Leveraging MSLQ Dataset for Predicting Students' Achievement Goal Orientations

by

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Abstract

Motivation, cognition, and achievement goals are three broad domains of learners' characteristics that affect how learners study and what they learn by studying. Two of the most commonly used instruments for measuring learners' characteristics are the Motivated Strategies for Learning Questionnaire, and the Achievement Goals Orientation. A substantial body of research over the last three decades has studied relationships between the motivational and the achievement goal constructs used in both the instruments. No previous study, however, attempted to use the existing knowledge of construct associations to derive learners' achievement goals from their measures of learning motivation or vice versa. This research aimed to leverage the Motivated Strategies for Learning Questionnaire dataset for predicting learners' achievement goals orientations and was guided by the following research question: whether the MSLQ measures of motivated strategies for learning reveal achievement goal orientations of college students. Data for this study was collected from 347 undergraduate students. Both a confirmatory data analysis approach and an exploratory data analysis approach were employed to examine the collected data. For confirmatory analysis, I built a new theoretical model of the Motivated Strategies for Learning Questionnaire items based on the previous empirical research findings, and employed Pearson correlation analysis, regression analysis and Akaike Information Criterion to identify the best-fit models. For exploratory investigations, I used canonical correlation analysis to identify relationships between Motivated Strategies for Learning Questionnaire measures and Achievement Goals Orientation constructs. The confirmatory analysis identified a 15-item model of motivated strategies which predicted four achievement orientations, whereas the exploratory analysis resulted in a 15-item model that predicted three achievement goal orientations.

Keywords: Achievement goal; AGQ; learning strategies; motivation; MSLQ

Dedicated to my parents, wife, family, and teachers whose prayers, support, well-wishes and guidance led me to reach this milestone.

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List of Acronyms

AGQ	Achievement Goal Questionnaire
CS	Cognitive-Strategy
IV	Intrinsic-Value
MSLQ	Motivated Strategies for Learning Questionnaire
SE	Self-Efficacy
SFU	Simon Fraser University
SIAT	School of Interactive Arts and Technology
SR	Self-Regulation
TA	Test-Anxiety
VIF	Variance Inflation Factor

1. Introduction

Motivation, cognition, and achievement goals are three broad domains of learners' characteristics that affect how learners study and what they learn by studying. There have been numerous research studies on these domains of learners' characteristics during the last 30 years (see Ames & Archer, 1987; Corno & Mandinach, 1983; Corno & Rohrkemper, 1985; Diseth, 2011; Elliot, 1996; Elliot & McGregor, 2001, 2011; McKeachie, Pintrich, Lin, & Smith, 1987; Duncan & McKeachie, 2005; Weinstein & Mayer, 1986; Winne & Perry, 2000). These studies have been instrumental in advancing our theoretical understanding of: motivational and achievement goals constructs; the nature of students' motivation and achievement goals; and the role of cognitive and metacognitive strategies in students' learning and achievement (e.g., Bong, 2001; Jakesova & Hrbackova, 2014; Winne & Hadwin, 2008). Like many studies in educational and cognitive psychology, researchers often employed introspection (Boring, 1950) and self-report instruments to measure the motivational and achievement goal constructs (Snyder, 1996). Two of the most commonly used instruments by researchers and educators in recent times were the *Motivated Strategies for Learning Questionnaire* (MSLQ) (Pintrich, Smith, & McKeachie, 1993), and the *Achievement Goals* Questionnaire (AGQ; Elliot, 1997).

The MSLQ is a widely used, self-report instrument for measuring learners' motivational, cognitive and meta-cognitive (self-regulation) characteristics (Cho & Summers, 2012; Crede & Phillips, 2011; Duncan & McKeachie, 2005). The motivational component of MSLQ measures students' self-reported beliefs about directing and sustaining their behaviours towards academic tasks. The cognition and self-regulation components measures students' use of cognitive and metacognitive learning strategies (e.g., rehearsal, elaboration) for maintaining their cognitive engagement in the learning task. The MSLQ has different versions. Each version has varying scales and items. Pintrich and DeGroot's (1990) version contains 44-items that are divided items into five motivational and cognitive scales. The motivational (affective) scales measure self-efficacy, intrinsic value, and test anxiety. The cognitive scales measure self-regulated learning and cognitive strategy use of students. The use of MSLQ over the years has generated a large pool of datasets worldwide (Duncan & McKeachie, 2005).

The Achievement Goals Orientation questionnaire measures “broad purposes or orientations that students adopt as reasons for engaging” in learning behaviors (Zhou & Winne, 2012, p. 1; Kaplan & Maehr, 2007). Goals appear extensively in the study of motivation in various domains and settings (see, Austin & Vancouver, 1996; Bandura, 1986; Dweck, 1986, Elliott & Dweck, 1988; Elliot & Murayama, 2008; Pekrun, Elliot, & Maier, 2009). The Achievement goal construct was pioneered in the early 1980s by motivational theorists and researchers (e.g., Ames, 1984; Dweck, 1986, Maehr, 1989; Nicholls, 1984), and is considered one of the most remarkable contributions to the study of motivation and competence in over 100 years (Elliot & Murayama, 2008). An achievement goal is defined as a “cognitive representation of a desired end-point” (Fishbach & Ferguson, 2007, p. 3) that is centered on competence (cf. Dweck & Leggett, 1988; Nicholls, 1984). The AGQ is a commonly used self-report instrument to measure students’ achievement goal orientations. The instrument has evolved from an earlier dichotomous model to a widely used 2 x 2 model (Elliot & McGregor, 2001) which theorizes four distinct orientations of learning motivation in academic settings: (1) mastery-approach goal orientation, (2) mastery-avoidance goal orientation, (3) performance-approach goal orientation, and (4) performance-avoidance goal orientation. A more recent 3 × 2 achievement goal model (Elliot et al., 2011) bifurcates mastery-orientation into task- and self-orientation. Each goal orientation offers a unique perceptual-cognitive framework (Elliot, 2008; Muis, Winne, & Edwards, 2009).

A substantial body of research over the last three decades had studied relationships between motivational and achievement goal constructs. Many of these studies found statistically significant correlations between the constructs contained in both the MSLQ instrument and the AGQ instrument. A conceptual analysis of the achievement goal orientations literature, for example, suggested that a student with a mastery-approach goal orientation (AGQ construct) was more likely to exhibit high intrinsic-value (MSLQ construct) for learning (e.g., Bodmann, & Harackiewicz, 2010; Nicholls, 1989). Similarly, positive correlations have been reported between the performance-avoidance goals and low self-efficacy (e.g., Elliot, 1999).

These earlier studies mostly focused on examining relationships between individual constructs using a variety of scales and measurements. Cerasoli and Ford (2014), for instance, examined relationships between intrinsic motivation and mastery

goals constructs only. They used an adapted version of the Self-Regulation Questionnaire for learning (SRQ-L; Williams & Deci, 1996; Black & Deci, 2000) and a 14-item questionnaire (Simons et al., 2004) to measure intrinsic motivation and mastery goals, respectively. Elliot and Harachiewicz (1996) used intrinsic motivation construct to investigate relationships with performance goals. To measure the effects of intrinsic motivation on performance goals Elliot and Harachiewicz used a hidden word puzzles called "Nina puzzles."

No previous study was found that attempted to use existing knowledge of construct associations to develop mappings between MSLQ and AGQ instruments for the purpose of eliciting knowledge of participants' additional characteristics. Hence, my research aims to fill in this void and to create opportunities for leveraging existing datasets to drive more information promptly and efficiently in lieu of running additional research studies.

1.1. Research Purpose

This research investigated associations between two different but related instruments, the MSLQ and AGQ. The research aimed to extend our knowledge of relationships between individual constructs and to draw additional knowledge of students' learning characteristics by analyzing existing datasets systematically. A main premise of this study, therefore, was that a dataset collected for measuring motivational strategies of students might usefully be measuring their achievement goal orientations as well. Derivation of additional information from existing datasets was highly desirable in designing student-specific interventions to support their leaning motivation in adaptive or collaborative online learning environments, as discussed below.

Scientific studies in the field of learning have been influential in informing educational practices for over a century now (Roediger, 2013). The advent of educational systems such as computer-based tutoring systems (e.g., AutoTutor[1]), online learning systems (e.g., Moodle[2]), personalized or adaptive learning systems (e.g., Knewton[3]), and MOOCs (massive open online course; e.g., edX[4]) are some recent

[1] http://ace.autotutor.org/
[2] http://moodle.org.
[3] https://www.knewton.com/

examples of practices driven by scientific research. Many of these learning systems allow educators to structure their courses and design learning tasks according to their preferred teaching styles (Ali et al., 2013). However, when it comes to adaptation and presentation of content based on, for instance, a student's motivational orientation, the support offered by learning systems is rather limited (Ali et al., 2013; Dabbagh & Reo, 2011; Dawson et al., 2008; Essalmi, Ayed, Jemni, Kinshuk, & Graf, 2010; Willging, 2005). Further, in online learning environments teachers and learners acquire new roles and responsibilities where teachers facilitate learning mostly, and students assume prime responsibility of their own learning (Fahy, 2006). These new roles require students to self-regulate their learning more than ever and pose new motivational, cognitive, and performance challenges (Visser, Plomp, Amirault, & Kuiper, 2002; Kim, 2009; Macfadyen & Dawson, 2010).

Data are key resources for advancing scientific research and supporting user centered system development for better learning outcomes (Esanu et al., 2003). Better learning outcomes were also associated with students' motivational behaviors and various achievement goals (Eom, Wen, & Ashill, 2006; Fyans & Maehr, 1987; Maehr, 1984; Walberg, 1984, Keller, 2010). Besides learning experiences, comprehension, and preferences (Bull & Kay, 2010; Jovanovic et al., 2007), adaptation and personalization of a learning process thus required data about students' motivational orientations and achievement goals. Being able to derive achievement goal orientations from data describing students' motivational strategies could provide a more comprehensive picture of students' affect and cognitive profiles to support their learning.

Research has shown that *feedback* could shift the learning focus of students and improve learning gains (Burgers et al., 2015; DePasque & Tricomi; 2015, Shute, 2008; Wingate, 2010). The possibility of eliciting more knowledge about students' characteristics from existing datasets could be useful for researchers and educators to personalize feedback messages. Based on the analysis of motivational and achievement orientations, learning management system could also generate *formative* feedback (Pat-El, Tillema, & van Koppen, 2012) to help students improve their academic behaviours. A system could display specific motivational messages designed to improve course grades

[4] https://www.edx.org/

(Martínez-Mirón, Harris, du Boulay, Luckin, & Yuill, 2005), for instance, by engaging in forum discussions or reading additional materials.

Further, establishing a correlation between the two instruments would allow for increased efficiency in gaining additional knowledge on students' characteristics. A good knowledge of students' characteristics is especially relevant in user modeling and designing adaptive learning systems. The MSLQ instrument has been used extensively and therefore, there is a great amount of data associated with the instrument. Researchers would benefit from being able to use the data collected in the past, and compare and analyze it alongside data collected in the present and the future, potentially offering extra dimensions of understanding and analysis. Through cross-referencing both instruments, it would also be possible to draw new conclusions. By establishing relations between the two instruments and determining the levels of correlation between items on the surveys, it would be possible to extrapolate and draw conclusions beyond the insights and analytics each individual instrument currently supports. For example, by examining the analytics generated by two highly correlated items on the different instruments, it may be possible to synthesize a novel insight.

1.2. Research Question and Hypotheses Overview

This research investigated associations between college students' motivated strategies for learning and their achievement goal orientations. Students' motivated strategies for learning and achievement goals were obtained by administering the self-report MSLQ and AGQ instruments, respectively. The following research question guided the study: *Do the MSLQ measures of motivated strategies for learning predict achievement goal orientations of college students?* To investigate this research question, the study used both a confirmatory and an exploratory analyses.

For the confirmatory approach a theoretical model was built based on previous empirical research findings. The model defined six new scales combining items from the MSLQ instrument to predict achievement goal orientations. Corresponding to the new scales, the following six hypotheses were formulated to investigate associations between the MSLQ items and the AGQ scales in this study.

H1: The MSLQ-based mastery-approach goal orientation predicts the AGQ mastery approach goal orientation.

H2: The MSLQ-based performance-approach goal orientation predicts the AGQ performance approach goal orientation.

H3: The MSLQ-based mastery-avoidance goal orientation predicts the AGQ mastery avoidance goal orientation.

H4: The MSLQ-based performance-avoidance goal orientation predicts the AGQ performance avoidance goal orientation.

H5: The MSLQ-based approach-goal orientations predict the AGQ approach goal orientations.

H6: The MSLQ-based avoidance-goal orientations predict the AGQ avoidance goal orientations.

For the exploratory analysis, the study aimed to identify possible underlying factors (achievement goal structure) represented by the MSLQ scales without imposing any pre-conceived structure on the outcome (Child, 1990). The new scales, a theorized model, and hypotheses are further described in chapters 2 and 3.

1.3. Study Overview

The study analyzed data collected from 347 undergraduate students who completed the MSLQ and AGQ questionnaires. Data were collected over a three-week period during the spring semester in 2013. Confirmatory data analysis was performed using standard descriptive statistics and inferential statistics, i.e., parametric linear models including Pearson correlation, regression analysis, and Akaike Information Criterion (AICc) for the best-fit model selection. Cronbach's alpha coefficient was used to measure the reliability of the theorized scales. For cross validation of the models using exploratory data analysis, I used canonical correlation analysis (CCA). More details of these methods are provided in chapter 3.

1.4. Organization of Dissertation

This dissertation is divided into five main chapters. Chapter 1 provides an overview of the research presented in this dissertation. It includes a rationale for current study, and introduces research question and study method. Chapter 2 is Background. This chapter provides the role, nature and history of the two instruments (MSLQ and AGQ) used in this study. For each instrument, the contents are organized under three sections: application, theoretical foundation, and an historical account of the making of the instrument. The chapter also identifies inter-construct relationships between the two instruments based on a review of literature and results from various research studies. These identified relationships guided the hypotheses-formulation for my research study. The chapter concludes with proposing a theorized model for predicting students' achievement goal orientations from MSLQ measures. Chapter 3 describes the methodology of this study. This chapter begins with a statement of the research question and the six hypotheses being investigated. A study design section describes participants, measures, procedure, and analysis (i.e., method) and provides rationale for the application of specific procedures, methodologies and statistical models used to collect and analyze data. Chapter 4 reports the study's results. This chapter describes results from two types of analyses performed for this study, namely: (1) confirmatory approach results, and (2) exploratory approach results. The confirmatory approach results section states the findings that lead to confirm or reject the hypotheses of my study. For each hypothesis, the section presents a systematic description of results followed by an explanation of key findings. The exploratory approach results section states the findings of the canonical correlational analyses, which explored the associations between the MSLQ items and the AGQ scales. For each MSLQ scale (e.g., self-efficacy, test anxiety) the section presents a systematic description of correlational results followed by an explanation of key findings. Chapter 5 provides interpretation and description of the significance of the findings in light of already known research. The chapter also explains any fresh insight or new understanding about the motivational, cognitive, or achievement goal constructs based the findings of this research. Chapter 6 synthesizes key points and recommendations for future research.

2. Background

2.1. Motivated Strategies for Learning Questionnaire (MSLQ)

The MSLQ has been used widely for measuring learners' motivational and cognitive characteristics (Cho & Summers, 2012; Crede & Phillips, 2011; Duncan & McKeachie, 2005). The motivational component measures the beliefs that guide students' behaviours towards learning, while the cognitive component measures the use of learning strategies students adopt in the learning tasks. The MSLQ instrument was grounded in a social-cognitive view of learning, which posited that learning occurs within a social context. It reflects the view that motivation was context specific (Corno & Rohrkemper, 1985; Malone, 1981), and requires respondents to make responses relative to a particular course in which they are enrolled.

Motivation "initiates," "directs" and "sustains" individual behaviors (Kleinginna & Kleinginna, 1981). Motivation, in an academic setting, can be reflected through a learner's choice, persistence, and performance. A substantial body of research has shown that motivation affects students' selection of academic tasks, the time and effort they spend on those tasks, their persistence in carrying out tasks, and their achievement (e.g. Brophy, 2010; Hsieh, Cho, Liu, & Schallert, 2008; Lee & Brophy, 1996; Maehr, 1984; Pintrich, Marx, & Boyle, 1993; Wigfield & Cambria, 2010). Motivation plays a pivotal role in learners' cognitive engagement with learning content and critical thinking (Lee & Brophy, 1996; Napier & Riley, 1985; Pintrich, Marx, & Boyle, 1993; Wolters, 1999. Students' self-efficacy, their task value beliefs, and their test or task anxieties are also associated with motivation (e.g., Ames & Archer, 1988; Nolen, 1988; Zimmerman, 2002). Numerous studies have shown that students need motivation to use and sustain learning strategies (e.g., Paris, Lipson, & Wixson, 1983; Pintrich, 1988, 1989; Pintrich, Cross, Kozma, & McKeachie, 1986).

A learning strategy refers to thoughts and patterns of behaviour that are intended to enhance learning outcomes (Weinstein, Husman, & Dierking, 2000; Wienstein & Mayer, 1986; Winne, 2013). Learning strategies include a number of competencies

presumed essential, or at least helpful, for effective learning and retention (Weinstein & Underwood, 1985). According to Alexander, Graham and Harris (1998) learning strategies have six attributes: (1) learning strategies are procedural; (2) strategies achieve a specific purpose; (3) learning strategies need resources, such as time, to achieve their purpose; (4) learning strategies require learners to apply will; (5) enactment of learning strategies must enhance performance; and (6) the performance must contribute to achieving the learner's goals. Further, learning strategies require cognitive and physical manipulation of selected information, and can possibly improve psychological characteristics such as motivation beyond contributing to learning performance (Hadwin & Winne, 2012). Students use learning strategies across a variety of academic tasks (e.g., the papers, quizzes, exams, presentations, lab reports. etc.), course content, and problem solving situations (Corno & Mandinach, 1983; Zimmerman & Pons, 1988; Winne & Hadwin, 2008; Winne & Perry, 2000).

The use of learning strategies dates back to ancient times. Methods for remembering information, often using mnemonics, were integral in teaching practices in the Greek and Roman eras (Wittrock, 1988). The advent of printing technology increased access to printed texts which diminished attention to such strategies (McClendon, 1993). Interest in learning strategies, however, has revived during recent years. Based on their review of 30 years of literature, Wienstein and Mayer (1986) summarized learning strategies into four categories: rehearsal, elaboration, organization, and management and affective. As the research on learning strategies expanded, more refined categorizations emerged. Pintrich (1991) bifurcated learning strategies into two broad categories: (1) cognitive information processing strategies, which included techniques for rehearsing, organizing and elaborating information; and (2) metacognitive strategies, that addressed efficient ways to manage learning strategies such as self-regulation, planning, monitoring, or evaluating cognition and behaviour (Duncan & McKeachie, 2005; Pintric, 1991; Stoffa, Kush, & Heo, 2011; Weinstein & Mayer, 1983; Winne & Hadwin, 1998). Subsequent research studies identified rehearsal, elaboration, and organization as important cognitive strategies to promote gains in academic performance (e.g., McKeachie, Pintrich, Lin & Smith, 1986; Pintrich, 1989; Pintrich & De Groot, 1990). Metacognitive strategies also have positive effects on students' learning and academic performance (e.g., Brown, Bransford, Campione, & Ferrara, 1983; Corno, 1986; Zimmerman & Pons, 1986, 1988; Winne & Hadwin, 2008). Later, a third category

resource management strategies was added. It was designed to measure students' competence and skills to effectively use the available resources, such as time, help and effort. Students' use of resource management strategies has been linked with academic performance (Sadi & Uyar, 2013; Stegers-Jager, Cohen-Schotanus, & Themmen, 2012).

2.1.1. Applications of the MSLQ Instrument

The MSLQ has been used by "hundreds of researchers and instructors" globally (Duncan & McKeachie, 2005, p. 1) for multiple purposes, which include: (1) to examine motivational and cognitive effects of instructional approaches and courses on students views of themselves (e.g., Cheang, 2009; Hancock, 2004; McClintic-Gilbert, Corpus, Wormington, & Haimovitz, 2013; Onemli & Yondem, 2012; Pintrich & De Groot, 1990; Ray, 2003; Wilke, 2003; Wintling, 2012); (2) to understand the nature of students' self-reported motivation and use of learning strategies across different content areas and diverse populations (e.g., Bandalos, Finney, & Geske, 2003; Brookhart & Durkin, 2003; Jakesova & Hrbáckova, 2014; Lee, Zhang, & Yin, 2010; Stoffa, Kush, & Heo, 2011; Vogt, 2003); (3) to promote our within-domains and across-domain understanding of the specificity of motivational constructs (e.g., Bong, 2001, 2004; Magson, Bodkin-Andrews, Craven, Nelson, & Yeung, 2013; Shen, McCaughtry, & Martin, 2008); (4) to investigate the nature of multiple goals (e.g., Smith, Duda, Allen, & Hall, 2002; Suarez, Gonzalez, & Valle, 2001); (5) and to further explore individual differences in self-regulated learning (e.g., Dunn, Lo, Mulvenon, & Sutcliffe, 2012; Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000; McKeachie, Lin, & Middleton, 2004; McKenzie & Gow, 2004; Wolters, 2003).

2.1.2. Theoretical Foundations of MSLQ

The development MSLQ is rooted in motivational and cognitive theories of learning, particularly Atkinson's expectancy-value theory of motivation (Pintrich & De Groot, 1990) and a social cognitive view of learning (McKeachie, Pintrich, Lin, & Smith, 1987; Pintrich, Smith, Garcia, & McKeachie, 1991). As the instrument is grounded in a social-cognitive view of learning which posits that learning occurs within a social context, all responses to the questionnaire are made relative to a particular course in which respondents are enrolled, implying that responses might vary across different courses.

Overviews of both the expectancy-value theory and the social-cognitive approach are provided in the following two subsections.

2.1.2.1. Expectancy-value Theory of Motivation

Expectancy-value is a long standing theory that explains the nature of achievement motivation. The theory contends that individuals' achievement choices, resolve, and performance can be explained by their expectancy of an *outcome* achieved by engaging in an activity and the *value* of that outcome. Individuals' *choice* of achievement tasks, their *persistence* in executing tasks, and their achievement *performance* are also represented by the achievement motivation. Stemming from Atkinson's (1957) seminal work, the theory is represented in a variety of research (e.g., Battle 1965; Battle 1966; Crandall 1969; Crandall et al., 1962; Eccles, Adler, & Meece, 1984; Feather, 1982, Feather 1992; Hulleman, Durik, Schweigert, & Harackiewicz, 2008; Wigfield, 1994; Wigfield & Eccles, 2000; Wigfield & Cambria, 2010). Many achievement theorists (e.g., Crandall, 1969; Feather, 1966; Parsons, 1978; Wigfield & Cambria, 2010) have highlighted the significance of expectancy for achievement behaviours, such as academic performance or persistence. Wigfield and Eccles (2000) contend that individuals' task-ability beliefs, perceived task-difficulty belief, and achievement goals influence expectancy and value (Wigfield & Eccles 2000). Eccles (1983) provides an expectancy-value model that identifies and relates psychological constructs that influence achievement behaviours. The model examined the interrelationships among various psychological factors and their contribution to actual achievement behavior. These analyses also confirmed the importance of students' self-concepts of ability, attributions for past success or failure, and beliefs about the authority figures as determinants of expectancies, values, and course plans.

The MSLQ instrument captures both the expectancy and value components of students' learning motivation. The expectancy component is reflected in the self-efficacy subscale, whereas the value component is reflected in the intrinsic value[5] subscale.

2.1.2.2. Cognitive and Social Cognitive Approaches

Researchers used a general cognitive information-processing model (Peterson, Sampson, Reardon, & Lenz, 2008) and a social-cognitive approach to learning

[5] The 44-items MSLQ has intrinsic value scale only. The 81-items MLSQ has both intrinsic and extrinsic value scales.

(Bandura, 1986; Bandura 2001) for formulating the cognitive and metacognitive scales of the MSLQ. Cognitive information-processing (CIS), in general, refers to various theoretical perspectives on how people sequence and execute cognitive events. Schunk (2012), for instance, takes the view that cognitive information-processing attempts to explain how individuals: (1) attend to the events in their environment, (2) encode relevant information from those events and relate it to prior knowledge in memory; (3) store new knowledge in memory, and (4) retrieve it as needed. The model assimilates research from three areas - cognitive psychology, instructional psychology, and classroom-based educational research. Bandura's social cognitive theory (SCT) is one of the theoretical perspectives for explaining developmental changes in people over time (Bandura, 1986). It argues that people acquire knowledge by observing others' behaviour and its consequences (Bandura, 1986, 2001; Pajares, 2002; Schunk, 2012). People remember the observed event and draw information from it that can guide their subsequent behaviors. The theory is founded on a triadic reciprocal causation model in which personal factors (e.g., cognition, beliefs, expectations, attitudes, and knowledge), environmental factors (e.g., resources, other people, physical settings), and behavioural factors (e.g., actions, or choices) interact with and influence each other bi-directionally (Bandura, 1986, 2001). Similar to the CIS, the observational learning in SCT is dependent on four inter-related processes: (1) attention, (2) retention, (3) production, and (4) motivation (Bandura, 2001; Schunk, 2012). Both theories take the view that students are active participants in the knowledge acquisition process. The construction of the MSLQ assumes the same view and considers that students' cognitive and motivational characteristics mediate the effects of instruction (Duncan & McKeachie, 2005; McKeachie, Pintrich, Lin, & Smith, 1987).

2.1.3. Making of MSLQ: Historical Progression

Prior to the MSLQ, research on students' leaning predominantly focused on examining individual differences (e.g., learning styles), and stable student behaviours or cognitive abilities (e.g., IQ) (Artino, 2005; Credé & Phillips, 2011). Classroom achievements were mostly predicted by students' scores on standardized aptitude tests, which measured stable cognitive abilities and traits (see, Halpin, Halpin, & Schaer, 1981; Kuncel, Hezlett, & Ones, 2001), such as conscientiousness or need for achievement. A substantial research literature, however, showed that individual differences constructs,

such as learning styles, were poor indicators of students' study behavior and classroom performance (Pashler et al., 2008; Rohrer & Pashler, 2012), and various study skills inventories were also criticized for a lack of theoretical foundation (McClendon, 1993). Weinstein and Underwood's (1985) study of earlier instruments (e.g., Dansereau, Long, McDonald, & Adkinson, 1975; Goldman & Warren, 1973; Schmeck, Ribich & Ramanaiah, 1977; Weinstein, Wicker, Cubberly, Roney, & Underwood, 1980) identified concerns about their validity, reliability and scope. The earlier instruments also suffered from inconsistent definitions of study skills, low reliability of subscales, inter-dependence of subscales, and a lack of empirical validation – i.e. a high score didn't correlate with an effective learning practice (Weinstein & Underwood, 1985; McClendon, 1993). Those earlier instruments had overall high reliability with Cronbach's alpha values around .80 but their subscales were often lower than .46 (Weinstein & Underwood, 1985). Additionally, the instruments were mostly validated for prediction of test scores, and not for diagnosis of motivational and cognitive processes; a single instrument measured either affect or learning habit but not both (Weinstein & Underwood, 1985). The common uses of earlier instruments included: (1) predicting academic performance of high school or college students, (2) counseling for study practices, and (3) screening students for study skills courses (Weinstein & Underwood, 1985). Other research studies (e.g., Lievens, Coetsier, De Fruyt, & De Maeseneer, 2002; O'Connor & Paunonen, 2007; Poropat, 2009; Robbins et al., 2004) observed that stable abilities and behaviours could explain substantial variation in students' academic performance. But, these studies were less successful in shining light onto learning processes and explaining specifically how students learned (Credé & Phillips, 2011).

In the early 1980s McKeachie and Pintrich, began development of an instrument to measure college students' motivation, use of strategies, and learning during a newly offered "Learning to Learn" course (McClendon, 1993; Artino, 2005). Both McKeachie and Pintrich were doing research at the National Center for the Improvement of Postsecondary Teaching and Learning at the University of Michigan. The instrument was intended to assess the effectiveness of a "Learning to Learn" course. Their research led them to develop the first MSLQ instrument in 1986 (Pintrich, 1986). It contained 40 items (Pintrich, 1986). Twenty-eight items reflected self-reported use of learning strategies, 5 items measured motivation and 7 items measured test anxiety. Refinement continued over several years toward an ultimate goal of helping students to improve their learning

skills (Duncan & McKeachie, 2005). Pintrich (1986) examined independent and interaction effects of learning strategies, motivation, and affect on achievement of 164 introductory psychology students. Results showed validity of the model and selected variables, as well as revealing positive associations between motivational items, strategy use items, and achievement. Excluding the low reliability items, Pintrich (1987) developed a revised and extended version of a questionnaire that contained 78 items. This time 221 college students participated in the study. The study was instrumental in identifying combined effects of students' affective orientations and self-reported cognitive strategies on their learning. Pintrich (1987) reported preliminary reliability coefficients for all the subscales constituting the instrument. Wilkinson (1990) included 105 MSLQ items in her study of 443 undergraduate science students. Besides achievement motivation measures, the instrument contained items on knowledge base and students' general study skills. Results of the Wilkinson (1990) study revealed statistically significant correlations between learning motivations and self-reported use of study strategies when prior knowledge was controlled.

Pintrich and DeGroot (1990) examined a 44-item version of the MSLQ which divided items into five motivational or cognitive scales. The motivational scales measured self-efficacy, intrinsic value, and test anxiety. The cognitive scales measured self-regulated learning and cognitive strategy use of students. The entry of self-regulated learning research into the MSLQ provided an interface between motivation and cognition (Schunk & Zimmerman, 1994; Zimmerman & Schunk, 1989). Pintrich and DeGroot (1990) collected data from 173 seventh-grade students in a classroom setting. The study found self-regulation, self-efficacy, and test- anxiety as predictors of students' achievements. This study did not report any direct relationship between intrinsic-value and classroom performance of students. There were, however, strong positive correlations among intrinsic value, students' self-regulation and cognitive strategy use. The instrument took approximately 10-15 minutes to administer in the class.

An extended version of the MSLQ contained 15 scales and 81 items (Pintrich, Smith, Garcia, & Mckeachie, 1993). The scales were split across two broad categories: motivation and learning strategies. The motivational component contained six scales and 31 items, which measured students' value beliefs, task anxiety and expectancy beliefs for a course. The learning strategies section contained nine scale and 50 items. Thirty-

one items were used to measure students' use of cognitive and metacognitive strategies and 19 items measured students' management of learning resources (Credé & Phillips, 2011). The instrument took approximately 20-30 minutes to administer in the class. The scales on the MSLQ were modular, however, and could be used together or in any configuration to fit the needs (Pintrich, Smith, Garcia, & Mckeachie, 1993).

The study reported in this thesis used the five-scale version of the MSLQ which has fewer items and a shorter administration time. As the instrument was designed to be given in classrooms (Pintrich, Smith, Garcia, & Mckeachie, 1993), a shorter administration time (10-15 minutes) was a considerable factor for the instructors to volunteer their classes to participate in this study in the context of the School of Interactive Arts and Technology at Simon Fraser University where some classes had effective duration as brief as, 50 minutes. Further, this study aimed to theorize a model of MSLQ items for predicting students' achievement goals. A shorter 44-item model was considered more efficient, in terms of number of items, in predicting the achievement goals compared to a longer 81-item model.

2.2. Achievement Goal Orientations Questionnaire

The achievement goal orientations questionnaire (AGQ) used in this study was based on the 3 × 2 achievement goals model proposed by Elliot et al. (2011). The 3 × 2 model was an extension of a 2 × 2 model (Elliot & McGregor, 2001) and a dichotomous model (Elliot, 1997, 1999; Elliot & Church, 1997; Elliot & Harackiewicz, 1996) proposed earlier. Each model described broad purposes or orientations that students adopted as a rationale for engaging in learning. The 3 × 2 achievement goal model described six orientations of students' motivational behaviour in academic settings: (1) task-approach orientation, (2) task-avoidance orientation, (3) self-approach orientation, (4) self-avoidance orientation, (5) other-approach orientation, and (6) other-avoidance orientation. Each goal orientation offers a unique "perceptual-cognitive framework" (Elliot & McGregor, 2001, p. 1) representing distinct patterns of learners' cognitive processes and outcomes (Elliot & McGregor, 2001, p. 1; Elliot, 2008; Muis, Winne, & Edwards, 2009).

