# DEVELOPING AND VALIDATING AN INSTRUMENT TO MEASURE ACADEMIC SELF-REGULATION

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**Abstract**

The purposes of this investigation were to develop and validate a comprehensive assessment instrument to measure academic self-regulation as a personal trait. The instrument was predicated upon an evidence-based conceptual framework of academic self-regulation which described the interactions between cognitive, motivational, volitional, and environmental variables and learners' activating purposeful goal oriented actions. Seven separate studies which included over 1000 undergraduate and graduate students at a large mid-Atlantic university provided reliability and validity evidence for this instrument. Data analysis included Rasch analysis, item response and item analysis, exploratory factor analysis, correlation analysis comparing the developed instrument with a version of an instrument frequently used in studies of academic self-regulation, multiple regression analysis predicting the scales of the frequently used instrument through the developed instrument, item-total correlations, and Cronbach's alpha for each scale and for the entire questionnaire. Findings included evidence that the model accurately represented academic self- regulation; that the developed instrument was reliable; that the instrument had excellent content, structural, substantive, and criterion validity; and that the instrument appeared to yield useful information about the degree to which learners engaged academic self-regulation skills. While additional validation studies are warranted, three potential applications of this instrument are: to investigate academic self-regulation variables; to design learning environments to promote academic self-regulation; and to assess and assist individual learners develop academic self-regulation skills and dispositions.

## Dedication

This work is dedicated to:

My husband, Parhum Delgoshaei, for going beyond supporting me, for offering his love and his time unrelentlessly, and for sharing his knowledge and ingenious ideas with me.

My mother, Shirin Namei, and my father, Mohsen Mokri, for devoting their being to their children, for their love and support throughout my life, and for their patience and guidance when we were kept apart for twelve years.

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# Chapter 1
## Introduction

Academic self-regulation refers to the ways that learners achieve their chosen learning outcomes by engaging and managing their motivational, cognitive, and environmental resources through activation of volitional skills. Learners who engage in academic self-regulation manipulate learning related variables to define their goals, strategically plan their learning activities, monitor and control their learning outcomes, and refine their behaviors based on the discrepancies between their achieved and desired outcomes. To engage in academic self-regulation learners must have a repertoire of intellectual and behavioral strategies to adapt their behaviors according to their needs to learn tasks in specific contexts. Academic self-regulated learners adjust their cognitions, actions, behaviors, and emotions in varying degrees according to the context, the learning environment, and their beliefs.

Consider two individuals, one of whom can effectively self-regulate her learning and another who has not developed her skills to self-regulate. The first individual would assess her learning environment and, based on her awareness of her cognitive ability and her beliefs about herself, determine how much she values certain outcomes and sets academic goals for herself that are attainable. This learner would have a broad range of cognitive and motivational strategies to choose from depending on the context, the task, and her learning environment. In addition, she can be flexible in her choices of strategies and change her plans when necessary to reach her goals. She can monitor her progress in reaching her goals and retrace her deficiencies to their causes so that she can modify her strategy decisions as needed. For example, she is capable of refocusing her attention, avoiding distractions, and controlling her cognitive and motivational strategies. She is also able to recognize and use existing resources in the environment such as teachers' feedback or peers' expertise to her advantage. This learner is very likely to achieve the academic goals that she has set for herself.

On the other hand, the learner who is not as proficient in self-regulating her learning might lack a number of skills to succeed in academic tasks. Because academic self-regulation is not dichotomous, learners can self-regulate on a continuum from minimal to nearly complete proficiency in self-regulation depending on personal and contextual variables. If she is on the lower end of the academic self-regulation continuum, she would not set general, higher level goals for her learning; she might not be able to recognize the specific lower level goals of the

smaller tasks that she has to be involved with which are linked to those higher level goals. She might get involved in tasks and later on realize that she does not value these tasks or that she does not expect to successfully complete them. She does not commit to tasks and would be easily distracted especially when she encounters difficulties. Since she has not defined goals for herself and does not have any plans to pursue academic goals, she would not monitor her progress in reaching her goals; therefore, she would not retrace her steps to identify her deficiencies. Consequently, she would not recognize or control her use of strategies or try to use available resources in the environment effectively. Furthermore, her strategy use will likely be limited and she would not have the flexibility to change when strategies prove to be ineffective. It is easy to see that such a learner would encounter problems in her academic career and would not be as successful as she could have been if she had developed self-regulatory skills.

To investigate the extent to which learners are able to self-regulate their learning and to design possible interventions to teach self-regulation skills and strategies, it is necessary to reliably measure learners' self-regulatory abilities. The purpose of this investigation is to develop and validate a comprehensive assessment instrument to measure academic self-regulation as a personal trait.

As illustrated in this hypothetical comparison learners' academic self-regulatory skills vary, the more effective learners are in regulating their learning, the more successful they are likely to be in achieving their academic goals. If educators and researchers are able to validly measure the extent to which learners are capable of regulating their thoughts, behaviors, and actions, they can address specific deficiencies that different learners might have in different areas of regulating their learning. Subsequently, they can assist individual learners to target their deficiencies and develop skills to become better self-regulated learners and achieve their academic goals. To understand and organize the variables involved in academic self-regulation, the evidence-based variables that impact academic self-regulation were identified and a model was constructed that comprehensively illustrates how successful learners regulate their cognition and motivation and interact with their learning environments. This model can be used to identify and assess possible deficiencies that learners have in different areas such as lack of motivation or a sufficiently broad repertoire of strategies that they can choose from to respond to unstable learning conditions and outcomes.

In addition, a valid measure of academic self-regulation can assist instructors as they design interventions to promote and support learners' developing and using academic self-regulation. For example, when learners lack the ability to recognize the goals of specific tasks or lack the motivational and volitional skills to continue to focus on academic tasks, educators can model setting achievable goals or add to the repertoire of learners' strategies. Gradually, students can take control of their own learning and learning strategies as they become more self-regulated. Finally, a valid instrument to assess a comprehensive construct of academic self-regulation can contribute to investigating and understanding how academic self-regulation is developed, influenced, and enacted. For example, this instrument can be used to establish reference points to measure learners' progress after interventions to improve their self-regulatory skills have been implemented. To this end, a self-report questionnaire based on the comprehensive model of academic self-regulation was developed to assess the extent to which learners are aware of and able to manage their cognitive and motivational resources and their capability to willingly use and interact with their learning environments to optimize achievement of their academic goals.

Academic self-regulation is one of three closely related self-regulatory concepts also called the regulatory triad: metacognition, self-regulation, and academic self-regulation. Although at times these terms have been used interchangeably in the literature (Dinsmore, Alexander, & Loughlin, 2008) and there exists a conceptual similarity between them, there are distinctive differences between these constructs. The focus of this study was academic self-regulation; the definitions below should clarify similarities and differences between this construct and the other two in the regulatory triad.

Metacognition has been defined as learners' awareness of their cognitive processes. Self-regulation refers to individuals' ability to modify their behavior based on environmental demands. Academic self-regulation has been defined as learners' ability to take strategic actions such as planning, monitoring, and taking corrective action to manage their learning. These three constructs share five attributes: (a) they vary across a continuum and cannot be viewed as dichotomous, (b) they are context dependent, (c) activating them depends on individuals' choice and awareness, (d) they can be improved when strategies and skills are developed and applied, and (e) initiating development and application of these constructs depends on individual cognitive and behavioral actions.

These constructs also differ in two aspects: (a) unlike metacognition that is a process limited to individuals' thoughts, self-regulation and academic self-regulation are interactive between individuals and their environments, (b) metacognition focuses on how to use intellectual resources to learn, self-regulation focuses on how to use intellectual and behavioral resources to achieve selected goals, and academic self-regulation focuses on how to use intellectual and behavioral resources to achieve selected academic goals.

