresting but required learning experiences more positively. A next step in line with the current research is to investigate the antecedents of college students' rationale generation orientations. In concordance with past research in Auto-Motive Model (Bargh, 1990; Levesque & Pelletier) and with SDT, I propose that individuals' prior experiences in receiving or generating rationales and perceptions of autonomy, competence and relatedness may affect the development of rationale generation orientation. For example, if individuals constantly receives rationales from their parents, teachers, or other authorities when required to do uninteresting

activities, such as household chores and repetitive calculations, and identifies with the rationales offered to them, those individuals are likely to develop a chronic tendency to spontaneously generate rationales for external demands. Further analyses of the factors associated with rationale generation orientation may provide information for intervention efforts. Study 2 has provided evidence about the positive effect of rationale generation on identification. Therefore, more rationale generation opportunities should be made available to students. In the experiment of Study 2, participants in the intervention group spent, on average, 112 seconds on generating rationales, which significantly enhanced their identification with a decent effect size (Cohen's d = 0.5). It is feasible to conduct the same intervention in real classrooms. For example, instructors give students three minutes to write down their reasons for taking the class at the start of each lecture. This may help students discover personal significance for completing such activities. Another important practical implication is to facilitate students to generate high-quality rationales. The significance of rationale generation quality has been demonstrated across three studies. It is recommended that students are well-informed of the courses prior to registering for them, especially for the required ones. Some participants of Study 3 stated that it was difficult for them to make the courses meaningful and relevant because they knew little about the course and they were not clear about what they wanted to get out of the courses. Even though this research focuses on rationale generation, I by no means devalue the importance of rationale provision. In fact, the qualitative results suggest that guidance from teachers or senior peers can help students see the value of taking required courses and generate high-quality rationales. It would also be helpful if we can make the learning/course objectives more explicit and more accessible to students.

6.3 Limitations and Future Directions

Even though this current work is the first of its kind to test the effects of rationale generation on students' autonomous motivation in the context of doing uninteresting but required academic activities, there are some limitations worth discussing. In Study 1, I use half of the dataset to run EFA and another half to run CFA, which is not an ideal approach to validate a scale. Although I believe it is acceptable as the focus of my study is to examine the relations among all variables not to develop a scale, more data is needed to test the viability of the findings. The primary limitation of Study 2 is that this is not carried out within the real classroom environments. Thus, the findings obtained in the present study cannot be generalized to real-life classrooms. Another limitation of Study 2 is that the limited sample size did not allow me to detect small effect sizes. It is likely that I did not obtain significant evidence to support the hypothesis related to learning outcomes due to this underpowered issue. Moreover, Study 2 cannot explain "why" rationale generation enhances identification. Additional research is needed to investigate the mechanism of the effect. Although my Study 3 provides more insight into students' experiences in real-life classrooms, it has a couple of methodological drawbacks. I, as the researcher, may introduce bias to the interview process as well as the data analysis process. For example, I may unintentionally encourage the expression of identification and rationale generation. Likewise, participants may introduce bias as well. For example, compared to other research methods, participants may be more likely to give socially-acceptable responses in a face-to-face interview. Moreover, it is difficult to replicate and generalize the findings obtained from qualitative data. Another limitation is about the characteristics of the participants. In Study 2 and Study 3, I recruited my participants from graduate students, because the experimental material in Study 2 is about APA formatting, which is more relevant to graduate students in

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comparison to undergraduates. Thus, it is important to bear in mind that the findings obtained in Study 2 and Study 3 may not reflect the experiences of undergraduates.

6.4 Conclusions

The present research extends SDT work on internalization by exploring the role of the characteristics of the learners in the process of internalization. I conducted three studies to examine the effects of rationale generation on students' autonomous motivation and learning during uninteresting but required academic activities. Compared to externally offered rationales, rationale generation is more autonomous because it is self-directed rather than imposed by an external source. Also, rationale generation is more likely to provoke perceptions of self-relevance as it is self-generated. In Study 1, I demonstrated that rationale generation orientation, including rationale generation tendency and rationale generation quality, is one learner-related factor influencing basic psychological needs, motivation, and learning outcomes. Rationale generation quality plays a more important role than rationale generation tendency. In Study 2, I developed and successfully tested a rationale generation intervention to enhance students' identification, although no significant differences in learning have been found between the rationale generation group and the control group. To gain more insight into students experience in uninteresting but required academic activities within the context of higher education, I interviewed 11 graduate students regarding their uninteresting learning experiences and motivational strategies. Students generally perceive uninteresting but required learning activities as boring and disappointing and have low motivation to engage in such activities. The most common strategy that the students use is enhancing personal significance. Many students believe that generating a high-quality rationale that is related to identification could enhance motivation. Taken together, my findings indicate that providing students with opportunities to generate

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rationales for the uninteresting but required academic activities may open the door to discovering personal significance for completing such activities. Autonomous motivation, especially identification, will be enhanced if students can recognize the significance of learning for their personal interests and lives.

LIST OF REFERENCES

Aviles, C. B. (2001). Grading with norm-referenced or criterion-referenced measurements: To curve or not to curve, that is the question. *Social Work Education*, *20*(5), 603–608. https://doi.org/10.1080/02615470120072869

Axtell, C. M., Maitlis, S., & Yearta, S. K. (1997). Predicting immediate and longer-term transfer of training. *Personnel Review*, *26*(3), 201–213. https://doi.org/10.1108/00483489710161413

Baker, S. R. (2004). Intrinsic, extrinsic, and amotivational orientations: Their role in university adjustment, stress, well-being, and subsequent academic performance. *Current Psychology*, *23*(3), 189–202. https://doi.org/10.1007/s12144-004-1019-9

Belenky, D. M., & Nokes-Malach, T. J. (2012). Motivation and transfer: The role of mastery-approach goals in preparation for future learning. *Journal of the Learning Sciences*, *21*(3), 399–432. https://doi.org/10.1080/10508406.2011.651232

Benware, C. A., & Deci, E. L. (1984). Quality of learning with an active versus passive motivational set. *American Educational Research Journal*, *21*(4), 755–765. https://doi.org/10.2307/1162999

Bereby-Meyer, Y., & Kaplan, A. (2005). Motivational influences on transfer of problem-solving strategies. *Contemporary Educational Psychology*, *30*(1), 1–22. https://doi.org/10.1016/j.cedpsych.2004.06.003

Bereby-Meyer, Y., Moran, S., & Unger-Aviram, E. (2004). When performance goals deter performance: Transfer of skills in integrative negotiations. *Organizational Behavior and Human Decision Processes*, *93*(2), 142–154. https://doi.org/10.1016/j.obhdp.2003.11.001

Black, A. E., & Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science Education*, *84*(6), 740–756. https://doi.org/10.1002/1098-237X(200011)84:6<740::AID-SCE4>3.0.CO;2-3

Bransford, J., Brown, A., & Cocking, R. (1999). *How people learn: Brain, mind, experience, and school.* Washington, D.C.: National Academy Press.

Bransford, J. D., & Schwartz, D. L. (1999). Rethinking transfer: A simple proposal with multiple implications. *Review of Research in Education*, *24*, 61–100. https://doi.org/10.2307/1167267

Brown, T. (2006). Confirmatory factor analysis for applied research. New York, NY: Guilford Press.

Brown, E. R., Smith, J. L., Thoman, D. B., Allen, J. M., & Muragishi, G. (2015). From bench to bedside: A communal utility value intervention to enhance students' biomedical science motivation. *Journal of Educational Psychology*, *107*(4), 1116–1135. https://doi.org/10.1037/edu0000033

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822–848. https://doi.org/10.1037/0022-3514.84.4.822

Burke, L. A., & Hutchins, H. M. (2007). Training transfer: An integrative literature review. *Human Resource Development Review*, *6*(3), 263–296. https://doi.org/10.1177/1534484307303035

Burton, K. D., Lydon, J. E., D'Alessandro, D. U., & Koestner, R. (2006). The differential effects of intrinsic and identified motivation on well-being and performance: Prospective, experimental, and implicit approaches to self-determination theory. *Journal of Personality and Social Psychology*, *91*(4), 750–762. https://doi.org/10.1037/0022-3514.91.4.750

Canning, E. A., Harackiewicz, J. M., Priniski, S. J., Hecht, C. A., Tibbetts, Y., & Hyde, J. S. (2018). Improving performance and retention in introductory biology with a utility-value intervention. *Journal of Educational Psychology*, *110*(6), 834–849. https://doi.org/10.1037/edu0000244

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155- 159. doi:10.1037/0033-2909.112.1.155

Cohen, J., Miles, J., & Shevlin, M. (2001). *Applying regression and correlation: A guide for students and researchers* (p. 272). London: Sage.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E., Kaap-Deeder, J., … Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion*, *39*(2), 216–236. https://doi.org/10.1007/s11031-014-9450-1

Chen, K.-C., & Jang, S.-J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior*, *26*(4), 741–752. https://doi.org/10.1016/j.chb.2010.01.011