As mentioned earlier, goals appeared extensively in the study of motivation, competence, and explanation of behavior in various domains and settings (see, Austin & Vancouver, 1996; Bandura, 1986; Dweck, 1986, Elliott & Dweck, 1988; Elliot & Murayama, 2008; Pekrun, Elliot, & Maier, 2009). Wentzel (2000, p. 1) defined a goal as a “cognitive representation of what it is that an individual is trying to achieve in a given situation." In educational psychology, goals have been studied to explain students’ motivations in achievement settings. Nicholls (1984) conceptualized achievement goals as cognitive representations of an end state that was centered on competence (cf. Dweck & Leggett, 1988). Elliot and Fryer (2008), however, identified five basic characteristics of a goal. It: (1) focused on an outcome state or an object, (2) directed or guided a behavior, (3) was situated in the future, (4) was internally represented (cognitively or otherwise e.g. implicit needs or drives), and finally (5) was something that an organism was committed to approach or avoid. Different achievement goals foster qualitatively different motivational patterns that influence task choice, such as method of learning and task pursuit, such as use of learning strategies or pursuit for challenging task to facilitate or impede performance (Ames 1992).

The achievement goal construct was pioneered in the early 1980s by motivational theorists and researchers (e.g., Ames, 1984; Dweck, 1986, Maehr, 1989; Nicholls, 1984), and considered as one of the remarkable contributions to the study of motivation and competence in over 100 years (Elliot & Murayama, 2008). In academic settings, achievement goals have been examined from various perspectives (Wentzel, 1999): (1) *levels of challenge*, where goals directed behavior toward definitions of performance or a standard (Bandura, 1986); (2) *content*, where goals directed behavior towards specific outcomes, such as to seek approval from others, to cooperate with peers, or to establish relationships with teachers (Ford, 1992; Wetzel, 1991); and (3) *achievement orientations* that addressed specific ways of regulating one’s cognitive and affective efforts to achieve (Diseth & Kobbeltvedt, 2010; Dweck, 1986, 1991; Nicholls, 1984, 1989). In the AGQ instruments, the achievement goal construct represented an individual’s orientations, purposes, or reasons for engaging in an achievement task (Maehr, 1989; Pintrich, 2000). Meece, Blumenfeld, and Hoyle, (1988, p. 514) defined achievement goal orientations are a “set of behavioral intentions that determine how students approach and engage in learning activities”; whereas Elliot (1997) viewed achievement goal as a cognitive-dynamic focus of competence-relevant behavior.

Achievement goals were distinguished along two dimensions of competence: (1) competence referent, and (2) valence (Elliot, 2006). A referent of competence divided an achievement goal into *mastery* vs. *performance* distinctions. Under the *mastery* goal distinction individuals were motivated to develop their competence to deepen their grasp of knowledge or improve skill. Under a performance goal, individuals sought to enhance their competence normatively, i.e., relative to others. Competence broadly referred to an individual's ability to engage effectively in a specific domain (Horn 2004; White, 1959). White (1959) contended that organisms were innately motivated to be competent, and personal competence was the "master re-enforcer" for humans. Unlike biological motives, the competence motives tended to enhance human abilities and were never fully satisfied (White, 1959).

The concept of competence lay at the center of the achievement goal theory, and was characterized along two dimensions: (1) how the competence was *defined*, and (2) how the competence was *valenced*. The competence was *defined* in terms of an *evaluation standard* or referent that was applied to judge whether one was doing well or poorly (Elliot, 1999; Elliot, Murayama, & Pekrun, 2011; Elliot et al., 2015). Three types of standards were identified for evaluating an achievement goal: (1) absolute, which measured performance with reference to the requirements or the mastery of the task itself, (2) intrapersonal, which took one's own past attainments (or future potential; Elliot, Murayama, Kobeisy, & Lichtenfeld, 2015) as a reference to determine one's progress or improvement, and (3) normative, which evaluated performance with reference to others, i.e., doing better than others (Elliot & McGregor, 2001).

The competence was *valenced* in terms of (1) a positive or desirable event or a possibility (i.e., success, or competence); or (2) a negative or undesirable event or a possibility (i.e., failure, or incompetence) (Elliot, 1999; Elliot, 2008; Elliot & McGregor, 2001; Elliot et al., 2015). This focus on *desirability* and *undesirability* of an outcome was associated with *approach* and *avoidance* inclinations of individuals, respectively (Atkinson & Feather, 1966; Cacioppo & Berntson, 1994). Thus, under the approach goal strivings, individuals "focused on the possibility of success" and tried to obtain a desirable outcome. Whereas under the avoidance goals influence, individuals were wary of failure and tried to avert an undesirable outcome (Elliot, 1999, p. 2; Thrash & Elliot, 2001). Both, definition and valence were considered essential elements of any

competence-based striving, including achievement goals. Numerous research studies on achievement goals during the last three decades have yielded a substantial body of results about the motivational efforts of individuals in achievement settings and about the outcomes of these efforts (e.g., Canfield & Zastavker, 2010; Diseth & Kobbeltvedt, 2010; Duchesne & Ratelle, 2010; Elliot, 2005, 2006; Elliot & Murayama, 2008; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Lacaille, Koestner, & Gaudreau, 2007; Meece, Blumenfeld, & Hoyle, 1988; Senko, Hulleman, & Harackiewicz, 2011; Wigfield & Cambria, 2010; Wigfield & Eccles, 2000).

2.2.1. Achievement Goal Orientation: A Theoretical Framework

Achievement motivation is a concept first used in 1890 by James (1890, pp. 309-311). Theoretical and empirical work on achievement motivation began over 85 years ago (Hoppe, 1930; Lewin, Dembo, Festinger, & Sears, 1944; Murray, 1938). Achievement motivation was seen as a force that energized and directed competence-based affect, cognition, and behavior in human organisms (Elliot, 1999; Elliot, 2008). McClelland (1951; McClelland et. al., 1953) highlighted two types of achievement motives: a positive achievement motive - learn to seek success, and a negative achievement motive - learn to avoid failure.

Many theoretical conceptualizations of achievement motivation had been offered. Some of the most prominent approaches for conceptualizing achievement motivation were: (1) *achievement motive* (Atkinson, 1957; McClelland, Atkinson, Clark, & Lowell, 1953); (2) *test anxiety* (Mandler & Sarason, 1952; Spielberger, 1972); (3) *attribution* (Weiner & Kukla, 1970); (4) *self-worth* (Covington & Beery, 1976); and (5) *achievement goal* approach (Dweck, 1986, 2000; Elliot, 2006; Nicholls, 1984, 1989; 2008).

Since the late 1970's, the achievement goal theory has remained a prominent area of theoretical and empirical research in educational psychology. It evolved from the pioneering work by Dweck (1986), Nicholls (1984), and others (Ames, 1984; Maehr, 1984). At the heart of the achievement goal theory lies the concepts of *achievement motivation* and *competence*. The achievement goal approach viewed achievement goals as cognitive representations that directed individuals towards specific competence-based strivings (Elliot & McGregor, 2001). Achievement goals focus on the broader purposes that students adopt for their engagement in the learning tasks (Kaplan,

Lichtinger, & Gorodetsky, 2009; Kaplan & Maehr, 2007). The achievement goals are differentiated from the outcome goals that students set for their academic engagement. The approach was very instrumental in the contemporary achievement motivation literature, and set foundations for much applied work in academic settings (Muis, Winne, & Edwards, 2009).

In academic settings, contemporary research on achievement goal motivation has focused on identifying associations between students' learning goals, classroom learning environments, and outcomes. Specifically, this research aimed to describe how different goal orientations were associated with different types of achievement goals and how students reflected those goals in their classroom learning environments. This focus of achievement motivation research marked a major shift from earlier research of 1960s which primarily addressed how classroom learning environments predicted student learning (Dweck, 1986). Past studies found that students set consistent goal orientations across a range of learning contexts and activities (e.g. Ames, 1992), though other studies contradicted those findings (Edwards & Muis, 2008; Fryer & Elliot, 2007; Lacaille, Koestner, & Gaudreau, 2007; Muis, Winne, & Edwards, 2009).

The achievement goal framework has evolved from being a two- to a three- to a four- and finally to a six-factor model. An overview of these models is presented next.

Dichotomous Achievement Goals Model: Early theorists and researchers (e.g., Dweck, Nicholls) relied on a dichotomous achievement goal orientations model that characterized students' competence-based strivings into *mastery* and *performance* – albeit they used different labels (Hulleman et al., 2010). For example, Dweck used *learning* and *performance* goal labels, while Nicholls named them *ego* and *task* involvement goals (e.g., Dweck, 1999; Nicholls, 1989). These various frameworks were viewed as conceptually similar enough to justify their collapsing into a mastery- and performance-goal dichotomy (Ames & Archer, 1987; Elliot, 1999; Elliot, 2008). A mastery goal represented an *intrapersonal* focus on developing competence, whereas a performance goal represented a focus on demonstrating competence *relative to others*. Each goal type had its distinct pattern of affect, cognitive processing, and behaviour (Ames, 1992; Ames & Archer, 1988; Dweck, 1999; Muis, Winne, & Edwards, 2009). Students' mastery goals were theorized to associate with their adoption of positive cognitive processes, effective learning strategies and outcomes, such as use of deep

learning and processing strategies, persistence in the face challenges, and high task enjoyment (Ames, 1992; Dweck & Leggett, 1988; Nicholls, 1989; Nolen, 1988). In contrast, performance goals were theorized to correlate with students' adoption of a self-sabotaging set of processes and negative outcomes, such as superficial processing of study material, withdrawal from challenging tasks, low task enjoyment, and quitting in the face of failure. By delineating achievement goals into a mastery-performance dichotomy, Dweck and Nicholls laid the groundwork for the framework to become one of the prominent theoretical perspective in the recent achievement motivation literature (Elliot, 1999; Elliot, 2008). Researchers across domains labeled mastery goals as "task" goals (Duda & Nicholls, 1992; Nicholls, 1984) or "learning" goals (Button et al., 1996; Dweck, 1986), and called the performance goals as the "ability" goals in education (Ames, 1992), "prove" goals in work (Vandewalle, 1997), and "ego" goals in sport (Duda & Nicholls, 1992; Roberts et al., 1998).

Trichotomous Achievement Goals Model: Elliot and colleagues (Elliot, 1994, 1997; Elliot & Church, 1997; Elliot & Harackiewicz, 1996) proposed a trichotomous framework of achievement goals. The framework partitioned performance goals into *approach* and *avoidance* distinctions. There was, however, no partitioning of the mastery goal construct, which was conceptualized to have an approach orientation only. The trichotomous framework fundamentally argued that performance-approach and performance-avoidance goals represented two dissimilar achievement goal orientations (Elliot & Harackiewicz, 1996). The approach orientation motivated individuals toward attainment of positive possibilities, whereas the avoidance orientation pushed individuals toward avoiding negative possibilities. The trichotomous model thus postulated three distinct achievement goals: (1) a mastery-approach goal, focused on attaining self or task referent competence; (2) a performance-approach goal, focused on performing or attaining normative competence; (3) and a performance-avoidance goal, focused on avoiding normative incompetence. As the mastery-approach goals and the performance-approach goals both underline the strivings for a positive outcome, they were conceptualized as *approach* orientations. In contrast, the performance-avoidance goal was considered an *avoidance orientation*, because it entailed strivings to avoid negative outcomes. Further, the performance-approach goals were differentiated from the mastery-approach goals in terms of how they *define* competence, i.e., defined either with reference to self, task or others. Performance-approach goals differed from

performance-avoidance goals in terms of how competence was *valenced*, i.e., positive or negative. Finally, the performance-avoidance goals were differentiated from the mastery-approach goals in terms of how they *define* and *valence* the competence.

Elliot and Church (1997) conceptualized achievement motivations as a hierarchical model, where *achievement motives* (e.g., need for achievement, and fear of failure) were theorized as antecedents of achievement goals which instigated achievement behaviors. Need for achievement motive (McClelland, 1951; McClelland et. al., 1953) was construed to prompt adoption of *approach* goals, whereas the fear of failure motive (Birney, Burdick, & Teevan, 1969) was theorized to spur the adoption of performance-avoidance goals. Fear of failure was also theorized to incite adoption of performance-approach goals when a desire to *avoid* failure could instigate strivings to attain success in individuals.

Besides achievement motives, *competence perceptions* (i.e., high or low perception of self-competence) were theorized as another set of independent antecedents of achievement goals. Both types of antecedents were construed to make their own independent contribution towards adoption of achievement goals, thereby rendering a possibility for a simultaneous adoption of approach and avoidance achievement goals (Elliot, 1999; Elliot, 2008). Competence perceptions were theorized to orient individuals towards adoption of approach or avoidance goals.

Moreover, *non-competence based stimuli* could also affect adoption of achievement goals, for example, self-esteem (Kernis, 1993), self-monitoring (Snyder, 1979), need for approval (Hatter, 1975), fear of rejection (Mehrabian & Ksionsky, 1974), attachment style (Hazan & Shaver, 1990), gender (Dweck, 1986), ethnicity (Urdan, 1997), and sociocultural background (Maehr & Nicholls, 1980).

Elliot and Church gathered much empirical support for their trichotomous achievement goal framework (e.g., Elliot & Church 1997; Elliot & Harackiewicz, 1996; Middleton & Midgley, 1997; Skaalvik, 1997; Vandewalle, 1997). The majority of this research focused on the outcomes of adopting different achievement goals. The findings clearly revealed that each goal (performance-approach, performance-avoidance, and mastery) in the trichotomous framework was associated with a distinct set of cognitive processes and learning outcomes (Elliot, 1999, 2008).

2 x 2 Achievement Goals Model: In their trichotomous achievement goal model, Elliot and colleagues conceptualized mastery goals as having a single, unified form, which neither made a distinction between approach and avoidance valence, nor between self or task standards of evaluations pursued by mastery-oriented individuals. Nevertheless, they acknowledged the possibility of a full mixture between performance-mastery and approach-avoidance dichotomies in a 2 x 2 framework as more empirical data became available (Elliot, 1999). Subsequent studies led Elliot and McGregor (2001) to conclude that mastery-avoidance goals had been manifested in many achievement settings and that they should expand their theoretical and empirical work on achievement motivation by adding the mastery-avoidance construct.

In 2001, Elliot and McGregor (2001) proposed a new 2 x 2 achievement goals framework by adding a distinction between *approach* and *avoidance* forms of mastery goals. The mastery-avoidance goals differed from: (1) mastery-approach goals in terms of *valence*, (2) performance-approach goals in terms of *valence* and *definition*, and (3) performance-avoidance goals in terms of *definition*. Mastery-avoidance goals oriented individuals toward avoiding mistakes and make them generally uninterested in task-improvement, self-improvement, or social comparisons (Elliot, 2008; Elliot & McGregor, 2001).

This 2 x 2 framework thus distinguished achievement strivings into four goals based on the combination of definitions (mastery versus performance) and valences (approach versus avoidance). The four distinct achievement goals were: (1) performance-approach goals, where competence was defined using a normative referent (i.e. others) and a positive valence, (2) performance-avoidance goals, where competence was defined using a normative referent and a negative valence, (3) mastery-approach goals, where competence was defined using an absolute (i.e. task) or intrapersonal (self) referent, and a positive valence, and (4) mastery-avoidance goals, where competence was defined using an absolute or intrapersonal referent, and a negative valence.

In approach-orientation students were positively motivated to excel an academic activity or receive favorable judgments. Individuals with performance-approach goal strivings focused on doing well relative to others and were generally motivated by expectations of external reinforcements or recognitions (Elliot & Church, 1997;

Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997). In contrast, the mastery-approach goals were posited to create feelings of excitement in individuals, and encourage affective and cognitive engagement in the achievement activity for mastery of task or self-improvement (Elliot & Church, 1997; Rawsthorne & Elliot, 1999; Elliot, 2008). In avoidance-orientation, students were negatively motivated to avoid failure or receive unfavorable judgments. Performance-avoidance goals were linked with negative cognitive processes and outcomes, such as disorganized studying, test anxiety, poor help seeking, low intrinsic motivation, low academic efficacy, and poor performance (Elliot & Church, 1997; Elliot, McGregor, & Gable, 1999; Skaalvik, 1997). In contrast the mastery-avoidance goal orientation was presumed to orient individuals toward avoiding mistakes and misunderstandings.

The mastery-avoidance goal orientation was an addition to the trichotomous achievement goal model presented earlier. The goal antecedents of the mastery avoidance-orientation were posited to be distinct from those for the goals in the trichotomous model. The mastery-avoidance goal strivings were associated with fear of failure, low self-determination, perceived classroom engagement, entity theory, parent worry induction, person-focused negative feedback, and competence valuation (Elliot & McGregor, 2001). In their studies, Elliot and McGregor (2001) posited that mastery-avoidance goals possess a less favorable set of antecedents than mastery-approach goals, and a more favorable set than performance-avoidance goals which evoke feelings of anxiety, low competence expectancies, and disruptive concentration (Linnenbrink & Pintrich, 2000).

3 x 2 Achievement Goals Framework: In the trichotomous and 2 x 2 achievement goal models, Elliot and colleagues used competence-based aims (mastery vs. performance) to define the achievement constructs (Elliot, 1999; Elliot & Fryer, 2008; Elliot & McGregor, 2001). The 3 x 2 achievement goals framework redefined achievement goal constructs using a referent view of competence for evaluating how well or poorly one is performing. (Elliot & Fryer, 2008, Kaplan & Maehr, 2007; Elliot, Murayama, & Pekrun, 2011). From a referent view, competence can be evaluated from three standards: (1) *self*, (2) *task*, and (3) *others*. The 3 x 2 framework presumed a distinct goal construct for each standard. “Task” used an *absolute* referent and defined competence in terms of behavioral accomplishments relative to the demands of the task

itself (Barrett & Morgan, 1995; Elliot, McGregor, & Thrash, 2002). “Self” used an *intrapersonal* evaluative referent, and defined competence in terms of doing well or poorly relative to one’s past achievements or future potential (Murayama, & Pekrun, 2011). “Other” also used an interpersonal evaluative referent, but defined competence in terms of doing well or poorly relative to others (Elliot, 1999; Elliot & Fryer, 2008; Elliot & McGregor, 2001).

Valence remained another integral component of achievement goal constructs. The 3 x 2 achievement goals framework was generated by crossing the three referents with the two valences. Thus, six distinct achievement goal types (Elliot & McGregor, 2001) were construed: (1) task-approach goals, which prompted towards the attainment of task-based competence (e.g., “Do the task correctly”); (2) task-avoidance goals, which prompted towards the avoidance of task-based incompetence (e.g., “Avoid doing the task incorrectly”); (3) self-approach goals, which prompted towards the attainment of self-based competence (e.g., “Do better than before”); (4) self-avoidance goal, which prompted towards the avoidance of self-based incompetence (e.g., Avoid doing worse than before”); (5) other-approach goals, which prompted towards the attainment of other-based competence (e.g., “Do better than others”), and (6) other-avoidance goals, which prompted towards avoidance of other-based incompetence (e.g., “Avoid doing worse than others”).

2.2.2. Making of AGQ: Historical Progression

Dichotomous Achievement Goals Questionnaire: In 1987, Ames and Archer, both researchers at the University of Illinois at Urbana, used a questionnaire to investigate mastery and performance goal distinctions. Data was collected from 501 mothers of children in grade 5 and below including kindergarten. The sample included 233 mothers of girls and 268 mothers of boys. The grade distribution of mothers’ children was as follows: 73 kindergarten, 69 grade one, 98 grade two, 87 grade three, 72 grade four, and 102 grade five. Mothers alone were included in the study sample because of their tendency to be more involved in children's early-school-years learning than fathers and because of a stronger relation of their beliefs to children's achievement-related attitudes than fathers’ (Parsons, Adler, & Kaczala, 1982). The questionnaire included items to examine relations between achievement goals and the following school

related beliefs: perceptions of success in school, preferred school feedback, preferred tasks, attributions, valued student characteristics, and perceived ability.

The goal priority scale asked mothers about their preferences for their child “do well in school even though he/she doesn't have to work very hard” or “work hard in school even though he/she doesn't do very well.” The questionnaire enquired five child behaviors: (1) getting good grades; (2) showing improvement; (3) working hard; (4) behaving well; and (5) doing as well as or better than others in class. For the preferred school feedback scale, the item asked mothers to rank the importance of six types of performance feedback: (1) child's grades on tests and assignments; (2) performance relative to other students in the class; (3) progress or improvement; (4) effort; (5) social behaviors; and (6) performance relative to grade level norms. The preferred tasks scale included two items (Dweck & Bempechat, 1983). One item reflected mothers' preferences for challenging versus easy tasks for their child (“a project where they'll learn a lot of new things but also make a lot of mistakes” vs. “a project that would involve a minimum of struggle and likely result in success”). The other item posed a choice between two actions for a situation in which the child was having difficulty: continue working on it vs. find another project where success is more likely. In the attributions scale, mothers rated child performance and identified one of four causal factors that best explained why their child performed best or could do better (little more or lot better more). The four causes for performance outcomes included: (1) ability (bright/not exceptionally bright); (2) effort (working very hard/not working hard enough); (3) quality of teaching (teaching is good/could be better); and (4) task (work is hard/easy). Mothers indicated their child’s similarity to five hypothetical descriptions on a 9-point scale (much 9; not at all 1). The hypothetical descriptions attempted to measure variations in: performance (does well/does poorly), ability (smart/not smart), and effort (works hard/does not work hard). The score for perceived ability of a child relative to other children in the class was obtained by both mothers and teachers on a 7-point scale (highest 7; one of the lowest 1). Ratings were made for reading and language arts.

The study found that mothers had uniquely differentiated views about their children’s school learning. Further, these views mapped with the achievement goals for their children. The mastery and performance achievement goals were correlated with

perceived success – and were consistent with the past research findings (e.g., Dweck, 1984; Maehr & Nicholls, 1980; Maehr, 1984; Nicholls, 1984).

Trichotomous Achievement Goals Questionnaire: In 1996, Elliot in the Department of Psychology, University of Rochester and Harackiewicz in the Department of Psychology, University of Wisconsin conducted two motivation experiments with the aim of examining the predictive utility of a distinction between the approach–avoidance achievement goals conceptualization. In both experiments, researchers manipulated performance goals (approach and avoidance) by using a normative standard for evaluating performance (Elliot & Harackiewicz, 1996). They also collected *process* measures (pre-, mid-, and post-puzzle items which measured anticipated difficulty, anticipatory affect, and perceived competence for deriving certain challenge and performance indices.)

Eighty-four male (30) and female (54) undergraduate students participated in the first experiment. Participants were asked to find a word in four puzzles under one of four experimental conditions: (1) a performance goal with success as outcome; (2) a performance goal with failure as outcome; (3) a performance neutral outcome; or (4) a mastery goal. Self-reported measures of intrinsic motivation were collected at the start and behavioral measures were video monitored during a free-choice interval given at the end of the puzzles activity. The process measures were collected thrice during the session at the start, at the midpoint, and at the end. At the start of the session, participants reported anticipated task difficulty and affect (eager, challenged, nervous, and worried). Between puzzles 2 and 3, participants recorded their responses to perceived competence and task involvement items (see Elliot & Harackiewicz, 1994; Harackiewicz & Elliot, 1993). At the end of the puzzle solving session, participants were asked to rate a perceived competence item: “How do you think you did on the four Nina puzzles today?” All responses were recorded on a 7-point (strongly disagree 1 to strongly agree 7) scale. Results supported the predictive utility of the approach–avoidance achievement goal distinctions. Results suggested that performance–avoidance strivings undermined participants’ intrinsic motivation, and performance-approach strivings revealed intrinsic motivation similar to that of master-goal participants and statistically significantly higher than that of the performance–avoidance participants (Elliot & Harackiewicz, 1996).

Ninety-two male (47) and female (45) university undergraduates participated in the second experiment. The experiment used more subtle manipulations of performance approach and performance avoidance goals orientations to replicate effects observed in the first experiment. The procedure was the same except for minor revisions in measures and performance goal manipulations. In the second study, however, the participants' also responded to an anticipated performance item "How do you think you will do on the Nina puzzles today?" on a 7-point scale (very poorly 1, very well 7). Additionally, participants responded to two task valuation items: "How important to you is your performance on the Nina puzzles?" (not at all important 1, very important 7), and "I care very much about how I do on these Nina puzzles" (strongly disagree 1, strongly agree 7). Finally, immediately before task engagement, participants were asked, "How important to you is your performance on the Nina puzzles?" (1 = not at all important, 7 = very important).

The results of second experiment largely confirmed the findings of the first experiment. A meta-analytic combination of results from the two experiments revealed an avoidance–mastery effect ($p = .06$), and meta-analyses of the other effects verified robustness of the results across experiments ($p < .005$ at minimum). The results strongly supported the proposition that strivings to avoid incompetence emasculate intrinsic motivation, whereas the strivings for the attainment of competence do not (Elliot & Harackiewicz, 1996).

The results led Elliot and Church (1997) to develop a questionnaire that contained self-report scales for measuring performance-approach, performance-avoidance goals, and mastery goals in a classroom setting (see also Middleton & Midgley, 1997; Skaalvik, 1997; Vandewalle, 1997). Items related to achievement motivation were mainly adopted from Jackson's (1974), and fear of failure items from Herman (1990) and Speilberger, Gonzalez, Taylor, Algaze, and Anton (1978). The three scales consisted of 18 items: (1) a performance-approach goal scale "It is important to me to do better than the other students.", "My goal in this class is to get a better grade than most of the students.", "I am striving to demonstrate my ability relative to others in this class.", "I am motivated by the thought of outperforming my peers.", "It is important to me to do well compared to others in this class.", "I want to do well in this class to show my ability to my family, friends, advisors, or others."; (2) a performance-avoidance goal

scale “I often think to myself, "What if I do badly in this class?", “I worry about the possibility of getting a bad grade in this class.”, “My fear of performing poorly in this class is often what motivates me.”, “I just want to avoid doing poorly in this class.”, “I'm afraid that if I ask my TA or instructor a "dumb" question, they might not think I'm very smart.”, “My goal for this class is to avoid performing poorly.”; (3) a mastery goal scale “I want to learn as much as possible from this class.”, “It is important for me to understand the content of this course as thoroughly as possible.”, “I hope to have gained a broader and deeper knowledge of psychology when I am done with this class.”, “I desire to completely master the material presented in this class.”, “In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.”, “In a class like this, I prefer course material that really challenges me so I can learn new things.”

Elliot and Church collected response data from 204 undergraduate participants (male 82 and female 122) enrolled in a personality psychology course at the University of Rochester. Principal components factor analysis of data yielded a three factors model, with a moderate to high internal consistency of the scales each with Cronbach's alphas .77 or above.

2 x 2 Achievement Goals Questionnaire: Elliot and McGregor (2001) developed a new achievement goal instrument to measure the goals in the 2 x 2 framework. The instrument consisted of 12 items divided into four scales. The *mastery-avoidance scale* comprised of “I want to learn as much as possible from this class.”, “It is important for me to understand the content of this course as thoroughly as possible.”, “I desire to completely master the material presented in this class.” The *mastery-avoidance scale* comprised of “I worry that I may not learn all that I possibly could in this class.”, “Sometimes I'm afraid that I may not understand the content of this class as thoroughly as I'd like.”, “I am often concerned that I may not learn all that there is to learn in this class.” The *performance-approach scale* contained “It is important for me to do better than other students.”, “It is important for me to do well compared to others in this class.”, “My goal in this class is to get a better grade than most of the other students.” The *performance-avoidance scale* included “I just want to avoid doing poorly in this class”, “My goal in this class is to avoid performing poorly”, and “My fear of performing poorly in this class is often what motivates me.”

The instrument was validated in a study which presented the items to 180 students (49 male and 131 female) in an undergraduate psychology class. The study aimed to identify four distinct factors corresponding to the four strivings postulated in the 2 x 2 achievement goal questionnaire. The exploratory factor analysis yielded a four-factor model with an eigenvalue exceeding 1 accounted for 81.5% of the total variance. Confirmatory factor analysis was later used to show that mastery-avoidance and mastery-approach better fit the data than mastery alone.

3 x 2 Achievement Goals Questionnaire: Elliot and McGregor (2011) devised a new achievement goal questionnaire to measure each of the six goals in the 3 x 2 framework. The instrument consisted of 18 items, which represented six achievement goal constructs. Each construct was measured by three items, which were selected after a series of pilot studies from a pool of items. The items for measuring the **task-approach** construct were:

1. To get a lot of questions right on the exams in this class.
2. To know the right answers to the questions on the exams in this class.
3. To answer a lot of questions correctly on the exams in this class.

The **task-avoidance** items were:

4. To avoid incorrect answers on the exams in this class.
5. To avoid getting a lot of questions wrong on the exams in this class.
6. To avoid missing a lot of questions on the exams in this class.

The **self-approach** items were:

7. To perform better on the exams in this class than I have done in the past on these types of exams.
8. To do well on the exams in this class relative to how well I have done in the past on such exams.
9. To do better on the exams in this class than I typically do in this type of situation.

The **self-avoidance** items were:

10. To avoid doing worse on the exams in this class than I normally do on these types of exams.
11. To avoid performing poorly on the exams in this class compared to my typical level of performance.
12. To avoid doing worse on the exams in this class than I have done on prior exams of this type.

The **other-approach** items were:

13. To outperform other students on the exams in this class.
14. To do well compared to others in the class on the exams.
15. To do better than my classmates on the exams in this class.

Finally, the three **other-avoidance** items were:

16. To avoid doing worse than other students on the exams in this class.
17. To avoid doing poorly in comparison to others on the exams in this class.
18. To avoid performing poorly relative to my fellow students on the exams in this class.

The instrument was validated in a research study which presented the 3 x 2 questionnaire items to 126 undergraduate (22 male and 104 female) in an introductory-level psychology class in Germany. The study hypothesized to identify six distinct factors corresponding to the six goals of the 3 x 2 formulation. The confirmatory factor analysis results strongly supported the hypothesized model with moderate to strong standardized factor loadings between .52 and .95, high scale reliability, and all the fit statistics meeting the good fit criteria. Additional analyses were performed to compare the fit of 3 x 2 model with the 2 x 2 and trichotomous models, in which achievement goals loaded on their hypothesized latent factors.

Scholarly research on achievement goal theory has resulted in over 1,000 publications during the last 25 years or so (Huang, 2012; Hulleman et al., 2010). The achievement goal questionnaires have been used in numerous studies worldwide to understand achievements goals of individuals in various contexts (e.g., see for meta reviews Day, Yeo, and Radosevich 2003); Huang, 2010, 2012; Harackiewicz, 2010;

Utman,1997). An overall growth of research on achievement motivations in recent decades is also evident from the graph in Figure 2.1.

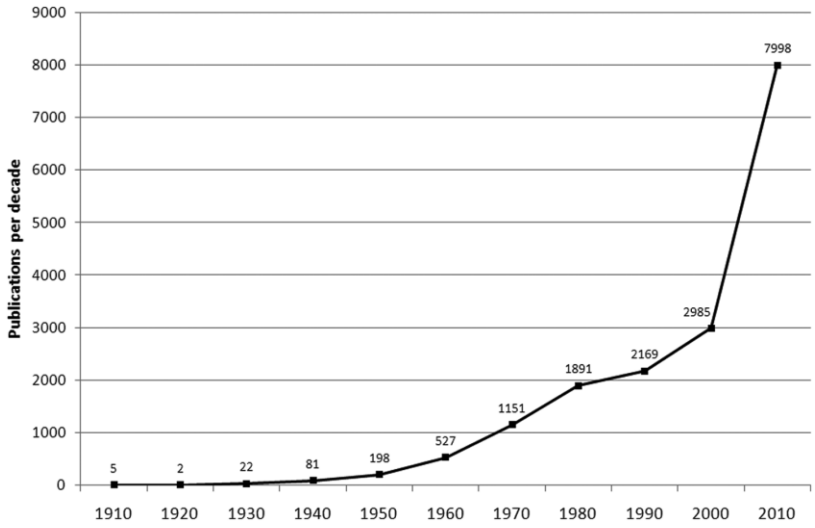

Figure 2.1. Scientific publications per decade on approach and avoidance motivation [adopted from Eder, Elliot, and Harmon-Jones (2013)]

2.3. Relation between MSLQ Constructs and Achievement Goal Orientations

The MSLQ questionnaire was designed to measure motivational and learning strategies of students. A substantial body of research over the last three decades has found statistically significant correlations between students' motivational and self-reported learning strategies and achievement goal orientations. My study aimed to use earlier research findings to predict the 2 x 2 achievement goal orientations of students from MSLQ measures. As mentioned earlier, for instance, one of the MSLQ scales measured a student's intrinsic motivation. A review of goal orientation literature suggested that a student with a mastery approach goal orientation was more likely to exhibit high intrinsic motivation towards learning (e.g., Bodmann, & Harackiewicz, 2010; Nicholls, 1989). Based on prior research results like the above, I theorized that students' achievement goal orientations were predictable using the MSLQ scales, i.e., self-efficacy, task value, test anxiety, cognitive strategy use, and self-regulated learning. This prediction of achievement goal orientations would allow drawing additional knowledge from existing MSLQ datasets.