In the following chapters, a historical and analytic review of the relationships between metacognition, self-regulation, and academic self-regulation is provided to establish the unique character of academic self-regulation and to present evidence of the importance and impact of academic self-regulation. Furthermore, the existing models that have been used to explain academic self-regulation and the instruments and processes that have been used to measure academic self-regulation are reviewed and analyzed. A tentative comprehensive model of academic self-regulation is presented; this model was employed to construct and collect evidence for the validity and reliability of the academic self-regulation assessment instrument presented in this investigation.

More specifically, the following chapters describe the evidence supporting academic self-regulation as an important variable for academic success, the methods applied to investigate the validity of an instrument to measure academic self-regulation, the results of that investigation, and conclusions based on these results as follows:

- Chapter 2 is devoted to proposing a model of academic self-regulation, designing an instrument to assess academic self-regulation, and evaluating the psychometric properties of the instrument.
- Chapter 3 focuses on the methodology used to collect evidence for validity and reliability for a large scale deployment of the instrument.
- Chapter 4 presents the analysis and results of item-total correlations, internal consistency, and the external validation of the academic self-regulation instrument.
- Chapter 5 addresses the interpretations and conclusions based on the results of the analysis. Applications of the scores of the academic self-regulation instrument and educational implications are discussed.

## Definition of Terms

**Metacognition.** Metacognition is defined as the knowledge and cognitive processes that learners use to monitor and control cognition. These are voluntary acts that involve self-awareness of learners and use of specific strategies for particular purposes. Brown (1978) has defined metacognitive knowledge as content specific knowledge about effective and ineffective strategies which contribute to learning. Flavell (1987) distinguished between three types of metacognitive knowledge: knowledge about self, knowledge about various cognitive tasks, and strategy knowledge. Metacognition has a cognitive orientation and focuses on the individual learners.

**Self-regulation.** For this study, self-regulation is defined as individuals' abilities to alter their behavior in response to personal and/or environmental variables. Self-regulation enables individuals to adapt their behaviors in response to a broad range of situations in their environments (Baumeister & Vohs, 2007). Bandura (1977) focused on the interactions between person, behavior, and the environment. Individuals' cognitive, affective, and biological characteristics affect their environments and the environments reciprocally affect individuals. This reciprocal determinism is mediated through self-regulation of behavior and emotion. Bandura, as a social psychologist, contributed to the inclusion of social, behavioral and environmental aspects in the study of self-regulation. Unlike metacognition that is confined to the learners' personal cognitions, based on Bandura's view, self-regulation cannot occur without interactions between individual learners and their environments (person-environment link). Other researchers have also recognized the importance of self-regulation in advancing the successes of learners in social settings and the role of self-regulation as a key to a successful society (Posner & Rothbart, 1998). Schunk (1991) emphasized the link between learners' efficacy beliefs and how they regulate their behaviors (person-behavior link). Self-efficacy beliefs affect learners' choice of tasks, choice of continuation with tasks, the amount of effort they invest in tasks, and the skills that they choose to apply to tasks.

**Academic self-regulation**. Academic self-regulation has been defined by various scholars who indicated its role and importance in learning successfully. Zimmerman (2000) defined academic self-regulation as "students' self-generated thoughts, feelings and actions that are planned and cyclically adapted to the attainment of personal goals" (p. 14). Further, Zimmerman has described the variations of academic self-regulation based on how involved

learners choose to be in managing their own learning, "learners are self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their own learning processes." (Zimmerman 2001, p. 5) In addition, Boekaerts, Maes, and Karoly (2005) related academic self-regulation to learners' self-generated intellectual actions and processes. They provided the following definition: "multi-component, iterative, self-steering processes that target one's own cognitions, feelings, and actions, as well as features of the environment for modulation in the service of one's own goals" (p. 150).

Academic self-regulation, also called self-regulated learning in the literature, is defined as "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior when guided and constrained by their goals and the contextual features in the environment'' (Pintrich, 2000, p. 453).

Schunk (2004) noted that there exists a degree of self-regulation in specific contexts and that the extent to which learners can make their own choices in tasks determines the degree of self-regulation. This means that providing learners with complete choice will result in maximum self-regulation. Thus, learners' potential for self-regulation depends on the amount of choice that is provided to them in different contexts such as when, where, and with whom to engage in learning activities.

Definitions of academic self-regulation in the literature share several commonalties. These definitions highlight learners' autonomy in engaging in intellectual actions to reach their goals. Furthermore, these definitions point out that academic self-regulation is an ongoing process in which learners adapt their cognitions and actions according to learning environments. For this investigation, academic self-regulation refers to learners' abilities to define and set their goals, strategically plan their learning activities, monitor and control individual and environmental resources, and refine their actions based on the discrepancies between their achieved outcomes and their self-set goals.

**Limitations**

Due to time and resource constraints, this instrument was administered a limited number of times which constrains the generalizability of the work to other settings. A larger sample size would support stronger inferences when analyzing individual differences in self-regulatory skills

and would support stronger relationships between the variables involved in academic self-regulation.

Further, the data was gathered in a setting with restricted demographics, a school composed of mostly white students. Collection of demographical information was limited to preserve anonymity. To obtain a more representative sample, it would be helpful to administer the instrument to students more representative of the population and to extend the current number of courses that included education, psychology, engineering, statistics, and economics to include more classes in different subjects. In addition, most of the participants were students in online courses thus limiting the analysis for comparisons in self-regulatory skills between online and classroom-based courses.

A convenient sample of Iranian students also participated in the research. These students' participation reveals both limitations and strengths for enhancing this research and the researchers' abilities to analyze and comprehend the data. Although this sample was limited in size, analyzing Iranian students' responses to items and to open-ended questions revealed that these students' language barrier had no impact on their understanding and ability in responding to this instrument compared to American students and that the study at hand has the potential to be validated in cross-country settings.

The model of academic self-regulation proposed in this investigation, represents variables that are important in academic self-regulation and does not seem to be constrained to a particular developmental stage. However, the wording of the instrument was designed for college students. It is possible that students in other age groups may not be able to comprehend the items or recognize the intended purpose of this instrument thus diminishing the anticipated benefit of using the instrument.

**Summary**

Academic self-regulation is an important variable influencing academic success. As such, it is likely that the ability to validly measure academic self-regulation could enable effective interventions with learners who are less successful, promote expanded investigations of theoretical and applied issues surrounding academic self-regulation, and guide educators in creating instructional environments that support learners engaging academic self-regulation skills

and strategies. The purpose of this investigation is to develop and validate a comprehensive assessment instrument to measure academic self-regulation as a personal trait.

# Chapter 2
# Theoretical Foundation

In this chapter the theoretical framework, learning theories, and frequently used models for describing the construct of academic self-regulation are reviewed. In addition, a model for academic self-regulation is introduced and the psychometric values of a questionnaire to validate this model is analyzed.

In the cognitive domain, academic self-regulation has strong links to learners' information processing. In the motivational domain, scholars have linked academic self-regulation to various concepts such as learners' goal attainment, self-efficacy and value beliefs. As active members of society, learners need to be able to self-regulate their learning in various social contexts and be flexible in their use of cognitive, motivational and environmental resources. The relationship of these concepts and academic self-regulation is reviewed in this chapter.

Scholars such as Brown (1978), Bransford (1979), Fernandez-Duque, Baird and Posner (2000), Winne (2001), and Smith and Kosslyn (2007) have related self-regulation to information processing theory and metacognition. The close connection between self-regulation and metacognition, learners' awareness of their cognitive processes, metacognitive knowledge, and knowledge about effective and ineffective strategies that contribute to learning are reviewed.