Chen, Z., Mo, L., & Honomichl, R. (2004). Having the memory of an elephant: Long-term retrieval and the use of analogues in problem solving. *Journal of Experimental Psychology: General*, *133*(3), 415–433. https://doi.org/10.1037/0096-3445.133.3.415

Conti, R. (2000). College goals: Do self-determined and carefully considered goals predict intrinsic motivation, academic performance, and adjustment during the first semester? *Social Psychology of Education*, *4*(2), 189–211. https://doi.org/10.1023/A:1009607907509

Davis, W., Kelley, N., Kim, J., Tang, D., & Hicks, J. (2016). Motivating the academic mind: High-level construal of academic goals enhances goal meaningfulness, motivation, and self-concordance. *Motivation & Emotion*, *40*(2), 193–202. https://doi.org/10.1007/s11031-015-9522-x

Day, S. B., & Goldstone, R. L. (2012). The import of knowledge export: Connecting findings and theories of transfer of learning. *Educational Psychologist*, *47*(3), 153–176. https://doi.org/10.1080/00461520.2012.696438

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination theory perspective. *Journal of Personality*, *62*(1), 119–142. https://doi.org/10.1111/j.1467-6494.1994.tb00797.x

Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*, *19*(2), 109–134. https://doi.org/10.1016/0092-6566(85)90023-6

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E. L., & Ryan, R. M. (Eds.). (2002). *Handbook of self-determination research*. University Rochester Press.

Deci, E., & Ryan, R. (2015). Self-determination theory. In J. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (2nd ed., pp. 486 – 491). http://dx.doi.org/10.1016/B978-0-08-097086-8.26036-4

Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist*, *26*(3–4), 325–346. https://doi.org/10.1080/00461520.1991.9653137

Entwistle, N. (2000). Approaches to studying and levels of understanding: The influences of teaching and assessment. *Higher Education: Handbook of Theory and Research.* New York. Agathon Press.

Eom, S. B., Wen, H. J., & Ashill, N. (2006). The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation*. *Decision Sciences Journal of Innovative Education*, *4*(2), 215–235. https://doi.org/10.1111/j.1540-4609.2006.00114.x

Grolnick, W. S., & Ryan, R. M. (1989). Parent styles associated with children's self-regulation and competence in school. *Journal of Educational Psychology*, *81*(2), 143–154. https://doi.org/10.1037/0022-0663.81.2.143

Guay, F., Vallerand, R. J., & Blanchard, C. (2000). On the assessment of situational intrinsic and extrinsic motivation: The situational motivation scale (SIMS). *Motivation and Emotion*, *24*(3), 175–213. https://doi.org/10.1023/A:1005614228250

Haerens, L., Aelterman, N., Vansteenkiste, M., Soenens, B., & Van Petegem, S. (2015). Do perceived autonomy-supportive and controlling teaching relate to physical education students' motivational experiences through unique pathways? Distinguishing between the bright and dark side of motivation. *Psychology of Sport and Exercise*, *16*, 26–36. https://doi.org/10.1016/j.psychsport.2014.08.013

Harackiewicz, J. M., Canning, E. A., Tibbetts, Y., Priniski, S. J., & Hyde, J. S. (2016). Closing achievement gaps with a utility-value intervention: Disentangling race and social class. *Journal of Personality and Social Psychology*, *111*(5), 745–765. https://doi.org/10.1037/pspp0000075

Hatcher, L. (1994). *A step-by-step approach to using the SAS(R) system for factor analysis and structural equation modeling*. Cary, NC: SAS Institute.

Holyoak, K. J., & Koh, K. (1987). Surface and structural similarity in analogical transfer. *Memory & Cognition*, *15*(4), 332–340. https://doi.org/10.3758/BF03197035

Hsu, H.-C. K., Wang, C. V., & Levesque-Bristol, C. (2019). Reexamining the impact of self-determination theory on learning outcomes in the online learning environment. *Education and Information Technologies*, *24*(3), 2159–2174. https://doi.org/10.1007/s10639-019-09863-w

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hulleman, C. S., Godes, O., Hendricks, B. L., & Harackiewicz, J. M. (2011). Enhancing interest and performance with a utility value intervention. *Journal of Educational Psychology*, *102*(4), 880–895. https://doi.org/10.1037/a0019506

Hulleman, C. S., & Harackiewicz, J. M. (2009). Promoting interest and performance in high school science classes. (Author abstract)(Report). *Science*, *326*(5958), 1410–1412. https://doi.org/10.1126/science.1177067

Ivankova, N. V., Creswell, J. W., & Stick, S. L. (2006). Using Mixed-Methods Sequential Explanatory Design: From Theory to Practice. *Field Methods*, *18*(1), 3–20. https://doi.org/10.1177/1525822X05282260

Jang, H. (2008). Supporting students' motivation, engagement, and learning during an uninteresting activity. *Journal of Educational Psychology*, *100*(4), 798–811. https://doi.org/10.1037/a0012841

Johnson, B., & Christensen, L. (2012). *Educational Research: Quantitative, qualitative, and mixed approaches*, University of South Alabama: SAGE.

Jöreskog, K.G. & Sörbom, D. (2006). LISREL 8.80 for Windows [Computer software]. Lincolnwood, IL: Scientific Software International, Inc.

Kim, J., Kwon, Y., & Cho, D. (2011). Investigating factors that influence social presence and learning outcomes in distance higher education. *Computers & Education*, *57*(2), 1512–1520. https://doi.org/10.1016/j.compedu.2011.02.005

Koestner, R., & Losier, G. F. (2002). Distinguishing three ways of being highly motivated: A closer look at introjection, identification, and intrinsic motivation. *Handbook of self-determination research*. Rochester, NY: University of Rochester Press

Kusurkar, R. A., Cate, T. J. T., Vos, C. M. P., Westers, P., & Croiset, G. (2013). How motivation affects academic performance: a structural equation modelling analysis. *Advances in Health Sciences Education*, *18*(1), 57–69. https://doi.org/10.1007/s10459-012-9354-3

Legault, L., Gutsell, J. N., & Inzlicht, M. (2011). Ironic effects of antiprejudice messages: How motivational interventions can reduce (but also increase) prejudice. *Psychological Science*, *22*(12), 1472–1477. https://doi.org/10.1177/0956797611427918

Levesque, C., & Pelletier, L. G. (2003). On the Investigation of Primed and Chronic Autonomous and Heteronomous Motivational Orientations. *Personality and Social Psychology Bulletin*, *29*(12), 1570–1584. https://doi.org/10.1177/0146167203256877

Levesque-Bristol, C., Bonem, E. M., Zissimopoulos, A., Nelson, D. B., Fedesco, H., Yu, S., & Wang, C. (Under review). Using self-determination theory to model the effects of student centeredness on the satisfaction of basic psychological needs, motivation and learning outcomes.

Levesque-Bristol, C., Knapp, T. D., & Fisher, B. J. (2010). The effectiveness of service-learning: It's not always what you think. *Journal of Experiential Education*, *33*(3), 208–224. https://doi.org/10.5193/JEE33.3.208

Levesque-Bristol, C., Richards, K. A. R., Zissimopoulos, A., Wang, C., & Yu, S. (Under review). Applying self-determination theory to the college classroom: A test of the integrative model for learning and motivation.

Levesque-Bristol, C., Sell, G. R., & Zimmerman, J. A. (2006). A theory-based integrative model for learning and motivation in higher education. In S. Chadwick-Blossey & D. R. Robertson (Eds.), To Improve the Academy (Vol. 24, pp. 86-103). Boston, MA: Anker.

Lim, D. H., & Morris, M. L. (2006). Influence of trainee characteristics, instructional satisfaction, and organizational climate on perceived learning and training transfer. *Human Resource Development Quarterly*, *17*(1), 85–115. https://doi.org/10.1002/hrdq.1162

Mackieson, P., Shlonsky, A., & Connolly, M. (2018). Increasing rigor and reducing bias in qualitative research: A document analysis of parliamentary debates using applied thematic analysis. *Qualitative Social Work,* https://doi.org/10.1177/1473325018786996

McLaren, B. M., Adams, D. M., & Mayer, R. E. (2015). Delayed learning effects with erroneous examples: a study of learning decimals with a web-based tutor. *International Journal of Artificial Intelligence in Education, 25*(4), 520-542.