To theorize an association of individual MSLQ items with one of the four major goal orientations (i.e., mastery approach, mastery avoidance, performance approach and performance avoidance), I used the following approach. The statement of each item on the MSLQ instrument was examined to identify its: (1) referent of competence, and (2) valence. The referent of competence assisted in categorizing an item into a *mastery* or *performance* distinction, and valence helped in categorizing the strivings into *approach* or *avoidance* bifurcation. For instance, the MSLQ item "I prefer class work that is challenging so I can learn new things" suggested a "self" referent where one would seek to develop competence for gaining mastery of a task for own sake. I hypothesized this item to reveal a *mastery* orientation. Since the focus of striving in this description is to obtain a positive or desirable outcome (i.e., learn new things), I further hypothesized the item to represent an "approach" goal orientation. Overall, the item was hypothesized to represent a mastery-approach achievement goal orientation. Similarly, I considered the MSLQ item "Compared with other students in this class I expect to do well" as representing a performance-approach goal orientation because of its as "other" referent and "approach" striving (i.e., to do well). To assure a reliable categorization of the MSLQ items, an independent rater coded the items as well. The inter-rater Cohen's kappa reliability coefficient was 0.88, which could be interpreted as a nearly perfect agreement according to the conventional interpretation of kappa (Landis & Koch, 1977) for both coding schemes respectively. In the final step all differences were resolved through the discussion during the meeting of the two raters.

2.3.1. Self-efficacy and Achievement Goal Orientations

Self-efficacy is the first component of the motivational scales in the MSLQ instrument (Pintrich & DeGroot, 1990). Bandura (1997, p. 2) defined self-efficacy as one's "beliefs in one's capabilities to organize and execute the courses of action required producing given attainments." Self-efficacy beliefs guide learners' aspirations and choice of behaviors to mobilize their effort, persistence, and academic achievements (Bandura, 1986, 1997; Hsieh, Cho, Liu, & Schallert, 2008; Phan, 2012). Self-efficacy reportedly has a compelling influence on human agency and performance outcomes both in academic and non-academic settings (Diseth, 2011; Elliot & Church, 1997; Pajares, 1996, 1996a; Schunk, 1989, 1991). The self-efficacy construct includes beliefs about one's learning abilities and performance skills (Duncan & McKeachie, 2005). Self-efficacy beliefs had

been associated with the effort individuals would spend on an activity, their perseverance when confronted with obstacles, and their resilience in the face of adversity (Pajares, 2002).

While self-efficacy beliefs indicate the “level of expected performance and learning” (Diseth, 2011, p. 1), an achievement goal orientation represents a unified pattern of beliefs that steers individuals towards “different ways of approaching, engaging in, and responding to achievement situations” (Ames, 1992, p. 261). Elliot and Harackiewicz (1996) described achievement goal orientations as motives or reasons for completing tasks. Like self-efficacy, achievement goal beliefs are theorized to influence affective, cognitive, and behavioral outcomes (Pintrich & Schunck, 2002). Beliefs underlying the mastery-approach achievement goal orientation guide students’ towards competence development, or mastery of a task. In contrast, performance-approach goal implies a motive to attain competence relative to others, or demonstration of skills. A mastery-avoidance goal characterizes students’ fear of losing competence. While a high level of performance-avoidance goal indicates a motive of trying to avoid appearing incompetent (Elliot and McGregor, 1999; Harackiewicz et al., 1998).

The expectancy judgments behind self-efficacy and the beliefs underlying achievement goals both influence students’ learning behaviours and academic achievements. Motivation and social-cognitive researchers have studied relationships between self-efficacy beliefs and achievement goals. Research studies have found consistent relations between self-efficacy and achievement goals. High self-efficacy was associated with both mastery and performance-approach goals (Diseth, 2011; Diseth, 2011a; Elliot & Church, 1997; Greene, Miller, Crowson, Duke, & Akey, 2004; Hsieh, Cho, Liu, & Schallert, 2008; Middleton & Midgley, 1997; Midgley & Urdan, 1995; Pajares, Britner, & Valiante, 2000). A learners’ confidence in one’s ability to accomplish a task has been found to reflect mastery goals (Duda & Nicholls, 1992; Kaplan & Midgley, 1997), and confidence in one’s skills to perform indicated performance goals (Wolters, Yu, & Pintrich, 1996). Low self-efficacy had mainly been associated with students having performance-avoidance goals (Elliot, 1999; Hidi & Harackiewicz, 2000; Middleton & Midgley, 1997; Pajares, Britner, & Valiante, 2000; Skaalvik, 1997; Wolters, Yu, & Pintrich, 1996).

In the MSLQ, the self-efficacy scale has nine items that measure students' expectancy of success. Expectancy was one of three motivational constructs measured by the MSLQ. The expectancy of success was measured as a "degree" to which students believed that they had "control over their level of achievement in a class" (Pintrich & De Groot, 1990, p. 1). As mentioned above, the MSLQ self-efficacy scale captured two types of achievement belief (Duncan & McKeachie, 2005) about one's learning abilities and performance skills. My study thus assumed that the nine items in the MSLQ self-efficacy scale either elicited the judgments of one's ability to accomplish a task or confidence in one's skills to perform a task as shown in Figure 2.2.

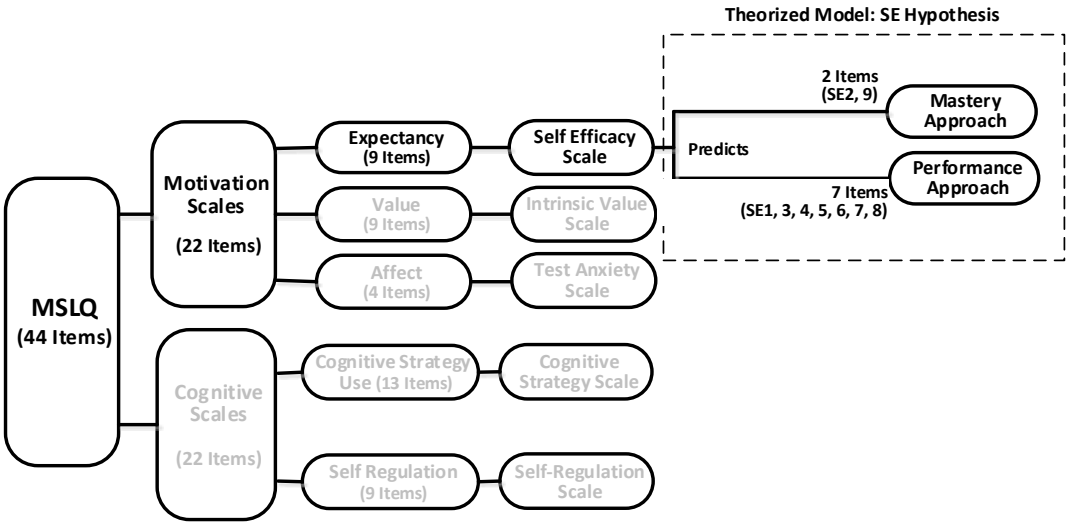

Figure 2.2. MSLQ self-efficacy items theorized to predict the mastery- and performance-approach goals.

As one's beliefs about *learning* abilities and *performance* skills indicated mastery approach and performance approach respectively, I hypothesized that each of the nine self-efficacy items measured the approach type goal orientation. Two of the nine items were hypothesized to measure the mastery-approach goals and the remaining seven items were hypothesized to measure the performance-approach goal orientation, as shown in Figure 2.2. To label an item either as a mastery or performance type, I examined the item description to identify its competence referent.

2.3.2. Intrinsic Value and Achievement Goal Orientations

Value is a second component of motivational scales in the MSLQ instrument (Pintrich & DeGroot, 1990). The value component is based two key theories: (1)

achievement goal theory, and (2) expectancy-value theory (Wigfield, 1994, 2000). The value component essentially identifies the goals and the reasons students adopt for engaging in learning activities. In the MSLQ the value component has been conceptualized as intrinsic value. Students' individual responses to the items in the intrinsic value scale basically provide answers to the question, "Why am I doing this task?" (Pintrich & DeGroot, 1990).

Intrinsically motivated students may engage in learning tasks for building or maintaining their self-concept (Combs, 1982; Purkey & Stanley, 1991), and to draw a sense of contentment or enjoyment from learning (Deci & Ryan, 1985), completing or even just working on a task itself (Malone & Lepper, 1987; Credé & Phillips, 2011). Individual and interpersonal factors reported to affect students' intrinsic motivation include: challenge, curiosity, control, fantasy, competition, cooperation and recognition (Malone, 1981, 1981a; Lepper & Henderlong, 2000; Malone & Lepper, 1987). Students' rationales for engaging in academic activities can be extrinsic in nature as well, which is essentially driven by tangible incentives or consequences such as seeking a high grade-point-average or praise, or avoiding punishment (Filsecker & Hickey, 2014; Jackson, 1968; Lepper, 1983; Lepper, Corpus, & Iyengar, 2005).

Items included in the Intrinsic value scale of the MSLQ essentially measured intrinsic motivation beliefs which focused on: learning (e.g., "I often choose paper topics I will learn something from even if they require more work."), mastery (e.g., "I think I will be able to use what I learn in this class in other classes."), challenge (e.g., "I prefer class work that is challenging so I can learn new things."), and beliefs that the task is interesting (e.g., "I think that what we are learning in this class is interesting.") and important (e.g., "It is important for me to learn what is being taught in this class.") (Credé & Phillips, 2011; Duncan & McKeachie, 2005; Pintrich & de Groot, 1990; Pintrich, Smith, Garcia, & Mckeachie, 1993). Research studies have found that students' interest in learning, challenge seeking, persistence, and their focus on task value represented a mastery goal orientation (Bjornebekk, Gjesme, & Ulriksen, 2011; Butler, 1987; Cerasoli & Ford, 2014; Durik & Harackiewicz, 2003; Dweck, 1985; Elliot & Harackiewicz, 1996; Harackiewicz & Elliot, 1993; Hulleman, Schrager, Bodmann, & Harackiewicz, 2010; Nicholls, 1989). I therefore theorized the MSLQ intrinsic value items to reveal the

mastery goal orientations of students, specifically the mastery-approach achievement goal orientation, as shown in Figure 2.3.

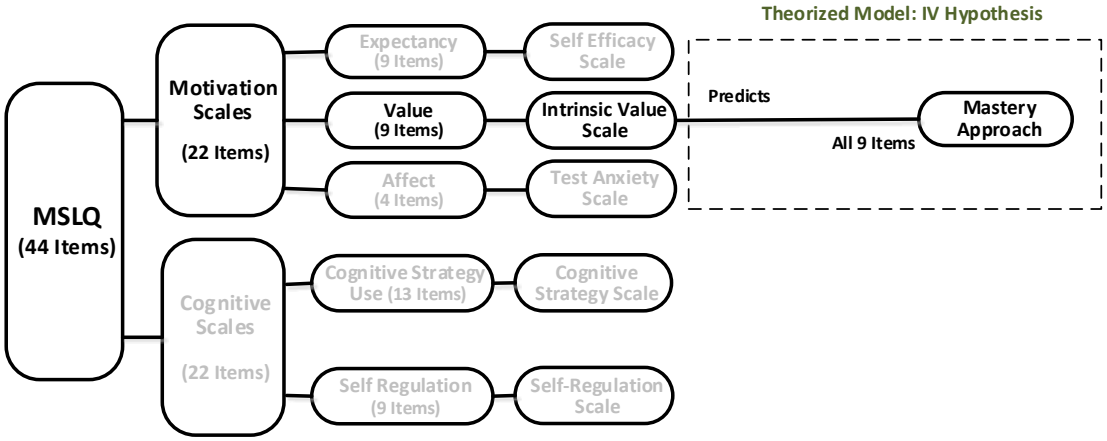

Figure 2.3. MSLQ Intrinsic Value items, theorized to predict the mastery-approach goals.

2.3.3. Text Anxiety (Affect) and Achievement Goal Orientations

Affect is a third component of the motivational scales in the MSLQ instrument (Pintrich & DeGroot, 1990) which was operationalized as “test anxiety”. The test anxiety scale was operationalized to measures students’ worries or negative thoughts that disrupt performance (a cognitive component) as well as physiological arousal aspects of their anxiety (an emotionality component). Test anxiety had been identified as one of main factors causing decline in students’ academic performance and lowering their success expectancies (Pintrich, Smith, Garcia, & McKeachie, 1991).

The MSLQ test anxiety scale was comprised of four items. One of the items concerned students’ perception of their inability to master the study material (“I am so nervous during a test that I cannot remember facts I have learned.”). The remaining three items attempt to explore students’ worries about their performance (e.g., “I have an uneasy, upset feeling when I take a test” or “When I take a test I think about how poorly I am doing.”). Fear or expectations of failure generally reflect avoidance goals (Elliot 1994; 2008; Elliot & Church, 1997; McClelland, 1951). Previous research has shown that students who did not want to look incompetent about their performance, or who lacked in ability relative to others, tend to adopt performance-avoidance goals (Elliot 1997, 2008; Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001). The fear of losing skills or inability to master the study material were linked with mastery-avoidance concerns

(Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000; Elliot, 1999, 2008; Harackiewicz, Durik, Barron, Linnenbrink-Garcia, & Tauer, 2008; Wolters, 2004). This study, therefore, theorized the MSLQ test anxiety scale to reveal the avoidance goal orientations, as shown in Figure 2.4. Based on the referent and valence analysis of item descriptions, I hypothesized one item to reveal mastery-avoidance achievement goal orientation whereas the remaining three items were hypothesized to reveal the performance-avoidance achievement goal orientation.

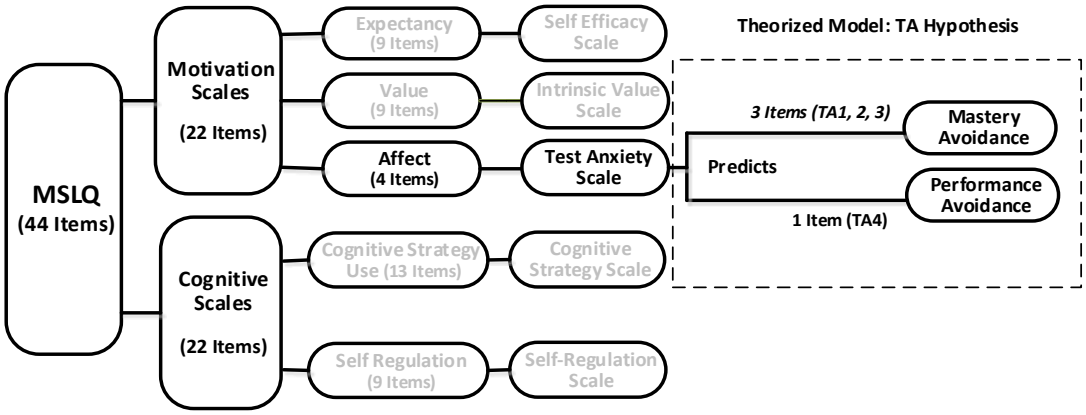

Figure 2.4. MSLQ test-anxiety items theorized to predict the mastery-avoidance goals.

2.3.4. Self-Regulation

Self-regulation is the first component of the two learning strategy scales in the MSLQ instrument (Pintrich & DeGroot, 1990). The self-regulation scale was conceptualized as students' differences in the use of metacognitive learning strategies for regulating and controlling their cognition, behaviour, and performance (Kaplan, Lichtinger, & Gorodetsky, 2009; Pintrich & DeGroot, 1990; Zimmerman & Schunk, 2001). Use of self-regulation to take control of and direct one's cognitive processes and behaviours had been identified as a vital component of learning and academic performance (Corno & Mandinach, 1983; Corno & Rohrkemper, 1985; Crede & Phillips, 2011; Duncan & McKeachie, 2005; Zimmerman, 2002). Self-regulated students were found to demonstrate active engagement, and persist with learning-effective behaviours, while monitoring their own learning and academic achievement (Credé & Phillips, 2011).

Self-regulation is defined in many ways. For instance, Zimmerman (2000) said that self-regulation, "...refers to self-generated thoughts, feelings, and actions that are

planned and cyclically adapted to the attainment of personal goals" (p.14). Zimmerman and Schunk, (2001) defined self-regulation as "…the self-directive processes through which learners transform their mental abilities into task-related academic skills" (p.1). Paris and Paris (2001) considered self-regulation as individual's autonomy and control in "monitoring, directing, and regulating" own actions toward academic achievements. Finally, Winne and Hadwin (2008) viewed self-regulation as "four flexibly sequenced phases of recursive cognition": (1) task perception, (2) goal setting and planning, (3) enacting, and (4) adaptation.

The MSLQ instrument assumed three types of learning strategies particularly important in making of a working definition of self-regulation (Credé & Phillips, 2011; Pintrich & DeGroot, 1990), which included students' use of: (1) *metacognitive* strategies for planning, monitoring, and adjusting their cognition; (2) *control* strategies to manage and control their effort on academic tasks; and (3) other cognitive strategies (e.g., rehearsal). The MSLQ instrument included two scales to measure these three types of learning strategies. The self-regulation scale included items to measure students' reported use of metacognitive and control strategies, whereas the items to measure students reported use of other cognitive strategies were included in a cognitive strategy scale (discussed in the next section).

Past research findings suggest that learners' use of various metacognitive strategies of self-regulated learning is positively correlated with different achievement goals (Kaplan, Lichtinger, & Gorodetsky, 2009). For instance, use of metacognitive strategies is positively associated with approach achievement goals (Barzegar, 2012; Vrugt & Oort, 2008; Wolters, 2004). Previous research findings also reported positive associations between mastery-approach achievement goals and self-regulation, use of deep learning strategies, and self-evaluation of comprehension (Blumenfeld, & Hoyle, 1988; Diseth, 2011; Dweck & Elliott, 1983; Kaplan, Lichtinger, & Gorodetsky, 2009; Pintrich, 2000; Vrugt & Oort, 2008; Wolters, 2004). Some studies have found a positive relation between performance approach goals and students' adoption of self-regulated learning (Barzegar, 2012; Wolters et al., 1996). Vrugt and Oort (2008) and few other studies (e.g., Middleton & Midgley, 1997; Wolters, 2004) reported negative relation between performance-avoidance goals with metacognition.

The MSLQ self-regulation scale has 9 items, which included three reflective or reverse coded items. Based on the findings of previous research, and the analysis of items' referent and valence, this study theorized eight items to predict mastery goal orientations – five mastery-approach achievement goal orientations, and three mastery-avoidance orientations (all reflective items). One item was theorized to predict the performance-approach goal orientation – as shown in Figure 2.5.

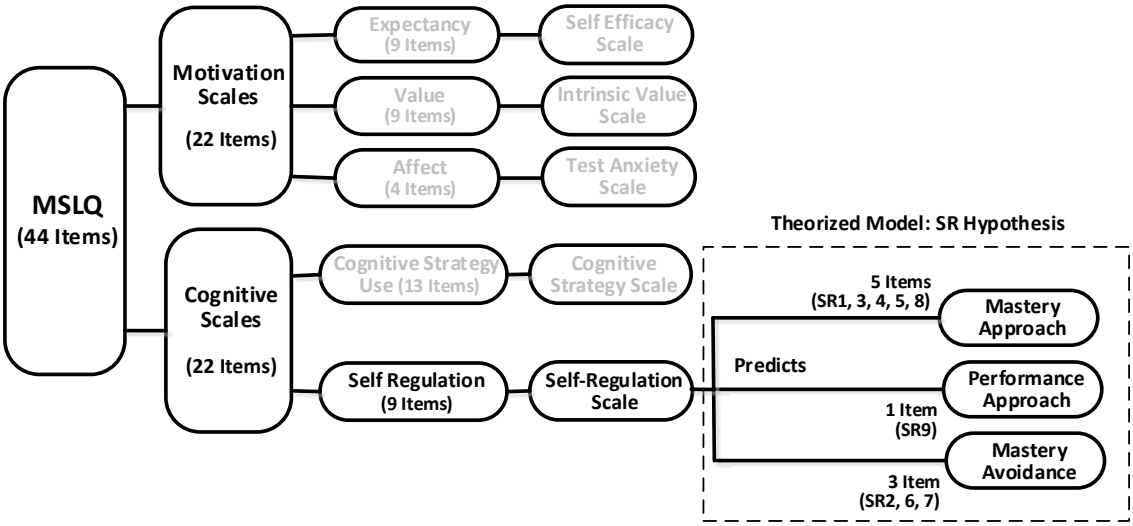

Figure 2.5. MSLQ Self-Regulation items, theorized to predict the mastery-approach, performance-approach, and mastery-avoidance goals.

2.3.5. Cognitive Strategies Use

Cognitive strategy use is the second component of the learning strategy scales in the MSLQ (Pintrich & DeGroot, 1990), which is based on a general cognitive model of learning and information processing theory (Weinstein & Mayer, 1986). The cognitive strategy scale is operationalized as how students use basic (e.g., rehearsal) and complex (e.g., summarizing) strategies for processing the information in course materials and classroom lectures.

Past research studies found positive correlations between students' reported use of cognitive learning strategies and their achievement goal orientations (Wolters, 2004). Many studies linked students' self-reported use of cognitive strategies with their learning and challenge seeking motivations as well as with the beliefs that the task was interesting and important – the dispositions commonly shown by the approach oriented students (Ames & Archer, 1988; Dweck & Elliott, 1983; Meece, Blumenfeld, & Hoyle,

1988; Nolen, 1988). Several studies have found a positive relation between adopting mastery goals and self-reported use of cognitive strategies (e.g., Archer, 1994; Elliot & McGregor, 2001; Gehlbach, 2006; Middleton & Midgley, 1997; Phan, 2009; Pintrich, 2000a; Valle et al., 2009; Wolters, 2004; Zimmerman, 2008) – in particular, the deep learning strategies such as elaboration and organizational strategies (Albaili, 1998; Diseth, 2011; Liem, Lau, & Nie, 2008; Sins, van Joolingen, Savelsbergh, & van Hout-Wolters, 2008; Vrugt & Oort, 2008). The research examining relations between students' cognitive engagement and performance-approach goals had found positive associations as well (e.g., Greene & Miller, 1996; Nolen, 1988; Pintrich, 2000a; Vermetten, Lodewijks, & Vermunt, 2001; Wolters, Yu, & Pintrich, 1996), especially surface learning processing strategies such as rehearsal (Albaili, 1998; Diseth, 2011; Liem, Lau, & Nie, 2008; Vrugt & Oort, 2008). There were some studies though which failed to find statistically detectable positive relations (Archer, 1994; Miller, Greene, Montalvo, Ravindran, & Nichols, 1996; Pintrich & Garcia, 1991). Students who focused on mastery-avoidance (Howell & Watson, 2007; Vrugt & Oort, 2008) and performance-avoidance goals (Middleton & Midgley, 1997; Wolters, 2004; Vrugt & Oort, 2008) reported less use of cognitive learning strategies. These results show that the students who expressed a greater tendency to adopt either of the mastery or performance goals have reported more use of cognitive strategies to some degree. I therefore theorized that the items in the cognitive strategy use scale of the MSLQ instrument could predict either of the approach orientations.

The cognitive strategy use scale was comprised of 13 items. Based on the competence-referent and valence suggested by the item descriptions, this study theorized seven items to predict mastery-approach goal orientation and five items to predict the performance-approach goal orientation, as shown in Figure 2.6. One of the items in the scale was reverse coded ("It is hard for me to decide what the main ideas are in what I read"). This item was hypothesized to predict the mastery avoidance goal orientation.

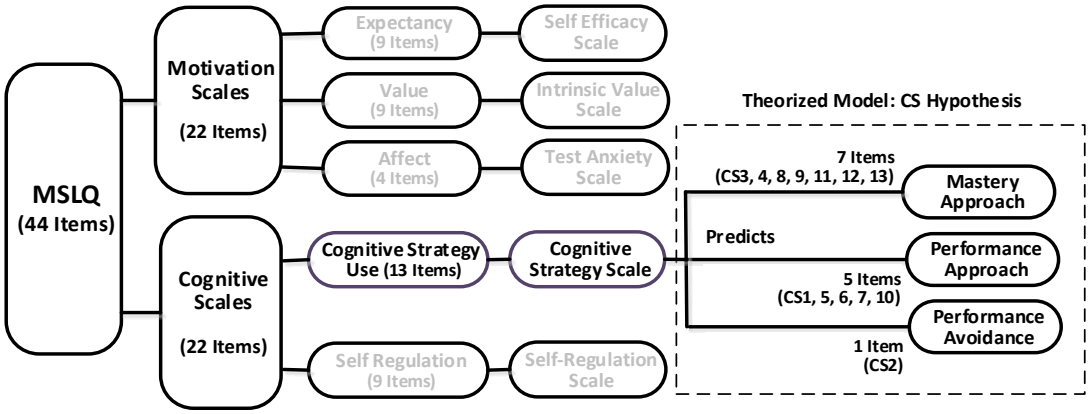

Figure 2.6. MSLQ Cognitive-strategy items theorized to predict the mastery-approach, performance-approach, and performance-avoidance goals.

2.4. A Theorized Model for Predicting Achievement Goals

Based on the correspondences identified in the previous section, this study theorized a model based on the 44 MSLQ items predicting students' achievement goal orientations from their reported use of motivated strategies for learning. The theorized model constructed four new scales, which were labeled as: (1) MSLQ-based mastery-approach scale, (2) MSLQ-based mastery-avoidance scale, (3) MSLQ-based performance-approach scale, and (4) MSLQ-based performance avoidance scale, as shown in Figure 2.7. These scales corresponded to the four achievement goal orientations, namely (1) mastery-approach goal orientation, (2) mastery-avoidance goal orientation, (3) performance-approach goal orientation, and (4) performance-avoidance goal orientation. Both *task* and *self* competence standards share conceptual and empirical similarities and represents the mastery goals together (Elliot & McGregor, 2001). The MSLQ is a well-known and well-researched instrument. It was originally intended as a measure of mastery and performance goals – crossing with both the approach and the avoidance valences. The further sub-division of the mastery goals into self and task orientation has only existed for the past several years. This new classification system for mastery goals is still undergoing examination to establish its usefulness. As well, the MSLQ was initially not intended to measure self vs. task. The introduction of this division may skew the MSLQ scales. This study thus treated both the *self* and *task* standards jointly (i.e., mastery competence standard). Hence, the task- and self-approach goals of the 3 x 2 AGQ framework were joined into a single mastery-

approach goal. Similarly the task-avoidance and self-avoidance orientations were jointed to constitute the mastery-avoidance goal. Participants' responses on the task and self scales were averaged (Elliot & Harackiewicz, 1996) to form the mastery scales.

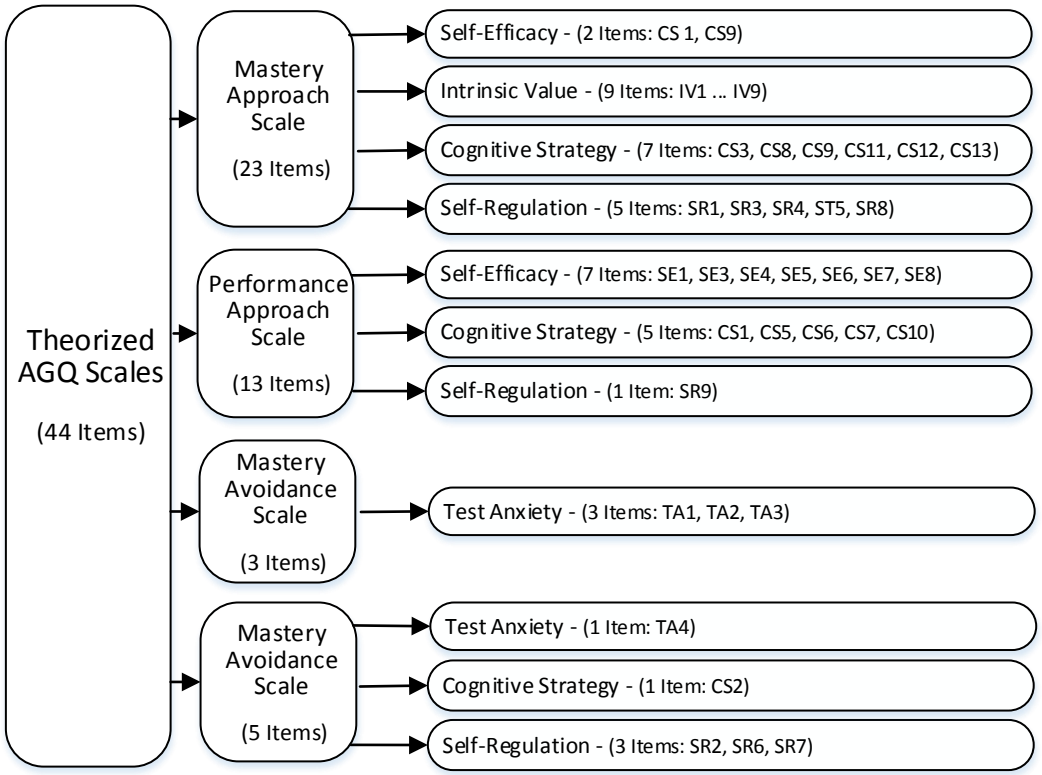

Figure 2.7. Theorized model for predicting the achievement goal orientations from the MSLQ items.

Additionally, two approach and avoidance scales were derived by averaging respective mastery and performance scales.

2.4.1. MSLQ-Based Mastery Approach Scale

The MSLQ-based mastery-approach scale was comprised of 23 items. It included two of the nine items from the self-efficacy scale of the original MSLQ questionnaire, all nine items from the intrinsic value scale, seven of the thirteen items from the cognitive strategy *use* scale, and five of the nine items from the self-regulation scale, as shown in Table 2.1.

Table 2.1. The MSLQ items included in the theorized MSLQ-based Mastery-Approach scale.

Item Id	Item Description
	Self-Efficacy
SE2	I'm certain I can understand the ideas taught in this course.
SE9	I know that I will be able to learn the material for this class.
	Intrinsic Value
IV1	I prefer class work that is challenging so I can learn new things.
IV2	It is important for me to learn what is being taught in this class.
IV3	I like what I am learning in this class.
IV4	I think I will be able to use what I learn in this class in other classes.
IV5	I often choose paper topics I will learn something from even if they require more work.
IV6	Even when I do poorly on a test I try to learn from my mistakes.
IV7	I think that what I am learning in this class is useful for me to know.
IV8	I think that what we are learning in this class is interesting.
IV9	Understanding this subject is important to me.
	Cognitive Strategy
CS3	When I study I put important ideas into my own words.
CS4	I always try to understand what the teacher is saying even if it doesn't make sense.
CS8	I use what I have learned from old assignments and the textbook to do new assignments.
CS9	When I am studying a topic, I try to make everything fit together.
CS11	I outline the chapters in my book to help me study.
CS12	When reading I try to connect the things I am reading about with what I already know.
CS13	When I study for a test, I try to put together the information from class and from the book.
	Self-Regulation
SR1	I ask myself questions to make sure I know the material I have been studying.
SR3	I work on practice exercises and answer end of chapter questions even when I don't have to.
SR4	Even when study materials are dull and uninteresting, I keep working until I finish.
SR5	Before I begin studying I think about the things I will need to do to learn.
SR8	When I'm reading I stop once in a while and go over what I have read.

2.4.2. MSLQ-Based Performance-Approach Scale

The MSLQ mastery approach scale was comprised of 13 items. It included seven items from the self-efficacy scale, five items from the cognitive strategy use scale, and one item from the self-regulation scale of the original MSLQ questionnaire, as shown in Table 2.2.

Table 2.2. The MSLQ items included in the theorized MSLQ-based Performance-Approach scale.

Item Id	Item Description
	Self-Efficacy
SE1	Compared with other students in this class I expect to do well.
SE3	I expect to do very well in this class.
SE4	Compared with others in this class, I think I'm a good student.
SE5	I am sure I can do an excellent job on the problems and tasks assigned for this class.
SE6	I think I will receive a good grade in this class.
SE7	My study skills are excellent compared with others in this class.
SE8	Compared with other students in this class I think I know a great deal about the subject.
	Cognitive Strategy
CS1	When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly
CS5	When I study for a test I try to remember as many facts as I can.
CS6	When studying, I copy my notes over to help me remember material.
CS7	When I study for a test I practice saying the important facts over and over to myself.
CS10	When I read material for this class, I say the words over and over to myself to help me remember.
	Self-Regulation
SR9	I work hard to get a good grade even when I don't like a class.

2.4.3. MSLQ-Based Mastery-Avoidance Scale

The MSLQ-based mastery approach scale was comprised of three items. All the three items belonged to the test anxiety scale of the original MSLQ questionnaire, as shown in Table 2.3.

Table 2.3. The MSLQ items included in the theorized MSLQ-based Mastery-Avoidance scale.

Item Id	Item Description
	Test Anxiety
TA1	I am so nervous during a test that I cannot remember facts I have learned.
TA2	I have an uneasy, upset feeling when I take a test.
TA3	I worry a great deal about tests.