## Dual Store Model of Information Processing.

To explain the role of information processing in academic self-regulation, Schunk (2004), proposed a model similar to the original dual store model of information processing proposed by Atkinson and Shiffrin (1968, 1971) which consists of the sensory register, short-term memory or working memory, and long-term memory. The appropriate sensory register for different types of inputs (e.g., hearing, sight) receives information briefly and transfers information to working memory. Working memory has a limited capacity and holds information for a short time. Information has to be rehearsed to be kept in working memory. When information is placed in the working memory, related information in long-term memory is activated and placed in working memory so it can be integrated with new information. An important implication for academic self-regulation is the control processes that regulate the flow of information between

different components of the dual store model. For example, rehearsal is a control processes that is related to working memory and to successful learning.

**Metacognitive Awareness and the Executive Function in Academic Self-Regulation.**

Fernandez-Duque et al. (2000) noted that an essential component in the growth of self-regulatory skills is the development of metacognitive abilities. Metacognition refers to knowledge and cognitive processes that monitor and control cognition. This is a voluntary act that involves learners' awareness and use of specific strategies for particular domains. In addition to the three types of metacognitive knowledge (knowledge about self, knowledge about various cognitive tasks, and strategy knowledge) learners may monitor and regulate their cognitive activities (control processes in the information processing model). This regulation is closely related to the executive control functions (metacognitive processes) which relates to the ability to monitor and control the underlying information processing which is needed for learners to take action.

Scholars have recognized executive processes that are organized by a central executive in the human working memory. Although all executive processes serve important functions in metacognitive awareness, of particular interest in the context of academic self-regulation, are the two cognitive processes of executive attention: switching attention and attention control (Smith & Kosslyn, 2007).

Executive attention is distinguished from attention as a control process in the dual-store model that is responsible for transfer of information between sensory register and working memory. Attention control, which relates to executive attention and switching attention, is a subset of the executive processes. As a metacognitive process or executive control function, attention control is the ability to monitor and control the information processing necessary to produce voluntary action (Fernandez-Duque et al., 2000).

Recent theories of metacognition divide cognitive theories into two levels: the meta level and the object level (Fernandez-Duque et al., 2000). The meta level contains a model of the object level and is continuously updated by monitoring control processes in the object level (bottom-up) and providing input to the object level control processes (top-down). Fernandez-Duque et al. (2000) noted that metacognitive regulation "modulates cognitive processes at the

lower level" (p. 289). This two level system (see Figure 1) adds flexibility to cognitive processes and makes the whole process less dependent on the external (environmental) cues.

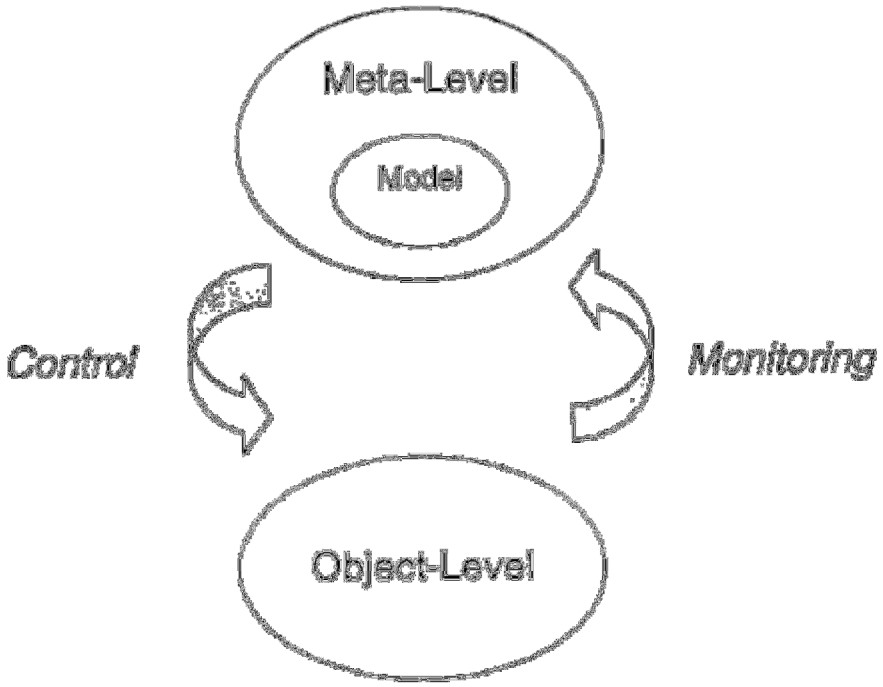


*Figure 1.* Current views on metacognition, adapted by Fernandez-Duque, Baird and Posner (2000) from Nelson and Narens (1994).

Without executive control, information is processed automatically by the individual's preconceived organized mental structures of thought or behavior. Action, then, becomes dependent on external stimuli. On the other hand, with executive control, information can be processed more deliberately by activating schemas on a voluntary basis. Especially when a metacognitively active individual faces a novel situation, the executive control guides action (see Figure 2).

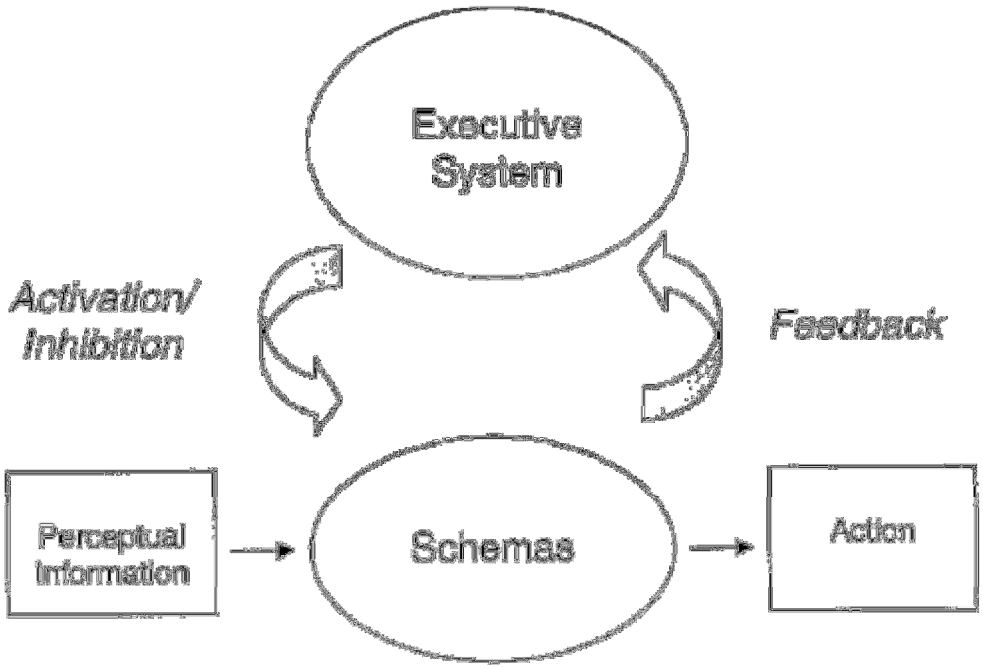


*Figure 2.* Models of executive attention, adapted by Fernandez-Duque, Baird and Posner (2000) from Norman and Shallice (1986).