Perkins, D. N., & Salomon, G. (2012). Knowledge to go: A motivational and dispositional view of transfer. *Educational Psychologist*, *47*(3), 248–258. https://doi.org/10.1080/00461520.2012.693354

Priniski, S. J., Hecht, C. A., & Harackiewicz, J. M. (2018). Making Learning Personally Meaningful: A New Framework for Relevance Research. *The Journal of Experimental Education*, *86*(1), 11–29. https://doi.org/10.1080/00220973.2017.1380589

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 & Emotion*, *26*(3), 183–207.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology*, *57*(5), 749–761. https://doi.org/10.1037/0022-3514.57.5.749

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, *25*(1), 54–67. https://doi.org/10.1006/ceps.1999.1020

Ryan, R. M., & Deci, E. L. (2008). A self-determination theory approach to psychotherapy: The motivational basis for effective change. *Canadian Psychology/Psychologie Canadienne*, *49*(3), 186–193. https://doi.org/10.1037/a0012753

Ryan, R. M., & Deci, E. L. (2017). *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness*. Retrieved from http://ebookcentral.proquest.com/lib/purdue/detail.action?docID=4773318

Sadler, D. R. (2005). Interpretations of criteria-based assessment and grading in higher education. *Assessment & Evaluation in Higher Education*, *30*(2), 175–194. https://doi.org/10.1080/0260293042000264262

Savard, A., Joussemet, M., Pelletier, L. G., & Mageau, G. A. (2013). The benefits of autonomy support for adolescents with severe emotional and behavioral problems. *Motivation and Emotion, 37*, 688–700.

Schafer, R. (1968). *Aspects of internalization*. International Universities Press, Inc.

Schreiber, J. B. (2016). *Motivation 101*. Springer Publishing Company.

Schwartz, D. L., Bransford, J. D., & Sears, D. (2005). Efficiency and innovation in transfer. *Transfer of learning from a modern multidisciplinary perspective*, 1-51.

Schwartz, D. L., & Martin, T. (2004). Inventing to prepare for future learning: The hidden efficiency of encouraging original student production in statistics instruction. *Cognition and Instruction*, *22*(2), 129–184. https://doi.org/10.1207/s1532690xci2202_1

Schwinger, M., Steinmayr, R., & Spinath, B. (2009). How do motivational regulation strategies affect achievement: Mediated by effort management and moderated by intelligence. *Learning and Individual Differences*, *19*(4), 621–627. https://doi.org/10.1016/j.lindif.2009.08.006

Sears, D. A. (2017). Preparation for future learning. In K. Pepper (Ed.), *Sage Encyclopedia of Out-of-School Learning* (pp. 613-616). Thousand Oaks, CA: Sage Publications, Inc.

Steingut, R. R., Patall, E. A., & Trimble, S. S. (2017). The effect of rationale provision on motivation and performance outcomes: A meta-analysis. *Motivation Science, 3*(1), 19.

Sun, P.-C., Tsai, R. J., Finger, G., Chen, Y.-Y., & Yeh, D. (2008). What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, *50*(4), 1183–1202. https://doi.org/10.1016/j.compedu.2006.11.007

Svanum, S., & Aigner, C. (2011). The influences of course effort, mastery and performance goals, grade expectancies, and earned course grades on student ratings of course satisfaction. *British Journal of Educational Psychology*, *81*(4), 667–679. https://doi.org/10.1111/j.2044-8279.2010.02011.x

Tabachnick, B. G., & Fidell, L. S. (2012). *Using multivariate statistics*. Needham height, MA: Allyn & Bacon.

Taylor, G., Jungert, T., Mageau, G. A., Schattke, K., Dedic, H., Rosenfield, S., & Koestner, R. (2014). A self-determination theory approach to predicting school achievement over time: The unique role of intrinsic motivation. *Contemporary Educational Psychology*, *39*(4), 342–358. https://doi.org/10.1016/j.cedpsych.2014.08.002

Taylor, P. J., Russ-Eft, D. F., & Chan, D. W. L. (2005). A meta-analytic review of behavior modeling training. *Journal of Applied Psychology*, *90*(4), 692–709. https://doi.org/10.1037/0021-9010.90.4.692

Tracey, J. B., Tannenbaum, S. I., & Kavanagh, M. J. (1995). Applying trained skills on the job: The importance of the work environment. *Journal of Applied Psychology*, *80*(2), 239–252. https://doi.org/10.1037/0021-9010.80.2.239

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 29, pp. 271–360). Academic Press. https://doi.org/10.1016/S0065-2601(08)60019-2

Vallerand, R. J., & Blssonnette, R. (1992). Intrinsic, extrinsic, and amotivational styles as predictors of behavior: A prospective study. *Journal of Personality*, *60*(3), 599–620. https://doi.org/10.1111/j.1467-6494.1992.tb00922.x

Vansteenkiste, M., Aelterman, N., De Muynck, G.-J., Haerens, L., Patall, E., & Reeve, J. (2018). Fostering personal meaning and self-relevance: A self-determination theory perspective on internalization. *The Journal of Experimental Education*, *86*(1), 30–49. https://doi.org/10.1080/00220973.2017.1381067

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating learning, performance, and persistence: The synergistic effects of intrinsic goal contents and autonomy-supportive contexts. *Journal of Personality and Social Psychology*, *87*(2), 246–260. https://doi.org/10.1037/0022-3514.87.2.246

Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., & Matos, L. (2005). Examining the motivational impact of intrinsic versus extrinsic goal framing and autonomy-supportive versus internally controlling communication style on early adolescents' academic achievement. *Child Development*, *76*(2), 483–501. https://doi.org/10.1111/j.1467-8624.2005.00858.x

Waldman, D. A., & Korbar, T. (2004). Student assessment center performance in the prediction of early career success. *Academy of Management Learning & Education*, *3*(2), 151–167. https://doi.org/10.5465/AMLE.2004.13500529

Wang, C., Hsu, H.-C. K., Bonem, E. M., Moss, J. D., Yu, S., Nelson, D. B., & Levesque-Bristol, C. (2019). Need satisfaction and need dissatisfaction: A comparative study of online and face-to-face learning contexts. *Computers in Human Behavior*, *95*, 114–125. https://doi.org/10.1016/j.chb.2019.01.034

Wang, C., Zhang, X., & Yao, M. (2019). Enhancing Chinese college students' transfer of
learning through service-learning. *Studies in Higher Education*, *44*(8), 1316–1331.
https://doi.org/10.1080/03075079.2018.1435635

Wang, C.**,** Zhang, Y., Moss, J. D., Bonem, E. M., & Levesque-Bristol, C. (Under review).
Multilevel factors affecting college students' perceptions of knowledge transfer: From the
perspective of self-determination theory.

Wang, J. C. K., Morin, A. J. S., Ryan, R. M., & Liu, W. C. (2016). Students' motivational
profiles in the physical education context. *Journal of Sport & Exercise Psychology*, *38*(6),
612–630. https://doi.org/10.1123/jsep.2016-0153

Weinstein, N., & Hodgins, H. S. (2009). The moderating role of autonomy and control on the
benefits of written emotion expression. *Personality and Social Psychology Bulletin, 35*(3),
351-364.

Weinstein, N., Przybylski, A. K., & Ryan, R. M. (2012). The index of autonomous functioning:
Development of a scale of human autonomy. *Journal of Research in Personality*, *46*(4),
397–413. https://doi.org/10.1016/j.jrp.2012.03.007

Williams, G. C., & Deci, E. L. (1996). Internalization of biopsychosocial values by medical
students: A test of self-determination theory. *Journal of Personality and Social Psychology*,
70(4), 767–779. https://doi.org/10.1037/0022-3514.70.4.767

Wolters, C. A. (1998). Self-regulated learning and college students' regulation of motivation.
Journal of Educational Psychology, *90*(2), 224–235. https://doi.org/10.1037/0022-
0663.90.2.224

Yeager, D. S., Henderson, M. D., Paunesku, D., Walton, G. M., D'mello, S., Spitzer, B. J., &
Duckworth, A. L. (2014). Boring but important: A self-transcendent purpose for learning
fosters academic self-regulation. *Journal of Personality and Social Psychology*, *107*(4),
559–580. https://doi.org/10.1037/a0037637

Zhang, Y., & Wildemuth, B. M. (2009). Qualitative analysis of content. In B. Wildemuth (Ed.),
Applications of social research methods to questions in information and library science (pp.
222–231). Westport CT: Libraries Unlimited

APPENDIX A: THE RECRUITMENT EMAIL FOR STUDY 1

Recruitment Email

Subject Line: Had Uninteresting but Required Academic Activities Experiences?

Dear Student,

"Learning is not always fun." Our Educational Psychology research team is seeking participants for a research study about uninteresting learning experience. We want to know how college students motivate themselves in uninteresting but required academic activities.

If you take part in this study, you would be asked to complete a 15-20 minutes survey. To be able to take part in this study, individuals must be 18 years old or older and have prior experiences related to uninteresting but required academic activities.

If you are interested in participating in this project, please follow this link to the survey: [survey link].

Your participation is completely voluntary, and once you enroll you can choose to withdraw at any time. If you have any questions, please feel free to contact us at wang2347@purdue.edu.

Thank you for your time!

Chantal Levesque-Bristol & Cong Wang

APPENDIX B: THE RECRUITMENT PAPER FLYERS FOR STUDY 2

RESEARCH PARTICIPANTS NEEDED

We are looking for participants for a Motivation and Learning experiences study!