2.4.4. MSLQ-Based Performance-Avoidance Scale

The MSLQ mastery approach scale was comprised of five items. It included one item from the test anxiety scale of the MSLQ questionnaire, one item from the cognitive-strategy scale, and three items from the self-regulation scale, as shown in Table 2.4.

Table 2.4. The MSLQ items included in the theorized MSLQ-based Performance-Avoidance scale.

Item Id	Item Description
	Test Anxiety
TA4	When I take a test I think about how poorly I am doing.
	Cognitive Strategy
CS2	It is hard for me to decide what the main ideas are in what I read.
	Self-regulation
SR2	When work is hard I either give up or study only the easy parts.
SR6	I often find that I have been reading for class but don't know what it is all about.
SR7	I find that when the teacher is talking I think of other things and don't really listen to what is being said.

2.4.5. MSLQ-Based Approach Scale

The MSLQ-based approach scale combines the MSLQ-based mastery-approach scale and the MSLQ-based performance-approach scale. The approach scale contained 36 items, which included 23 mastery-approach items listed in Table 1 and eight performance-approach items listed in Table 2.

2.4.6. MSLQ-Based Avoidance Scale

The MSLQ-based avoidance scale combines the MSLQ-based mastery-avoidance and the MSLQ-based performance-avoidance scales. The scale contained eight items, which included three mastery-avoidance items listed in Table 2.3 and five performance-avoidance items listed in Table 2.4.

3. Study

3.1. Research Questions and Hypotheses

This study aimed to compare college students' self-reported measures of their motivated strategies for learning and their achievement goal orientations in order to investigate predictive associations between the two. The measures of students' motivated strategies for learning and achievement goals were obtained from the MSLQ and the AGQ instruments, respectively. Previous research findings provided a basis for the investigation of an association between the MSLQ and AGQ items and constructs. The following research question guided this study: *Do the MSLQ measures of motivated strategies for learning reveal achievement goal orientations of university students?* To investigate this research question, the study used two approaches to analyze the data: (1) a confirmatory approach; (2) an exploratory approach.

For the confirmatory approach a theoretical model was built based on previous empirical research findings. The model defined six new scales from the MSLQ items to predict the achievement goal orientations. (The six scales are further described in the *Theorized Measures* section below.) Based on these scales, the following six hypotheses were put forward about a predictive relationship between the theorized MSLQ constructs (scales) and the AGQ constructs (scales), shown in the Figure 3.1.

3.1.1. Hypothesis H1

The first hypothesis addressed the associative relationship between the mean self-report measures of those *motivated strategies for learning* items from the constructs on the MSLQ instrument which had been reported to represent the mastery-approach achievement goal orientation by the past research and the mean self-report measure of students' mastery-approach achievement goal orientation measured by the *task-approach and self-approach* constructs on the AGQ instrument. Students' self-report measures of the motivated strategies for learning items and the mastery-approach achievement goal orientation were collected during the current study. The hypothesis was stated as:

H1: The theorized MSLQ-based mastery-approach achievement goal orientation predicted the AGQ mastery-approach achievement goal orientation.

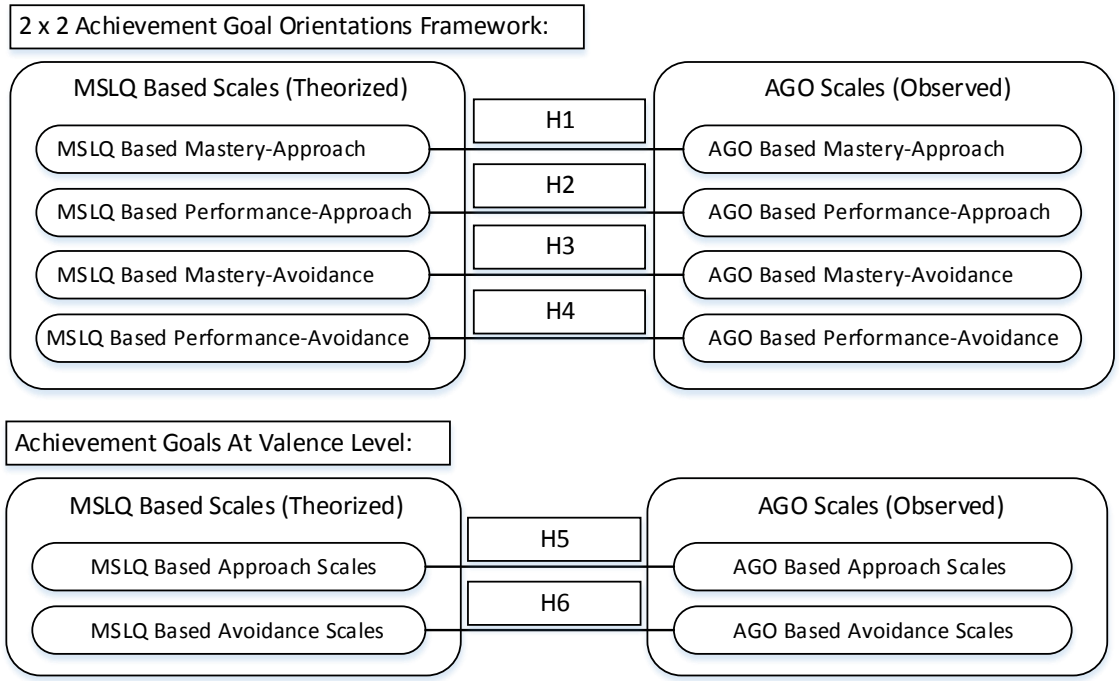

Figure 3.1. A model representing predictive associations between the theorized MSLQ-based constructs and the AGQ achievement goal orientations.

3.1.2. Hypothesis H2

The second hypothesis aimed to examine the associative relationship between the mean self-report measures of those *motivated strategies for learning* items from the constructs on the MSLQ instrument which had been reported to represent the performance-approach achievement goal orientation by the past research **and** the mean self-report measure of students' performance-approach achievement goal orientation measured by the *other-approach* construct on the AGQ instrument. Students' self-report measures of the motivated strategies for learning items and the performance-approach achievement goal orientation were collected during the current study. The hypothesis was stated as:

H2: The theorized MSLQ-based performance-approach goal orientation predicted the AGQ performance-approach achievement goal orientation.

3.1.3. Hypothesis H3

The third hypothesis aimed to examine the associative relationship between the mean self-report measures of those *motivated strategies for learning* items from the constructs on the MSLQ instrument which had been reported to represent the mastery-avoidance achievement goal orientation by the past research and the mean self-report measure of students' mastery-avoidance achievement goal orientation measured by the *task-avoidance and self-avoidance* constructs on the AGQ instrument. Students' self-report measures of the motivated strategies for learning items and the mastery-avoidance achievement goal orientation were collected during the current study. The hypothesis was stated as:

H3: The theorized MSLQ-based mastery-avoidance goal orientation predicted the AGQ mastery-avoidance achievement goal orientation.

3.1.4. Hypothesis H4

The fourth hypothesis aimed to examine the associative relationship between the mean self-report measures of those *motivated strategies for learning* items from the constructs on the MSLQ instrument which had been reported to represent the performance-avoidance achievement goal orientation by the past research and the mean self-report measure of students' mastery-approach achievement goal orientation measured by the *other-avoidance* construct on the AGQ instrument. Students' self-report measures of the motivated strategies for learning items and the performance-avoidance achievement goal orientation were collected during the current study. The hypothesis was stated as:

H4: The MSLQ-based performance-avoidance goal orientation predicts the AGQ performance avoidance goal orientation.

3.1.5. Hypothesis H5

The fifth hypothesis aimed to examine the predictive association between measures of the two instruments at a higher, positive valence, level. It examined the associative relationship between the mean self-report measures of those *motivated*

strategies for learning items from the constructs on the MSLQ instrument which were theorized to represent the *approach* valence and the mean self-report measure of students' *approach* valence measured by the task-, self-, and other-approach constructs on the AGQ instrument. The hypothesis was stated as:

H5: The theorized MSLQ-based approach-goal orientations predict the AGQ approach goal orientations.

3.1.6. Hypothesis H6

The sixth hypothesis aimed to examine the predictive association between measures of the two instruments at a higher, negative valence, level. It examined the associative relationship between the mean self-report measures of those *motivated strategies for learning* items from the constructs on the MSLQ instrument which were theorized to represent the *avoidance* valence and the mean self-report measure of students' *avoidance* valence measured by the task-, self-, and other-avoidance constructs on the AGQ instrument. The hypothesis was stated as:

H6: The MSLQ-based avoidance-goal orientations predict the AGQ avoidance goal orientations.

For the exploratory data analysis, the study aimed to discover the possible underlying achievement goal orientation structure represented by the MSLQ scales without imposing any preconceived structure on the outcome (Child, 1990). The results of both the exploratory and the confirmatory analyses were used to inform the discussions.

3.2. Study Design

3.2.1. Participants

A total of 376 undergraduate students from the School of Interactive Arts and Technology (SIAT) at Simon Fraser University in Canada participated in this study. Twenty-nine respondents provided either incomplete responses or simply provided

“overly” satisfactory answers by choosing the response choices all 7’s or 6’s – a phenomenon called satisficing (Krosnick, 2000). Students with this response pattern were excluded from the analysis. Of the remaining 347 students, 54.8% (n = 190) were female and 45.2% (n = 156) were male. Participants included 21.3% (n = 74) freshmen, 33.4% (n = 116) sophomores, 28.0% (n = 97) juniors, and 17% (n = 59) seniors. From among these participants, 36.6% (n = 127) completed the questionnaire during the IAT-100 Digital Image Design class, 6.3% (n = 22) in IAT-103 Design Communication and Collaboration, 13.0% (n = 45) in IAT-201 Human-Computer Interaction and Cognition, 25.4% (n = 88) in IAT-333 Interaction Design Methods,13.3% (n = 46) in IAT-334 Interface Design, and 03.2% (n = 11) in the IAT-452 Developing Design Tools class. With a an estimated SIAT population size of 1000, a 95% confidence interval and 5% margin of error, a minimum sample size required was 278. Participation in the study was entirely voluntary. At the conclusion of the study, participants were included in a draw to win one of the 10 gifts cards valued CAD $50 each.

3.2.2. Measures

3.2.2.1. Motivation and Learning Strategies Measures

Students’ use of learning strategies was measured by the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, & McKeachie, 1993). The questionnaire included 44 items on student motivation, cognitive strategy use, and metacognitive strategy use. Students were instructed to respond to the items on a 7-point scale (1 = not true of me to 7 = extremely true of me) in terms of their behavior in the class. The motivational items measured self-efficacy, intrinsic value, and test anxiety. The self-efficacy scale (α = .87, this sample) contained nine items pertaining to the perception of one’s ability and confidence to complete academic tasks (e.g., “I expect to do very well in this class”). The intrinsic value scale (α = .86, this sample) consisted of nine items that measured intrinsic interest in and perceived importance of course deliverables (“It is important for me to learn what is being taught in this class”. The test anxiety scale (α = .83, this sample) was composed of four items concerning the worry about and cognitive interference on exams or projects in the class (e.g., “I am so nervous during a test that I cannot remember facts I have learned”, or “When I take a test I think about how poorly I am doing”.) The cognitive strategy use scale (α = .77, this sample) comprised of 13 items regarding the use of rehearsal, elaboration, paraphrasing

and organizational strategies (e.g., “When I read material for this class, I say the words over and over to myself to help me remember”, or “I outline the chapters in my book to help me study”). Finally, the self-regulation scale (α = .61, this sample) contained nine items pertaining to effort management and metacognitive strategies. The effort management items measured students’ diligence and persistence at difficult or boring tasks (e.g., “Even when study materials are dull and uninteresting, I keep working until I finish”). The metacognitive items measured comprehension monitoring, planning, and skimming strategies of students (e.g., “I ask myself questions to make sure I know the material I have been studying”).

3.2.2.2. Achievements Goal Measures

Students’ goal orientations were measured using the 3 x 2 Achievement Goal Orientation questionnaire (Elliot et al., 2011). The questionnaire consisted of 18 items grouped into six equal size scales: task-approach (α = .76, this sample), self-approach (α = .74), other-approach (α = .86, this sample), task-avoidance (α = .77, this sample), self-avoidance (α = .78, this sample) and other avoidance (α = .82, this sample). Most of the courses at SIAT were project-based; I therefore adapted some of the original items by replacing the word ‘exams’ with ‘exams or projects’. For example, the statement ‘My goal is to get a lot of questions right on the exams in this class’ was adapted to ‘My goal is to get a lot of questions right on the exams or projects in this class’. A 7-point scale was used ranging from 1 (not true of me) to 7 (extremely true of me).

3.2.2.3. Theorized Measures

The theorized model was measured using the data collected from the MSLQ instrument. The mean score for each of the four theorized scales (MSLQ-based mastery-approach scale, MSLQ-based mastery-avoidance scale, MSLQ-based performance-approach scale, and MSLQ-based performance avoidance-scale) was computed by averaging the scores of the items (1 = not true of me to 7 = extremely true of me) contained in the scale. To measure the achievement goal orientations at valence level, two additional constructs, MSLQ-based approach goals and MSLQ-based avoidance goals, were defined. The MSLQ-based approach goal construct was measured by averaging the mastery- and performance-approach scores. Similarly, the MSLQ-based avoidance goal construct was measured by averaging the mastery- and performance-avoidance scores.

The theorized MSLQ-based mastery-approach scale (α = .89, this sample) consisted of 23 items (two from self-efficacy, nine intrinsic value, nine cognitive strategy, and five items from the self-regulation scale). The theorized MSLQ-based performance approach scale (α = .81, this sample) was comprised of 13 MSLQ items (seven from self-efficacy, and six from the cognitive strategy scale). The theorized MSLQ-based Mastery Avoidance scale (α = .74, this sample) contained five items, one from the MSLQ test anxiety scale, one from the cognitive strategy scale, and three items from the self-regulation scale. Finally, the theorized MSLQ-based performance-avoidance scale (α = .80) was constructed from three MSLQ test anxiety items.

The task-based and self-based goal orientations in the 3 x 2 achievement goal model represented the mastery goal orientation (Elliot et al., 2011). I therefore derived the AGQ mastery-approach scale (α = .83, this sample) collectively from the AGQ task-approach and AGQ self-approach items. Similarly, I combined the items in the AGQ task-avoidance and AGQ self-avoidance scales to derive the AGQ mastery-avoidance scale (α = .85, this sample). The AGQ other-approach and AGQ other- avoidance goal orientations were synonymous to performance-approach and performance- avoidance orientations of Elliot's 2X2 goal model respectively (Elliot et al., 2011). I, therefore, treated the AGQ performance goals (α = .86, this sample) same as the AGQ other goals.

3.2.3. Procedure

With the ethics approval obtained from the Office of Research Ethics, the study took place over a three-week period in the Spring 2013 semester. I sent emails to course instructors to recruit participants and schedule sessions for collecting data. The questionnaire was administered in classrooms with each session lasting about 15 minutes. Each participant was given a single paper-based questionnaire to fill out after reading and signing the consent form. The questionnaire contained 18 items from the AGQ instrument followed by 44 items from the MSLQ instrument. The items were unnumbered and randomly sorted for each instrument. A research associate was available to assist, if required. At the end of the study all the responses were serially numbered in the order of collection and entered into a data file. I used the Microsoft Excel, SPSS, and R applications to organize and analyze the data.

3.2.4. Analysis

I analyzed the students' self-reported responses using standard descriptive statistics and inferential statistics. Use of descriptive statistics, such as mean or standard deviation, to analyze the type of the data I had, is a common practice as reported by Blaikie (2003). There are two schools of thoughts on analyzing the Likert-scale data as ordinal vs. interval (Carifio & Perla, 2008), I followed the later which is based on a significant amount of empirical evidence that Likert scales can be used as interval data (Carifio, 1978; Carifio & Perla, 2007). Accordingly, I decided to use the parametric statistics (e.g., Pearson's correlation, multiple-regression) for analysing data in this study.

3.2.4.1. Analyzing the Theorized Model by Confirmatory Approach

To test whether the four-factor theorized model predicted the achievement goal orientations, I followed the confirmatory analysis approach. The data were analyzed using parametric linear models. To measure the reliability of theorized scales, I computed Cronbach's alpha coefficients, which provided an estimate of the internal consistency of the items within each scale (see the computed values in the Theorized Measures section above). Pearson's correlations were computed for each theorized scale to examine how students' goal orientations, as derived from their responses to learning strategies items on the MSLQ instrument, related to their achievement goal orientations reflected by their responses to the AGQ scales.

Next, I conducted a model evaluation of the correlated theorized scales to identify the best-fit model that could efficiently predict achievement goal orientation. To evaluate the competing models rigorously, I used the corrected Akaike Information Criterion (AICc) (Hastie et al. 2009) in conjunction with multiple linear regression using the backward elimination method (Kutner et al. 2004). To elaborate, I started the regression analysis with all items of a theorized scale and computed the: (1) AICc value, and (2) *t*-test statistic and p-value for the regression coefficient associated with each variable I tested for. I removed the item with the largest *p*-value, and ran the regression model again with the reduced set of predictors. I iterated through this item elimination process until I reached a model with the smallest AICc value (i.e., before the AICc value started to increase again). I also tested the marginality and multicollinearity using

variance inflation factor (VIF) of the resulting model. Finally, I selected the model with the smallest AICc, which pointed to the better-fitting model (Kline, 2005). I followed the exploratory cross-validation approach (Lombardi et al., 2013) using canonical correlations analysis (CCA) as described in the following section.

3.2.4.2. Using the Exploratory Analysis Approach for Cross Validation

I used canonical correlation analysis (CCA) to explore for MSLQ items which could predict the achievement goals orientations. Instead of using the theorized MSLQ model, I used the actual MSLQ scales instead. CCA is very general linear parametric technique which subsumes all other parametric methods including *t*-tests, ANOVA, regression analysis, MANOVA and discriminant analysis (Humphries-Wadsworth, 1998; Sherry & Henson, 2005). I ran CCA to investigate relationships between the actual MSLQ scale items as predictor variables and the AGQ scales as a set of criterion variables. As a multivariate technique, CCA is reported to have several advantages including: (1) ability to capture complex cause-and-effect relationships of psychological nature (Sherry & Henson, 2005); and (2) lowered probability of committing Type I errors (Thompson, 1991). The CCA yields (1) canonical correlation coefficients indicating strength of the relationships that might exist between the predictor and the criterion variate sets; (2) canonical function coefficients (i.e., the weights) for each set of variables that yielded maximal correlation between the predictor and criterion canonical variates; and (3) canonical structure coefficients showing strength of within-set variable-variate correlations (i.e., canonical loadings) and between-set variable-variate correlations (i.e., canonical cross loadings) (Hair et al., 1998). I used these canonical correlation coefficients (Rc), canonical function coefficients, and canonical structure coefficients (r_s) for interpreting the relationships the MSLQ items and the AGQ scales. The interpretation was, however, restricted to the extracted canonical functions that were statistically significant (Thompson, 1984) and explained a noteworthy amount of variance (Sherry & Henson, 2005). To assess the significance of the canonical functions, I computed a commonly used Wilks' lambda (λ), which has the most general applicability (Sherry & Henson, 2005) and represents the variance not explained by the model (Nimon, Henson, & Gates, 2010).

The canonical correlation coefficients indicate the association between the canonical scores for each pair of predictor and criterion variates (Green 1978). I used

the magnitudes of the canonical correlation coefficients to assess the strength of the association between the predictor and the criterion variable sets. Examining the canonical correlation coefficient alone, however, does not reveal the amount of variance shared by the two sets of variables. Lambert and Durand (1975) recommend the redundancy index as a more indicative measure of the predictive ability of a canonical relationship in accounting for variance extracted from the criterion variable set. Consequently, I computed the redundancy index, as well. A high relative value of a structure coefficient represents a high contribution of the observed variable and vice versa. A low value of a structure coefficient, however, may not necessarily mean a low contribution when two or more variables are correlated in a variate set (Nimon, Henson, & Gates, 2010). In such a situation, the CCA technique can obfuscate the impact of a variable, making interpretation of the results less clear (Hair et. al., 1998; Zientek & Thompson, 2006). To make interpretation of the results more reliable, I used canonical function coefficients in conjunction with canonical structure coefficients (Hair et. al., 1998; Nimon, Henson, & Gates, 2010). The structure coefficients reflected the variance that an observed variable shares with the predictor and criterion canonical variates. Statistically significant structure coefficients were interpreted as having either a secondary level of usefulness (>0.45) or a primary level of usefulness in the model (>0.60) (Sherry & Henson, 2005). Finally, I conducted canonical commonality analysis of contributing variables to partition unique and common effects (Daniel, 1989; Nimon, Henson, & Gates, 2010, Zientek & Thompson, 2009).

4. Results

4.1. Confirmatory Approach

This section presents the results of statistical analysis using a confirmatory approach. I conducted these analyses to test all my hypotheses. The findings reported here are based on the analysis of 347 usable responses collected from the respondents. Pearson's correlation (*r*) analyses were used to estimate the degree of linear dependence between the theorized measures of the achievement goals and the observed measures. For statistically significant *r* values I further examined the relationship between theorized and observed measures using multiple-regression and AICc analyses to identify the best-fit model. I used the SPSS and R software tools to perform the statistical analyses.

4.1.1. Correlational Analyses

The correlations between the theorized and the observed achievement goal measures were analyzed at two levels: (1) at the 2 x 2 achievement goal orientations framework level, that considered both the valence and referent dimensions, and (2) at the valence level only. The hypotheses H1 to H4 dealt with the 2 x 2 achievement goal orientations framework, whereas the hypotheses H5 and H6 were concerned with the achievement goal orientations at a valence level. The results of Pearson's correlations are shown in Figure 4.1.

All the hypothesized correlations that dealt with the 2 x 2 achievement goal orientations framework were statistically significant, including mastery-approach, H1, (r = .41, p <.05), performance-approach, H2, (r = .42, p <.05), mastery avoidance, H3, (r = .24, p <.05), and performance-avoidance, H6, (r = .68, p <.05) scale, shown in Figure 4.1.

The analysis of hypotheses H5 and H6 showed that the MSLQ-based approach variable was positively correlated with the AGQ approach variable (r = .45, p <.05), and the MSLQ-based avoidance variable was positively correlated with the AGQ based avoidance variable (r = .22, p <.05).

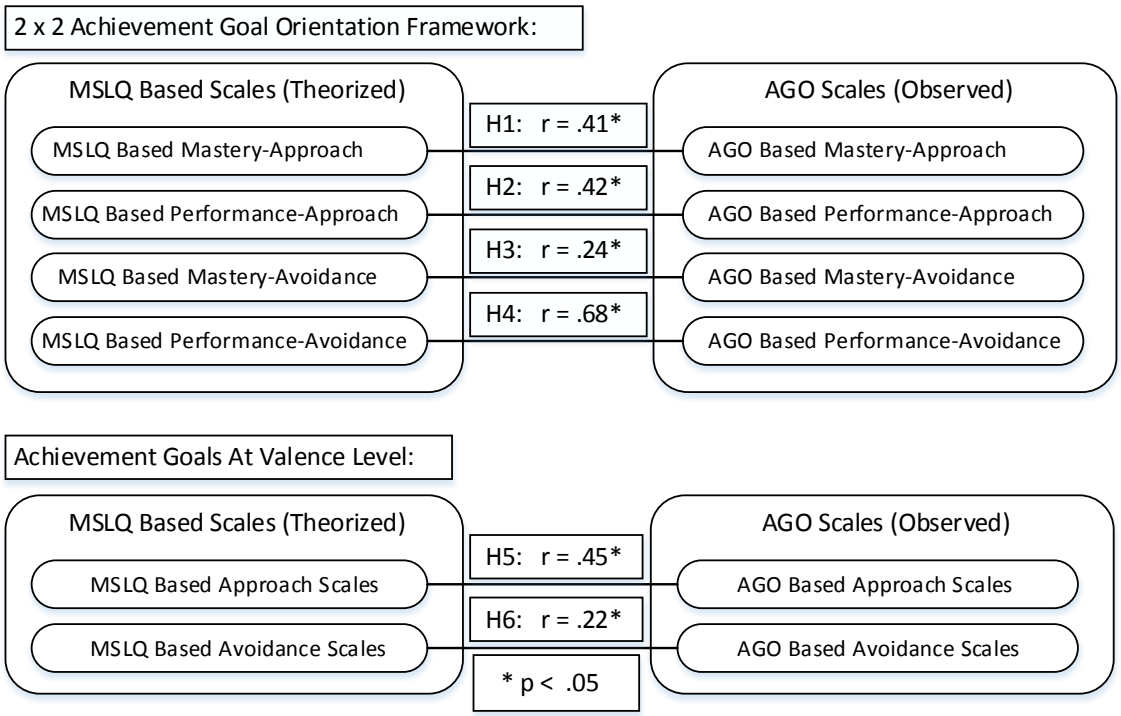

Figure 4.1. Correlations between the theorized and observed scales.

The statistically significant correlations provided a preliminary view of how the theorized MSLQ-based scales fared against the observed values of their corresponding AGQ based scales. These correlations suggested that all the MSLQ-based theorized constructs could potentially contribute to explaining and predict the observed achievement goal orientations measures. To further investigate these correlational analyses results, next I performed model selection using regression and AICc analyses to identify best-fit models. The objective of these analyses was to identify the minimum number of MSLQ items that could efficiently predict each AGQ based achievement goal orientation. The results of regression and AICc analyses for each hypothesis are provided in section 4.1.2 below.

4.1.2. Regression Analyses

4.1.2.1. Hypothesis H1

The regression and AICc analyses were conducted to identify the minimum set of items from the theorized MSLQ mastery-approach scale that could best predict the AGQ mastery-approach goals. As the 3 X 2 AGQ instrument measured the mastery-approach

achievement goal orientation using two different competence referents *task* and *self*, I could derive a single mastery-approach index in two possible ways. First, the theorized MSLQ mastery-approach scale might be regressed against the AGQ based task-approach (TAP) and self-approach (SAP) scales separately. This regression would render a set of items in the best-fit model for each task- and self-approach scale. AGQ based mastery-approach index then might be derived by the taking union of items in both the sets. Alternatively, we could get mean of TAP and SAP scores to drive a new AGQ based mastery-approach index. The theorized MSLQ-based mastery-approach scale then might be regressed against derived mastery-approach index. Both the approaches are depicted in Figure 4.2 with the resultant numbers of items.

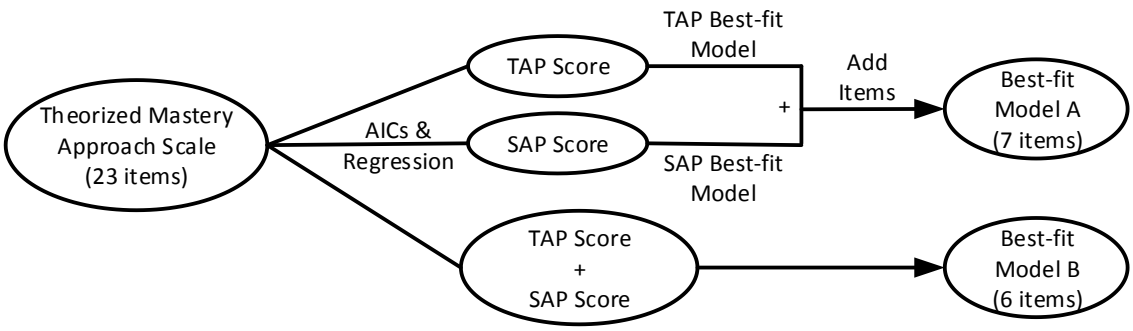

Figure 4.2. Two approaches for deriving the mastery-approach best-fit models using the regression and AICc analyses.

A regression model against the TAP (R^2 = .24, F(23,323) = 4.517, p < .001) and SAP (R^2 = .21, F(23,323) = 3.673, p < .001) with all 23 predictors explained 24.3% and 20.7% of the variance, respectively. To identify the best-fit models, I iterated through the regression analysis with AICc elimination method. The AICc analysis revealed that a regression model comprising of five MSLQ items (SE2, IV2, CS4, CS11, and SR5) fitted the task-approach (TAP) data best, as shown in Table 4.1.

The results of the best-fit regression model, obtained based on the AICc values, indicated that the five MSLQ predictors explained 21.9% of the variance (R^2 = .22, F(5,341) = 19.120, p < .001) of TAP. It was found that SE2 contributed statistically significantly in predicting the task (i.e., mastery) approach orientation (β = .14, t(341) = 3.176, p < .01), as did IV2 (β = .24, t(341) = 5.528, p < .001), CS11 (β = -.09, t(341) = -3.071, p < .01), and SR5 (β = .09, t(341) = 2.333, p < .05). The contribution of CS4 (β = .08, t(341) = 1.929, p < .055) was close to statistical significance.

Table 4.1. MSLQ items included in the best-fit regression models which predicted the AGQ based task-approach, self-approach and mastery-approach achievement goal orientations. A boldface value represents statistically significant *t*-test between the item and the AGQ scale.

		β		
Id	**Item**	**Task**	**Self**	**Mastery**
SE2	I'm certain I can understand the ideas taught in this course.	**.14**	.10	**.14**
SE9	I know that I will be able to learn the material for this class.		.09	
IV2	It is important for me to learn what is being taught in this class.	**.24**	**.21**	**.23**
CS4	I always try to understand what the teacher is saying even if it doesn't make sense.	.08		.08
CS11	I outline the chapters in my book to help me study.	**-.09**		**-.07**
CS12	When reading I try to connect the things I am reading about with what I already know.		**.09**	.08
SR5	Before I begin studying I think about the things I will need to do to learn.	**.09**		.08

For the SAP achievement goal orientation, the AICc-based regression analysis identified the best predictor model consisting of four MSLQ items (SE2, SE9, IV2, and CS12). The results of regression revealed that the four predictors explained 20.0% of the variance (R^2 = .20, F(6,346) = 14.459, p < .001). Two of the four items IV2 (β = .21, t(342) = 4.387, p < .001) and CS12 (β = .09, t(342) = 2.113, p < .05) statistically significantly contributed in the prediction model. The contributions of items SE2 (β = .10, t(342) = 1.965, p = .050), and SE9 (β = .09, t(342) = 1.650, p = 10) were not statistically significant.

Following the first approach for deriving items for the best-fit theorized mastery-approach scale, a union of items from both the TAP and SAP sets of best-fit models produced a set of seven unique items (SE2, SE9, IV2, CS4, CS11, CS12, and SR5). These items best predicted the AGQ based mastery-approach achievement goal orientation from the MSLQ items, labeled as best-fit model A in Figure 4.2.

To derive the best-fit theorized mastery-approach scale following the alternate approach (model B in Figure 4.2), a regression analysis between the theorized MSLQ-based mastery-approach predictor items and the derived AGQ mastery-approach

outcome variable was performed next. The analysis with all the 23 predictors explained 27% of the variance (R^2 = .27, F(23,323) = 5.184, p < .001). The AICc best-fit analysis revealed a six items model (SE2, IV2, CS4, CS11, CS12 and SR5) for predicting the AGQ mastery-approach goal. The model explained 25.4% of the variance (R^2 = .25, F(6,340) = 19.32, p < .001). It was found that SE2 (β = .14, t(340) = 3.42, p < .001) IV2 (β = .23, t(340) = 5.969, p < .001), and CS11 (β = -.07, t(340) = -2.687, p < .01), contributed statistically in predicting the mastery-approach orientation. The contributions of CS4 (β = .08, t(340) = 1.484, p = .138), CS12 (β = .08, t(340) = 1.821, p = .069), and SR5 (β = .08, t(340) = 1.762, p = .078) were not statistically different from zero. This results is labelled as mastery-approach best-fit model B in Figure 4.2.

Both models A and B had six items in common except that model A contained an additional predictor (SE9). To test how much variance could possibly be accounted for by retaining the SE9 predictor in the model, I regressed the 7-item model against the derived AGQ mastery-approach scale. The regression analysis suggested that the seven-item model collectively explained 25.5% of the variance (R^2 = .26, F(7,339) = 16.570, p < .001). Three of the items SE2 (β = .24, t(339) = 2.703, p < .01), IV2 (β = .45, t(339) = 5.538, p < .001) and CS11 (β = -.14, t(339) =-2.646, p < .01) showed a statistically significant predictability of mastery approach goal. The contributions of remaining four items were SE9 (β = .06, t(339) = 0.4654, p = .513), CS4 (β = .11, t(339) = 1.406, p = .160), CS12 (β = .13, t(339) = 1.719, p = .086) and SR5 (β = .12, t(339) = 1.686, p = .092) were not statistically significant. The seven-item model (A), thus, explained only .1% more variance than the six-item model (B), which was caused by the inclusion of the SE9 predictor. Model A however, was not optimal as the regression-AICc analyses suggested that the best-fit model B was more efficient in predicting the AGQ mastery-approach goal orientation in terms of the number of items used, as shown in Table 5. The analysis further revealed that the contribution of the SE9 item was not statistically different from zero. I considered the six-item model B as the best-fit model for predicting the AGQ mastery-approach goal orientation from the MSLQ items. The internal consistency of the six-item scale was acceptable with a Cronbach's alpha coefficient value 0.74.