In short, executive processes organize mental lives similarly to the way that corporate executives run businesses. They both have an administrative function. The information processing system has the responsibility of executing the practical, lower level functions. The following quote from Flavell, Miller, and Miller (2002) summarizes this view:

> Metacognitively sophisticated children or adults are like busy executives, analyzing new problems, judging how far they are from the goal, allocating attention, selecting a strategy, attempting a solution, monitoring the success or failure of current performance, and deciding whether to change to a different strategy. (p. 263)

Boekaerts (1997) described how self-regulated learners regulate their cognition based on three levels of cognitive self-regulation: content domain, cognitive strategies, and cognitive regulatory strategies. According to Boekaerts, academically self-regulated learners are efficient in activating their prior knowledge at all levels. Specifically, at the strategy level they activate cognitive processes and strategies such as rehearsal and elaboration and utilize their attention, working memory, and long-term memory. These learners can organize information in their long

term memory in the form of knowledge structures (products) so that they can apply cognitive and metacognitive strategies (cognitive regulatory strategies) and monitor and control their learning.

The strategy level processes of selective attention, elaboration and rehearsal listed by Boekaerts are similar to the "object level" classification by Fernandez-Duque et al. (2000) described earlier and explain the cognitive processes that learners activate from educational and cognitive psychology points of view respectively. The cognitive regulatory strategies listed by Boekaerts (monitoring progress and evaluating goal achievement) are similar to the "meta level" processes described by Fernandez-Duque et al. (2000) as both of these strategies and processes highlight metacognitive processes from the perspective of education and cognitive psychology.

As a result, the current conception of academic self-regulation is closely connected to cognitive and metacognitive processes. Controlling and monitoring these processes is one part of regulating academic learning. In addition to regulating cognition, academic self-regulation also involves regulating motivation and volition. In the following section, motivational beliefs and processes as well as the volitional strategies involved in academic self-regulation are reviewed.

**The Role of Motivation and Volition in Academic Self-Regulation.**

Researchers have noted that focusing on cognitive and metacognitive strategies used in academic self-regulation, leaves behind important processes that guide the efforts and behaviors of learners (Boekaerts, 1993; Corno, 1994; Pintrich, 2000). Pintrich (2000) noted that there is more research on how learners regulate their cognition than there is on regulation of motivation. He listed the following motivational beliefs as areas that learners can self-regulate: motivational beliefs related to achievement motivation such as goal orientation, self-efficacy, task value beliefs (importance, utility and relevance), and personal interest in the task.

Similarly, Boekaerts (1997) noted that content domain knowledge, cognitive strategies and cognitive regulatory strategies alone, cannot explain the process of self-regulation. Self-regulated learners also rely on motivational beliefs (goal orientation, values related to tasks and strategy beliefs), motivational strategies (effort avoidance and attributions) and motivational regulatory strategies (following through with goals when faced with obstacles and linking behavior to goals) to reach their academic goals.

In addition, Corno (2001) distinguished the construct of volition from motivation as the construct that controls intentions and impulses that lead to action. Volition as a self-regulatory

process follows *after* a decision has been made to learn or complete an academic task. Self-regulated learners use volitional control to maintain their intended action. In other words, activation of volitional processes is required before learners can take action according to what motivates them. Corno (2001) describes the role of volition as "postdecisional processes that protect intentions to learn." (p. 198) Performance attributions, self-observations, and self-evaluations during a learning activity are some of the processes that can be activated after the decision to participate in a learning activity has been made by learners. Using volitional control, learners remain engaged in activities by protecting their intention to learn after they have made a decision and demonstrated their intention to learn (also referred to as motivation to learn). Thus, in addition to cognitive and motivational processes of academic self-regulation, volitional strategies also affect learners' performance.

Because learners have different goals and alternative action tendencies, by using volitional strategies, learners are able to give priority to commitments and remain involved in the intended actions by selectively strengthening and protecting the intention to act as opposed to engaging in competing actions. Learners gradually develop volitional control strategies as they internalize academic rules, take responsibility and learn to deal with the increased complexities of academic success and achievement (Winne, 1995). Furthermore, according to Corno (2001), learners' awareness of their functioning (cognitive, motivational, and affective) results in developing volitional strategies. This developmental process is affected by the socialization practices of learners. Volitional strategies vary across learners and learners can be taught to use them although learners' success in using them might be disrupted during early training. Unlike cognitive strategies, volitional strategies cannot be taught by short-term instruction (Corno, 2001).

Volitional control strategies (see Table 1) include three categories of covert and overt processes of self-control (Corno, 2001): cognition, motivation, and emotion. Control of cognition was further divided into attention control (diverting attention from distractions when studying), encoding control (selectively rehearsing parts of the task that will be the focus of evaluation), and information processing control which refers to processing information efficiently and assessing steps to be taken for completing the task. Volitional control strategies will result in "optimizing the motivational power of the intent" to learn therefore increasing performance.

Emotion control or control of affect is another covert process of self-control. Self-regulated learners can suppress negative emotions such as their anxiety about test results by activating their positive emotions such as thinking of interesting things instead of worrying about the exam. Corno (2001) also cites using positive inner speech as another example of emotion control. Learners who are able to consciously control their emotion and think ahead of positive and negative outcomes brought on by their action, can control affective and motivational aspects of their learning and performance.

Table 1

*Volitional Strategies*

| ***Covert processes of self-control*** | | | ***Overt processes of self-control*** | | |
|---|---|---|---|---|---|
| | | | **Environmental control** | | |
| **Cognition control** | **Motivation control** | **Emotion control** | **Control of the task** | **Control of setting** | **Control of others** |
| ❖ Attention control: diverting attention from distractions<br><br>❖ Encoding control: selective rehearsal<br><br>❖ Information-processing control: efficiently processing information | ❖ Prioritizing intentions<br><br>❖ Attribution: identifying and correcting causes of academic failure<br><br>❖ Self-instructing: evaluating previous performance and self-verbalizing courses of action | ❖ Suppressing negative emotions<br><br>❖ Activating positive emotions | ❖ Changing controllable aspects of the task (i.e. turning the task into a game) | ❖ Changing location to reduce distraction<br><br>❖ Changing time to improve productivity | ❖ Asking the teacher to change the pace of instruction<br><br>❖ Engaging Peers in a learning activity |

Scholars have used the term motivation control to refer to the ability to prioritize intentions; for example, prioritizing homework over socializing with friends (Corno, 2001). Learners who can foresee the rewards that can follow after completing their homework and the consequences of failure over the instant gratification of socializing with friends exercise this type of covert volitional control. Corno (2001) expanded motivation control to include attribution

(identifying the cause of academic failure and correcting it) and self-instructing (self-verbalizing a course of action based on evaluating previous performance).

In addition to covert processes of self-control (control of cognitive, motivation and emotion), the overt processes of self-control focus on the control of the environment. Academic self-regulation can involve controlling the task, controlling the setting in which the task takes place (where and when), and controlling others in the task setting (teachers and peers). Compared to the covert processes of self-control, these processes can be more easily influenced by direct intervention (Corno, 2001). Examples of these interventions include changing the task, the setting, the time, or the location where the task is completed. These overt processes develop naturally in the learners' environment (home or school). Learners can influence the covert processes of self-control and perform efficiently by controlling their environments (i.e. modeling, adapting, reorganizing priorities, using others' assistance) using these overt processes.

**Learning Theories and Academic Self-Regulation**

Academic self-regulation has been examined from the view point of cognitive, metacognitive, motivational, and volitional processes that learners, as individuals, monitor and control in order to regulate their learning. However, learning is a social process and requires learners' interaction with their environments. Below, the evidence supporting the efficacy of academic self-regulation from the viewpoint of socio-cognitive and information processing theories is reviewed. Also in this section, cognitive and metacognitive strategies involved in academic self-regulation, and how these strategies relate to learners' ability to transfer their knowledge from one domain to another and their ability to problem solve is reviewed.