Purpose of the study:

This study is to investigate how students adjust their motivation when they engage in uninteresting but required activities.

Eligibility requirements:

- Graduate students
- Aged 18 or older

What does this study involve?

- Watch a ten-minute video regarding the knowledge of APA formatting and answer ten multiple-choice questions;
- Fill out a survey;
- Revise the format of a text using APA formatting.
- Participating in the study will require approximately 30 minutes of your time.

Compensation:

For your participation, you will receive a total of $5 dollars at the end of the study.

Contact:

If you are interested in participating you can schedule via calendly.com/wang2347, or scan the QR code

If you have questions, please email Cong (Vivi) Wang wang2347@purdue.edu

A PHD STUDENT NEED YOUR HELP

FOR DISSERTATION STUDY

HELP WANTED:

Graduate Students

30-min

$5.00 Paid

TIME: March-April, 2019

LOCATION: YONG 507

CONTACT: Cong (Vivi) Wang, wang2347@purdue.edu

Scan the QR code to schedule

PosterMyWall.com

APPENDIX C: THE RECRUITMENT EMAIL FOR STUDY 2

Subject of Email: We are looking for participants for a Motivation and Learning experiences study!

Dear graduate students,

We are looking for participants for a Motivation and Learning experiences study!

Eligibility requirements:
• Graduate students
• Aged 18 or older

What does this study involve?
• Participating in the study will require approximately 30 minutes of your time.
• Watch a ten-minute video regarding APA formatting and answer some questions.
• Fill out a survey.

Compensation:
For your participation, you will receive a total of $5 dollars at the end of the study.

If you are interested in participating, you can schedule via
https://calendly.com/wang2347/motivation-and-learning-study
Experiment location: YONG 507
Experiment period: March-April, 2019

If you have any questions, please feel free to contact us at wang2347@purdue.edu.
Thank you for your time!

Chantal Levesque-Bristol & Cong Wang

APPENDIX D: THE RECRUITMENT EMAIL FOR STUDY 3

Subject Line: Had Uninteresting but Required Academic Activities Experiences?

Dear Student,

"Learning is not always fun." Our Educational Psychology research team is seeking participants for a research study about uninteresting learning experience. We want to know how college students motivate themselves in uninteresting but required academic activities.

If you take part in this study, you would be asked to participate a 30-minute one-on-one interview. To be able to take part in this study, individuals must be 18 years old or older and have prior experiences related to uninteresting but required academic activities. You will get $5 for your participation.

If you are interested in participating in this project, please visit https://calendly.com/wang2347/motivation-and-learning-study-interview to schedule an interview.

Your participation is completely voluntary, and once you enroll you can choose to withdraw at any time. If you have any questions, please feel free to contact us at wang2347@purdue.edu.

Thank you for your time!

Chantal Levesque-Bristol & Cong Wang

APPENDIX E: THE RATIONALE GENERATION ORIENTATION SCALE

Below is a collection of statements about your general experiences. Please indicate how true each statement is of your experiences on the whole. Remember that there are no right or wrong answers. Please answer according to what really reflects your experience rather than what you think your experience should be.

(1 = Never, 2 = Sometimes, 3 = About half the time, 4 = Most of the time, 5 = Always)

Construct	Item	Source
Rationale generation tendency	1. I tend to think about reasons for studying while I study.	Self-developed
	2. When I learn something, I think about the reasons for studying it.	
	3. I pay attention to my reasons for studying.	
	4. I strive to think about my purpose for studying.	
	5. I look for reasons before I do a thing.	
	6. I frequently take time to think about why I study.	
Rationale generation quality	7. I try to make whatever I am learning as useful as possible.	
	8. I tend to see connections between learning and my professional goals.	
	9. I tend to think about the meaning of things I do.	
	10. When I study, I look for a way to make it meaningful.	
	11. I consider a way to make learning more relevant.	
	12. I try to bring more value to learning.	
	13. I look for connections between learning tasks and my life.	MRQ
	14. I strive to relate the learning tasks to my goals.	
	15. I try to establish relations between studying and my personal interests.	

APPENDIX F: THE INDEX OF AUTONOMOUS FUNCTIONING (IAF; WEINSTEIN ET AL., 2012)

Below is a collection of statements about your general experiences. Please indicate how true each statement is of your experiences on the whole. Remember that there are no right or wrong answers. Please circle the answer that best matches your usual behavior rather than what you think your experience should be.

(1 = Not at all true, 2 = A bit true, 3 = somewhat true, 4 = Mostly true, 5 = Completely true)

1   My decisions represent my most important values and feelings.

2   I strongly identify with the things that I do.

3   My actions are congruent with who I really am.

4   My whole self stands behind the important decisions I make.

5   My decisions are steadily informed by things I want or care about.

6   I do things in order to avoid feeling badly about myself.

7   I do a lot of things to avoid feeling ashamed.

8   I try to manipulate myself into doing certain things.

9   I believe certain things so that others will like me.

10   I often pressure myself.

11   I often reflect on why I react the way I do.

12   I am deeply curious when I react with fear or anxiety to events in my life.

13   I am interested in understanding the reasons for my actions.

14   I am interested in why I act the way I do.

15   I like to investigate my feelings.

APPENDIX G: THE BASIC PSYCHOLOGICAL NEED SATISFACTION AND FRUSTRATION SCALE (BPNSFP; CHEN ET AL., 2015)

The following questions concern your feelings about your experience in ${q://QID13/ChoiceTextEntryValue}. Please indicate how true each of the following statement is for you given your specific experiences with ${q://QID13/ChoiceTextEntryValue}.

(1 = Not at all true, 7 = Completely true)

1. I feel a sense of choice and freedom in the things I undertake.

2. Most of the things I do feel like "I have to."

3. I feel that the people I care about also care about me.

4. I feel excluded from the group I want to belong to.

5. I feel confident that I can do things well.

6. I have serious doubts about whether I can do things well.

7. I feel that my decisions reflect what I really want.

8. I feel forced to do many things I wouldn't choose to do.

9. I feel connected with people who care for me, and for whom I care.

10. I feel that people who are important to me are cold and distant towards me.

11. I feel capable at what I do.

12. I feel disappointed with many of my performances.

13. I feel my choices express who I really am.

14. I feel pressured to do too many things.

15. I feel close and connected with other people who are important to me.

16. I have the impression that people I spend time with dislike me.

17. I feel competent to achieve my goals.

18. I feel insecure about my abilities.

19. I feel I have been doing what really interests me.

20. My daily activities feel like a chain of obligations.

21. I experience a warm feeling with the people I spend time with.

22. I feel the relationships I have are just superficial.

23. I feel I can successfully complete difficult tasks.

24. I feel like a failure because of the mistakes I make.

Autonomy satisfaction: items 1, 7, 13, 19

Autonomy frustration: items 2, 8, 14, 20

Competence satisfaction: items 3, 9, 15, 21

Competence frustration: items 4, 10, 16, 22

Relatedness satisfaction: items 5, 11, 17, 23

Relatedness frustration: items 6, 12, 18, 24

APPENDIX H: THE SITUATIONAL MOTIVATION SCALE (SIMS; GUAY, VALLERAND, & BLANCHARD, 2000).

The questions below are related to your feelings of why you are taking ${q://QID13/ChoiceTextEntryValue}. Students have different motivations for taking different courses, and we are interested in your motivations for taking ${q://QID13/ChoiceTextEntryValue}. Your responses are confidential. Please be honest and candid. Use the scale provided below to answer each item.

(1 = Strongly Disagree, 2 = Disagree, 3 = Somewhat Disagree, 4 = Neither Agree nor Disagree, 5 = Somewhat Agree, 6 = Agree, 7 = Strongly Agree)

1. I take ${q://QID13/ChoiceTextEntryValue} because it allows me to develop skills that are important to me.
2. I take ${q://QID13/ChoiceTextEntryValue} because I would feel bad if I didn't.
3. I take ${q://QID13/ChoiceTextEntryValue} because learning all I can about academic work is really essential for me.
4. I don't know. I have the impression I'm wasting my time.
5. I take ${q://QID13/ChoiceTextEntryValue} because acquiring all kinds of knowledge is fundamental for me.
6. I take ${q://QID13/ChoiceTextEntryValue} because I feel I have to.
7. I'm not sure anymore. I think that maybe I should quit (drop the class).
8. I take ${q://QID13/ChoiceTextEntryValue} because I really enjoy it.
9. I take ${q://QID13/ChoiceTextEntryValue} because it's a sensible way to get a meaningful experience.
10. I take ${q://QID13/ChoiceTextEntryValue} because I would feel guilty if I didn't.
11. I take ${q://QID13/ChoiceTextEntryValue} because it's a practical way to acquire new knowledge.
12. I take ${q://QID13/ChoiceTextEntryValue} because I really like it.
13. I take ${q://QID13/ChoiceTextEntryValue} because experiencing new things is a part of who I am.
14. I take ${q://QID13/ChoiceTextEntryValue} because that's what I'm supposed to do.
15. I don't know. I wonder if I should continue.