Mastery-approach goals are characterized by high self-efficacy, positive patterns of learning, acceptance of challenging tasks, persistence in face of difficulty, and high

metacognition, as mentioned in the Chapter 2. The items that appeared in the optimized MSLQ-based mastery-approach model reflect these mastery-approach characteristics. Four of these items were, although phrased to measure students' self-efficacy, intrinsic value, self-regulation, and cognitive strategy, a closer look at their wording revealed one similarity i.e., they had an explicit focus on either learning or understanding, which was a defining characteristic of a mastery-approach achievement goal orientation. Further, the items did not use a goal-oriented language either, except the goal of the learning itself. Previous research had shown that the measurements of mastery-approach goals were much more diverse and the measures prior to 2000 tended to include more no-goal items (Hulleman et al., 2010). Further, the descriptions of remaining items included in the best-fit model, i.e., CS11 and CS12, represent goal language without explicit reference to the learning. Past studies have suggested that besides having a basic, underlying dimension that focuses on learning and skill development, the mastery-approach goals also encapsulate interest and curiosity (Lepper et al., 2005), and aim to develop competence (Middleton & Midgley, 1997) or fulfill one's potential (Elliot & McGregor, 2001).

4.1.2.2. Hypothesis H2

Model selection for efficiently predicting the AGQ other-approach (i.e., performance approach according to the 2x2 framework) achievement goal orientation was performed next. The AICc revealed that a solution with six MSLQ items fitted the data best, as shown in Table 4.2. Of these six items, four belonged to the MSLQ self-efficacy scale and two from the cognitive strategy. Regression analysis revealed that the six predictors explained 32.8% of the variance ($R^2 = .328$, $F(5,346) = 28.163$, $p < .001$). It was found that all the items statistically predicted task-approach orientation, SE1 ($\beta = .32$, $t(346) = 6.055$, $p < .001$), SE4 ($\beta = .16$, $t(346) = 2.091$, $p < .05$), SE6 ($\beta = .14$, $t(346) = 2.397$, $p < .05$), SE7 ($\beta = .13$, $t(346) = -2.715$, $p < .01$), CS5 ($\beta = .16$, $t(346) = 3.388$, $p < .01$), and CS7 ($\beta = -.15$, $t(344) = -3.472$, $p < .001$). The internal consistency of the six-item scale was acceptable with a Cronbach's alpha coefficient value 0.67.

Table 4.2. MSLQ best-fit regression model for predicting the AGQ performance-approach goal orientation.

Id	Items	*β*
SE1	Compared with other students in this class I expect to do well.	.32
SE4	Compared with others in this class, I think I'm a good student.	.16
SE6	I think I will receive a good grade in this class.	.14
SE7	My study skills are excellent compared with others in this class.	.13
CS5	When I study for a test I try to remember as many facts as I can.	.16
CS7	When I study for a test I practice saying the important facts over and over to myself.	-.15

Individuals with performance-approach orientation could be motivated by a desire for validation of their ability (appearance), normative comparison (competition), normative ability (combined ability validation and normative comparisons), and outcome goals focused on attaining a positive outcome (Elliot, 1999, 2005, 2010; Elliot, McGregor & Gable, 1999; Grant, & Dweck, 2003). The items appearing in the MSLQ-based performance-approach best-fit model contained the components which satisfied the definitions of performance-approach achievement goal orientation provided in the literature. Three of the self-efficacy item descriptions defined a normative approach (Hullman et al., 2010; Urdan & Mestas, 2006). Specifically, item SE1 represented a normative goal component with focus on performance. Items SE4 and SE7 defined the performance-approach with a normative goal component that had a focus on social ego (Duda & Nicholls, 1992). The items implicitly suggested an objective standard whereby individuals could judge whether they were better than others in the group. Another self-efficacy item SE6 and a cognitive-strategy item CS5 defined performance-approach goal with performance orientation and a focus on attaining a positive outcome (Elliot & McGregor, 2001). Cognitive strategy item CS7 also represented a performance focus. The contribution of this item in the model was negative, however. One possible explanation could be that many of the courses offered at SIAT were project based and did not have the exam component. So the student participants did not considered the practice of "saying the important facts over and over" relevant in the context of projects. It is also possiblee that the language of the item (i.e., saying the important facts over and over) suggested a negative affect, such as worry or fear, and does not represent an approach orientation.

4.1.2.3. Hypothesis H3

Regression analysis was conducted to identify items from the theorized MSLQ mastery-avoidance scale that could best predict the AGQ mastery avoidance goals. The theorized MSLQ-based mastery avoidance scale was composed of three items. The mastery-avoidance goals in AGQ instrument were measured by the task-avoidance (TAV) and self-avoidance (SAV) scales. We could possibly regress the theorized mastery-avoidance scale against the TAV and the SAV to get the best-fit model for each subscale, and then add the resultant items in each best-fit model to get the MSLQ mastery-avoidance index. Alternatively, we could add the TAP and SAP scores to drive a new mastery-approach scale, and then regress the theorized mastery-approach scale against this derived index – as I did for the mastery-approach index. Both the approaches are shown in Figure 4.3, with the resultant numbers of items for each approach.

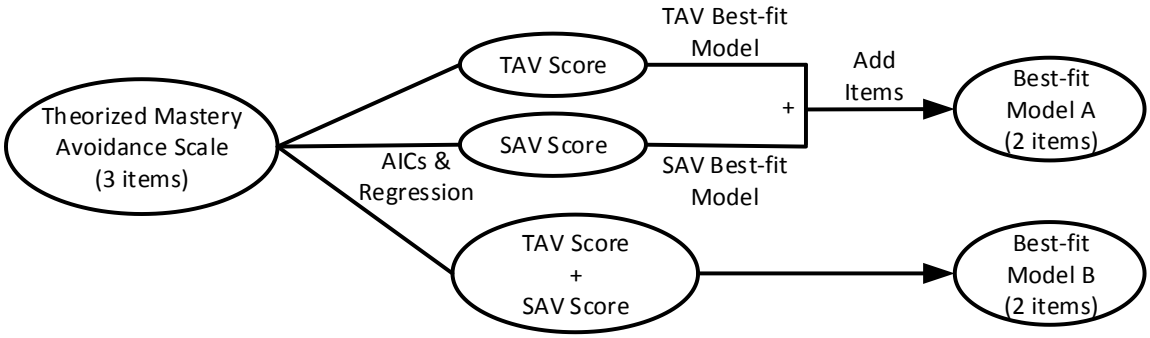

Figure 4.3. Two approaches used for deriving the mastery-avoidance best-fit models.

Regression analyses against the task-avoidance and the self-avoidance goal orientations were performed, first. A regression model against TAV (R^2 = .08, F(3,343) = 9.275, p < .001) and SAV (R^2 = .04, F(3,343) = 5.034, p < .001) with all three predictors explained 7.5% and 4.2% of the variance respectively. Against the derived mastery-avoidance goals (TAV plus SAV) the three-item model explained 6.8% of the variance (R^2 = .07, F(3,34) = 8.323, p < .001). To identify the best-fit models, I iterated through the regression analysis with the AICc elimination method.

The AICc analyses revealed that regression models comprising of items TA1 and TA3 fitted the TAV (R^2 = .07, F(2,344) = 12.08, p < .01). Both the items contributed

statistically in predicting the task-avoidance goal TA1 (β = .09, t(344) = 2.326, p < .05), and TA3 (β = .11, t(344) = 2.758, p < .01), Table 4.3.

Table 4.3. MSLQ items included in the best-fit regression models which predicted the AGQ-based task-avoidance, self-avoidance and mastery-avoidance goal orientations. Bold X represents a statistically significant t-test between the item and the AGQ mastery approach scale.

		β		
Id	**Item**	**Task**	**Self**	**Mastery**
TA1	I am so nervous during a test that I cannot remember facts I have learned.	**.07**	.09	**.07**
TA3.	I worry a great deal about tests.	**.09**		.08

For self-avoidance mastery goals, the item TA3 (β = .12, t(345) = 3.420, p < .001) fitted the data best (R^2 = .03, F(21,345) = 11.700, p < .001). To get the best-fit model A, I added the items in the TAV and the SAV best-fit models, which resulted in items TA1 and TA3. Next, I performed AICc and regression analyses between the theorized MSLQ mastery-avoidance scale and the derived AGQ based mastery-avoidance scale, obtained by using the TAV and the SAV means scores, to get the best-fit model B. The results showed that the TA1 and the TA3 items best predicted the derived mastery-avoidance goals (R^2 = .07, F(2,344) = 12.06, p < .091) and explained 6.6% of the variance. Both the items contributed statistically in predicting the mastery-avoidance goal TA1 (β = .07, t(344) = 2.000, p < .05), and TA3 (β = .10, t(344) = 2.729, p < .01). The number of items in the both the best-fit models, A and B, were same. Therefore, I considered the MSLQ items TA1 and TA3 as representing the overall mastery-avoidance best-fit model that could best predict the AGQ mastery-avoidance goal orientation. The Cronbach alpha coefficient value for the best-fit model was good – 0.70.

Both the best-fit model items tapped participants' nervousness and worry during the execution of tests taking task. The two items, however, did not use the goal specific language.

4.1.2.4. Hypothesis H4

Regression analysis was conducted to identify items from the theorized performance avoidance scale that could best predict the AGQ performance avoidance goals. The theorized scale was composed of five items. The regression model of the theorized performance avoidance scale explained 2.5% of the variance (R^2 = .025, F(5,341) =1.719, p = .12), though the model was not statistically significant. The AICc best fit model that predicted AGQ performance avoidance contained a single MSLQ item CS2 (*It is hard for me to decide what the main ideas are in what I read*). The results of regression showed that CS2 explained 2% of the variance (R^2 = .019, F(1,345) = 6.997, p < .001). The item (CS2) contributed statistically in predicting the performance-avoidance goal (β = .11, t(345) = 2.624, p < .001). Four items were eliminated from the initial model during the best-fit analysis, which accounted for 0.5% of the total variance. The best-fit model thus improved the prediction efficiency of the theorized scale by reducing the number of predictors down to one. Item CS2 reflected worry about negative outcome – typically shown by the individuals with performance-avoidance goals.

4.1.2.5. Hypothesis H5

For hypothesis H5, the regression and AICc analyses were conducted to identify the minimum set of items for the theorized MSLQ-based approach goals scale that could best predict the AGQ approach goals. The MSLQ-based approach goals scale was constructed by combining the items from the theorized MSLQ-based mastery-approach and performance approach scales. The regression model containing all the items explained 38.6% of the variance (R^2 = .38, F(36,310) = 5.42, p < .001). The AICc best-fit analysis suggested that the AGQ approach goal orientation could be best predicted by an 11-items model, as shown in Table 4.4. The regression analysis revealed that the eleven predictors explained 37.54% of the variance (R^2 = .38, F(11,335) =17.37, p < .001). Ten of the eleven items – SE1 (β = .12, t(335) = 3.390, p < .001), SE2 (β = .08, t(335) = 2.170, p < .05), SE4 (β = .08, t(335) = 2.275 p < .05), SE6 (β = .12, t(355) = 3.012, p < .01), IV2 (β = .12, t(355) = 3.201, p < .01), CS3 (β = -.07, t(355) =-2.108, p < .05), CS4 (β = .08, t(335) = 2.280, p < .05), CS5 (β = .10, t(335) = 2.970, p < .01), CS11 (β = -.07, t(335) =-2.918, p < .01), and SR9 (β = .06, t(335) = 2.217, p < .05) – statistically predicted the AGQ approach goal orientations – indicating that the predictive contribution of each item was statistically significant from zero. The contribution of IV1 (β

= -.04, $t(335)$ =-1.458, p = .149), was not statistically different from zero in the regression model. The internal consistency of the best-fit MSLQ approach scale was good with a Cronbach's alpha coefficient value .80.

Table 4.4. MSLQ items included in the best-fit regression models which predicted the AGQ-based approach goal orientations. The bold items represent statistically significant contribution in the regression model. The letter P represents performance and M mastery orientation.

Id	Item	*β*
SE1 (P)	Compared with other students in this class I expect to do well.	**.12**
SE2 (M)	I'm certain I can understand the ideas taught in this course.	**.08**
SE4 (P)	Compared with others in this class, I think I'm a good student.	**.08**
SE6 (P)	I think I will receive a good grade in this class.	**.12**
IV1 (M)	I prefer class work that is challenging so I can learn new things.	-.04
IV2 (M)	It is important for me to learn what is being taught in this class.	**.12**
CS3 (M)	When I study I put important ideas into my own words.	**-.07**
CS4 (M)	I always try to understand what the teacher is saying even if it doesn't make sense.	**.08**
CS5 (P)	When I study for a test I try to remember as many facts as I can.	**.10**
CS11 (M)	I outline the chapters in my book to help me study.	**-.07**
SR9 (P)	I work hard to get a good grade even when I don't like a class.	**.06**

The best-fit analysis eliminated 25 least contributing predictors from the overall model. These eliminated predictors accounted for approximately 2.3% of the total variance. But the best-fit model improved the prediction efficiency of the theorized scale considerably by reducing the number of predictor items from 36 down to 11. All the items appearing in the best-fit approach model represented the conceptualizations identified in the definitions of approach goals in the literature (e.g., Elliot, 1999, 2005, 2008; Elliot & McGregor, 2001; Hullman et al., 2010; Urdan & Mestas, 2006). These definition viewed approach goals as strivings that focused on competence defined by either (1) competition or performance compared with that of others (performance), or (2) learning and skill development (mastery). The MSLQ items appearing in the approach best-fit model contained the components that satisfied the definitions of approach goals provided in the literature. Five of the predictors represented the performance-approach

type goal conceptualizations and six predictors represented the mastery-approach type conceptualizations, as shown in Figure 4.4. Of the performance-approach type goal predictors, SE1 and SE4 represented the conceptualization defined by a normative comparison (Elliot, 1999; 2008) with focus on outcome and social ego respectively. Whereas items SE6, CS5 and SR9 represented the performance-approach goals that focused on the outcome only (e.g., getting good grades; Eison, Pollio, & Milton, 1982; Grant & Dweck, 2003).

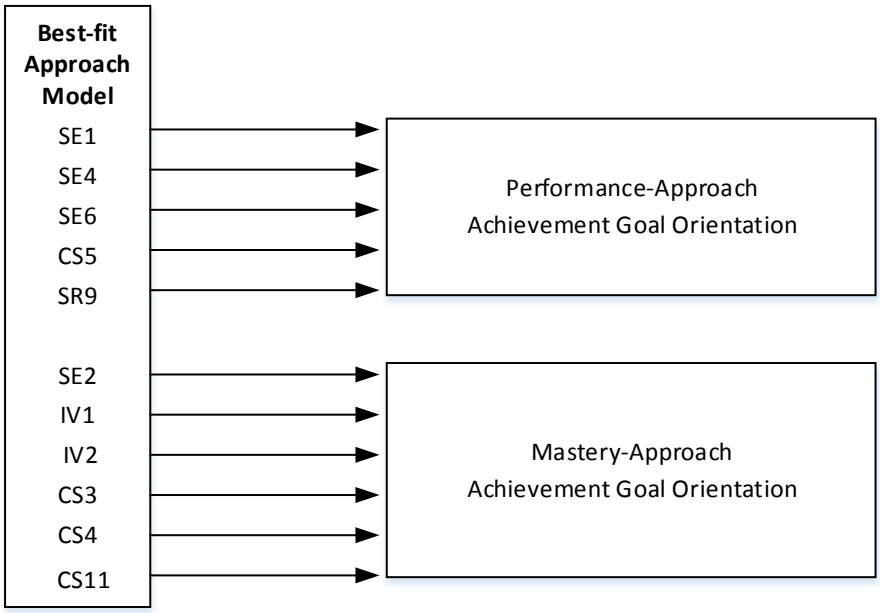

Figure 4.4. Distribution of the items in the approach best-fit model into the respective performance or mastery approach orientations.

Six of the MSLQ-based predictors represented mastery-approach type goal conceptualizations in the best-fit approach model, as shown in Figure 4.4. The descriptions of these predictor items contained the components that satisfied the definitions of the mastery-approach type goals provided in the literature. These conceptualizations focus on learning and skill development ranging from interest to curiosity to improvement to fulfillment of one's potential (Hullman et al., 2010). The predictors SE2 and IV1 represented strivings for developing competence. The former conceptualized mastery-approach as an intrapersonal goal of self-improvement (*I'm certain I can understand the ideas taught in this course;* Elliot, 1999) and the later represented a mastery approach goal driven by challenge and curiosity (*I prefer class work that is challenging so I can learn new things;* Elliot & Church, 1997; Midgley et al., 1998). The items IV2 and CS4 conceptualized the approach strivings as task-mastery (*It*

is important for me to learn what is being taught in this class; Barron & Harackieweicz, 2001) and self-mastery *(I always try to understand what the teacher is saying even if it doesn't make sense*; Elliot & McGregor, 2001) respectively. The end result of strivings in both the items was same (i.e. learn or understand) but the IV2 predictor had the learning task itself as its goal while the CS4 predictor had the goal of intrapersonal improvement or potential attainment (Hullman et al., 2010). The final two items in the model CS3 (*When I study I put important ideas into my own words*) and CS11 (*I outline the chapters in my book to help me study*) represented learning as their goal. Both the items represented mastery approach goal as active strivings toward development and growth of one's competence, or increase of ability (Grant & Dweck, 2003).

A scale-wise composition of the best-fit model indicated that four of the MSLQ-based predictor items came from the MSLQ self-efficacy scale, four from the MSLQ cognitive-strategy scale, two from the MSLQ intrinsic-value scale, and one from the MSLQ self-regulation scale (SR9). Three of the MSLQ self-efficacy predictors (SE1, SE4, and SE6) represented the performance-approach achievement goal orientation and one item (SE2) represented the mastery-approach. From the MSLQ cognitive-strategy scale, one predictor (CS5) represented the performance-approach goal and three (CS3, CS4, and CS11) mastery-approach. Both the MSLQ intrinsic-value items represented the mastery-approach achievement goal orientation, while the self-regulation item represented the performance-approach, as shown in Figure 4.5.

Approach Orientation Model	
Mastery Approach Items	**Performance Approach Items**
SE2	SE1
	SE4
	SE6
IV1	
IV2	
CS3	CS5
CS4	
CS11	
	SR9

Figure 4.5. MSLQ-scales wise distribution of the items in the best-fit approach model into the respective performance- or mastery-approach orientations.

Finally, I compared the best-fit approach model with the best-fit mastery-approach model (i.e., hypothesis H1 model) and the best-fit performance approach model (hypothesis H2 model), as shown in Figure 4.6.

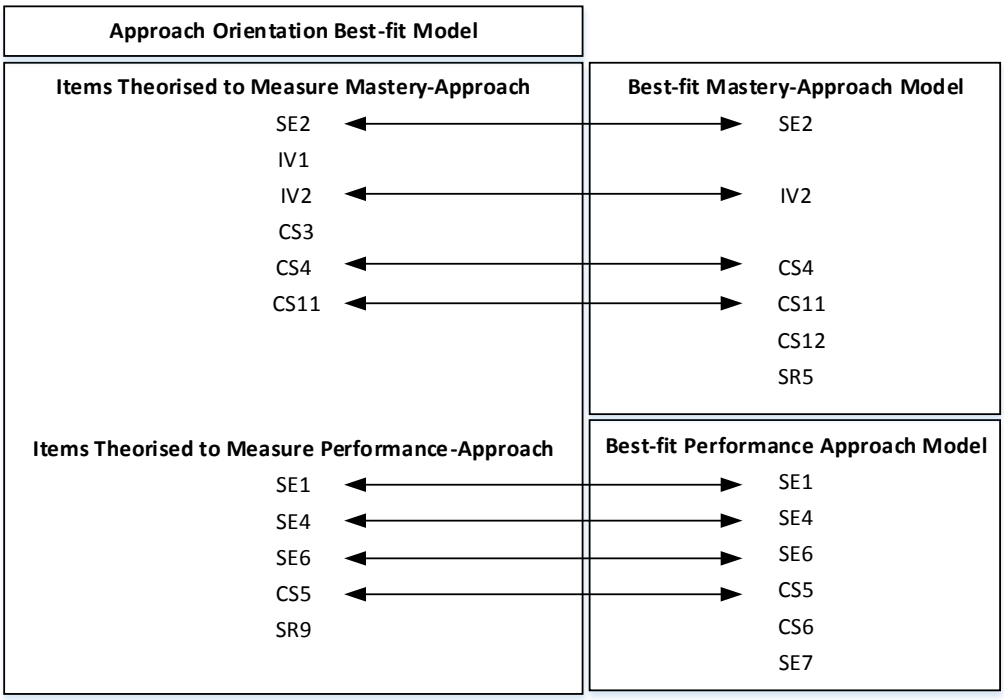

Figure 4.6. One-to-one mapping between the **items appearing in the approach best-fit model, and the corresponding performance-approach and the mastery-approach best-fit models.**

The analysis revealed that all the predictors, which represented the performance type goals in the best-fit approach model, appeared in the best-fit performance-approach model except for SR9. Further review of the description of the SR9 item revealed that the item explicitly contained an approach element of striving to achieve a good grade (*I work hard to get a good grade even when I don't like a class*). This type of goal striving had been used in the literature to measure the performance-approach goal orientations. It was expected that the SR9 item could measure both the overall approach goal orientation as well as the performance-approach goal orientation. However, exclusion of the item from the best-fit performance-approach model could mean that the performance-oriented students might inhibit their achievement aspirations in a learning environment they perceive as not likeable. On the other hand, the striving to achieve a goal under any situation also represented a focus on competence development (Elliot & Church, 1997), which is attributed to the mastery-approach orientation. The SR9 item thus might have measured the goal pursuits of the mastery-approach oriented students as well, which explained the inclusion of the predictor in the best-fit approach model and not in the best-fit performance-approach model.

From the MLSQ predictor items theorized to represent the mastery-approach goal strivings in the best-fit approach model, four appeared in the best-fit mastery-approach model as well, see Figure 4.6. Two items – IV1 and CS3 – did not appear in the mastery-approach best-fit model. The IV2 item was an intrinsic-value motivational item which was designed to measure value beliefs of students. The objective of goal pursuit in this item was to learn new things, and the reason for this pursuit was preferring a challenging work (i.e., *I prefer class work that is challenging so I can learn new things*). The preference for a challenging task was associated with intrinsically motivated mastery-approach students (Ames, 1992; Lepper, Corpus, & Iyengar, 2005; Pintrich & Garcia, 1991). However, the appearance of the item in the approach best-fit model only suggested that the performance oriented students might prefer challenging learning tasks as well. Further, past research had shown that the preference for a challenging task could also be caused by cognitive abilities or some other factors, besides intrinsic motivation (Dweck, 1986). Thus, the IV2 item might have measured challenge preferences mediated by factors other than the intrinsic value. The CS3 item was supposed to measure students' use of cognitive-strategies (*When I study I put important ideas into my own words*). Specifically, putting ideas into own words indicated students'

use of elaboration strategy (e.g. paraphrasing, summarizing) – also categorized as a deep-learning strategy (Pintrich, 1991). The use of deep learning strategies was positively associated with mastery-approach orientation. But the appearance of the item in the approach best-fit model only indicated that learners with performance-approach orientation tend to engage in the deep-processing strategies as well. The use deep learning strategies by performance oriented students is suggested in research literature previously (e.g., Senko, Hulleman, & Harackiewicz, 2011). These results further suggests that the strategy of putting ideas in one's own words is used regardless of whether a student's goal is performance or mastery. Approach in general is characterized by setting goals, and the mastery or performance modifier outlines the intention in setting those goals. However learning is key in either case. Since putting key ideas in one's own words is common between mastery and performance, it enforces the idea that this might be an effective strategy for learning. Similarly, the IV1 item (*I prefer class work that is challenging so I can learn new things*) also describes a fundamental aspect of approach, where learning takes place through setting and achieving goals. It hints that more difficult goals are more enjoyable to achieve.

4.1.2.6. Hypothesis H6

For hypothesis H6, the regression and AICc analyses were conducted to identify the minimum set of items for the theorized MSLQ-based avoidance goals scale that could best predict the AGQ avoidance goals. The MSLQ-based avoidance scale was constructed by combining the items from the theorized MSLQ-based mastery-avoidance and performance-avoidance scales. The regression model containing all the items explained 7.5% of the variance (R^2 = .38, F(8,338) = 3.446, p < .001). The AICc best-fit analysis suggested that the AGQ avoidance goal orientation could be best predicted by five items shown in Table 4.5. The regression analysis revealed that the five predictors explained 7.4% of the variance (R^2 = .074, F(5,341) = 5.496, p < .001). Individual contributions of the item TA3 (β = .09, t(341) = 2.285, p < .05) was statistically different from non-zero. The contributions of other items were TA1 (β = .06, t(341) = 1.709, p = .088), TA4 (β =-05, t(341) =-1.564, p = .118), CS2 (β = .06, t(341) = 1.486, p = .154) and SR7 (β = .05, t(341) = 1.486, p = .132) were small and not statistically different from zero. The internal consistency of the best-fit MSLQ avoidance scale was good with Cronbach's alpha coefficient value .83.

Table 4.5. MSLQ items included in the best-fit regression models which predicted the AGQ avoidance goal orientations.

Id	Item	*β*
TA1 (M)	I am so nervous during a test that I cannot remember facts I have learned.	.06
TA3 (M)	I worry a great deal about tests.	**.09**
TA4 (P)	When I take a test I think about how poorly I am doing.	-.05
CS2 (P)	It is hard for me to decide what the main ideas are in what I read.	.06
SR7 (P)	I find that when the teacher is talking I think of other things and don't really listen to what is being said.	.05

The avoidance achievement goal orientations are viewed as strivings that focused on the avoidance of negative outcomes such as: (1) performing poorly, doing poorly compared with others (performance avoidance); and (2) being unable to master an activity, failing to learn or develop skills, losing previously acquired skills (mastery avoidance) (e.g., Baranik et al., 2007; Bonney, 2006; Elliot, 1994, 2008; Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001; Elliot & Murayama, 2008; Urdan & Mestas, 2006). All the items appearing in the best-fit avoidance model represented the conceptualizations identified in the definitions of avoidance goals in the literature, with couple of exceptions. Two predictors represented the mastery-avoidance type conceptualizations, and three of the predictors represented the performance-avoidance type goal conceptualizations, as shown in Figure 4.7.

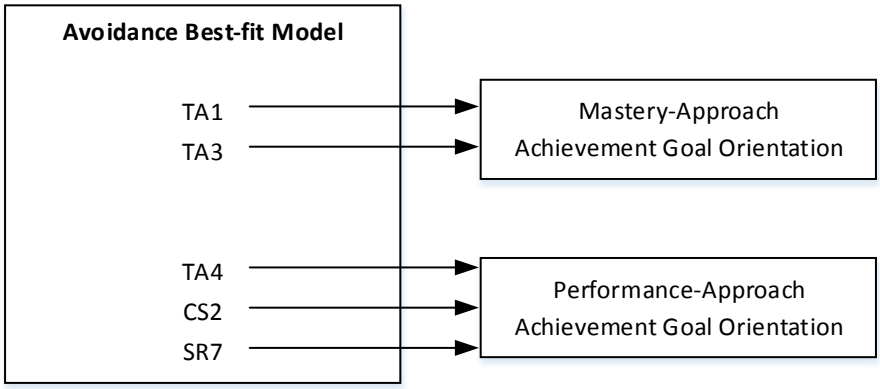

Figure 4.7. Distribution of the items in the approach best-fit model into respective performance- or mastery-approach orientations.

Both the predictors representing the mastery-avoidance achievement goal orientation belonged to the MSLQ test-anxiety scale and tapped nervousness and worries typically associated with mastery-avoidance students (Elliot & McGregor, 2001).

Of the performance-avoidance goal predictors, TA4 represented a negative affect about performing poorly (Elliot & McGregor, 2001). The CS2 item did not contain a goal specific language though it might be interpreted as representing shallow processing strategies or work-avoidance (i.e., doing as little work as is necessary; Pieper, 2009) which was associated with performance-avoidance type goals (Harackiewicz et al, 1997; Meece et., al., 1988; Pieper, 2009). The SR7 item inquired about students' active listening, attentiveness, or self-regulation practices in the class. This item, however, did not conceptualized self-regulation in terms of goal specific language.

A scale-wise composition of the best-fit model indicated that three of the predictor items came from the test-anxiety scale (TA1, TA3, and TA4), one from the cognitive-strategy scale (CS2), and one from the self-regulation scale (SR7). Test-anxiety predictors TA1 and TA3 represented the mastery-avoidance goals and TA4 represented performance-avoidance. But a single item from cognitive-strategy scale (CS2) and self-regulation scale each (SR7) represented the performance-avoidance goal, as shown in Figure 4.8.

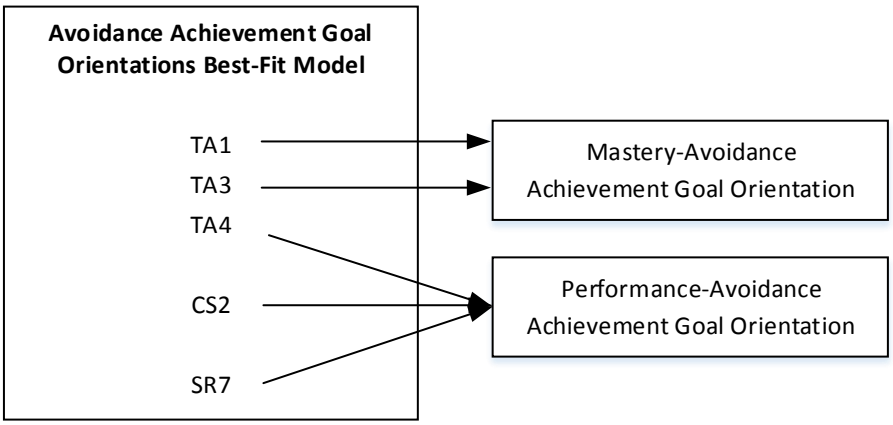

Figure 4.8. Scale-wise breakdown of the MSLQ items in the avoidance best-fit model into respective performance or mastery avoidance orientations.

Finally, I compared the best-fit avoidance model with the best-fit mastery-avoidance model (i.e., hypothesis H3 model) and the best-fit performance avoidance

model (hypothesis H4 model), as shown in Figure 4.9. The analysis revealed that all the predictors which represented the mastery goals in the best-fit avoidance model, appeared in the best-fit mastery-avoidance.

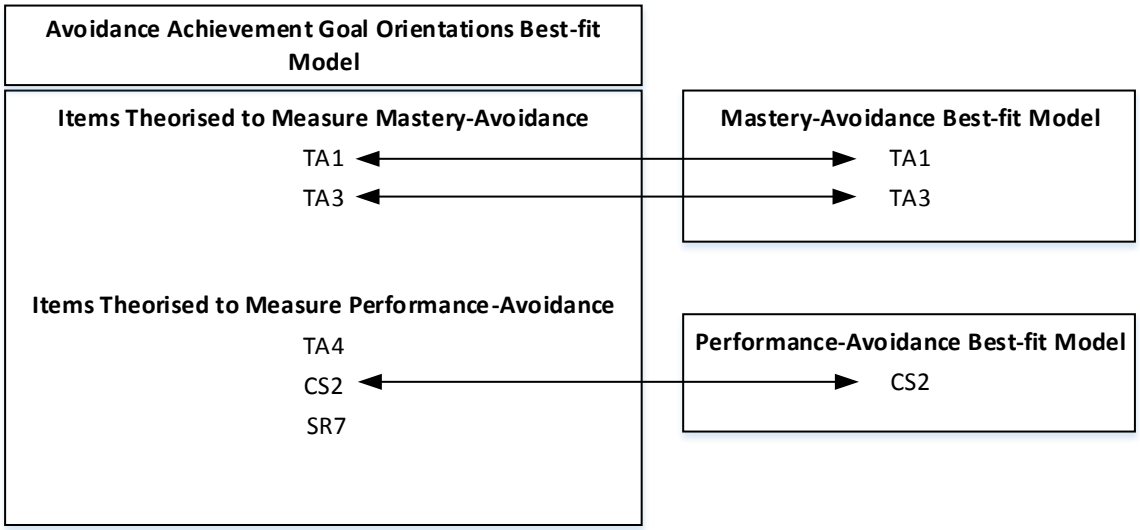

Figure 4.9. One-to-one mapping between items appearing in the avoidance achievement goal orientation best-fit model, and corresponding mastery- and performance-avoidance best-fit models.