Zimmerman (1990) notes that development of student self-regulatory skills can result in higher student achievement. The reasons that learners try to achieve certain goals can be further explored by considering achievement goal theory (Anderman, Urdan, & Roeser, 2005) and expectancy-value theory (Wigfield & Eccles, 2000). The results of scholars' investigation in the areas of goal orientation, expectancy-value, social cognitive, and information processing theories suggest a broader connection between self-regulation and key constructs of interest in educational psychology.

According to the achievement goal theory, learners' goals are classified as either performance oriented or mastery oriented. The perception that learners hold about the purpose of

achievement provides a framework for cognitions about the value of tasks or why the learner is trying to achieve certain goals. Goal-orientation also impacts the perceptions about the causes of success and failure and the subsequent affective reaction (Anderman et al., 2005). Schunk and Zimmerman (1994) noted that unlike mastery oriented learners, performance oriented learners display negative affect toward their learning ability when they begin to experience failure. This difference in attribution influences the learning activities that students consider and engage as well as how they use their cognitive resources and strategies. Expectancy-value theory explains that learners' motivation is determined by both the extent to which they value the task at hand and the extent to which they expect to succeed in a certain task (Wigfield & Eccles, 2000).

Self-regulation can also be related to other constructs that have important roles in student learning. Self-regulation has been related to academic achievement (Zimmerman 1990), self-efficacy (Ainley, Buckley & Chan, 2009), and self-concept (Morf & Mischel, 2002). Zimmerman (1990) noted that investigating students' mastery of their own learning (self-regulation) can help teachers know how to interact with students and how schools should be organized.

**Self-regulation and social cognitive, expectancy-value, achievement goal and self-determination theories.** Schunk (2004) proposed a conceptual framework for self-regulation from the viewpoint of Social Cognitive Theory. From the perspective of this theory, the more control that is given to learners, the more they can self-regulate their learning. Therefore, the choices potentially available to learners in Schunk's framework are of particular interest. These choices correspond to learners' responses to the "why," "how," "when," "what," "where," and "with whom" of learning. They respond with their choice to participate, choice of method, time limits, outcome behavior, setting, and choice of partner, model, or teacher respectively. According to Schunk, learners have a degree of self-regulation in any specific setting based on the amount of choice that they are given in that setting. Complete self-regulation happens when learners are given full control over the task at hand, although, in academic settings, often little control is given to learners.

Schunk (2004) noted that the social cognitive perspective assumes three phases for self-regulation: self-observation or self-monitoring, self-judgment, and self-reaction. These phases are defined in learners' minds based on a certain goals such as finishing workbook pages or

acquiring knowledge. These phases are executed by learners according to their progress with respect to these goals.

During the self-observation phase, learners monitor their behaviors and judge their performance against standards determined by the environment and react positively or negatively. In the self-judgment phase, learners compare their performance level against their goals. This phase is closely connected to the importance of goal-attainment for the learners. These goals can be either absolute such as writing a paragraph in five minutes or normative goals that can be obtained by social comparisons. Progress in reaching goals results in increased self-efficacy which in turn results in increased motivation.

The last phase of self-regulation according to social cognitive theory is self-reaction. During this phase efficacious learners who believe they have the ability to succeed with more effort will put forth more effort when they perceive their progress in attaining their goals to be insufficient. Learners' evaluation of their progress is based on absolute or normative goals they have set for themselves and varies from learner to learner.

Schunk (2004) refers to social cognitive theory (Bandura, 1986) to explain the reciprocal interactions between behavior, environmental variables, and personal factors as follows:

1. Person-Behavior Interaction: Personal factors (i.e. self-efficacy) influence choice of task and student effort; reciprocally, performing well results in increased self-efficacy.
2. Environment-Person Interaction: Teacher feedback can change efficacy beliefs; reciprocally, teachers or peers may react to, for example, students with learning disabilities, based on how they perceive these students' efficacy.
3. Environment-Behavior Interaction: Students may look at the board without consciously thinking about what is written on it; reciprocally, teacher might re-teach a lesson when students give wrong answers to the questions asked.

Accordingly, Schunk explained self-regulation as a cyclical process because any of the three interactions between person, behavior, and environment can change during learning and these changes must be monitored by learners.

Zimmerman (1998) proposed a "self-fulfilling cycles of academic regulation" model (Figure 3) to demonstrate the cyclic nature of self-regulation. This model demonstrates how self-regulated learners cycle between the forethought, performance or volitional control, and self-

reflection phases. The regulation in Zimmerman's model applies to actions, cognitions, beliefs, intentions, and affects. In the forethought phase, goal-setting and planning processes are affected by learners' self-efficacy, goal orientation, intrinsic interest and task value.

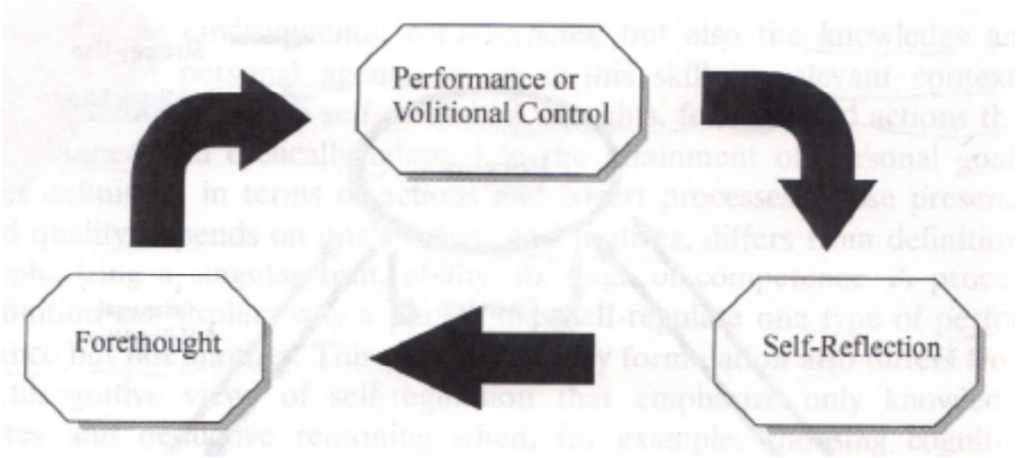


*Figure 3.* Self-fulfilling cycles of academic regulation.

According to Schunk (2004), social cognitive theorists believe that goals that are set during self-regulated learning activities can be changed based on self-evaluations. Zimmerman and Schunk (2001) list four characteristics in defining goals that help learners to regulate their learning.

First, general goals cause learners to be unsure about the next step that they need to take. Therefore, task-specific goals would be beneficial in academic self-regulation. Second, learners who set distal goals do not receive feedback immediately after performing a task and their motivation might decrease. Therefore, setting proximal goals are preferable for academic self-regulation. Third, learners who set absolute goals might see their slow progress as discouraging. Therefore, setting appropriately challenging goals that are slightly above one's current performance level, is helpful in academic self-regulation. Fourth, learners who lack the ability to recognize the purposes of the processes that they engage in to meet the final outcome goals of the task, cannot develop efficient strategies. Therefore, process goals should be linked to higher level outcome goals.

Zimmerman and Schunk (2001), note that in addition to characterizing goals that promote academic self-regulation, another strength of social cognitive theory in explaining academic self-

regulation is defining expectations based on perceptions of success in performing a specific task according to performance-based measures of expectation, such as self-efficacy. Based on social cognitive theory, modeling setting goals, defining expectancies, and creating social experiences that can become a source of learners' self-efficacy are strategies educators can use to assist learners in developing self-regulatory skills.