16. I take ${q://QID13/ChoiceTextEntryValue} because I would feel awful about myself if I didn't.

17. I take ${q://QID13/ChoiceTextEntryValue} because it's really fun.

18. I take ${q://QID13/ChoiceTextEntryValue} because that's what I was told to do.

Intrinsic motivation: items 8, 12, 17

Integration: items 3, 5, 13

Identification: items 1, 9, 11

Introjection: items 2, 10, 16

External regulation: 6, 14, 18

Amotivation: 4, 7, 15

APPENDIX I: THE PERCEIVED KNOWLEDGE TRANSFERABILITY SCALE (PKTS; RICHARDS ET AL., UNDER REVIEW).

Please consider the following questions as they relate to ${q://QID13/ChoiceTextEntryValue} and record the extent to which you agree using the choices provided.

(1 = Strongly Disagree, 2 = Disagree, 3 = Somewhat Disagree, 4 = Neither Agree nor Disagree, 5 = Somewhat Agree, 6 = Agree, 7 = Strongly Agree)

1. **I feel confident in my ability to apply the course material in other classes that I have.**
2. I feel confident in my ability to apply the course material in my professional life.
3. I feel as if the material covered in this course is relevant to my future career.
4. Given the future career that I have chosen, it is important for me to learn the information covered in this class.
5. **I understand how I will use the information learned in this class in my professional life.**
6. Information learned in this course will inform my future learning experiences.
7. **I believe that it is important for me to learn the information included in this course.**
8. The information learned in this course will help me become a more well-rounded individual.

   Note: The statements in bold were used in Study 2.

APPENDIX J: THE PERCEIVED LEARNING SATISFACTION SCALE (KIM, KWON, & CHO, 2011).

Please consider the following questions as they relate to ${q://QID13/ChoiceTextEntryValue} and record the extent to which you agree using the choices provided.

(1 = Strongly Disagree, 2 = Disagree, 3 = Somewhat Disagree, 4 = Neither Agree nor Disagree, 5 = Somewhat Agree, 6 = Agree, 7 = Strongly Agree)

1. **I think I learned a lot from this course.**
2. I think this class satisfied my learning needs.
3. Overall, I am satisfied with this course.
4. **I would like to recommend this course to others.**
5. **I am glad I took this course.**
6. **I would like to take a similar course in the future.**

   Note: The statements in bold were used in Study 2.

APPENDIX K: THE MULTIPLE-CHOICE ITEMS FOR ROTE LEARNING ASSESSMENT

In the next part, you will be asked to answer 8 multiple-choice questions regarding the content covered in the video. Please answer the questions accurately and quickly.

Please don't spend too much time on the questions. If you don't know the answer or are not sure which is correct, please select "I don't know." Do Not choose an answer at random.

1. What is the correct way to write a number that represents hours and minutes?

A. 3 hours 45 minutes

B. Three hours 45 minutes

C. Three hours forty-five minutes

D. Both A and C

E. I don't know

2. Please choose the correct way to write a fraction

A. 1/2

B. One/second

C. One half

D. One-half

E. I don't know

3. Which statement is incorrect in terms of the expressions of the numbers?

A. It takes 30 minutes to participate in the current study.

B. When you flip a fair coin, the probability you get a head is 0.50.

C. The depth of the phone is 0.76 cm.

D. The type II error rate of the study is 5%.

E. I don't know

4. Which statement is incorrect in terms of the expressions of the numbers?

A. Forty-eight percent of the sample showed an increase.

B. It was measured with a 5-point scale.

C. The experimental group gained 3 times as many.

D. We interviewed five students from Grade Four.

E. I don't know

5. Assuming this is the first citation in a paper, which is correct according to APA style?

A. Briddel, Rimm, Caddy, Krawitz, Scholis, and Wunderling (1978) found that …

B. Briddel, Rimm, Caddy, Krawitz, Scholis, & Wunderling (1978) found that …

C. Briddel et al. (1978) found that …

D. Briddel's research team (1978) found that

E. I don't know

6. In which text the citation is correct according to the APA style?

A. Ecphory is "the process by which retrieval information is brought into interaction with stored information (p. 178)" (Tulving, 1983).

B. Ecphory is "the process by which retrieval information is brought into interaction with stored information" (Tulving, 1983) [see p. 178].

C. Ecphory is "the process by which retrieval information is brought into interaction with stored information" (Tulving, 1983, p. 178).

D. Ecphory is "the process by which retrieval information is brought into interaction with stored information" (Tulving, 1983).

E. I don't know

7. What is the correct order of these references in the same parentheses?

a. Tulving, E., Pearlstone, Z., & Craik, F. M. (1966).

b. Tulving E., & Thompson, D. M. (1966).

c. Craik, F. M., & Tulving, E. (1966).

d. Tulving, E. (1966).

A. c-a-b-d

B. c-d-a-b

C. a-b-c-d

D. c-d-b-a

E. I don't know

8. Assuming this is the second time you cite this work in your paper, in which text the citation is correct according to the APA style?

A. Wang & Hsu (1973) define leadership in a more practical way.

B. Wang and Hsu (1973) define leadership in a more practical way.

C. Wang et al. (1973) define leadership in a more practical way.

D. Wang and Hsu (1973, p. 25) define leadership in a more practical way.

E. I don't know

Note: the options in bold are the correct answers.

APPENDIX L: TRANSFER TASK 1 FOR THE MAIN STUDY OF STUDY 2

In the next section, there are some APA formatting errors in the text. Please identify as many as you can in 5 minutes and highlight the errors. If you complete the task before 5 minutes, you can move on before the 5 minutes end.

With the increasing accessibility of the internet in the past decade, online learning is becoming an integral part of most higher education institutions (Bowers & Kumar, 2015; **Porter, etc., 2014**). In 2010, 65.5% of higher education institutions in the United States offered online courses (Allen & Seaman, 2011) and the online enrollment has been steadily growing. In Fall 2016, "31.6% of all higher education students had taken at least one online **course" (Seaman, Allen, & Seaman, 2018).** Despite the explosive growth of online learning in higher education, it has also raised some pressing concerns regarding low student engagement and high dropout rates in online courses and programs. For example, non-completion rates as high as 75% have been reported in multiple studies (e.g., Carr, 2000; Jun, 2005; **Rochester and Pradel, 2008**). Though various factors can account for the high attrition rates in online learning environments, motivation, as a salient component of learning in any educational environment, has drawn increased research attention (e.g., Broadbent & Poon, 2015; **Miltiadou & Savenye, 2003; Chen & Jang, 2010**). In addition to the self-regulation strategies, contextual support in the online courses is critical. Online learners need a variety of support from instructors as well as their peers (**Seaman, Allen, & Seaman, 2018**). Some researchers are concerned that not being present in the same location at the same time eliminates the opportunities for immediate social interactions to occur among students and instructors in online learning (Chen & Jang, 2010). As a result, learners in online learning contexts reported negative experiences, such as feelings of isolation, frustration, anxiety, and confusion (e.g., Jun, 2005). **Bowers & Kumar (2015)** have pointed out that lack of connectedness and instructor presence could lead to student disengagement. Researchers have found that students are more likely to withdraw or fail when they perceive a lack of social interactions and instructor presence (e.g., Bower & Kumar, 2015; **Porter, et al.,** 2014).

Participants in the study were undergraduate students at a comprehensive university in Beijing, China. Most students in this university were academically successful students when they were in high school, because in order to get accepted to the university they need to rank at least in the top **five** percentage in the National College Entrance Examination. We **recruited 1860 students**. They were from various academic disciplines including Agriculture, Health and Human Science, Science, Liberal Arts, Technology, and Engineering. See Table 2 for a list of participant demographics. **900 students** (630 females and 270 males) received the traditional instruction, and 960 students (750 females and 210 males) received the online instruction. **The 2 groups** were taught by the same instructor. There was no significant difference in cumulative grade point average between the two groups (t (df = 1580) = -1.04, p = .30). Upon IRB approval, students received a 5-minute survey via email assessing their perceptions about a course in which they were currently enrolled.

Note: the words in bold are the keys.

APPENDIX M: TRANSFER TASK 2 FOR THE FOLLOW-UP STUDY OF STUDY 2

There are some APA formatting errors in the following paragraphs. Please identify as many as you can in 3 minutes and highlight the errors. If you complete the task before 3 minutes, you can move on before the 3 minutes end.

Allen, I. E., & Seaman, J. (2011). Going the distance: Online education in the United States, 2011. Sloan Consortium. Retrieved from https://eric.ed.gov/?id=ED529948

Bowers, J., & Kumar, P. (2015). Students' perceptions of teaching and social presence: A comparative analysis of face-to-face and online learning environments. International Journal of Web-Based Learning and Teaching Technologies, 10(1), 27–44.