From the items theorized to predict the performance-avoidance goal strivings in the avoidance achievement goal orientations best-fit model, Figure 4.9, one item (CS2) appeared in the performance-avoidance best-fit model as well. However, two of the items, TA4 and SR7, emerged in the overall avoidance model but did not appear in the performance-avoidance best-fit model. The TA4 test-anxiety item was designed to measure negative affect about performing poorly (Elliot & McGregor, 2001) and the self-regulation item SR7 measured students' lack of active attentiveness in the class. Both the TA4 and the SR7 may be explained by the CS2. The CS2 describes a student's inability to distinguish the main ideas in text. Similarly, the TA4 and SR7 also describe a student's inability to distinguish the main task at hand from low priority activities. The similarities between these items may explain why TA4 and SR7 appear in the general avoidance model, but not in the performance avoidance model that includes CS2.

4.1.3. Summary of Confirmatory Results

A summary of confirmatory results is listed in this section. In total, 15 MSLQ items were found to predict four achievement goal orientations. These items are grouped

into predicted achievement goal orientations. Six items comprising from all but text-anxiety MSLQ scale predicted the AGQ mastery-approach achievement goal orientation. The performance-approach achievement goal orientation was best predicted by six MSLQ items comprising from the self-efficacy and cognitive strategy use scales. Two test-anxiety items predicted the mastery-avoidance achievement goal orientation, whereas a single item from the cognitive strategy use appeared to predict the AGQ performance-avoidance achievement goal orientation. The items are shown in Table 4.6.

Table 4.6. A summarized model of MSLQ items that best predicted each achievement goal orientation based on confirmatory analysis.

Id	Item
	Mastery-Approach Achievement Goal Orientation
SE2	I'm certain I can understand the ideas taught in this course.
IV2	It is important for me to learn what is being taught in this class.
CS4	I always try to understand what the teacher is saying even if it doesn't make sense.
CS11	I outline the chapters in my book to help me study.
CS12	When reading I try to connect the things I am reading about with what I already know.
SR5	Before I begin studying I think about the things I will need to do to learn.
	Performance-Approach Achievement Goal Orientation
SE1	Compared with other students in this class I expect to do well.
SE4	Compared with others in this class, I think I'm a good student.
SE6	I think I will receive a good grade in this class.
SE7	My study skills are excellent compared with others in this class.
CS5	When I study for a test I try to remember as many facts as I can.
CS7	When I study for a test I practice saying the important facts over and over to myself.
	Mastery-Avoidance Achievement Goal Orientation
TA1	I am so nervous during a test that I cannot remember facts I have learned.
TA3	I worry a great deal about tests.
	Performance-Avoidance Goal Orientation
CS2	It is hard for me to decide what the main ideas are in what I read.

4.2. Exploratory Approach Results

4.2.1. Self-Efficacy Items versus AGQ Achievement Goal Orientations

A canonical correlation analysis was conducted, using nine Self-Efficacy items of the MSLQ instrument as predictors of six achievement goal orientations. The analysis yielded six canonical correlation functions (F_1, F_2 … F_6). Each function yielded a pair of *canonical variates:* one for a predictor set of variables (labelled as *SE Canonical Variate)* and other for a criterion set of variables (labeled as *AGQ Canonical Variate*). A general form of these variates is shown in equations 1 and 2. Coefficient β is a relative contribution of the observed variable in the weighted sum of respective variate. The values of coefficient β were computed to maximize the correlation between the two canonical variates.

Predictor canonical variate for $F_n = \beta_{pn1} SE_1 + \beta_{pn2} SE_2 + \ldots + \beta_{pn9} SE_9$

Equation (1)

Criterion Canonical Variate for $F_n = \beta_{cn1} AGQ_1 + \beta_{cn2} AGQ_2 + \ldots + \beta_{cn6} AGQ_6$

Equation (2)[6]

The maximized canonical correlations R_c between the MSLQ self-efficacy (SE) and AGQ variates for each of the six functions were 0.563, 0.391, 0.217, 0.185, 0.122 and 0.043 respectively. The presence of canonical correlation between the two variates indicated a linear relationship between our measurements on the SE and AGQ variable sets. This further implied that our measurements on the self-efficacy items and achievement goals orientations were not independent of one another. The squared canonical correlations values, which represented the amount of shared variance between the canonical variates for each successive function (Sherry & Henson, 2005) were 31.7%, 15.3%, 4.7%, 3.4%, 1.5% and 0.2%.

Collectively, the full model across all functions was statistically significant using Wilks's λ = .524 criterion, $F(54, 1697.47) = 4.247$, $p < .001$. Because Wilks's λ also represents the variance unexplained by the model, $1 - \lambda$ yields the full model effect size

[6] The subscripts p and c stand for predictor and criterion respectively. The function F2 maximizes the correlation for the variance unexplained by the Function F1, and so on. Thus, the six canonical correlation functions were mutually orthogonal to each other and had no linear relationship among them.

in the r^2 metric (Nimon, Henson, & Gates, 2010). For the set of six canonical functions (i.e. functions F_1 to F_6) the r^2 type effect size was .476. This effect size indicates that the full model explained a substantial portion of the shared variance, about 47.6%, between our predictor and criterion variable sets.

The second canonical model comprising of functions F_2 to F_6 was also statistically significant using Wilks's λ = .767 criterion, $F(40, 1454.31) = 2.282$, $p < .001$, $r^2 = .233$. The second model explained 23.3% of the shared variance, between the second predictor and criterion variable sets. The remaining models (comprised of functions F_3 to F_6, F_4 to F_6, and F_5 to F_6) were not statistically significant. Finally, the function F_6, which was tested in isolation, did not explain a statistically significant amount of shared variance between the variable sets either, $F(4, 337) = .153$, $p = .961$. Accordingly, the discussion focused on the first two canonical functions.

Table 4.7 presents the standardized canonical function coefficients (β) and structure coefficients ($\boldsymbol{r_s}$) for Function 1. Also given are the squared structure coefficients, adequacy coefficient, redundancy index (R_d) and canonical commonality. The adequacy coefficient was an average of all predictor/criterion squared structure coefficients and indicated how well "a canonical variate represents the variance of the original variables in a domain" (Thompson. 1980, p.10), was for the variables in one set with respect to one function. The redundancy index explained the amount of variance in criterion canonical variate explained by the predictor canonical variate and vice versa. The commonality analysis partitioned the variance explained by the squared canonical correlation into unique and common contributions of predictor and criterion variables.

4.2.1.1. Function 1

The standardized function coefficients β for Function 1 revealed that other approach variable OAP (-.587) received a relatively large credit in making-up the first criterion variate. It should be noted that the minus sign is arbitrary and does reflect the negative relationship as the scale can be reversed when all coefficients are so signed. The function coefficients of the remaining five criterion variables TAP, SAP, TAV, SAV and OAV were relatively modest between -.102 and -.178. The structure coefficient analysis revealed that the OAP had the highest usefulness in the model with a value of -.898. The remaining five criterion variables also indicated a primary usefulness in the

model with relatively high coefficient values. But the low function coefficient values of these five criterion variables combined with relatively high structure coefficients suggested that these variables contributed little unique variance to the canonical effect (Nimon, Henson, & Gates, 2010).

Table 4.7. Canonical solution for self-efficacy items predicting achievement goals for Functions 1 and 2.

	Function 1			Function 2		
	β Coef [a]	**r_s [b]**	**rs^2 (Total) [c]**	**β Coef [a]**	**r_s [b]**	**rs^2 (Total) [c]**
Dependent variables						
TAP - Task Approach	-0.109	-0.643	41.34	-0.335	-0.461	21.25
SAP - Self Approach	-0.135	-0.599	35.88	**-0.585**	-0.676	45.70
OAP - Other Approach	**-0.587**	**-0.898**	**80.64**	**0.826**	**0.405**	16.40
TAV - Task Avoidance	-0.102	-0.695	48.30	0.101	-0.289	8.35
SAV - Self Avoidance	-0.178	-0.735	54.02	-0.334	-0.436	19.01
OAV - Other Avoidance	-0.149	-0.807	65.12	-0.001	0.076	0.58
Adequacy Coefficient			54.22			18.55
Rd (DV Set)			17.19			2.84
R_c^2 (%)			**31.70**			**15.29**
Rd (IV Set)			13.15			1.58
Adequacy Coefficient			41.47			10.32
Independent variables						
SE1 - Self Efficacy 1	**-0.503**	**-0.811**	65.77	0.435	0.401	16.08
SE2 - Self Efficacy 2	-0.133	-0.544	29.59	-0.371	-0.421	17.72
SE3 - Self Efficacy 3	0.005	-0.635	40.32	0.126	-0.004	0.00
SE4 - Self Efficacy 4	**-0.333**	**-0.775**	60.06	-0.239	-0.055	0.30
SE5 - Self Efficacy 5	-0.044	-0.635	39.82	-0.194	-0.185	3.42
SE6 - Self Efficacy 6	-0.206	-0.688	47.33	-0.185	-0.241	5.81
SE7 - Self Efficacy 7	-0.070	-0.507	25.70	0.513	0.495	24.50
SE8 - Self Efficacy 8	0.121	-0.458	20.98	0.488	0.358	12.82
SE9 - Self Efficacy 9	**-0.173**	-0.661	43.69	-0.422	-0.350	12.25

[a] Relative contribution of observed variable in the weighted sum of a variate.

[b] Independent contribution of observed variable to respective predictor or criterion variate.

[c] Percentage of shared variance between the observed variable and variate.

This conclusion was supported by the commonality analysis, which revealed that unique variance effects of TAP, SAP, TAV, SAV and OAV in making up the criterion

variate were only 0.60%, 0.93%, 0.00%, 0.00% and 0.20% respectively. On the other hand, the unique contribution of OAP was 17.20%. The percentage of total shared variance between each criterion variable and its variate as computed by the squared structure coefficients (r_S^2) also supported the above conclusions. The total (unique plus common) shared variance of OAP was also the largest (80.64%) among the criterion variables. The total variance of the remaining five variables were TAP 41.34%, SAP 35.88%, TAV 48.30%, SAV 54.02%, and OAV 65.12%. The fact that AGQ criterion variables collectively contributed more than 100% of variance to the AGQ canonical variate, was an indication that some of the variance they accounted for was commonly explained by the variables. The redundancy index value suggested that a proportion of the self-efficacy (predictor) variance accounted for by the AGQ (criterion) variance was 17.19%. Furthermore, all criterion structure coefficients had the same sign, indicating that they were all positively related.

For the predictor set of variables the standardized function coefficients (β) revealed that self-efficacy items SE1 (-.503) and SE4 (-.333) received large credits in making-up the first predictor variate. The coefficients of items SE6 (-.206) and SE9 (-173) were substantial but the remaining self-efficacy items had relatively low β values. These results were supported by the structure coefficients as both SE1 (-.811) and SE4 (-.775) had relatively high values indicating that these two self-efficacy items contributed heavily to the weighted sum of the first predictor canonical variate. The moderate to high structure coefficient values of the remaining seven self-efficacy items (SE2, SE3, SE5, SE6, SE7, SE8 and SE9) suggested their usefulness in the model. But the canonical commonality analysis revealed that the unique contributions of some of these items were relatively low SE2 (1.01%), SE3 (0.00%), SE5 (0.10%), SE7 (0.34%), and SE8 (0.93%). The unique contributions of SE1 (16.85%) and SE4 (6.65%) were the largest among the predictor variables, followed by the two items SE6 (2.30%) and SE9 (1.50%). These analysis suggested that the self-efficacy items SE1 (*Compared with other students in this class I expect to do well*) and SE4 (*Compared with others in this class, I think I'm a good student*) were the primary contributors to the predictor canonical variate, with secondary contributions from SE6 (*I think I will receive a good grade in this class*) and SE9 (*I know that I will be able to learn the material for this class*). To further examine the role of SE6 and SE9 in the model, multiple linear regression was performed along with moderator and mediator analyses.

An examination of moderator and mediator effects of the SE6 and SE9 items on the predictors SE1 and SE4 revealed no statistically significant effects. The multiple regression model containing two primary predictors SE1 and SE4, and one outcome variable OAP explained 25.2% of the variance (R^2 = .257, F(2,344) = 58.08, p < .001). Addition of predictor SE6 in the model further explained 1.3% of variance (R^2 = .265, F(3,343) = 41.235, p < .001), whereas inclusion of SE9 caused a small change of 0.1% in the R^2 value (R^2 = .266, F(4,342) = 31.01, p < .001). The AICc best-fit regression analysis also identified that amongst SE1, SE4, SE6 and SE9 a three-variable model containing SE1 (β = .38, t(343) = 7.066, p < .001), S4 (β = .14, t(343) = 2.607, p < .01), and SE6 (β = .16, t(343) = 2.625, p < .01 predicted the *other approach* goal orientation best. I, therefore, included SE6 as a predictor in the model and excluded SE9. This conclusion was supported by the squared structure coefficients (R_s^2) values of SE1 (65.77%), SE4 (60.06%) and SE6 (47.33%) showing a high percentage of shared variances between self-efficacy items and their predictor variates. Given that these self-efficacy items collectively contributed more than 100% of variance to the predictor canonical variate, it was an indication that some of the variance they accounted for is commonly explained by both the variables. The signs of structure coefficients for all the predictor variables were same as for the criterion variables showing that the self-efficacy items were directly related to achievement goals orientation. Looking at the above results of Function 1, it was evident that the self-efficacy items SE1, SE4 and SE6, and the OAP achievement goal orientation were primary contributors in the formation of their respective canonical variates, as shown in Table 7.

4.2.1.2. Function 2

The standardized function coefficients β for Function 2 (Table 4.7 above) revealed that other approach variable OAP (.826) received a relatively large credit in making-up the second criterion variate, followed by the SAP (-.585). The function coefficients of TAP (-.335) and SAV (-.344) were moderate, but the remaining two criterion variables TAV (.101) and OAV (-.001) had relatively modest or negligible values respectively. The structure coefficient analysis revealed that the SAP (-.676) had the highest usefulness in the model along with TAP (-.461). The low function coefficient values of TAP and SAP criterion variables combined with relatively high structure coefficients suggested that these variables might be contributing a little unique variance to the canonical effect (Nimon, Henson, & Gates, 2010). The structure coefficients of all

the avoidance type variables (TAV, SAV, and OAV) were below the primary usefulness threshold 0.45 and were excluded from further review. The structure coefficient of OAP (.405) was also marginally below the primary threshold but due to its large value of function coefficient it was retained for further analysis. The redundancy index value suggested that a proportion of the self-efficacy (predictor) variance accounted for by the AGQ (criterion) variance was 2.84%.

For the predictor set of variables the standardized function coefficients (*β*) revealed that self-efficacy items SE7 (.513), SE8 (.488), SE1 (.435), SE9 (-.422), and SE2 (-.371) received large credits in making-up the first predictor variate. The coefficients of the remaining four items had relatively low *β* values, below -.239. The structure coefficient analyses revealed that only SE7 (.495) had a value above the .45 usefulness threshold. All other items including SE8 (.358), SE1 (.401), SE9 (-.350) and SE2 (-.421) had the usefulness below the threshold level. These analyses, thus, suggested that the self-efficacy items SE7 (*My study skills are excellent compared with others in this class*) was primary contributor to the second predictor canonical variate. Further, looking at the Function 2 results, it was evident that the self-efficacy item SE7 and the OAP achievement goal orientation were primary contributors in the formation of their respective canonical variates. The sign of the SE7 structure coefficient was same as for the criterion variable OAP showing that the self-efficacy item was directly related to achievement goals orientation. Combined results of Function 1 and Function 2 indicated that four self-efficacy items could predict the performance-approach achievement goal orientation of college students in this study. These four predictor items are presented in Table 4.8.

Table 4.8. MSLQ self-efficacy items best predicting the AGQ performance-approach goal orientation.

Id	Item	SE Items Best Predicting Performance Approach (β)
Function 1 Result		
SE1	Compared with other students in this class I expect to do well.	.38
SE4	Compared with others in this class, I think I'm a good student.	.14
SE6	I think I will receive a good grade in this class.	.16
Function 2 Result		
SE7	My study skills are excellent compared with others in this class.	.13

The AICc best-fit regression analysis identified that a four-variable predictor model explained 28% of performance-approach variance with four-item model (R^2 = .280, $F(4,342) = 33.19$, $p < .001$), SE1 ($\beta = .32$, $t(342) = 6.000$, $p < .001$), S4 ($\beta = .11$, $t(342) = 1.949$, $p = .052$), SE6 ($\beta = .13$, $t(342) = 2.295$, $p < .05$), and SE7 ($\beta = .13$, $t(342) = 2.633$, $p < .01$). The four-item model improved the predictive power by 1.5% over the three-item model identified in Function 1.

The canonical correlations analysis between the MSLQ self-efficacy items and the achievement goal orientation scales thus revealed a four-item model that predicted the performance-approach achievement goal orientation. The internal consistency Cronbach's alpha coefficient value of the four-item scale was .69. The identified model could measure students' performance-approach goal orientations as defined by their desire to perform better and to be judged favorably by others as discussed below.

A linguistic review revealed presence of competition and appearance goal components in the item statements, e.g., compared with others, doing well, or thinking good (Urdan & Mestas, 2006). A competition typically represents a normative or social comparison, whereas an appearance goal is characterized by individuals' desire for validation of their ability by others (Grant, & Dweck, 2003). Grant and Dweck (2003) labeled combined *normative comparison* and *ability validation* as the normative ability. The three items thus measured the normative ability of students. The fourth item SE6 represented a *performance* goal focused on attaining a positive outcome, such as a good grade (Grant, & Dweck, 2003). All the items together measured either the normative ability or the outcome goals of students, which collectively represented the performance-approach goal orientation (Elliot, 1999, 2005, 2010; Elliot, McGregor & Gable, 1999; Hullman et al., 2010).

4.2.2. Intrinsic Value Items versus AGQ Achievement Goal Orientations

A canonical correlation analysis between the MSLQ intrinsic value (IV) items and the AGQ achievement goal orientations yielded six canonical correlation functions. The maximized canonical correlations R_c between the IV and AGQ variates, for each of the six functions, were 0.463, 0.235, 0.170, 0.155, 0.120, and 0.038 respectively. The presence of canonical correlation between the two variates indicated a linear relationship

between our measurements on the IV and AGQ variable sets. The squared canonical correlations values, which represented the amount of shared variance between the canonical variates for each successive function (Sherry & Henson, 2005), were 21.4%, 5.5%, 2.9%, 2.4%, 1.4%, and 0.1%. Collectively, the full model across all functions was statistically significant using the Wilks's λ = .692 criterion, $F(54, 1697.47) = 2.345$, $p < .001$. Because Wilks's λ also represents the variance unexplained by the model, $1 - \lambda$ yields the full model effect size in an r^2 metric (Nimon, Henson, & Gates, 2010). For the set of six canonical functions (i.e. Functions 1 to 6) the r^2 type effect size was 0.308. This effect size indicated that the full model explained a substantial (30.8%) portion of the shared variance between our predictor and criterion variable sets. Rest of the models (comprising of Functions 2 to 6, 3 to 6, 4 to 6, and 5 to 6) were not statistically significant. Finally, Function 6, which was tested in isolation, did not explain a statistically significant amount of shared variance between the variable sets either, ($F(4, 343) = .031$, $p = .998$). Accordingly, the discussion focuses on the first canonical function only. Table 8 presents the standardized canonical function coefficients (β) structure coefficients ($\underline{r_s}$) for Function 1. Also given are the squared structure coefficients, adequacy coefficient, redundancy index (R_d) and canonical commonality.

The standardized function coefficients β for Function 1 revealed that task approach variable TAP (-.465) and self-approach SAP (-.385) received relatively large credits in making-up the first criterion variate, Table 4.9. The self-avoidance SAV and other avoidance OAV variables showed modest contributions with β values -.200 and -.192 respectively. The function coefficients of OAP (-.04) and TAV (-.007) were low. The structure coefficient analysis indicated that both TAP and SAP had the highest usefulness in the model with r values -.869 and -.950. The SAV (-.792) and TAV (-.737) criterion variables had the next highest usefulness in the model, followed by OAV (-.606) and OAP (-.481).

The relatively low function coefficient values (below .45) of SAV, TAV, OAV and OAP criterion variables combined with relatively high structure coefficients suggested that these variables contributed a little unique variance to the canonical effect (Nimon, Henson, & Gates, 2010). This conclusion was supported by the commonality analysis, which revealed that the unique variance effects of SAV (1.51%), TAV (0.04%), OAV (0.00%) and OAP (0.19%) in the making up of the criterion variate were relatively low.

Table 4.9. Canonical solution for intrinsic value predicting achievement goals for Function 1 of full model.

	Function 1				
			Variance (%)		
	β [a]	r_s [b]	rs^2 (Total) [c]	Unique	Common
Dependent variables					
TAP - Task Approach	**-0.465**	**-0.869**	75.58	10.86	64.72
SAP - Self Approach	**-0.385**	**-0.850**	72.31	7.53	64.77
OAP - Other Approach	0.061	-0.481	23.14	0.19	22.96
TAV - Task Avoidance	-0.031	-0.737	54.39	0.04	54.35
SAV - Self Avoidance	-0.200	-0.792	62.67	1.51	61.16
OAV - Other Avoidance	-0.192	-0.606	36.73	1.40	35.32
Adequacy Coefficient			54.14		
Rd			11.25		
R_c^2 (%)			**21.44**		
Rd			8.66		
Adequacy Coefficient			40.41		
Independent variables					
IV1 - Intrinsic Value Item 1	-0.091	-0.524	27.47	1.50	26.97
IV2 - Intrinsic Value Item 2	**-0.610**	**-0.932**	86.80	21.38	65.41
IV3 - Intrinsic Value Item 3	**-0.301**	**-0.749**	56.14	5.32	50.82
IV4 - Intrinsic Value Item 4	-0.011	-0.526	27.71	0.05	27.66
IV5 - Intrinsic Value Item 5	-0.081	-0.511	26.09	0.45	25.65
IV6 - Intrinsic Value Item 6	-0.189	-0.569	32.37	3.59	28.78
IV7 - Intrinsic Value Item 7	-0.041	-0.627	39.28	0.32	39.96
IV8 - Intrinsic Value Item 8	0.109	-0.584	34.06	1.50	32.57
IV9 - Intrinsic Value Item 9	-0.070	-0.581	33.75	0.09	33.67

[a] Relative contribution of observed variable in the weighted sum of a variate.
[b] Independent contribution of observed variable to respective predictor or criterion variate.
[c] Percentage of shared variance between the observed variable and variate.

On the other hand, the unique contributions of the criterion variables TAP and SAP were 10.86% and 7.53%, respectively. The percentage of the total shared variance between each criterion variable and its variate as computed by the squared structure coefficients (r_S^2) also supported the above conclusions. The total (unique plus common) shared variance of TAP and SAP were 75.58% and 72.31%. The redundancy index value suggested that a proportion of the intrinsic value (predictor) variance accounted for

by the AGQ (criterion) variance was 11.61%. Furthermore, all criterion structure coefficients, except OAP, had the same sign, indicating that they were all positively related.

For the predictor set of variables, the standardized function coefficients (β) revealed that intrinsic value items IV2 (-.610) and IV3 (-.301) received the largest credits in making-up the first predictor variate. The coefficients of items IV6 (-.189) and IV8 (-.109) were also substantial, but the remaining intrinsic-value items had relatively low *β* values. These results were supported by the structure coefficients, as the IV2 (-.932) and IV3 (-.749) items contributed heavily to the weighted sum of the first predictor canonical variate followed by the IV6 (-.596) and IV1 (-0.524) variables. The structure coefficients of the remaining five items (IV4, IV5, IV7, IV8, and IV9) were greater than .5, which suggested their usefulness in the model. The canonical commonality analysis, however, revealed that the unique contributions of IV4 (.05%), IV5 (0.45%), IV7 (0.32%), and IV9 (.09%) were quite low relative to the highly contributing items IV2 (21.36%), IV3 (5.32%), and IV6 (3.59%). Hence, IV4, IV5, IV7, and IV9 were excluded from further analysis. The unique contributions of IV1 (1.5%) and IV8 (1.5%) were relatively moderate. To further examine the effect of the IV1 and IV8 predictors in the model, a multiple linear regression was performed.

The multiple regression analysis using the AICc best fit analysis revealed that three variables – IV2 (β = .23, t(343) = 5.011, p < .001), IV3 (β = .08, t(343) = 1.983, p < .05), IV6 (β = .08, t(343) = 1.90, p < .059) – best predicted the mastery-approach goal orientation. The model explained 19.19% of the variance (R^2 = .192, F(3,343) = 27.150, p < .001). For the 3 x 2 AGQ self-approach goal orientation, the results of the regression analysis showed the model comprised of three items with IV2 (β = .22, t(343) = 4.147, p < .001), IV3 (β = .08, t(343) = 1.753, p = .083), and IV6 (β = .10, t(343) = 2.057, p < .05) as the best predictors. The full model explained 15.3% of the variance (R^2 = .153, F(3,343) = 20.690, p < .001). Finally, the regression results revealed that only IV2 and IV3 items best predicted the AGQ task-approach goal orientation. The regression model explained 15.1% of the variance (R^2 = .146, F(2,344) = 30.510, p < .001). The IV2 (β = .26, t(347) = 5.189, p < .001) item made statistically significant contributions, while the contribution of IV3 (β = .08, t(344) = 1.857, p = .06) was nearly statistically significant. The above results showed that the IV8 and IV1 items could not enhance the

predictability of the *task approach* and *mastery approach* outcome variables. I, therefore, excluded IV1 and IV8 from further analysis. Table 9 shows the relationship between the predictor and outcomes variables.

These regression analyses suggested that the intrinsic value items IV2 (*It is important for me to learn what is being taught in this class*), IV3 (*I like what I am learning in this class*) and IV6 (*Even when I do poorly on a test I try to learn from my mistakes*) were primary contributors to the predictor canonical variate, Table 4.10. The signs of structure coefficients for all the predictor variables were same as for the criterion variables, except for OAP, showing that the intrinsic value items were directly related to achievement goals orientations. The three-item MSLQ-based intrinsic value model had an internal scale consistency coefficient Cronbach's alpha value .68.

Table 4.10. MSLQ intrinsic-value items best predicting the AGQ task-approach, self-approach, and mastery-approach goal orientations each.

Id	Item	Group of IV Items Best Predicting (β)		
		Task Approach	Self-Approach	Mastery Approach
IV2	It is important for me to learn what is being taught in this class.	.26	.22	.23
IV3	I like what I am learning in this class.	.08	.08	.08
IV6	Even when I do poorly on a test I try to learn from my mistakes.		.10	.08

An examination of the statements of the items suggested that the IV2, IV3, and IV6 represented interest, task and challenge based approach goal components (Hulleman et al., 2010). All the three items showed strivings for learning, developing competence, and task-mastery. The goal strivings in IV2 and IV3 were driven by the intrinsic motivation and task mastery (i.e., to learn what is being taught in the class; Barron & Harackieweicz, 2001; Lepper et al., 2005). The IV6 item conceptualized goal strivings both as mastery challenge and competence development. The end result of strivings in all the items was to learn or develop competence. The descriptions of the three MSLQ intrinsic-value items IV2, IV3 and IV6 thus concluded to represent the mastery-approach goal orientation. The interpretations of the canonical correlation results also revealed that the aforementioned three intrinsic-value items were predictors of the mastery-approach goal orientation, which collectively represented the combined task-approach and self-approach goal orientations of the 3 x 2 AGQ model. Thus, the

results of the linguistic analysis of the items and the interpretations of the canonical correlations analysis both coincided, and supported a model comprising of intrinsic-value items IV2, IV3 and IV6 to best predict the mastery-approach goal orientation.

The canonical correlations and regression analyses results also showed that the three intrinsic value items represented both the task-approach and the self-approach achievement goal orientation equally well. All the three items appeared in the best-fit self-approach model and explained 15.3% of the variance. While, two of the three items (i.e., IV2 and IV3) appeared in the best-fit task-approach model explaining 15.1% of the variance. These results were also supported by the language analysis of the items. All items contained a self-referent (i.e., important for me, or I like, I try to learn from mistakes) which characterized self-approach goal orientation. In contrast the IV2 and IV3 items also included absolute referents for the task itself (i.e., what is being taught in this class, or what I am learning in this class), which epitomized the task-approach achievement goal orientation.

4.2.3. Test Anxiety Items versus AGQ Achievement Goal Orientations

A canonical correlation analysis between the MSLQ test-anxiety (TA) items and the AGQ achievement goal orientations yielded four canonical correlation functions. The maximized canonical correlations R_c between the TA and AGQ variates, for each of the four functions, were 0.283, 0.136, 0.087, and 0.014 respectively. The presence of canonical correlation between the two variates indicated a linear relationship between our measurements on the TA and AGQ variable sets. The squared canonical correlations values, which represented the amount of shared variance between the canonical variates for each successive function (Sherry & Henson, 2005), were 8.1%, 1.8%, 0.7%, and 0.0%.

Collectively, the full model across all functions was statistically significant using the Wilks's λ = .895 criterion, $F(24, 1176.86) = 1.572$, $p < .05$. Because Wilks's λ also represents the variance unexplained by the model, $1 - \lambda$ yields the full model effect size in an r^2 metric (Nimon, Henson, & Gates, 2010). For the set of four canonical functions (i.e. functions 1 to 4), the r^2 type effect size was 0.105. This effect size indicated that the full model explained a substantial (10.5%) portion of the shared variance between our

predictor and criterion variable sets. The rest of the models (comprising of Functions 2 to 4, and 3 to 4) were not statistically significant.

Finally, Function 4, which was tested in isolation, did not explain a statistically significant amount of the shared variance between the variable sets either, ($F(3, 340) = .999$, $p = .995$). Accordingly, the discussion focuses on the first canonical function only. Table 4.11 presents the standardized canonical function coefficients (β) structure coefficients (r_s) for Function 1. Also given are the squared structure coefficients, adequacy coefficient, redundancy index (R_d) and canonical commonality.

Table 4.11. Canonical solution for test-anxiety items predicting the achievement goals.

	Function 1				
			Variance (%)		
	β [a]	r_s [b]	rs^2 (Total) [c]	Unique	Common
Dependent variables					
TAP - Task Approach	-0.002	-0.611	37.33	0.00	37.33
SAP - Self Approach	0.165	-0.478	22.85	1.39	21.46
OAP - Other Approach	-0.296	-0.595	35.40	4.38	31.03
TAV - Task Avoidance	-0.894	-0.967	93.51	35.44	58.07
SAV - Self Avoidance	-0.199	-0.700	49.00	1.50	47.50
OAV - Other Avoidance	0.183	-0.558	31.14	1.27	29.86
Adequacy Coefficient			44.87		
Rd			03.60		
R_c^2 (%)			08.02		
Rd			04.31		
Adequacy Coefficient			53.78		
Independent variables					
TA1 – Test-Anxiety Item 1	-0.554	-0.849	72.08	18.39	53.69
TA2 – Test-Anxiety Item 2	0.033	-0.644	41.47	0.05	41.42
TA3 – Test-Anxiety Item 3	-0.676	-0.892	79.57	24.52	55.05
TA4 – Test-Anxiety Item 4	0.111	-0.400	22.00	0.77	21.23

[a] Relative contribution of observed variable in the weighted sum of a variate.
[b] Independent contribution of observed variable to respective predictor or criterion variate.
[c] Percentage of shared variance between the observed variable and variate.

The standardized function coefficients *β* for Function 1 revealed that task-avoidance variable TAV (-.849) received a relatively very large credit in making-up the first criterion variate. Other-approach (-0.296), self-avoidance (-0.199), other-avoidance (0.183) and self-approach (0.165) also made contributions. The function coefficient of task-approach (-.002) was low. The structure coefficient analysis indicated that the TAV (-.967) had the highest usefulness in the model. TAV (35.44%) also had the largest percentage of the unique variance explained in the model. All other criterion variables also had usefulness in the model with the structure coefficient values ranging from -0.700 (SAV) to -0.558 (OAV). But the relatively low function coefficient values of these criterion variables combined with the relatively high structure coefficients suggested that the variables contributed a little unique variance to the canonical effect (Nimon, Henson, & Gates, 2010). This conclusion was supported by the commonality analysis, which revealed that the unique variance effects of SAV (1.50%), OAV (1.275), SAP (1.39%), TAP (0.00%), and OAP (4.38%) in the making up of the criterion variate were relatively low. The percentage of total shared variance between each criterion variable and its variate, as computed by the squared structure coefficients (r_s^2), also supported the above conclusions. The total (unique plus common) shared variance of TAV was 93.51%. The redundancy index value suggested that a proportion of the test-anxiety (predictor) variance accounted for by the AGQ (criterion) variance was 44.87%. Furthermore, all criterion structure coefficients had the same sign, indicating that they were all positively related.