**Self-regulation and information processing theory.** Winne (2001) noted that self-regulated learners are different from other learners in terms of how they use their working memory. Self-regulated learners try to make the best use of the limited capacity of their working memories in three ways: reducing the demands of the task on working memory by gaining domain specific knowledge, constructing schemas and automating using them, and off-loading the working memory.

According to Winne (2001) learning is a complicated task that uses a considerable amount of the capacity of working memory. As a result, sometimes insufficient working memory capacity is left to be devoted to self-regulation. This can happen when students who do not have previous knowledge of the subject matter find themselves encountering cognitive overload when presented with difficult problems. These students need to devote much of their working memory to processing the subject; therefore little or no capacity of their working memory is left to be dedicated to self-regulation. According to Winne when enhancing student self-regulatory skills is a main concern, instruction should not overload working memory. In the other words, the learning environment should be such that it does not require the learners to search too deeply for knowledge or schemas for the task they are assigned to complete.

Winne (2001) proposed forming large chunks of information and integrating the relevant information in each chunk as the second way to increase the capacity of working memory; he characterizes this procedure as "schematizing and automating." These chunks contain procedural knowledge in addition to strategies for processing information. Although such a chunk can be complex, it still can be processed as one unit in the working memory if learned well. To clarify Winne's point, consider the acronym "MOVER" as an example: MOVER can be used as one integrated unit representing meaningful learning, organization, visual imagery, elaboration and rehearsal. Learners who create or have access to the processes by which such memory aids can be created are more likely to develop academic self-regulation.

Winne (2001) noted that "schematizing" to automate a network of procedural knowledge is a method used by expert learners and requires a considerable amount of practice. According to Bransford, Brown, and Cocking (2000), experts in any particular context differ from novices in several aspects. They recognize meaningful patterns of information, their conceptual knowledge of the topic is more detailed and organized, relevant concepts are linked together more clearly, they are able to apply their knowledge in appropriate contexts, and they can show flexibility when new situations arise. Furthermore, Ertmer and Newby (2004), similar to Winne, noted that expert learners are self-regulated. Boekaerts and Cascallar (2006) noted that, as expert learners, self-regulated learners are able to monitor and control their learning and they have a well-integrated goal hierarchy system, strategically plan to reach their goals, use a variety of strategies and are able to change their strategies in any specific context in order to achieve their goal. Winne (2001) concluded that schematizing and automating schemas increase the cognitive resources in students' working memory in order to engage in self-regulation; therefore, it is important to understand how working memory's limited resources can be preserved to understand how self-regulation works and how educators and researchers can guide learners to foster the development of self-regulation.

Winne proposed that the third way that learners can increase the capacity of their working memory is off-loading information into other media so it can be accessed when needed. For example, students take notes to record information in a lecture session. He cited "planned offloading" as a good example of self-regulation. Promoting students' note taking skills is another example of how to promote their self-regulation.

Zimmerman and Schunk (2001) noted that information processing models can explain the self-monitoring processes used in self-regulation in terms of feedback loops. When there exists a negative discrepancy between feedback and standards that are used in the self-evaluation process, learners adjust their performance until the discrepancy no longer exists. According to Zimmerman and Schunk, (2001) adjusting based on negative feedback discrepancies is effective in familiar environments when learners know what the next step would be; but, in unfamiliar situations, learners either develop better strategies, lower their standards and become content with lower performance and lesser outcomes, or keep their standards and be dissatisfied. Integration of negative feedback with positive control loop such as confirming attainment of previous goals and setting new, yet challenging goals would increase the usefulness of feedback.

**Self-Regulation and Metacognition in Problem Solving and Transfer of Knowledge**

Transfer occurs when learning in one situation affects the way we learn or perform in another situation. Problem solving includes a set of cognitive processes that learners use to reach a goal where there are no immediate solutions. Thus, the purpose of teaching and research on how to problem solve is to identify the strategies that are used when learners are presented with a "novel situation." These include identifying the problem, finding ways to represent it, and choosing a course of action that will help learners arrive at the goal (Smith & Kosslyn, 2007).

Bransford et al. (2000) relate metacognition with transfer of knowledge. The authors' interpretation of metacognition includes self-regulation as "the ability to orchestrate one's learning: to plan, monitor success, and correct errors when appropriate " (p. 97). Bransford et al. (2000) argue that transfer can be improved by helping students to develop their meteacognitive skills. It has been shown that metacognitive approaches to instruction increase transfer to new situations without the need for specifically pointing out the similarities between the new field of knowledge and the original domain of the learner's prior knowledge. One example is reciprocal teaching in which, teachers and students share leading the discussion of different parts of text. These discussions are organized around strategies such as predicting, question generating, summarizing, and clarifying to construct meaning from the text and to monitor their understanding. The teacher initially models the use of strategies as an expert reader; students then become more involved in their learning process and use strategies more effectively by getting feedback from their teacher. As they become more experienced, students assume more responsibility in their learning (Zimmerman & Schunk, 2003).

Bransford et al. (2000) also mention the work of Scardamalia, Bereiter, and Steinbach (1984), where they propose procedural facilitation for teaching written composition. This method is similar to reciprocal teaching as students along with their teacher alternately present their ideas to the group on how they reflect on activities that lead to writing such as identifying goals, generating new ideas and improving and elaborating on existing ideas.

Learners' reflection on applying metacognitive strategies, as Schoenfeld (1985) showed in the field of mathematics, can help in teaching problem-solving techniques. He teaches and shows the application of heuristics (strategies and techniques for problem solving) in generating "alternative courses of action", assessing which action can be completed in the time available and monitoring progress.

Bransford et al. (2000) cite modeling, coaching, and scaffolding in addition to collaborative peer-social interaction as the common characteristics of all these techniques in teaching metacognitive strategies in different domains.

Scholars have also examined academic self-regulation from the view point of social-cognitive and information processing theories. The link between self-regulated learners' cognitive processes, motivational beliefs and the environment was highlighted in the literature. Self-regulated learners adaptation and utilization of these processes and beliefs depend on specific contexts that learning takes place. Classroom environments provide contexts and opportunities for learners to regulate their learning.

**Self-Regulation and the Design of Classroom Learning Environments**

Boekaerts and Minnaert (1999) argued that since self-regulation is central to understanding the learning process in the classroom, research into academic self-regulation outcomes can guide creating optimal learning environments. Many researchers have noted over the years that students' judgment on a specific learning environment may indirectly affect the quality of their learning process in addition to their learning outcomes. Different environments do not equally fulfill the basic psychological needs of students, and thus, affect their motivation (Deci & Ryan, 1985).

Learners' personal perceptions of their learning environments, whether they are conscious or unconscious, favorable or unfavorable, impact their goals and their general responses to learning environments (Boekaerts & Corno, 2005). Learners should be given opportunities to experience the advantages and disadvantages of different types of learning environments that can promote acquiring their self-regulatory skills and using them effectively. Such control in choosing their learning environments results in increased intrinsic motivation which can affect their achievements. Learning can be classified from highly informal to highly formal where informal learning is a "purposeful, systematic and sustained learning activity that is not sponsored, planed or directed by any organization" and formal learning is "classroom-based and highly structured." (Boekaerts & Minnaert, 1999, p. 535) Self-regulated learners can monitor and control what and how they learn in both informal and formal learning environments; however the main focus of this review is on formal environments because they are the types of environment most common.