Broadbent, J., **and** Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. The Internet and Higher Education, 27, 1–13.

Carr, S. (2000). As distance education comes of age, the challenge is keeping the students. Chronicle of Higher Education, 46(23).

Chen & Jang. (2010). Motivation in online learning: Testing a model of self-determination theory. Computers in Human Behavior, 26(4), 741–752.

Jun, J. (2005). Understanding e-dropout? International Journal on E-Learning, 4(2), 229-240.

Miltiadou, M., Savenye, W. C. (2003). Applying social cognitive constructs of motivation to enhance student success in online distance education. AACE Journal, 11(1), 78–95.

Porter, W. W., Graham, C. R., Spring, K. A., & Welch, K. R. (2014). Blended learning in higher education: Institutional adoption and implementation. Computers & Education, 75, 185–195.
https://doi.org/10.1016/j.compedu.2014.02.011

Rochester, C. D., **& Pradel, F. Students'** perceptions and satisfaction with a web-based human nutrition course. American Journal of Pharmaceutical Education, 72(4), 91.

Seaman, J., & Seaman, J. (2017). Grade increase: Tracking distance education in the United States. Online Learning Consortium. Retrieved from https://onlinelearningconsortium.org/read/grade-increase-tracking-distance-education-united-states/

Seaman, J., Allen, I. E., & Seaman, J. (2018). Grade increase: Tracking distance education in the United States. Online Learning Consortium. Retrieved from https://onlinelearningconsortium.org/read/grade-increase-tracking-distance-education-united-states/

Note: the words in bold are the keys.

APPENDIX N: THE SEMI-STRUCTURED INTERVIEW PROTOCOL

Research Question: How do students perceive uninteresting but required academic activities and what strategies do they use to motivate yourself in such condition?

Experience in Uninteresting but Required Academic Activities (major and non-major course)

1.   Could you give me an example of a time when you had to do some uninteresting but required academic activities or tasks? Describe it to me.

a.   How did you feel/respond/react/interpret about that task?

b.   How did you go about working on that academic task?

2.   Did you do anything to keep yourself motivated to engage in that activity?

If yes, ask: what did you do?

If no, ask the next question and then ask: what would you do in that situation if you wanted to keep yourself motivated?

3.   What were your reasons for doing the task? Did you think about your reasons before working on the task as a way to motivate yourself?

4.   What efforts did you take to complete the activity? (Help center, office hours, check your work, read more about the subject….)

5.   Did you successfully complete the task/activity? Did you get feedback and/or a good result/grade for that activity/task?

Experience in Interesting Academic Activities (major and non-major course)

1.   Could you now give me an example of a time when you worked on an interesting and required academic tasks? Describe it to me/tell me about it.

2.   What were your reasons for doing the task? Did you think about your reasons before working on the task (or did you find that unnecessary to get you started)?

3.   How would you compare your working on, motivation, and completion of the interesting task from what you told me about the uninteresting task?

APPENDIX O: A SUMMARY OF UNINTERESTING BUT REQUIRED COURSES

Discipline	n
Engineering	22
Mathematics	20
Technology	20
Chemistry	17
Communication	16
Physics	12
Statistics	10
Education	8
English	6
Biology	6
Management	6
Agriculture	5
Others	71

Note: Disciplines with frequency values less than five were included in others.

APPENDIX P: EXAMPLES OF HIGH-QUALITY RATIONALES AND LOW-QUALITY RATIONALES

Categories	Examples
High-quality Rationales	1. The APA formatting style is essential for written communication in my field. It is not only about referencing sources, but mostly creating and efficient an organized way to disseminate knowledge. [Identification] 2. I'm going to write a thesis next year so I need to learn APA formatting in order to make a decent job. 2. APA formatting is a good frame in terms of providing neat information to the reader and its consideration as a worldwide format. [Identification] 3. I have never used APA style of writing, but after watching the video, I think it would be useful for my academic work. [Identification] 4. I'm a graduate student researching in the field of education/psychology, so it is expected of me to know how to write a technical paper in APA style. [Integration]
Low-quality Rationales	1. APA formatting is required in certain classes and by certain journals. In order to submit assignments or publications to these classes or journals, I need to learn to write in APA format. [External regulation] 2. The reason why I learn APA style is because my dissertation is required to follow APA standard. [External regulation] 3. Some assignments and HWs need APA formatting to be followed. So I had to learn some details of APA style formatting. [External regulation]

APPENDIX Q: THE OPEN CODES, CATEGORIZATIONS, AND MAIN THEMES OF STUDY 3

Contexts	Questions	Open Codes	Categorizations	Themes
Uninteresting, major-related activities	Feelings	The activities were: Disappointing, uninteresting, challenging, and important.	- All participants felt that the activities were boring. - Two participants mentioned the activities were uninteresting but also important. - One participant said it was challenging.	Participants had negative feelings towards those activities; however, they could also see the importance of doing them.
	Motivational Strategies	Selective hearing/engaging, taking copious notes, choosing the tasks/topics more relevant to them, reflecting on the learning needs, connecting it with other activities, thinking the utility value, seeking help, preparing mood, adjusting for environments, using incentives, reflecting on the goal	- Seven participants mentioned connecting the uninteresting learning activities with their research or personal lives. - Two participants mentioned selective learning strategy. - Two people mentioned incentives. - One people emphasized emotion and environment control.	The most common strategy participants used to motivate themselves was enhancing personal significance. Some participants mentioned strategies that were very similar to rationale generation.
Uninteresting, nonmajor-related activities	Feelings	Lost, dislike, uninterested, awful, boring, not helpful, painful, helpful but time consuming	- Ten participants felt that the activities were boring and painful. - One participant said it was helpful but time consuming.	When the uninteresting learning activities were not closely related to participants' majors, they felt that learning was boring and painful, and they rarely saw the value of doing it.
	Motivational Strategies	Collaborating, performance-approach self-talk, seeking utility value, applying the	- One participant worked with their friends to reduce the workload.	The strategies varied across participants.

		skills/knowledge in other situations, mastery self-talk	- One participant sought to get a good grade and seek the utility value. - One participant tried to apply the knowledge and skills. - One participant mentioned seeing his/her progress was motivating.	
Interesting, major-related activities	Feelings	Felt blessed, enjoyed, relaxed, and excited. The activities were interesting, relevant to their research/personal lives. Perceiving autonomy.	- All participants enjoyed learning interesting and major-related tasks. - Three participants mentioned the relevance of the tasks. - One participant mentioned that the interesting learning task provided choices.	Learning was enjoyable.
	Motivational Strategies	Not needed.	- All participants said they did not need to try motivational strategies, because they were highly motivated.	Students did not need to motivate themselves because the tasks were interesting and they were highly motivated.
Comparison between interesting and uninteresting experience that was closely related to majors		Needs for self-motivating strategies, engagement, learning outcomes, locus of control.	- Two participants said self-motivating strategies were not needed for interesting tasks, whereas strategies were desired for uninteresting tasks. - Two participants said they had more behavioral and cognitive engagement when engaging in interesting tasks. - Most (10/11) participants achieved good grades in both interesting and uninteresting courses; however, four participants said they learned little from the uninteresting courses.	Interesting and uninteresting learning activities differed a lot in many aspects, which included motivation, engagement, and deep learning.

		- One participant stated that the most difference between the two learning situations was whether the behaviors were chosen by himself/herself or others.	
Attitudes towards rationale generation	Seeing the personal significance /value of the task is helpful, not sure about the effect on motivation, it can promote behavioral engagement, high quality rationale can be helpful, it can help with initiating an action, it may work as a motivation reminder, students need guidance on it	- Five participants believed that having a high quality rationale that was related to personal significance could enhance motivation. - Two participants mentioned the timing of rationale generation. - Two participants thought it could at least promote behavior engagement. - One participant was not sure about the effectiveness of rationale generation. - One participant said he/she would need mentor to generate a meaningful rationale.	Participants felt the rationale related to identification would enhance motivation.

APPENDIX R: SELF-REFLECTION FOR STUDY 3

I am an international student from China. Prior to coming to Purdue University, I have studied in China for 19 years, received a bachelor's of science in applied psychology from Sun Yat-sen University and a master's of education in educational psychology from Beijing Normal University. Both universities are top-tier universities in China. To get into those universities and programs, students need to rank at least in the top 1% in the high-stake national college/graduate school entrance examination. I worked very hard during my high school and undergraduate study because for people who are from low socioeconomic status families, getting into top universities is the most practical way to climb the social ladder. I endorse the value of intrinsic motivation as an educational researcher; however, studying only for fun is a luxury that I cannot afford even now. As a graduate student, I am supposed to have more autonomy than high school students and undergraduates; however, I still took several uninteresting courses to fulfill my degree requirements in the past five years. Therefore, I have rich firsthand experience of what it is like to experience uninteresting but required academic activities. Extrinsic motivation is very effective in driving me to engage and persist in learning activities that are not interesting but important for my career. I feel this is why I appreciate and endorse the ideas of viewing extrinsic motivation in terms of a continuum of autonomy and differentiating different types of extrinsic motivation based on the degree of autonomy. During my time as a doctoral student in educational psychology at Purdue University, I have been reading literature on SDT and utilizing SDT as the theoretical framework of my research. Some of the studies that I have completed as part of my doctoral program demonstrated the positive effects of autonomous types of extrinsic motivation on learning outcomes (Levesque-Bristol et al., under review; Wang, Zhang, Moss, Bonem, Levesque-Bristol, under review). In summary, all of the knowledge that I bring into this

dissertation comes from my firsthand experience, previous research that I have done, and my review of the literature.