For the predictor set of variables, the standardized function coefficients (*β*) revealed that test-anxiety (TA) items TA3 (-.676) and TA1 (-.554) received the largest credits in making-up the first predictor variate. The function coefficient of item TA4 (0.111) was relatively modest and it was low for TA2 (.033). These results were supported by the structure coefficients, as the TA3 (-.892) and TA1 (-.849) items contributed heavily to the weighted sum of the first predictor canonical variate followed by the TA2 (-.644) and TA4 (-0.400) variables. The canonical commonality analysis, however, revealed that the unique contributions of TA2 (.05%) and TA4 (0.77%) were quite low relative to the largely contributing items TA3 (24.52%) and TA1 (18.39%). Hence, TA2 and TA4 were excluded from further analysis. These results, therefore, suggested that the test-anxiety items TA3 and TA1 were primary contributors to the predictor canonical variate, as shown in Table 4.12. The best-fit analysis confirmed

these results. A model comprising of items TA3 (β = .10, t(344) = 2.758, p < .01) and TA1 (β = .09, t(344) = 2.326, p < .05) best predicted the task-avoidance goal orientation. A full model explained 7.46% of the variance (R^2 = .075, F(2,344) = 13.87, p < .001).

Table 4.12. MSLQ test-anxiety items best predicting the AGQ task-avoidance, self-avoidance, mastery-avoidance and other-avoidance achievement goal orientations.

Id	Item	Group of TA Items Best Predicting (β)		
		Task Avoidance	Self / Other Avoidance	Mastery Avoidance
TA1	I am so nervous during a test that I cannot remember facts I have learned.	.09		.07
TA3	I worry a great deal about tests.	.10	.10 / .12	.10

Further, the best-fit analysis of the test-anxiety items with the derived AGQ mastery-avoidance goal also revealed that a model comprising of items TA3 (β = .10, t(344) = 2.729, p < .01) and TA1 (β = .07, t(344) = 2.000, p < .05) predicted the mastery-avoidance goal orientation as well. The full model explained 6.55% of the variance (R^2 = .075, F(2,344) = 13.87, p < .001).

As the self-avoidance and the other-avoidance criterion variables also had usefulness in the model with the structure coefficient values ranging from -0.700 and -0.558 respectively. A best-fit regression analysis was conducted with each to further examine the interpretations drawn from the canonical correlations analysis and to identify any predictor items, which might have contributed to their high structure coefficient values. The analysis revealed that the TA3 test-anxiety item predicted the self-avoidance (β = .12, t(345) = 3.420, p < .01) and other-avoidance (β = .10, t(345) = 2.640, p < .05) goal orientations. The item explained 3.28% of the variance in self-avoidance (R^2 = .034, F(1,345) = 11.70, p < .001) and 1.98% of the variance in other-avoidance (R^2 = .020, F(1,345) = 6.97, p < .001), respectively. Overall, the two-item predictor model collectively explained 6.55% of the mastery-avoidance and 7.46% of the task-avoidance variances respectively, with an internal scale consistency or Cronbach's alpha coefficient value of .69.

As mentioned earlier, the mastery-avoidance goal construct is characterized by a focus on avoiding incompetence to master an activity or task, failing to learn, losing previously acquired, or being unable to live up to one's recognized potential (Elliot &

Murayama, 2008; Baranik et al., 2007; Cury, Elliot, Da Fonseca, & Moller, 2006). The TA1 and TA3 predictor items both represented participants' negative feelings about a task. The task used to measure the negative feelings was a "test" in both the items. The language used in both the constructs was similar too. The TA1 construct measured participants' negative feelings of nervousness during the test. While, the negative affect tapped in TA3 was worry. The constructs did not contained a goal specific language, and the outcome-specific reasons for the negative affect about the task were not present either. But the item descriptions specified a task, i.e., test. A task-based striving inherits in itself a standard for evaluating the competence (Elliot, Murayama, & Pekrun, 2011). Individuals engage in a task for evaluating their behavioral accomplishments (Barrett & Morgan, 1995; Elliot, McGregor, & Thrash, 2002; Elliot, Murayama, & Pekrun, 2011). The feelings of anxiety and worry as elicited by the TA1 and TA3 items, thus, could represent participants concerns about their test accomplishments, which subsequently represent their task-avoidance goals. Also, the negative affect (worry, nervousness about the task; Elliot & McGregor, 2001) are typically associated with the mastery-avoidance achievement goal orientation. Hence, the descriptions of both the TA1 and TA3 text-anxiety items contained the components that defined task-avoidance achievement goal orientation, in particular, and the mastery-avoidance achievement goal orientation, in general.

Overall, the results of the linguistic analysis of the items and the interpretations of the canonical correlations analysis both coincided, and supported a model comprising of the TA1 and TA3 test-anxiety items to best predict the mastery-avoidance goal orientation. The items could also predict the task-avoidance goal-orientation achievement goal orientation.

4.2.4. Cognitive Strategy Items versus AGQ Achievement Goal Orientations

The canonical correlation analysis between the MSLQ cognitive strategy (CS) items and the AGQ achievement goal orientations produced six canonical correlation functions. The maximized canonical correlations R_c between the CS and AGQ variates were 0.478, 0.266, 0.245, 0.195, 0.152, and 0.07 respectively. The presence of the canonical correlation between the two variates indicated a linear relationship between our measurements on the CS and AGQ variable sets. The amount of the shared

variance between the canonical variates for each successive function was 22.8%, 7.1%, 6.0%, 3.8%, 2.3%, and 0.5%. The full model across all functions was statistically significant using Wilks's λ = .629 criterion, $F(78, 1814.58) = 2.033$, $p < .001$. The full model effect size r^2 (1-Wilk's λ) for all functions was 0.371. This effect size indicated that the full model explained a substantial portion of the shared variance, about 37.1%, between our predictor and criterion variable sets. The rest of the models (comprising of functions from 2 to 6, 3 to 6, 4 to 6, and 5 to 6) were not statistically significant.

Finally, Function 6, which was tested in isolation, did not explain a statistically significant amount of shared variance between the variable sets either, ($F(8, 333) = .227$, $p = 0.986$). Accordingly, the discussion focuses on the first canonical function only. Table 4.13 presents the standardized canonical function coefficients (β) and structure coefficients (r_s) for Function 1, along with squared structure coefficients, adequacy coefficient, redundancy index (R_d) and canonical commonality are also given.

The standardized function coefficients β for Function 1 revealed that task-avoidance variable TAV (-.492) received a relatively large credit in making-up the first criterion variate along with self-avoidance SAV (-.229) and TAP (-.300). The structure coefficient analysis supported these results as TAV, SAV, and TAP all had the highest usefulness in the model with r_s values -.921, -.811 and -.815 respectively. The SAP (-.707), OAV (-.622) and OAP (-.550) criterion variables had the primary usefulness in the model, but their β value were low -.081, -.021 and -.070, which suggested multicollinearity. This conclusion was supported by the commonality analysis, which revealed that the unique variance effects of SAP, OAV and OAP in the making up of the criterion variate were only 0.6%, 0.4%, and 0.6% respectively. On the other hand, the unique contribution of TAV was the highest 9.2%, followed by TAP 3.8% and SAV 2.4%. It was thus concluded that the TAV criterion variate best represented the task-avoidance goal orientation. The percentage of the total shared variance between each criterion variable and its variate as computed by the squared structure coefficients (rs^2) also supported the above conclusions. The redundancy index value suggested that a proportion of the cognitive strategy (predictor) variance accounted for by the AGQ (criterion) variance was 13%. Furthermore, all criterion structure coefficients, except OAV, had the same sign, indicating that they were all positively related.

Table 4.13. Canonical solution for *cognitive-strategy* items predicting the achievement goal orientations.

	Function 1				
			Variance (%)		
	β [a]	r_s [b]	rs^2 (Total) [c]	Unique	Common
Dependent variables					
TAP - Task Approach	-0.3	-0.815	66.42	4.5071	61.92
SAP - Self Approach	-0.081	-0.707	49.98	0.336	49.65
OAP - Other Approach	-0.07	-0.550	30.25	0.246	30.00
TAV - Task Avoidance	-0.492	-0.921	84.82	10.7287	74.10
SAV - Self Avoidance	-0.239	-0.811	65.77	2.1522	63.62
OAV - Other Avoidance	-0.021	-0.622	38.69	0.0164	38.67
Adequacy Coefficient			55.99		
Rd			12.79		
R_c^2 *(%)*			**22.85**		
Rd			4.91		
Adequacy Coefficient			21.50		
Independent variables					
CS1 - Cognitive Strategy 1	-0.337	-0.670	44.89	7.38	37.51
CS2 - Cognitive Strategy 2	-0.201	-0.370	13.69	3.40	10.29
CS3 - Cognitive Strategy 3	0.267	-0.290	8.41	4.56	3.85
CS4 - Cognitive Strategy 4	-0.305	-0.594	35.28	6.18	29.10
CS5 - Cognitive Strategy 5	-0.427	-0.695	48.30	12.48	35.82
CS6 - Cognitive Strategy 6	-0.170	-0.460	21.16	2.03	19.13
CS7 - Cognitive Strategy 7	0.054	-0.299	8.94	0.19	8.75
CS8 - Cognitive Strategy 8	-0.150	-0.447	19.98	1.67	18.31
CS9 - Cognitive Strategy 9	-0.186	-0.534	28.52	2.14	26.38
CS10 - Cognitive Strategy 10	0.050	-0.234	5.48	0.16	5.32
CS11 - Cognitive Strategy 11	0.236	0.014	0.02	4.32	-4.30
CS12 - Cognitive Strategy 12	-0.171	-0.512	26.21	2.03	24.18
CS13 - Cognitive Strategy 13	0.018	-0.432	18.66	0.02	18.64

[a] Relative contribution of observed variable in the weighted sum of a variate.
[b] Independent contribution of observed variable to respective predictor or criterion variate.
[c] Percentage of shared variance between the observed variable and variate.

For the predictor set of variables the standardized function coefficients (β) revealed that the CS5 (-.427), CS1 (-.337), and CS4 (-.303) cognitive strategy items had the largest credits in making-up the first predictor variate followed by the CS3 (.267), CS11 (.236), and CS2 (-.201) items. The standardized function coefficients of other

items – i.e., CS9 (-.186), CS12 (-.171), CS6 (-.170), CS8 (-.150), CS7 (-.054), CS10 (-.050), and CS13 (-.018) – were low. The function coefficient values of items CS5 (-.695), CS1 (-.670), and CS4 (-.596) as well as items CS9 (-.534), CS12 (-.512), and CS6 (-.460) were greater than 0.450, which suggested their usefulness in the model. The canonical commonality analysis supported the above results as items CS5 (12.48%), CS1 (7.38%), CS4 (6.18%), CS9 (2.14%), CS6 (2.03%), and CS12 (2.03%) showed the largest unique contributions in the model. These items were thus included in the preliminary predictor model. The function coefficients of all other predictor items (i.e., CS2, CS3, CS7, CS8, CS10, CS11, and CS13) were below the secondary level of usefulness (.45) in the model. The unique variances explained by these items were low as well. Hence, the items were excluded from the prediction model. The signs of structure coefficients for these predictor variables were same as for the criterion variables TAP, TAV and SAV except for CS11. This showed that all but the CS11 predictor items in the model were directly related to achievement goals orientations.

The AICc best-fit regression analyses were performed to further examine these relations. The results showed that a three-variable model – based on CS5 (β = .20, t(343) = 4.251, p < .001), CS1 (β = .13, t(343) = 2.885, p < .01), and CS4 (β = .10, t(343) = 2.259, p < .05) – predicted the task-avoidance goal orientation best, as shown in Table 13. All the predictors made statistically significant contributions in the model. The full model explained 15.94% of the variance (R^2 = .159, F(3,343) = 21.68, p < .001). With SAV, the best-fit analysis revealed a four-variable model including CS5 (β = .13, t(342) = 2.756, p < .01), CS1 (β = .13, t(342) = 2.782, p < .01), CS4 (β = .07, t(342) = 1.418, p = .157) and CS9 (β = .09, t(342) = 1.664, p = .097). The full model explained 12.08% of the variance (R^2 = .159, F(3,343) = 21.68, p < .001). For mastery-avoidance goal orientation, the best-fit analysis with a combined TAV and SAV scale also revealed a four-variable model, including CS5 (β = .16, t(342) = 4.037, p < .001), CS1 (β = .13, t(342) = 3.049, p < .01), CS4 (β = .08, t(342) = 1.847, p = .066), and CS9 (β = .07, t(342) = 1.437, p = .151). The full model explained 16.71% of the variance (R^2 = .159, F(3,343) = 21.68, p < .001). Finally, with TAP the regression analysis revealed a relatively weaker model that explained 8.29% of the variance with a four-item model comprising of a different set of predictors which did not make statistically significant contributions - CS5 (β = .09, t(342) = 1.742, p = .824), CS1 (β = .10, t(342) = 1.948, p = .052), CS6 (β = .07, t(342) = 1.934, p = .054) and CS12 (β = .090, t(342) = 1.776, p = .076). Thus, the

canonical correlations results were interpreted to predict the mastery-avoidance goals best using a four-item model comprising of cognitive-strategy items CS1, CS4, CS5, and CS9, as shown in Table 4.14, with an internal scale consistency Cronbach alpha coefficient value of .67.

Table 4.14. MSLQ cognitive-strategy items best predicting the AGQ task-avoidance goal orientation.

Id	Item	Cognitive Strategy Items Predicting (β)		
		Task-Avoidance	Self-Avoidance	Mastery-Avoidance
CS1	When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly.	.13	.13	.13
CS4	I always try to understand what the teacher is saying even if it doesn't make sense.	.10	.07	.08
CS5	When I study for a test I try to remember as many facts as I can.	.20	.13	.16
CS9	When I am studying a topic, I try to make everything fit together.		.09	.07

Besides showing worries for failing to learn or losing previously acquired (Elliot & Murayama, 2008), a mastery-avoidance goal construct is characterized by a focus on avoiding intrapersonal incompetence to master an activity (Baranik et al., 2007), and avoiding being unable to attain one's maximum potential on a task (Cury, Elliot, Da Fonseca, & Moller, 2006). The statements of avoidance-type items generally contained explicit indicators of avoidance behaviour. For instance, these statements typically used words such as avoid or used negative affect, such as worry. But, the four cognitive-strategy predictors of master-avoidance goal orientation in our canonical correlation analysis did not contain any avoidance related goal language or explicit expression of negative affect. However, descriptions of the items contained languages similarities, and the goal components which appeared to tap in avoidance behaviours or elicit negative emotions of students.

4.2.5. Self-Regulation Items versus AGQ Goal Orientations

The canonical correlation analysis between the MSLQ self-regulation (SR) items and the AGQ achievement goal orientations produced six canonical correlation

functions. The maximized canonical correlations R_c between the SR and AGQ variates were 0.395, 0.231, 0.204, 0.145, 0.104, and 0.058 respectively.

The amount of shared variance between the canonical variates for each successive function was 15.6%, 5.3%, 4.2%, 2.1%, 1.1%, and 0.3%. The full model across all functions was statistically significant using Wilks's λ = .739 criterion, (F(54, 1697.47) = 1.919, p < .001). The full model effect size r^2 (1-Wilk's λ) for all functions was .261. This effect size indicated that the full model explained a substantial portion of the shared variance, about 26.1%, between our predictor and criterion variable sets.

The rest of the models (comprising of functions from 2 to 6, 3 to 6, 4 to 6, and 5 to 6) were not statistically significant. Finally, Function 6, which was tested in isolation, did not explain a statistically significant amount of shared variance between the variable sets either, F(4, 337) = .285, p = .888. Accordingly, the discussion focuses on the first canonical function only. Table 4.15 presents the standardized canonical function coefficients (β) structure coefficients (r_s) for Function 1. The squared structure coefficients, adequacy coefficient, redundancy index (R_d), and canonical commonality are also given.

The standardized function coefficients β for Function 1 revealed that the other avoidance variable OAV (-.386) received a relatively large credit in making-up the first criterion variate along with task-approach TAP (-.343) and self-approach SAP (-.312). The structure coefficient analysis supported these results, except that TAP emerged with the highest usefulness in the model with the r value -.818, followed by TAV (-.799), SAP (-.775), and OVA (-.760). The remaining two criterion variables also had a primary usefulness in the making of the criterion variate with the r values for SAV (-.767) and OAP (-.629) but their respective β values were low (i.e., -.016 and -.040, respectively) suggesting multicollinearity. This conclusion was supported by the commonality analysis, which revealed that the unique variance effects of SAV and OAP, as well as TAV in the making up of the criterion variate were only 0.01%, 0.08%, and 0.10% respectively. On the other hand, the unique contribution of TAP, SAP and OAV were relatively high 5.89%, 4.95% and 5.66%, which indicated their highest relevancy in the model.

Table 4.15. Canonical solution for MSLQ *self-regulation* items predicting achievement goals.

	Function 1				
			Variance (%)		
	β [a]	r_s [b]	rs^2 (Total) [c]	Unique	Common
Dependent variables					
TAP - Task Approach	-0.343	-0.818	66.92	5.89	61.03
SAP - Self Approach	-0.312	-0.775	60.09	4.95	55.13
OAP - Other Approach	0.040	-0.629	39.50	0.08	39.42
TAV - Task Avoidance	-0.184	-0.799	63.83	1.49	62.33
SAV - Self Avoidance	0.016	-0.767	58.85	0.01	58.84
OAV - Other Avoidance	-0.386	-0.760	57.79	5.66	52.13
Adequacy Coefficient			57.83		
Rd			9.03		
R_c^2 (%)			**15.61**		
Rd			2.50		
Adequacy Coefficient			17.72		
Independent variables					
SR1 - Self Regulation 1	-0.141	-0.442	19.53	1.43	18.09
$SR2_R$ - Self Regulation 2	-0.231	-0.183	3.35	4.34	- 0.99
SR3 - Self Regulation 3	-0.077	-0.213	4.52	0.48	4.04
SR4 - Self Regulation 4	0.051	-0.381	14.54	0.17	14.37
SR5 - Self Regulation 5	-0.307	-0.497	24.68	7.58	17.11
$SR6_R$ - Self Regulation 6	-0.054	-0.277	7.68	0.14	7.47
$SR7_R$ - Self Regulation 7	-0.175	-0.290	8.42	3.62	6.29
SR8 - Self Regulation 8	0.218	-0.164	2.67	2.06	- 0.96
SR9 - Self Regulation 9	-0.832	-0.861	74.08	53.59	20.49

[a] Relative contribution of observed variable in the weighted sum of a variate.
[b] Independent contribution of observed variable to respective predictor or criterion variate.
[c] Percentage of shared variance between the observed variable and variate.
[R] Reverse coded item.

To narrow down these results further, total contributions of these variables was analyzed. The analysis revealed that TAP had the highest total (66.92%) and shared (61.03%) contributions in the model. The total and shared contributions of OAV was the lowest of the three with respective values of 57.79% and 52.13%. It was thus concluded that the criterion variate represented the task approach goal orientation most. Since the self-approach was close second with a 60.09% total contribution, it was further

concluded that the criterion variate represented the overall mastery goal orientation. The redundancy index value suggested that a proportion of the self-regulation (predictor) variance accounted for by the AGQ (criterion) variance was 9.03%. Furthermore, the criterion structure coefficients of TAV and SAV had the same sign, indicating that they were positively related.

For the predictor set of variables the standardized function coefficients (β) revealed that self-regulation items SR9 (-.832), SR5 (-.307), $SR2_R$ (-.231), SR8 (.217), $SR7_R$ (-.175), and SR1 (-.141) received the largest credits in making-up the first predictor variate. The β coefficients of other items were low (below .078), with equally low values of their function coefficients. The function coefficient of items SR4 (-.381), SR7 (-.381), and SR8 (-.164) were also below the secondary level (.45) of usefulness in the model. Hence, these items were excluded from further analysis. The function coefficients of SR9 (-.861) and SR5 (-.497) were all greater than .450 which suggested their usefulness in the model. The function coefficient of SR1 (-.442) was close to the secondary level (.45) threshold, the item therefore was retained for further analysis. The canonical commonality analysis also supported the conclusion as the items SR9 (53.59%) had the highest unique contributions in the model followed by SR5 (7.58%). Since the unique contribution of $SR2_R$ (4.34%) was relatively large, it was decided to retain the $SR2_R$ predictor variable in the model for further analysis. The signs of the structure coefficients of predictor variables were same as that of criterion variables. This showed that the self-regulation items were positively related to achievement goals orientations.

The effects of SR9, SR5, $SR2_R$ and SR1 on mastery approach, task approach, self-approach were further examined through regression analyses. The AICc best fit regression analysis revealed that a three-variable model of SR9 (β = .20, t(343) = 4.835, p < .001), SR5 (β = .09, t(343) = 2.350, p < .01) and $SR2_R$ (β = .06, t(343) = 1.853, p = .065) best predicted the mastery-approach goal orientation, with an internal scale consistency, i.e., Cronbach's alpha coefficient value of .57. The full model explained 12.2% of the variance (R^2= .122, F(3,343) = 15.89, p < .001). Also, the three-variable model built based on SR9 (β = .19, t(343) = 4.835, p < .001), SR5 (β = .11, t(343) = 2.616, p < .01), and $SR2_R$ (β = .07, t(343) = 1.828, p = .068) best predicted the task-approach goal orientation. The full model explained 10.5% of the variance (R^2 = .105, F(3,343) = 13.42, p < .001). For self-approach, however, the best-fit analysis suggested

a two-item predictor model of SR9 (β = .19, $t(344) = 4.633$, $p < .001$) and SR1 (β = .08, $t(344) = 2.07$, $p < .05$) items only. The full model explained 9.1% of the variance (R^2 = .091, $F(2,344) = 17.300$, $p < .001$). The best-fit model predicting the task-, self-, and mastery-approach achievement goal orientations is listed in Table 4.16.

Table 4.16. Self-regulation items best predicting AGQ task-, self-, and mastery-approach goals.

Item Id	Item Description	Task-Approach	Self-Approach	Mastery-Approach
SR1	I ask myself questions to make sure I know the material I have been studying.		.08	
SR2	When work is hard I either give up or study only the easy parts. (*R).	.07		.06
SR5	Before I begin studying I think about the things I will need to do to learn.	.11		.09
SR9	I work hard to get a good grade even when I don't like a class.	.19	.19	.20

The language analysis of the items supported the best-fit self-regulation model above. The predictors SR2 and SR9 contained the mastery-approach goal components which presented a focus on task-based learning and challenge (Grant & Dweck, 2003; Skaalvik, 1997). Both the items measured challenge by presenting hardship and striving to achieve the goal under an unlikeable situation. The SR2 item contained a stem "when work is hard…" and measured whether the student would gave up the study task or not. The item used a task, i.e., an absolute, referent and defined competence in terms of behavioral accomplishments relative to the demands of the task itself (Barrett & Morgan, 1995; Elliot, McGregor, & Thrash, 2002), which is typical of a task-based mastery-approach goal orientation. A high score on the reversed item would indicate persistency with the learning task even when the work was hard. Similarly, the SR9 item started with the stem "I work hard" and measured persistency to achieve a goal in an unlikable situation. The focus of goal striving in this case was on a task outcome. The evaluative referent, however, was not explicitly defined in the item. A strong association of the item with both the task- and self-approach goal orientations, as indicated by the TAP and SAP best-fit analyses, suggested that item could possibly tap both the absolute and intrapersonal evaluative referents. In either case, both the referents represented the mastery-approach goal orientation. The item conceptualized learning as its goal-striving with focus on a study task. The item measured active striving towards development of

one's competence, or increase of ability. These conceptualizations represented both a task- and mastery-approach goal orientation (Grant & Dweck, 2003). The interpretations of the canonical correlation results also revealed that the aforementioned three self-regulation items were predictors of a task- and mastery-approach goal orientations. Thus, the results of the linguistic analysis of the items and the interpretations of the canonical correlations analysis both coincided, and supported a model comprising of self-regulation items SR2, SR5 and SR9 to best predict a mastery-approach goal orientation.

4.2.6. Summary of Exploratory Results

A summary of exploratory results is provided. The table listed the best predictors identified from each MSLQ scale. In total, 15 MSLQ items were found to predict three achievement goal orientations. The items are grouped into the predicted achievement goal orientations, Table 4.17.

A total of six items from two of the MSLQ scales (intrinsic value and self-regulation) predicted the AGQ mastery-approach achievement goal orientation. Three of the items from the MSLQ self-efficacy scale only, predicted the AGQ performance-approach achievement goal orientation. Finally, six items from two of the MSLQ scales (test-anxiety and cognitive-strategy) predicted the AGQ mastery-avoidance achievement goal orientation. None of the statistically significant canonical variates from the MSLQ scales was found to represent the AGQ performance-avoidance achievement goal orientation.

The AGQ mastery-approach goals were best predicted by the MSLQ items from the intrinsic-value scale as well as from the self-regulation scale. Each predictor set contained three items and explained 19.19% and 12.2% of the variance respectively. A regression analysis, combining the six items from both the scales, collectively explained 20.7% of the mastery-approach variance (R^2 = .2068, $F(6,340) = 14.77$, $p < .001$). An AICc best-fit analysis, however, revealed that a four-item model comprising of IV2 (β = .23, t(342) = 4.967, $p < .001$), IV3 (β = .07, $t(342) = 1.845$, $p = .07$), IV6 (β = .06, $t(342) = 1.431$, $p = .15$) and SR5 (β = .06, $t(342) = 1.431$, $p = .15$) could best predict the mastery-approach goal orientation explaining 20.2% of the variance (R^2 = .202, $F(4,342) = 21.62$,

$p < .001$). Hence, the combined best-fit model improved predictability by 1% with the addition of a single item.

Table 4.17. List of items from each MSLQ scale found to predict any of the achievement goal orientation based on exploratory analysis. (The items from same MSLQ scale represent the best-fit model derived for that scale.)

Id	Item
	Mastery-Approach Achievement Goal Orientation Prediction Models
	A model based on Intrinsic-Value items
IV2	It is important for me to learn what is being taught in this class.
IV3	I like what I am learning in this class.
IV6	Even when I do poorly on a test I try to learn from my mistakes.
	A model based on Self-Regulation items
SR2	When work is hard I either give up or study only the easy parts.
SR5	Before I begin studying I think about the things I will need to do to learn.
SR9	I work hard to get a good grade even when I don't like a class.
	Performance-Approach Achievement Goal Orientation Prediction Model
SE1	Compared with other students in this class I expect to do well.
SE4	Compared with others in this class, I think I'm a good student.
SE6	I think I will receive a good grade in this class.
	Mastery-Avoidance Achievement Goal Orientation Prediction Models
	A model based on test-Anxiety items
TA1	I am so nervous during a test that I cannot remember facts I have learned.
TA3	I worry a great deal about tests.
	A model based on Cognitive-Strategy items
CS1	When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly.
CS4	I always try to understand what the teacher is saying even if it doesn't make sense.
CS5	When I study for a test I try to remember as many facts as I can.
CS9	When I am studying a topic, I try to make everything fit together.

The performance-approach goal orientation was predicted by the items from a single scale and its results have already reported in the self-efficacy section. So, no combined analysis was required for the performance-approach goal orientation. For the mastery-avoidance scale, it emerged that a combined six-items model collectively

explained 19.7% of the variance and best-predicted the goal orientation, TA1 (β = .07, t(340) = 1.936, p = .053), TA3 (β = .05, t(340) = 1.531, p = .127), CS1 (β = .11, t(340) = 2.603, p < .01), CS4 (β = .09, t(340) = 1.919, p = .055), CS5 (β = .14, t(340) = 3.396, p < .001), and CS9 (β = .07, t(340) = 1.613, p = .108). The optimized model predicting the achievement goal orientations is shown in Table 4.18.

Table 4.18. Optimized model of MSLQ items that best predicted an achievement goal orientation based on exploratory analysis.

Id	Item
	Mastery-Approach Goal Orientation
IV2	It is important for me to learn what is being taught in this class.
IV3	I like what I am learning in this class.
IV6	Even when I do poorly on a test I try to learn from my mistakes.
SR5	Before I begin studying I think about the things I will need to do to learn.
	Performance-Approach Goal Orientation
SE1	Compared with other students in this class I expect to do well.
SE4	Compared with others in this class, I think I'm a good student.
SE6	I think I will receive a good grade in this class.
	Mastery-Avoidance Goal Orientation
TA1	I am so nervous during a test that I cannot remember facts I have learned.
TA3	I worry a great deal about tests.
CS1	When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly.
CS4	I always try to understand what the teacher is saying even if it doesn't make sense.
CS5	When I study for a test I try to remember as many facts as I can.
CS9	When I am studying a topic, I try to make everything fit together.

The summarized exploratory results showed that items in two of the five MSLQ scales, intrinsic-value and self-regulation, predicted the mastery-approach goals. Each scale produced a prediction model comprised of three items. One could use either model to predict the mastery-approach goals. The model based on the intrinsic-value items, however, was a stronger predictor of the mastery-approach goals than the self-regulation model. As the results indicated, the former model explained 19.2% of the variance compared to 12.2% explained by the later. In the combined-scales analysis, all the six-items from both the intrinsic-value and self-regulation scales were aggregated to

form a single scale. The AICc best-fit regression analysis produced a four-item prediction model. The best-fit model retained all the items from the intrinsic-value scale, but retained only one item from the self-regulation scale. This domination of intrinsic-value items in the combined model was consistent with the confirmatory results. Further, the intrinsic-value best-fit model predicted the mastery-approach goal with more efficiency (with fewer number of items i.e., 3), more internal consistency, and with only 1% drop in the variance explained. As the results showed that the best-fit combined model contained four predictors and explained 20.2% of the variance, whereas the single scale intrinsic-value model explained 19.2% of the variance with three predictors. The internal consistency of the combined four-item scale .64 Cronbach's alpha was lower compared to the .68 for the intrinsic-value best-fit scale.

For the performance-approach goals, the summarized canonical correlations results showed that items from the MSLQ self-efficacy scale were the only predictors. The scale produced a prediction model comprised of same three items as identified for the individual self-efficacy The summarized model was thus same as the individual model. Interpretation of this finding have already been provided in Section 4.2.1. The summarized exploratory results showed that items in two of the five MSLQ scales, test-anxiety and cognitive-strategy, predicted the master-avoidance goals. The test-anxiety scale produced a two item perdition model, whereas the cognitive-strategy produced a model comprised of four items. One could use either model to predict the mastery-avoidance goals. The model based on the cognitive-strategy items, however, was a stronger predictor of the mastery-avoidance goals than the test-anxiety model. The former model explained 15.9% of the variance compared to 7.5% explained by the later. A combined model of six items from both scales explained 19.7% of the variance. The AICc and regression analyses identified the six-item model as the best. A combined best-fit model, therefore, increased the prediction power by at least 2.6% with addition of two items. The internal scale consistency of the six-item model, however, decreased to .63 compared to the four-item cognitive-strategy scale Cronbach’s alpha coefficient value of .67.

5. Discussions

The purpose of this study was to examine whether students' motivated strategies for learning as measured by the MSLQ can explain their achievement goal orientations. Utilizing a field study, data suggest predictive relationships between the MSLQ and the AGQ measures. Results from this study provided support for the theorized model reveling some statistically significant Pearson's correlations and beta values. Specifically, the obtained results successfully addressed each of the six hypotheses posited to define relationships between the MSLQ items and the achievement goal orientations. A discussion of these results is presented here. Section 1 covers discussions of pertinent confirmatory results relating to the hypotheses analyses. Section 2 discusses pertinent exploratory results. Section 3 covers study limitation, and finally Section 4 presents implications of the study results.

5.1. Discussion of Confirmatory Results

The discussion of the confirmatory results section discusses the prominent predictors in the six best-fit models corresponding to six hypotheses, as well as suggestions for further research. There are two subsections: discussion, and discussion summary of confirmatory results.

5.1.1. Discussion

The MSLQ-based mastery-approach model (H1) contained four items which included a key word "learning" or "understanding". These four items came from four different MSLQ scales; self-efficacy, intrinsic value, cognitive strategy use, and self-regulation. This might suggest that item descriptions which make some explicit reference to learning or comprehension are good candidates for measuring students' mastery-approach achievement goal orientation irrespective of their motivational strategies. The presence of three cognitive strategy items in the model might suggest a greater use of cognitive learning strategies by mastery-oriented students. Past research has shown associations between mastery-approach achievement goal orientation and students' use of cognitive learning strategies, in particular deep learning strategies (e.g., Albaili, 1998;

Diseth, 2011; Liem, Lau, & Nie, 2008; Sins, van Joolingen, Savelsbergh, & van Hout-Wolters, 2008). Notably, the items using relatively stronger and positive language like "I'm certain" or "It is important" ended up in the best-fit model rather than the eliminated items list. The items beginning with the stem "I think" or "I prefer" mostly appeared in the eliminated list. This might suggest that items with strong and positive descriptions could better predict the mastery approach goal orientation than the items with probabilistic descriptions. A closer look at the best-fit models and eliminated items also suggested that some of the questions might be too similar in what they were measuring. For instance, the phrases "understand the ideas taught in this course" (SE2; retained) and "learn the material for this class" (SE9, eliminated), or "It is important for me to learn what is being taught in this class" (IV2; retained) and "I think that what I am learning in this class is useful" (IV7; eliminated) might convey similar meaning. So the elimination of one of these two items might not change the strength of the theorized mastery-approach scale. Further, it was interesting to note that only one of the nine intrinsic value items and one of the five self-regulation items were retained in the best fit model. This might suggest a redundancy in the questions asked. It may be that only one well-designed item is sufficient to measure a construct, such as self-regulation, as a student who engages in one of these behaviours is very likely to engage in the other behaviours.