In designing learning environments, an important factor to consider is the type of instruction. Minimally guided approaches such as discovery learning, problem-based learning, inquiry learning, experiential learning, and constructivist learning have become popular and are appealing to many instructors in recent years. Kirschner, Sweller, and Clark (2006) argue that minimally guided approaches can be effective when learners have adequate prior knowledge to guide their learning internally. These authors argue however, that minimally guided instruction is incompatible with the information processing model, consisting of sensory memory, working memory, and long term memory. More specifically in the cognitive view as it is today, long term memory is viewed as the central, dominant structure of human cognition. Everything that we sense and think about is influenced by our long term memories. Experts' skills are the result of extensive experience that they have stored in their long term memories. They can use this information and can quickly select and apply the best solution for the task at hand. Whereas novice learners will be forced to search through the limited working memory for solutions, making unguided or minimally guided instruction not suitable to make necessary changes in their long-term memory. Zimmerman (1990) argues that educators need to take into account that students develop their self-regulated abilities over time. As they age, learners view of their self-competence, cognitive strategies, and motivation change, which affects how their self-regulation develops.

One conclusion that can be drawn from comparing different learning environments is that self-regulated learners, by relying on their cognitive and motivational resources, can adapt to both minimally guided and highly guided learning environments and achieve their goals.

Supportive learning environments can influence learners' choices and help them to strategically adapt their actions and planning according to environmental changes. Learners' adaptation can occur as they navigate between top-down and bottom up self-regulation based on their environmental cues.

According to Boekaerts and Corno (2005) learners have multiple goals at the same time that might be conflicting with one another. In academic settings, one priority for learners is to enhance knowledge and increase cognitive and social skills. The other priority is to protect one's emotional well-being by trying to look competent. Learners try to balance these two priorities. Top-down self-regulation takes place when learners' mastery goals steer the process of self-regulation while bottom-up self-regulation occurs when cues from the environment drive

learners to self-regulate their learning to protect their well-being goals (Boekaerts & Corno, 2005). When the learning environment is guided, self-regulated learners might be able to create choices for themselves to achieve either academic or well-being goals. On the other hand, when the learning environment is minimally guided, self-regulated learners have access to a wider range of choices on their learning conditions. These learning conditions, as explained by Schunk (2004), can be on the following learning conditions: why (choice of participation), how (choice of learning method), when (choice of time limits), what (choice of outcome), where (choice of setting), and with whom (choice of partner, model, or teacher).

Educators can play an important role in directing student learning. In unfamiliar settings or when students have limited prior knowledge of the subject and generally when learners next step is not obvious, instructors can model steps, teach adaptation of strategy use and guide learners' efforts so that learners can optimally use their resources whether they are cognitive (working memory and long term memory) or environmental resources. This guidance can result in changing students' expectancy beliefs therefore increasing their motivation and results in higher performance.

Academic self-regulation is viewed as a complex and theory-based concept. Researchers have proposed practical models to organize conceptions of academic self-regulation based on self-related constructs, environmental attributes, and learners' actions. In the following section, the three most prominent models of academic self-regulation are reviewed.

**Review of Three Self-Regulation Models**

All three frequently referenced models (Boekaerts, 1997; Pintrich, 2000; Winne & Hadwin, 1998) highlight the importance of planning, monitoring, and cognitive control as phases in self-regulatory learning. According to all three models, academic self-regulation involves regulation of cognition and motivation. Pintrich (2000) also adds regulation of behavior and learning context.

Pintrich highlighted four important assumptions about learning and regulation common in models of academic self-regulation proposed by various scholars. First, they assume that learners are active, constructive participants in the learning process. Second, they assume that learners can potentially monitor, control and regulate their cognition, motivation, behavior, and some aspects of the learning environment. Third, there exists some goal or standard that can be used by

learners to determine if they should continue the process that they are engaged in or if some changes should be made. Finally, the fourth assumption is that personal characteristics and attributes of the learning environment do not impact achievement directly; instead, they impact achievement through learners' regulation of their cognition, motivation, and behavior.

**The self-regulation model proposed by Pintrich.** Pintrich (2000) uniquely organized the actions and strategies of academic self-regulation into four phases to develop academic self-regulation: goal-setting and planning, monitoring, control, and reflection. Self-regulation takes place in four domains: cognition, motivation/affect, behavior, and context. It is during the reflection phase that learners evaluate how well they have regulated in each of the four areas: cognition (cognitive judgments), motivation/affect (affective reactions), behavior (choice behavior), and context (evaluation of task and context).

As shown in Table 2, goal orientation, task value activation, interest activation, efficacy judgments, and attributions are all related to the first phase, "forethought, planning and activation phase" of self-regulation. This justifies the need for a model that focuses on the goal-setting and planning phase and the related cognitive, behavioral and context based variables.

The distinguishing characteristic of the model proposed by Pintrich is that it addresses areas of regulation proposed by the other models (cognition and motivation), in addition to how learners regulate the context of the learning activity, interactions with the environment, and their own behavior.

**The self-regulation model proposed by Winne and Hadwin.** Winne and Hadwin (1998), proposed a four phase model of self-regulation from an information processing viewpoint. This model is based upon cognitive products such as new information resulting from cognitive operations of learners which can be either primitive or acquired. Metacognitive monitoring and control are considered as two events that are critical in academic self-regulation.

Winne (2001) identified five key information processes involved in academic self-regulation: searching, monitoring, assembling, rehearsing, and translating (SMARTs). When these processes are used to manipulate existing information, new information or a "product" is created by learners. Successive products result in reaching a goal that completes a task. Winne

Table 2

*Phases and Areas of Academic Self-Regulation from Pintrich (2000).*

**Table 2 -** Phases and Areas for Self-Regulated Learning

| | Areas for regulation | | | |
|---|---|---|---|---|
| Phases | Cognition | Motivation/affect | Behavior | Context |
| 1. Forethought, planning, and activation | Target goal setting | Goal orientation adoption | [Time and effort planning] | [Perceptions of task] |
| | Prior content knowledge activation | Efficacy judgments | [Planning for self-observations of behavior] | [Perceptions of context] |
| | Metacognitive knowledge activation | Ease of learning judgements (EOLs); perceptions of task difficulty | | |
| | | Task value activation | | |
| | | Interest activation | | |
| 2. Monitoring | Metacognitive awareness and monitoring of cognition (FOKs, JOLs) | Awareness and monitoring of motivation and affect | Awareness and monitoring of effort, time use, need for help | Monitoring changing task and context conditions |
| | | | Self-observation of behavior | |
| 3. Control | Selection and adaptation of cognitive strategies for learning, thinking | Selection and adaptation of strategies for managing motivation and affect | Increase/decrease effort | Change or renegotiate tasl |
| | | | Persist, give up | Change or leave context |
| | | | Help-seeking behavior | |
| 4. Reaction and reflection | Cognitive judgments | Affective reactions | Choice behavior | Evaluation of task |
| | Attributions | Attributions | | Evaluation of context |

(2001) also identified four phases in academic self-regulation: defining the task, setting goals and planning how to reach them, enacting tactics, and adapting metacognition. During each phase, information products are generated either in learners' memory (i.e. arriving at a solution to a problem before writing it down) or in the environment (i.e. an essay) as a result of the SMARTs processes.

Winne (2001) explained how learners process information during each of the four phases of self-regulation: definition, goal-setting, enacting tactics, and adapting metacognition as follows:

1. Definition Phase - learners process information about the cognitive conditions from conditions retrieved from long-term memory (beliefs, domain knowledge, knowledge of task) and conditions from the environment (available resources, time, directions for completing a task) required to complete a task.
2. Goal-setting Phase - learners set goals and develop plans to achieve their goals. Once a goal is set, tactics or strategies related to that goal may be retrieved automatically from long-term memory if the learner is an expert in the learning subject.
3. Enacting Tactics Phase - learners actual work on the task takes place by retrieving information based on their perception of the task from their long-term memory into their working memory.
4. Adapting Metacognition Phase - learners revise conditions and change their chosen tactics to better complete the task at hand. This phase might not always be necessary.