Although my perceptivity helps me come up with the research idea of the dissertation, it is also likely to increase my bias as a qualitative investigator. The personal experiences and beliefs I bring into the research may influence what I expect to find in the interviews and how I interpret participants' statements. One thing I did to manage my biases throughout the whole process is to constantly remind myself that I had no hypotheses for Study 3 and all I wanted to get from Study 3 was participants' true experiences and perspectives. I knew that, during the interviews, I might unintentionally encourage the expressions of generating rationales, especially for the ones related to identification and integration. To reduce my impulses to ask leading questions or hint at rationale generation or identification, I explicitly asked the participants about their opinions on generating rationales as a way to motivate themselves. This allowed me to maintain as neutral as possible when inquiring about the strategies that my participants used during uninteresting but required academic activities. Also, for the first two interviews, I listened to the interview records right after completed them to check whether any biases had been introduced to the interviews. I found that sometimes I rephrased participants' statements with my own words to clarify their perspectives, which may not accurately reflect participants' original thoughts. For the following interviews, I used more clarification questions instead of rephrasing the participants' words. During the data analysis process, to minimize my personal biases, I only developed codes from participants' original statements. For example, during one of the interviews, I said that "if you were able to see that [the value of the course] back then, you probably would be more motivated," and the participants confirmed, "Yeah, I think, yeah." I did not code this content

because it was possible that the participants gave me confirmative responses due to social desirability bias. Ignoring those contents might not influence my findings substantially because after going through the entire interview data set, I did not see many similar cases and I believed that I had sufficient information from the participants' firsthand statements. To ensure the consistency of my coding, I revisited all transcripts and made amendments after I completed the first iteration of the coding.

VITA

Cong Wang

EDUCATION

Present	**Purdue University—West Lafayette, IN**
	Ph.D. Educational Psychology (expected graduation date: Dec. 2019)
	Dissertation Title: *"Learning is not always fun, but it is fine" Effects of Rationale Generation on Autonomous Motivation and Learning in Uninteresting but Required Academic Activities*
	Advisor: Chantal Levesque-Bristol, Ph.D.
May. 2019	**Purdue University—West Lafayette, IN**
	M.S. Applied Statistics
Jun. 2013	**Beijing Normal University, Beijing, China**
	M.Ed. Developmental and Educational Psychology
	Thesis Title: *The Effects of Service-Learning on College Students' Learning Transfer Abilities*
	Advisor: Meilin Yao, Ph.D.
Jun. 2010	**Sun Yat-Sen University, Guangzhou, China**
	B.S. Applied Psychology

RESEARCH INTERESTS

My research focuses on students' motivation and learning in classrooms. I have been utilizing the framework of self-determination theory to study the impact of autonomy-supportive teaching approaches and self-generated rationales on student learning within the context of higher education. As a second related line of research I study students' transfer of learning using the framework of preparation for future learning.

PUBLICATIONS

1.   **Wang, C.,** Hsu, H. K., Bonem, E. M., Moss, J. D., Yu, S., Nelson, D. B., & Levesque-Bristol, C. (2019). Need satisfaction and need dissatisfaction: A comparative study of online and face-to-face learning contexts. *Computers in Human Behavior, 95*, 114-125. DOI: https://doi.org/10.1016/j.chb.2019.01.034

2.   **Wang, C.,** Zhang, X., & Yao, M. (2019). Enhancing Chinese college students' transfer of learning through service-learning. *Studies in Higher Education, 44*(8), 1316–1331. https://doi.org/10.1080/03075079.2018.1435635

3.   Hsu, H. K., **Wang, C. V.,** & Levesque-Bristol, C. (2019). Reexamining the impact of self-determination theory on learning outcomes in the online learning environment. *Education and Information Technologies, 24*(3), 2159-2174. DOI: 10.1007/s10639-019-09863-w

4.   Fedesco, H. N., Bonem, E. M., **Wang, C.,** & Henares, R. (2019). Connections in the classroom: Separating the effects of instructor and peer relatedness in the Basic Needs Satisfaction scale. *Motivation and Emotion.* DOI: https://doi.org/10.1007/s11031-019-09765-x [online first]

5.   Guo, F., Li, Y., **Wang, C.,** Zong, X., Yao, M., & Yan, W. (2019). Service participation among adolescents in mainland China. *Journal of Social Service Research.* DOI: 10.1080/01488376.2018.1524812 [online first]

6.   Tan, D., Yough, M., & **Wang, C.** (2018) International students in higher education: Promoting their willingness to communicate in classrooms, *Journal of Applied Research in Higher Education, 10*(4), 430-442. DOI: 10.1108/JARHE-01-2018-0008

7.   Krishnan, L. A., Masters, C., Holgate, H., **Wang, C.,** & Calahan, C. A. (2017). Structured study abroad enhances intercultural competence. *Teaching and Learning in Communication Sciences & Disorders, 1*(1), Art.5. DOI: doi.org/10.30707/TLCSD1.1Krishnan

8.   Li Y, Guo F, Yao M, **Wang C.,** & Yan, W. F. (2016). The role of subjective task value in service-learning engagement among Chinese college students. *Front. Psychol. 7*:954. DOI: 10.3389/fpsyg.2016.00954

9.   Guo, F. F., Yao, M.L., **Wang, C.,** Yan, W. F., & Zong, X. L. (2016). The effects of service learning on student problem solving: The mediating role of classroom engagement. *Teaching of Psychology, 43*(1), 16-21. DOI: 10.1177/0098628315620064

10.   **Wang, C.,** Yao, M.L., Guo, F.F., Yan, W.F., Weng, C., & Zhao, F. H. (2013). Students' social service experiences and the effects on their civic action intentions: The mediating role of community service perspectives. *Psychological Development and Education, 3*(29), 53-60. [In Chinese]

MANUSCRIPTS UNDER REVIEW

1.   **Wang, C.,** Zhang, Y., Moss, J. D., Bonem, E. M., & Levesque-Bristol, C. (Major revision). Multilevel factors affecting college students' perceptions of knowledge transfer: From the perspective of self-determination theory.

2.   **Wang, C.,** Moss, J. D., Wiles, B., Li, Q., Lu, Y., Cho, H. J., & Levesque-Bristol, C. (Under review). Assessing students' conceptual understanding of calculus using item response theory.

3.	Bonem, E. M., **Wang, C.,** Lott, E.A., Fedesco, H. N., & Levesque-Bristol., C. (Under review). Gender differences in STEM courses in a self-determination theory model of student motivation and performance.

4.	Levesque-Bristol, C., Richards, K. A. R., Zissimopoulos, A., **Wang, C.,** & Yu, S. (Minor revision). Applying self-determination theory to the college classroom: A test of the integrative model for learning and motivation.

5.	Levesque-Bristol, C., Bonem, E. M., Zissimopoulos, A., Nelson, D. B., Fedesco, H., Yu, S., & **Wang, C.** (Under review). Using self-determination theory to model the effects of student centeredness on the satisfaction of basic psychological needs, motivation and learning outcomes.

MANUSCRIPTS IN PREPARATION

1.	**Wang, C.,** Wiles, B., Moss, J. D., & Levesque-Bristol, C. Motivational predictors of college students' mathematics achievement: A multilevel modeling analysis.

2.	**Wang, C.,** Chen, Y., & Yao, M. Autonomy-support and transfer of learning: Testing the self-determination theory in a Chinese service-learning activity.

3.	Cho, H. J., **Wang, C.,** Bonem, E. M., & Levesque-Bristol, C. Campus wide course transformation program systematic review and meta-analysis.

CONFERENCES

International

•	**Wang, C.,** Chen, Y., & Yao, M. (May, 2019). Autonomy-support and transfer of learning: Testing the self-determination theory in a Chinese service-learning activity. Poster presentation accepted at 7th International Self-Determination Theory Conference, Egmond aan Zee, Netherlands.

•	Cho, H. J., **Wang, C.,** Bonem, E. M., & Levesque-Bristol, C. (May, 2019). Instructional Matters: Purdue's Academic Course Transformation (IMPACT) program systematic review. Poster presentation accepted at 7th International Self-Determination Theory Conference, Egmond aan Zee, Netherlands.