Items which measure performance-approach achievement goal orientations (H2) using a normative-comparison language (Grant & Dweck, 2003) quite often use the "compare" word in their statements. However, one item – i.e., SE8 (*Compared with other students in this class I think I know a great deal about the subject*) – was eliminated from my theorized MSLQ-based performance-approach model during the AICc regression analysis. A closer look at the item shows that the first part of the statement represents a normative comparison component (i.e., compared to others; Urdan & Mestas, 2006), but the second part can be interpreted as reflecting a *learning* or a *task*-oriented goal component (i.e., knowing about the subject), rather than a performance goal component (i.e., doing better; Elliot & McGregor, 2001; Grant & Dweck, 2003). This might suggest that the use of normative-comparison language alone might not be enough to measure the performance-approach goal orientation. Especially, the use of learning specific language might be avoided while using normative-comparison language in referring to performance-approach achievement goals. This conclusion was further supported when I examined the statement of item SE1, which resembled item SE8, but was retained in

the best-fit model. Both the items shared the same stem except that SE1 ended with a phrase "*I expect to do well*", which expressed a performance goal (i.e., doing well). The SE1 item, thus, contained both the normative outcome (Grant & Dweck, 2003) and performance goal components. This might suggest that subjects' performance-approach orientation was reflected more through the item whose description contained both the normative and performance components than the description which contained a normative-comparison part only. A semantic review of six more eliminated items (SE5, CS1, CS5, CS6, CS7, and CS10) provided further support to the aforementioned conclusion. The SE3 item (*I expect to do very well in this class*) was another eliminated item from the performance-approach best-fit model that closely resembled SE6 (*I think I will receive a good grade in this class*) which was retained in the model. Both the items expressed performance orientations. However, the performance outcome was more concrete and measureable (i.e., *getting good grade*) in SE6 than in SE3 (i.e., *doing very well*). This suggested that an item description that made an explicit reference to the performance outcome was a better measure of the performance-approach goal orientation than one which contained an abstract or generalized reference. Finally, from the MSLQ self-regulation scale, there was a single item (SR9) in the theorized MSLQ performance–approach model. The item explicitly defined a performance goal of getting a good grade but it described a situation in which the student did not like the class (i.e., *I work hard to get a good grade even when I don't like a class*). This item was eliminated from the best-fit model. This might suggest that the learning environment was an equally important consideration for performance-oriented students. Particularly, students with art and design concentrations, such as in the program where I carried this study, might prefer to inhibit their performance aspirations in unlikeable situations. It might be useful to avoid items that constrain goal definitions with negative conditions when measuring the performance-approach goal orientations of individuals only.

The test-anxiety confirmatory model (H3) contained TA1 *(I am so nervous during a test that I cannot remember facts I have learned*) and TA3 (*I worry a great deal about tests*). Both the items tapped participants' nervousness and worry during the execution of test taking task. The negative affects of fear and worry about the task outcome are typically associated with the mastery avoidance goal (Elliot & McGregor, 2001). Both the item statements thus contained the components that define mastery-avoidance goals and could be used to measure the mastery-avoidance goal orientations. Further, as both

the items did not include any goal-specific language, it suggested that mere mentioning of a negative affect explicitly in an item statement tapped students' mastery-avoidance achievement goal orientation equally well.

The test-anxiety item TA2 (*I have an uneasy, upset feeling when I take a test*) was similar to TA1 but was vaguer and did not appear in the best-fit model. The TA1, TA2, TA3 items overall dealt with negative feelings of worry, fear and nervousness towards test taking tasks. The differentiating factor between these items is the degree of the negative feelings. TA1 quantified the degree of negative feelings as enough to hinder one's ability to remember facts. TA3 described the degree of worry as "a great deal". TA2, on the other hand, did not emphasize the negative feeling, but rather, left it at "an uneasy, upset feeling" when taking a test. This general feeling of uneasiness can be expected of most students taking an exam and isn't necessarily specific to the mastery-avoidance goal. For this reason, TA2 was not included in the best-fit model while TA1 and TA3 were. This follows the trend in Hypothesis 1 where items with stronger language were more likely to be included in the best-fit model. This suggests that an item containing a general feeling of uneasiness might not be a good candidate for tapping into students' mastery-avoidance achievement goal orientation.

The use of strong language in the mastery-avoidance could also hint at students' attitudes towards and confidence in their test taking ability. While most students likely have a general uneasy feeling about tests, those who quantify this feeling as "intense" or enough to effect their ability to take tests negatively may place greater importance on the test and are not confident enough in their ability to do well. This leads them to the mastery-avoidance achievement goal orientation. The TA1 and TA3 items both placed focus on an examination task. Avoiding poor performance in an examination should normally be a focus of performance oriented students. It is thus interesting to observe that the exam related items predict mastery-avoidance achievement goal rather than performance-avoidance.

The performance-avoidance best-fit model (H4) contained one item and eliminated the other four. Three of the eliminated items (SR2, SR6 and SR7) MSLQ-based belonged to the self-regulation scale and were reverse coded. The elimination of all the self-regulation items from the performance-avoidance model suggests that the self-regulation is not a good predictor of the performance-avoidance achievement goal

orientation. All three of these items relate to the student's focus on study material. The SR2 (*when work is hard I either give up or study only the easy parts*) indicates that the student struggles with efficiently allocating attention. Rather than studying the highest priority tasks, which contain information they do not know, they focus their attention on reviewing easier material. The SR6 (*I often find that I have been reading for classes but don't know what it is all about*) indicates that students have difficulty evaluating how well they have learned material, again suggesting a lack of concentration as the student studies. SR7 *(I find that when the teacher is talking I think of other things and don't really listen to what is being said*) also indicates that students direct their attention toward lower priority tasks, such as their thoughts, rather than trying to understand the teacher, which would have the greatest effect on their performance. These three items describe students that tend to shy away from the work that has the most significant impact on their performance. Instead they devote that focus to busywork and pointless exercises, maybe in an attempt to convince themselves they are working hard. Since neither of these three self-regulation items are in the performance avoidance model, it may be that students with a performance avoidance orientation either do not have trouble with focusing on high priority tasks, or they do not believe they do. This might also suggest that self-regulation habits had no or little effect on predicting whether a student adopted a performance-avoidance goal.

A dominant presence of the items from the self-efficacy and self-regulation scales in the best-fit MSLQ-based approach model (H5) suggests that students' perceptions of their self-efficacy and self-regulation are good predictors of their performance-approach achievement goal orientation. In contrast, the cognitive-strategy use and intrinsic-value are good predictors of mastery-approach achievement goal orientation. Appearance of the SR9 self-regulation item (*I work hard to get a good grade even when I don't like a class*) in the best-fit approach achievement goal orientation model was intriguing. This item did not show up in either of mastery- or performance-approach best-fit models. A further review suggests that the item explicitly contained an approach element of *striving to achieve a good grade*. Goal striving has been used in the literature to measure performance-approach goal orientations. However, exclusion of the item from the best-fit performance-approach model could mean that the performance-oriented students might inhibit their achievement aspirations in learning environment they perceive as not likeable. On the other hand, striving to achieve a goal under any

situation and working hard represented a focus on competence development (Elliot & Church, 1997), which is attributed to the mastery-approach orientation. So both the mastery- and performance-approach orientations might have related to the "work hard" aspect of this item. The SR9 item thus might have measured the goal pursuits of the mastery-approach oriented students as well, which explained the inclusion of the predictor in the best-fit approach model and not in either of subdivisions. The item is thus good enough to measure the overall achievement strivings of both the mastery and the performance oriented students. Further, the goals in an approach orientation might overrule personal preference, and wanting to get a good grade or mastering the material could be more important for college students than their likes or dislikes for a class. This seems somewhat contrary to the MSLQ view that motivation is context specific.

A model comprising of six MSLQ items predicted the avoidance type (H6) achievement goal orientations. A scale-wise decomposition of the avoidance achievement goal orientation prediction model, Figure 4.8, indicated that the MSLQ test-anxiety items were good predictors of the mastery-avoidance goals. Whereas, the negatively coded cognitive-strategy and self-regulation items were good predictors of performance-avoidance goal orientations. Both the TA4 (*When I take a test I think about how poorly I am doing*) and the SR7 (*when the teacher is talking I think of other things and don't really listen to what is being said*) relate to the student's attention. In the TA4, the student takes attention away from the task at hand to focus on evaluating performance. Similarly in the SR7, the student does not focus on the current task at hand, i.e. listening to the teacher. Rather, they direct their attention towards their own thoughts. These two items may indicate that students with an avoidance approach are often distracted by secondary tasks, leading them to ignore the high-priority, time-sensitive activity they should be performing. The student's difficulty with focusing may arise from anxiety over their performance and a fear of failure, leading to an avoidance of engaging in tasks that will impact how well they perform.

5.1.2. Discussion Summary

This section summarizes the results of the six hypotheses and discusses possible implications. For each of the six models certain language constructs were found to predict the various orientations and approaches, either through their inclusion or

exclusion. The MSLQ-based mastery-approach model suggests that student's mastery-approach achievement goal orientation can be measured by strong, positive, and explicit references to learning or comprehension. Normative-comparison language is not sufficient to measure the performance-approach goal orientation and other factors, such as the learning environment, may be important for students with a performance-approach goal orientation. The test-anxiety confirmatory model suggests that the presence of a negative affect in an item statement was a good measure for predicting student's mastery-avoidance goal orientation. Similar to the first model (H1), stronger language in the test-anxiety items increased the probability of the item being part of the best-fit model. According to the fourth model (H4), MSLQ self-regulation items do not appear to predict the performance-avoidance goal orientation. Further, students with performance-avoidance goal orientation seem to avoid high-priority tasks in favor of exercises they are already comfortable with. The MSLQ-based approach model (H5) suggests a link between mastery- and performance-orientations. Both approaches appear to contain a "work-hard" aspect, albeit in differing manners. For the avoidance type achievement goals model (H6), different categories of items predicted mastery-avoidance (test-anxiety items) and performance-avoidance (cognitive-strategy and self-regulation items).

5.2 Discussion of Exploratory Analysis Results

The discussion of the confirmatory results section discusses the prominent predictors in the six best-fit models corresponding to six hypotheses, as well as suggestions for further research. There are two subsections: MSLQ Scales Discussion, and Discussion Summary.

5.2.1. Discussion

Exploratory analysis resulted in a 15-item model that predicted three achievement goal orientations. Six MSLQ items from the intrinsic-value and self-regulation scales predicted the mastery-approach achievement goal orientation. Three self-efficacy items predicted the performance-approach achievement goal orientation. Finally, a six-item model of test-anxiety and cognitive-strategy use predicted the AGQ mastery-avoidance achievement goal orientation.

The canonical correlations analysis between the self-efficacy and the achievement goal orientation scales revealed a four-item predictor model for performance-approach achievement goal orientation. This result suggested that the MSLQ self-efficacy based scale is a good predictor of AGQ performance-approach achievement goal orientation. This result supports the previous research findings (see, Bong, 2001; Pajares et al., 2000; Wolters, 2004; Wolters, Yu, & Pintrich, 1996). The wording of self-efficacy items in the model mostly represented *competition* and *appearance* goal components (Urdan & Mestas, 2006), e.g., compared with others, doing well, or thinking good. A competition typically represents a normative or social comparison, whereas an appearance goal is characterized by individuals' desire for validation of their ability by others (Grant, & Dweck, 2003). This further supports the earlier research findings that *normative comparison* and *ability validation* represent performance-approach orientation (Elliot, 1999, 2005, 2010; Elliot, McGregor & Gable, 1999; Hullman et al., 2010).It is interesting to observe that none of self-efficacy items predicted mastery-approach achievement goal orientation.

The intrinsic-value canonical correlation analysis identified a four-item model for predicting mastery-approach achievement goal orientation. The items represented interest, task and challenge-based goal components (Hulleman et al., 2010) and showed strivings for learning. Previous research has shown that a student's focus on learning by showing intrinsic-motivation, positive patterns of learning, or persistence in face of difficulty typically represented a mastery-approach goal orientation (Barron & Harackieweicz, 2001; Grant & Dweck, 2003; Hulleman et al., 2010; Lepper et al., 2005; Middleton & Midgley, 1997; Pajares, Britner, & Valiante, 2000; Skaalvik, 1997). Further, the intrinsic-value predictor model contained the items which appeared in both the task- and the self-approach best-fit models suggesting they were good predictors of students' overall approach competence. This result suggests the use of both absolute and self referents in formulating the measures of approach achievement goal orientation. Conversely, the items which are aimed to measure the mastery-approach achievement goal orientation alone should not include mixed competence referents in their descriptions. The mastery-approach achievement goal orientation was also predicted by the self-regulation items suggesting that intrinsic-value and self-regulation are good predictors of mastery approach achievement goal orientation.

The test-anxiety analysis generated a two-item model that predicted mastery-avoidance achievement goal orientation. The MSLQ TA1 construct measures nervousness during a test, whereas construct TA3 captures feelings that may exist before, during or after a test. Item TA1 does not predict the performance-avoidance goal orientation, though TA3 does. This result may indicate that though participants with performance-avoidance orientations do worry in general about tests, they do not associate their test performance with how well they remember what they have learned. The references to remembering and learning in item TA3 may not hold significance for participants with performance-avoidance orientations, as they do not believe that nervousness has a direct impact on their learning, though they acknowledge they do get anxious about tests.

Two of the cognitive strategy items CS5 (*When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly*) and CS1 (*When I study for a test I try to remember as many facts as I can*) made statistically significant contributions to the prediction of mastery-avoidance goals. A comparative look at the language of both the items showed that they aimed to measure a study-strategy focused on rote learning. Both the items specified an evaluative task i.e., homework or test. The end-goal of striving in CS5 was explicitly identified, that is to “answer the questions correctly”. In the item CS1 answering correctly was not explicitly mentioned but it might be implied from the stem "when I study for the test”. Further, both the items included a wording “I try to remember”. The goal of remembering in item CS5, as mentioned above, was to answer the questions “correctly” by memorizing what teacher said in the class. Similarly, in the item CS1 the end goal of rote-learning was preparing for the test by remembering as many facts as possible. These descriptions suggested that the items measuring students’ strivings for memorizing exam-related content could exhibit their worries about the task outcome, or their focus on avoiding intrapersonal incompetence implicitly. The contribution of two other items CS4 *(I always try to understand what the teacher is saying even if it doesn’t make sense*) and CS9 (*When I am studying a topic, I try to make everything fit together*) statistically were not significantly different from zero in the best-fit model predicting the mastery-avoidance goal. A comparison with the item statements which made statistically significant contributions (i.e., C5 and CS1) revealed that the language of the items CS4 and CS9 did not contain any goal striving or end-purpose of the activity or effort. This might suggest that an explicit reference to a task-

outcome in a question statement could elicit any negative affect or feelings of intrapersonal incompetence about the task among the students.

5.2.2. Discussion Summary

A summary of the exploratory results showed that the MSLQ items from intrinsic-value (3 items) and self-regulation (3 items), predicted the mastery-approach goals. Regression and best-fit analyses results, however, suggest that the intrinsic-value items alone form a more efficient and reliable predictor model of a mastery-approach achievement goal orientation in undergraduate students than a self-regulation or combined model. Similarly, a single cognitive-strategy scale might predict the mastery-avoidance achievement goal orientation with a relatively higher efficiency and reliability as compared to a combined scale with test-anxiety.

The results of exploratory analysis supported the theorized model overall. These results could be used to further optimize the identified models. For mastery-approach achievement goal orientation, the confirmatory analysis produced a six-item predictor model. The model had two items in common with the confirmatory model. The items belonged to the intrinsic-value and self-efficacy scales. This suggests that the intrinsic-value and self-regulation are good predictors of mastery-approach achievement goal orientation. For performance-approach goal orientation, the exploratory analysis generated a three item predictor model. All the items belonged to the self-efficacy scale and were included in the confirmatory predictor model as well. This suggests that self-efficacy is a good predictor of performance-approach goal orientation. For mastery-avoidance achievement goal orientation, the confirmatory analysis produced an expanded predictor model which contained six items. The two test-anxiety TA1 and TA3 items were, however, common in both the models suggesting test-anxiety as a good predictor of mastery-avoidance achievement goal orientation of students.

5.3. Discussion Conclusion

The confirmatory results section discussed several models that predicted various goal orientations. The confirmatory results discussion provided further support for the results and implications of these models and offered greater insights. Both the

confirmatory results and canonical analysis discovered that components containing normative comparisons related to, but were not sufficient for predicting, the performance-approach achievement goal orientation. Both suggest other factors, such as the learning environment and external validation of ability, may also be involved in predicting the performance-approach orientation. The best-fit model for the mastery-approach achievement orientation contained items with strong and positive language. Canonical analysis further revealed that the approach is predicted well by intrinsic-value and self-regulation. These findings suggest that purely positive competence referents are strongly tied to the mastery-approach goal orientation. For the mastery-avoidance achievement goal orientation, however, confirmatory results indicate that negative affect is a good predictor. The canonical analysis offers greater detail, suggesting that students with the mastery-avoidance goal orientation suffer nervousness about exams, but may fail to link their performance with learning.

5.4 Limitations

As participants reported on their own behaviors in the questionnaire, they may have been tempted to select what they thought was ideal rather than true. While this is a limitation of the AGQ and MSLQ, correlating these instruments may compound these issues.

Earlier research found mastery-avoidance goals consistently correlated with the goals in the 2 X 2 framework with which they shared a conceptual dimension (i.e., mastery-approach and performance-avoidance), whereas no consistent association was evidenced with the performance-approach (Elliot & McGregor, 2001). Moreover, the mean of mastery-avoidance was found close to the scale midpoint and lower than the means of the other goals (Elliot & McGregor, 2001). In this research the mastery-avoidance goals were correlated with all the goals in the 2 X 2 framework including the performance-approach. Also, the mean scores of all the achievement goals were higher the scale mid-point and ranged between 4.480 and 4.898. This suggests that the participants in this study might have perceived the theoretical conceptualizations used to define different goals as similar, or they held multiple goals at the same time. The presence of multiple goals had been related to levels of anxiety and academic performance (e.g., Koul et al., 2009; Wentzel, 2000 and Wolters et al., 1996). The

students who participated in this research studied courses from three distinct concentrations of the same school at a university in Canada, namely: (1) interactive systems, (2), design, and (3) media art. To meet the degree requirements students had to take courses from more than one concentration. Design and media students, for instance, were required to take programming courses from the interactive systems concentration. This mix of courses from distinct concentrations might pose anxiety and performance challenges for students, especially in students taking courses not from their concentration. Additionally, the participants are all from the same department, which could lead to sample biases. Further, the demographics of the participants in the study may limit its generalizability. The students came from programs that generally are not looked at in achievement goals research (combination of computing with design and new media vs. social sciences). While data collected from this study produced a model, ideally this model would be validated across departments and universities.

Since instructors volunteered their classes to participate and were required to set aside time during lectures, this could also have led to a sample bias. For example, an instructor teaching a difficult class with a lot of material may not be able to dedicate time for the questionnaire. This would exclude students in the difficult class who would not get a chance to participate. This bias could be avoided if all classes were required to participate.

Additionally, the instructors used both the absolute and the normative grading structures for students' assessment in this research. These varying grading structures might have promoted adoption of situationally influenced goals (Durik & Harackiewicz, 2003). In a normative grading condition, for instance, students might pursue a goal to outperform other students. Thus the student in this research might had a different motivational climate and personal goal orientations that helped them pursue different goals (Harackiewicz & Sansone, 1991).

Although the 2 X 2 Achievement Goal Orientations questionnaire employed in this research (AGQ: Elliot and McGregor 2001) is among the most commonly used instruments in last fifteen years, there have been recent arguments in meta-analyses and comprehensive reviews (e.g., Huang, 2011; Hulleman et al., 2010; Ranellucci et al., 2015) about the definition of constructs and instrument's reliability of measurements for the avoidance goals, particularly the mastery avoidance goals. This could partly be due

to the reason that mastery-avoidance has received considerably less research attention owing to its weak or statistically non-significant relations with other constructs, as in current research, (e.g., Elliot & McGregor, 2001; Elliot & Murayama, 2008; Ranellucci, Hall, & Goetz, 2015; Van Yperen, Blaga, & Postmes, 2014). As the conceptual clarity and reliability of the AGQ avoidance-scales measurement are lacking, the question of relationships between the AGQ and the MSLQ warrants further exploration.

The definitions of some of the MSLQ items, particularly, for the items theorized to predict the avoidance achievement goals (e.g., TA3, CS2) lacked explicit cues or avoidance-goals-specific language. Consider the test-anxiety item TA3, for example. This item represents a general emotion of anxiety about a test. This study conceptualized test as a representation of a a task referent. Other researchers might argue that “mere mentioning” of a negative affect is not sufficient to tap the avoidance achievement goal orientations of students, or they might decode test as a representation of a performance referent instead. This study thus recognizes this limitation and need to involve more researchers in the coding process to evaluate the congruence of items.

This research has provided varying levels of support for the across-measure equivalence among the MSLQ and the AGQ measures. For instance, support for the performance-avoidance scale was strong, but for the mastery-avoidance measures and the cumulative avoidance measures the support was not very strong. It is therefore suggested that Elliot’s original avoidance measures, particularly the mastery-avoidance measures, (Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001) might still serve as better measures of the mastery-avoidance or the cumulative avoidance goals.

This research collapsed self and task referents into mastery as explained in section 2.4. This collapsing of the self and task dimensions would limit the relevance of this research moving forward as future studies increasingly adopt the 3 x 2 achievement goal orientations framework approach. Additionally, the correlational nature of the study might preclude more in-depth analyses of consistency between measures over time. Further, the generally low correlational and beta values (e.g., .13 -.16 for self-efficacy) underscore the need for replication with larger and more diverse samples to see if stronger relations are possible, or employing alternate theoretical perspectives that might better capture the MSLQ items.

6. Conclusion and Future Research Directions

6.1. Conclusion

This research theorized and validated relations between two self-report instruments, MSLQ and AGQ. The MSLQ has been used to measure academic motivation and use of cognitive strategies as reported by college students, and the AGQ measured achievement goals that students adopt as reasons to engage in academic tasks. Academic motivation, the use of cognitive strategies, and achievement goals correlate with students' academic performance. Past research had often used either the MSLQ (i.e., academic motivation, and use of cognitive strategies) or the AGQ (i.e., achievement goals) to examine students' performance. To include both constructs, one had to use both the instruments. Other research, however, found associations between motivational, cognitive, and achievement goal constructs. Building on findings from these earlier studies, the present research theorized and tested a model to predict students' achievement goals from their self-reported MSLQ measurements.

The models in this research provide some support for exchanging one set of measures for another opening venue for future research studies aiming to better utilize existing data through secondary analyses. The magnitudes of some of the beta coefficients which assess variable importance in multivariate regression and canonical analyses models (Nimon, Henson, & Gates, 2010) are strong. Few correlational and beta values were surprising weak in the confirmatory analyses (e.g., r's = .41, .42, .45), particularly for mastery-avoidance (e.g., r's = -.24, .22 on pg. 56; Beta = .07), as well as the notably little variance explained in the target measure for this construct (e.g., 6.8%). The models, however, provide evidence for the idea of exploring the extent to which two prominent measures demonstrate empirical overlap so as to inform future studies aiming to better utilize existing data through secondary analyses of goal orientation constructs. It is also worth mentioning that my interpretation of canonical correlations analyses do not rely solely on the beta weights and take into consideration other measures including structure coefficients and commonality coefficients (Nathans, Oswald, & Nimon, 2012).

The mastery-avoidance goals in this research were correlated with all the goals in the 2 X 2 framework including the performance-approach. Also, the mean scores of all the achievement goals were higher than the scale mid-point (ranged between 4.480 and 4.898). The mean of the mastery-avoidance goal (M = 4.898, SD = .054, N = 347; r = .790, p < .001) was higher than the means of the other goal types in the 2 X 2 framework. The mastery-avoidance goals had the strongest association with the performance-avoidance (M = 4.849, SD = .065, N = 347; r = .504, P < .001) followed by the mastery-approach (M = 4.753, SD = .051, N = 347; r = .719, p < .001) and the performance-approach (M = 4.480, SD = .070, N = 347; r = .656, p < .001). These results suggested that (1) participants might have perceived the theoretical conceptualizations used to define different goals as similar, or (2) the students held multiple goals at the same time. The presence of multiple goals had been related to levels of anxiety and academic performance (e.g., Koul et al., 2009; Wentzel, 2000 and Wolters et al., 1996). The courses at SIAT were offered from three distinct concentrations, namely: (1) interactive systems, (2), design, and (3) media art. To meet the degree requirements students had to take courses from more than one concentrations. For instance, design and media students were required take some programming courses from the interactive systems concentration. This mix of courses from distinct concentrations might pose anxiety and performance challenges for students which need to be investigated further. Additionally, the SIAT courses had both absolute and normative grading structures. These varying grading structures might have promoted adoption of situationally influenced goals. For instance, in a normative grading condition students might pursue a goal to outperform other students (Durik & Harackiewicz, 2003). Thus the population at SIAT might have a different motivational climate and personal goal orientations that helped them pursue different goals (Harackiewicz & Sansone, 1991). This might warrant a further research into investigating students' interpretations of the conceptualizations used in the construct.

Overall, this research advances understanding of students' academic behaviours by enabling researchers to gain insight about students' achievement goals from the data about their motivational dispositions, and by proposing a new direction of multi-utilizing the survey-data resources. The research provided an empirical support for the theorized model. The model would expand our analysis of students' performance using the MSLQ data. Previous research on motivational strategies and achievement goals studied these

constructs mainly as separate constructs. To my knowledge, no recent research had examined predictive relationships between the two instruments at the level of items or scales. The current research thus lends empirical support to the idea of expanding research on the multiple utility of data by constructing conversion models for these two popular measures. With trends of making primary data from published research publicly available, the use of MSLQ data to predict achievement goals could be useful in meta-analytic and other studies.

6.2. Future Research Directions

To further develop this research, future contributions could explore the insights discussed in section 5. The discussions in section 5 suggested possible implications of the confirmatory and exploratory results, and provide prompts for future study. Future research could engage in a more fine-grained analysis of items in the best-fit model and the goal orientations they predict. The initial analysis presented here suggested how and why components in the set of items in the best-fit model might be predictive of a goal-orientation. Future research could attempt to validate these suggestions and uncover patterns that link the set of items to the goal orientation. The results of such study could have implications on our current understanding of students' goal orientations. For instance, uncovering how external variables, such as learning environment or peer validation, influence the goal orientations students adopt, and how students in various domain interpret the questionnaire items. The knowledge of students' learning strategies and achievement goal orientations can be used for creating effective learners' models of motivation. These learner models could be used for: (1) identifying online content presentation methods suitable for each goal orientation, and (2) enabling personalized online course adaptation and content presentation for motivating students to adopt effective learning behaviours.

As mentioned in the limitations, the definitions of some of the MSLQ items lacked explicit goal orientation cues or avoidance-goals-specific language. This study thus recognizes the need to involve more researchers in the coding process to evaluate the congruence of items to provide greater confidence in face validity assumptions in future studies.

Future research might explore moderation effects by various demographic variables such as year of study, gender or ethnicity to further understand how the different descriptive statistics relate with previous studies to determine how well such results can generalize across studies.

Additionally, longitudinal studies are warranted to better examine relations between motivational constructs over time (e.g., cross-lagged models over 3 phases to assess whether one measure indeed predicts, and is also predicted, by the other to provide stronger evidence of causality and constructs overlap), as well as equivalency between the measures in terms of temporal stability (e.g., test-retest reliability, autoregressive path magnitude, etc.).

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Appendix A. MSLQ Scales and Items

Id	MSLQ Scales and Items
	1. Self-efficacy Scale
SE1	Compared with other students in this class I expect to do well.
SE2	I'm certain I can understand the ideas taught in this course.
SE3	I expect to do very well in this class.
SE4	Compared with others in this class, I think I'm a good student.
SE5	I am sure I can do an excellent job on the problems and tasks assigned for this class.
SE6	I think I will receive a good grade in this class.
SE7	My study skills are excellent compared with others in this class.
SE8	Compared with other students in this class I think I know a great deal about the subject.
SE9	I know that I will be able to learn the material for this class.
	2. Intrinsic Value Scale
IV1	I prefer class work that is challenging so I can learn new things.
IV2	It is important for me to learn what is being taught in this class.
IV3	I like what I am learning in this class.
IV4	I think I will be able to use what I learn in this class in other classes.
IV5	I often choose paper topics I will learn something from even if they require more work.
IV6	Even when I do poorly on a test I try to learn from my mistakes.
IV7	I think that what I am learning in this class is useful for me to know.
IV8	I think that what we are learning in this class is interesting.
IV9	Understanding this subject is important to me.
	3. Test Anxiety Scale
TA1	I am so nervous during a test that I cannot remember facts I have learned.
TA2	I have an uneasy, upset feeling when I take a test.
TA3	I worry a great deal about tests.

Id	MSLQ Scales and Items
TA4	When I take a test I think about how poorly I am doing.
	4. Cognitive Strategy Scale
CS1	When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly.
CS2	It is hard for me to decide what the main ideas are in what I read. (*R)
CS3	When I study I put important ideas into my own words.
CS4	I always try to understand what the teacher is saying even if it doesn't make sense.
CS5	When I study for a test I try to remember as many facts as I can.
CS6	When studying, I copy my notes over to help me remember material.
CS7	When I study for a test I practice saying the important facts over and over to myself.
CS8	I use what I have learned from old homework assignments and the textbook to do new assignments.
CS9	When I am studying a topic, I try to make everything fit together.
CS10	When I read material for this class, I say the words over and over to myself to help me remember.
CS11	I outline the chapters in my book to help me study.
CS12	When reading I try to connect the things I am reading about with what I already know.
CS13	When I study for a test, I try to put together the information from class and from the book.
	5. Self-Regulation Scale
SR1	I ask myself questions to make sure I know the material I have been studying.
SR2	When work is hard I either give up or study only the easy parts. (*R)
SR3	I work on practice exercises and answer end of chapter questions even when I don't have to.
SR4	Even when study materials are dull and uninteresting, I keep working until I finish.
SR5	Before I begin studying I think about the things I will need to do to learn.
SR6	I often find that I have been reading for class but don't know what it is all about. (*R)
SR7	I find that when the teacher is talking I think of other things and don't really listen to what is being said. (*R)
SR8	When I'm reading I stop once in a while and go over what I have read.
SR9	I work hard to get a good grade even when I don't like a class.

Appendix B. 3 x 2 AGQ Scale

Id	3 x 2 AGQ Scale
	1. Task-Approach Achievement Goal Orientation Scale
TAP1	To get a lot of questions right on the exams in this class.
TAP2	To know the right answers to the questions on the exams in this class.
TAP3	To answer a lot of questions correctly on the exams in this class.
	2. Task-Avoidance Achievement Goal Orientation Scale
TAV1	To avoid incorrect answers on the exams in this class.
TAV2	To avoid getting a lot of questions wrong on the exams in this class.
TAV3	To avoid missing a lot of questions on the exams in this class.
	3. Self-Approach Achievement Goal Orientation Scale
SAP1	To perform better on the exams in this class than I have done in the past on these types of exams.
SAP2	To do well on the exams in this class relative to how well I have done in the past on such exams.
SAP3	To do better on the exams in this class than I typically do in this type of situation.
	4. Self-Avoidance Achievement Goal Orientation Scale
SAV1	To avoid doing worse on the exams in this class than I normally do on these types of exams.
SAV2	To avoid performing poorly on the exams in this class compared to my typical level of performance.
SAV3	To avoid doing worse on the exams in this class than I have done on prior exams of this type.
	5. Other-Approach Achievement Goal Orientation Scale
OAP1	To outperform other students on the exams in this class.
OAP2	To do well compared to others in the class on the exams.
OAP3	To do better than my classmates on the exams in this class.
	6. Other-Avoidance Achievement Goal Orientation Scale
OAV1	To avoid doing worse than other students on the exams in this class.
OAV2	To avoid doing poorly in comparison to others on the exams in this class.
OAV3	To avoid performing poorly relative to my fellow students on the exams in this class.