•	Moss, J. D., & **Wang, C.** (May, 2019) Predictors of Change in Preservice Teachers' Motivational Profiles. Paper presented accepted at the 7th International Self-determination Theory Conference, Egmond aan Zee, Netherlands.

•	Nunes, L.D., Moss, J. D., **Wang, C.,** Carlson, E., Gardner, S., & Levesque-Bristol, C. (Aug, 2018). Motivation in the classroom: The effects of control and the use of technology. Paper presentation at the Earli/SIG 8 - 16th International Conference on Motivation, Aarhus, Denmark.

• Yao, M. L., Guo, F. F., Yan, W. F., **Wang, C.,** & Li, Y.L. (Jun, 2013). What is learning in Service-Learning? Findings from service learning research at Beijing Normal University. Paper presentation at the 4th Asia-Pacific Regional Conference on Service-Learning, Hong Kong, China.

National

• **Wang, C.,** Moss, J. D., Wiles, B., Li, Q., Lu, Y., Cho, H. J., & Levesque-Bristol, C. (Aug, 2019). Analyzing a short version of the calculus concept inventory with item response theory. Poster presentation accepted at the American Psychological Association Annual Convention, Chicago, IL.

• Bonem, E., **Wang, C.,** Lott, E.A., Fedesco, H., & Levesque-Bristol, C. (Nov, 2018). Modeling the experiences of women in STEM courses using a self-determination theory framework. Paper presentation at the Professional and Organizational Development Network in Higher Education, Portland, OR.

• **Wang, C.,** & Levesque-Bristol, C. (Aug, 2018). Factors affecting US college students' knowledge transfer: A multilevel modeling analysis. Poster presentation at the American Psychological Association Annual Convention, San Francisco, CA.

• **Wang, C.,** Zhang, X., & Yao, M. L. (Apr, 2017). Service-learning and transfer of learning: Roles of cognitive conflict and behavioral engagement. Paper presentation at the American Educational Research Association Annual Meeting, San Antonio, TX.

• **Wang, C.,** Hsu, H. K., Moss, J., Yu, S., Nelson, D. B., & Levesque-Bristol, C. (Nov, 2016). A comparative study of need satisfactions in online and face-to-face environments. Paper presentation at Professional and Organizational Development Network in Higher Education, Louisville, KY.

• **Wang, C.,** & Levesque-Bristol, C. (Aug, 2016). Promoting learning transfer through autonomy-supportive environment: Both degree and tendency matter. Poster presentation at the American Psychological Association Annual Convention, Denver, CO.

• Hsu. H. K., **Wang, C.,** & Levesque-Bristol, C. (Aug, 2016). Testing self-determination theory in online learning environment. Poster presentation at the American Psychological Association Annual Convention, Denver, CO.

• Tan, D., Yough, M., **Wang, C.** (Aug, 2016). Chinese international students' willingness to communicate in the ESL classrooms. Poster presentation at the American Psychological Association Annual Convention, Denver, CO.

• **Wang, C.,** Yao, M. L., & Guo, F. F. (May, 2015). Can cognitive conflict induce more learning? The type matters. Poster Presentation at 27th Association for Psychological Science Convention, New York, N.Y., USA.

- **Wang, C.,** & Yao, M.L. (Sep, 2012). Service-learning qualities and civic action intentions: The mediating role of service perspectives. Paper presentation at the 15th National Academic Conference of Psychology. China: Guangzhou.

Regional

- Cho, H. J., Holgate, H. A., Tan, D., **Wang, C.,** Yu, S., & Levesque-Bristol, C. (The first 5 authors have equal contribution and hence ordered alphabetically; Mar, 2017). College students' day-to-day experiences inside and outside the classroom: Effects on motivation, engagement and well-being. Poster presentation at Annual Graduate Symposium of Educational Research, Purdue University, West Lafayette, IN.

- Holgate, H, **Wang, C,** Levesque–Bristol, C., & Calahan, C. (Nov, 2015). Integrating Culture & Motivation: Preliminary results for validation of a measure of culturally responsive learning climate. Poster Presentation at the 6th Biennial Conference of the Southwest Consortium for Innovative Psychology in Education, Albuquerque, NM.

RESEARCH EXPERIENCE

Aug. 2014 - Present   Graduate Research Assistant, Center for Instructional Excellence, Purdue University-West Lafayette, IN

- Manage and analyze data related to a First in the World (FITW) project and the IMPACT course transformation project at Purdue.

- Prepare, administer, support and assist with student perception surveys and knowledge test validation surveys, i.e., creating, distributing, monitoring, analyzing, compiling results, and reporting.

- Involved in Scholarship of Teaching and Learning (SoTL) project. Primary responsibilities include identifying research questions, analyzing data, writing manuscripts for publications, presenting the projects at conferences.

- Assist with other office tasks, e.g., Consultations, TA orientation, Micro-Teaching, College Teaching Workshops, and Small Group Instructional Diagnosis (SGID)

Sep. 2010 - Jun.2013   Beijing Normal University-Beijing, China

"Improving the University Students' Transferable Ability through Service-Learning" project. (National Eleventh Five-Year Plan of Ministry of Education)

- Designed experiments, prepared surveys, created assessing rubric, conducted interventions, conducted interviews, analyzed data, and wrote manuscripts for publication.

"Development of career adaption inventory for Beijing ** district teachers" project
-        Developed the inventory, collected data, and completed analyses and reports.

"Educational Psychology 2nd Edition (written by Robert J. Sternberg &Wendy M. Williams) translation project."

-        Translated the 3rd, 7th, and 14th chapters into Chinese, and proofread the other 11 chapters.

TEACHING EXPERIENCE

Purdue University

2019 Spring, Instructor, STAT30100 Elementary Statistical Methods (Lab)

Class Size and Level: 58 undergraduate students

2019 Spring, Instructor, EDPS63200 Structural Equation Modeling

Class Size and Level: 6 graduate students

2018 Fall, Teaching Assistant, PSY12000 Elementary Psychology

Class Size and Level: 445 undergraduates

2018 Fall, Teaching Assistant, EDPS63200 Structural Equation Modeling

Class Size and Level: 9 graduate students

2017 Fall, Teaching Assistant, EDPS63800 Factor Analysis

Class Size and Level: 16 graduate students

Beijing Normal University

2011 Fall, Teaching Assistant, Psychology of Learning

Class size and Level: 103 undergraduates

PROFESSIONAL SKILLS & DEVELOPMENT

Advanced statistical skills: Factor Analysis (EFA, CFA), Structural Equation Modeling (SEM), Multilevel Modeling (MLM), Meta-Analysis, Item Response Theory (IRT)

Statistical software: SPSS, SAS, R, LISREL, IRT, CMA

Research software: Qualtrics, E-Prime, NVivo

Fall 2018   **Graduate Instructional Development Certificate**, Purdue University, West Lafayette. Completed a series of teaching and professional development activities to enhance teaching skills.

Summer 2018   **Claire Ellen Weinstein Doctoral Student Seminar**, American Psychological Association Division 15 (Educational Psychology). Selected among a highly competitive group of applicants to participate in a seminar that trains Ph.D. students on how to be successful scholars.

Spring 2018   **Meta-Analysis Workshop**, New York, USA. Participated in a 3-day workshop lectured by Dr. Michael Borenstein to learn to how to perform meta-analyses using the software Comprehensive Meta-Analysis.

Summer 2015 **Base Programmer for SAS 9**. Received training on SAS programming and earned a passing score on the SAS Base Programming for SAS 9 exam.

AWARD

2019   Dean's Graduate Student Support ($200), College of Education, Purdue University

2018   Outstanding Scientific Research Achievement Award ($2,000), Beijing Normal University

2017   Travel Grant $250, Purdue Graduate Student Government

2015   Honorable Mention Award, Ninth Annual Graduate Student Educational Research Symposium, Purdue University

2009   National Encouragement Scholarship Award, Sun Yat-Sen University

2009   Excellent Student Scholarship Award, Sun Yat-Sen University

COMMUNITY ENGAGEMENT

Apr. 2019 **Purdue Undergraduate Research Conference**, Purdue University. Volunteered as a poster judger.

2018 - 2019 **Statistics in the Community (StatCom)**, Purdue University. Volunteered as a consultant. Provided professional statistical consulting services to governmental and nonprofit groups.
     Certell Project (Project leader)

Aug. 2018 **Graduate Student Mentor**, Department of Statistics, Purdue University. Volunteered as a mentor for new graduate students. Provided information and advice about Purdue and the program.

Jun. 2018 **9th International Purdue Symposium on Statistics**, Purdue University. Volunteered to help with the symposium.

Nov. 2015 **Next Generation Scholars Presentation**, Purdue University. Volunteer to give a presentation to local high school students about my career as an educational researcher.

2010 - 2012 **Lecture team of School of Psychology**, Beijing Normal University. Volunteered as a senior lecture for middle school students in Beijing. Developed lectures related to Psychology and delivered lectures.