The distinguishing characteristic of Winne and Hadwin's model is providing a detailed description of self-regulation as a process. Their model focuses on cognitive regulatory stages which include adapting meacognition when necessary. This model seems to assume that all self-regulated learners automatically go through these phases and does not take into account the environmental and motivational factors involved.

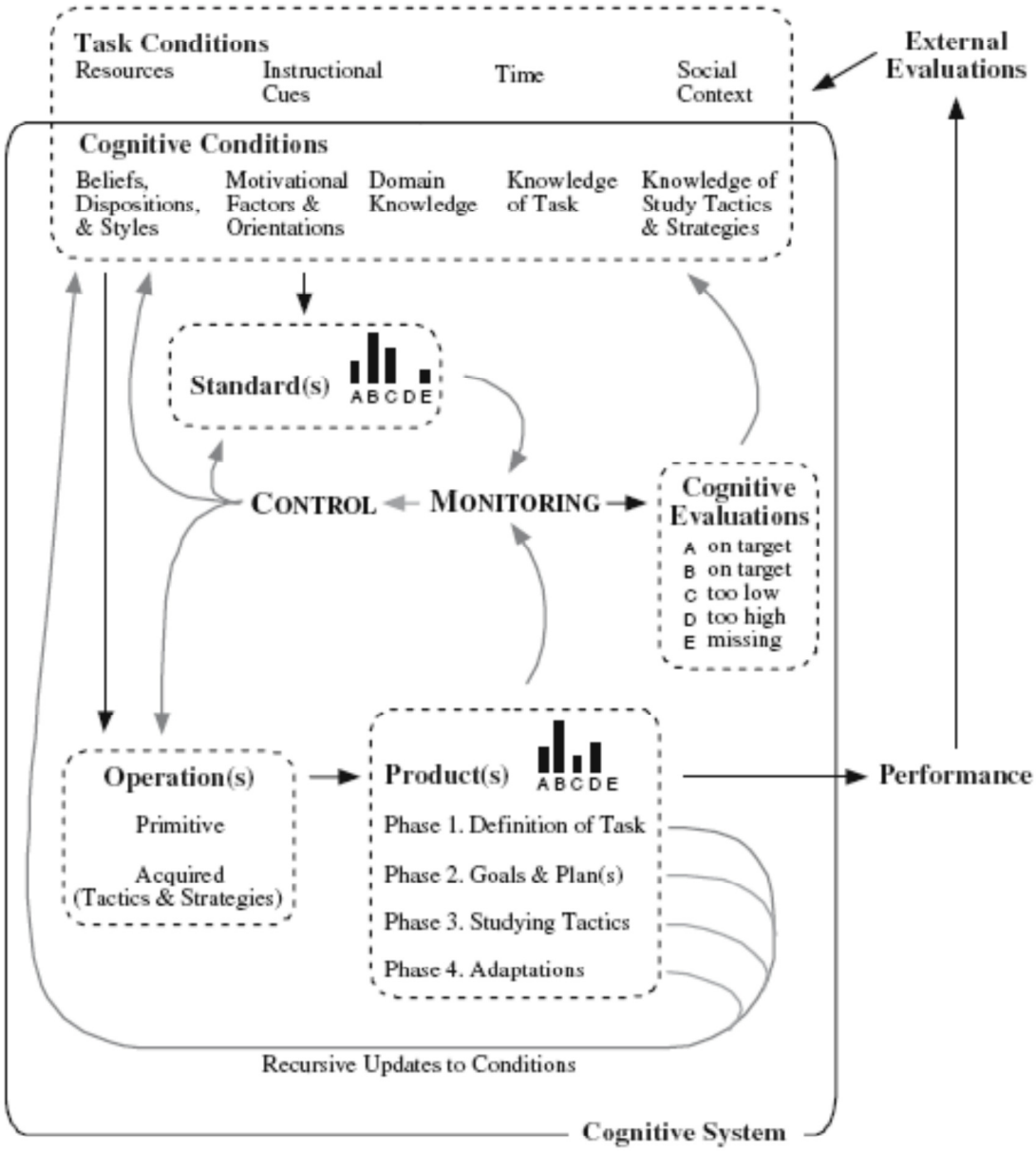


**Fig. 1** The Winne-Hadwin model of self-regulated learning.

*Figure 4.* A 4-stage model of academic self-regulation from Winne & Hadwin (1998). In Winne & Perry (2000).

Table 3

*Summary of Academic Self-Regulation Model Winne and Hadwin (1998)*

| | | |
|---|---|---|
| **Information Processes** | Manipulation of existing information ➔ results in new knowledge (products) | Searching<br>Monitoring<br>Assembling<br>Rehearsing<br>Translating |
| **Phases** | New knowledge in each phase<br>• memory<br>• environment | Defining tasks<br>Setting goals and planning how to reach goals<br>Enacting tactics<br>Adapting metacognition |

**The self-regulation model proposed by Boekaerts.** Boekaerts (1997) proposed a six component model for academic self-regulation from cognitive and motivational viewpoints. She described three levels for each component: domain specific knowledge, strategy use and setting goals, and monitoring the attainment of goals. These components are used by learners to set their own academic goals, plan learning based on these goals, monitor their learning, and control the attainment of goals.

At the domain-specific knowledge level, cognitive self-regulation depends on the learners content domain knowledge (procedural and conceptual). Some learners also have access to a third type of content domain knowledge, metacognitive knowledge. As classified by Flavell (1987) there are three types of metacognitive knowledge: knowledge about self, knowledge about various cognitive tasks, and strategy knowledge.

At the strategy use level, cognitive self-regulation relies on cognitive strategies such as the decoding, rehearsal, and elaboration that are necessary for information processing. In transferring these strategies to a new domain, learners may need external regulation in addition to the content knowledge, although, a subset of their strategies may be transferred to the new domain.

At the goal level, cognitive self-regulation relies on cognitive regulatory strategies which are available to learners who are metacognitively aware of their actions. These strategies include planning, monitoring, reflection, and self-testing. Learners who can take advantage of these metacognitive skills, can activate their cognitive strategies and utilize their content knowledge intentionally. Learners who lack these skills will face difficulties in defining and reaching their goals. This may be due to lack of coherent content knowledge or difficulty in developing cognitive strategies.

In explaining motivational self-regulation, Boekaerts (1997), lists three levels: domain specific knowledge, strategy use, and setting goals. At the knowledge level, metacognitive knowledge and motivational beliefs such as beliefs and values related to the tasks in a certain domain and goal orientation are listed in her model. At the strategy level, motivation strategies such as effort avoidance and using social resources are listed. Finally, at the goal level, motivational regulatory strategies such as maintaining action plans when faced with difficulties or deciding not to continue following the current goal.

Boekaerts (1997) noted that the motivational knowledge, strategies, or goals can either be specific to a certain domain or may be transferred from one domain to another. Learners who demonstrate good performance in one learning area, when learning a new content domain, may be able to transfer their knowledge, strategies, or goals used in either cognitive or motivational regulation to the new domain if the knowledge, strategies, or goals of the previous domain have some similarities with those of the new domain.

The major contribution of the model proposed by Boekaerts is its emphasis on both cognitive and motivational forms of academic self-regulation and demonstrating that each form is enacted by learners in three levels, (from top to bottom: goals, strategy use, and domain-specific knowledge) where the lower levels are needed to regulate at the higher levels.

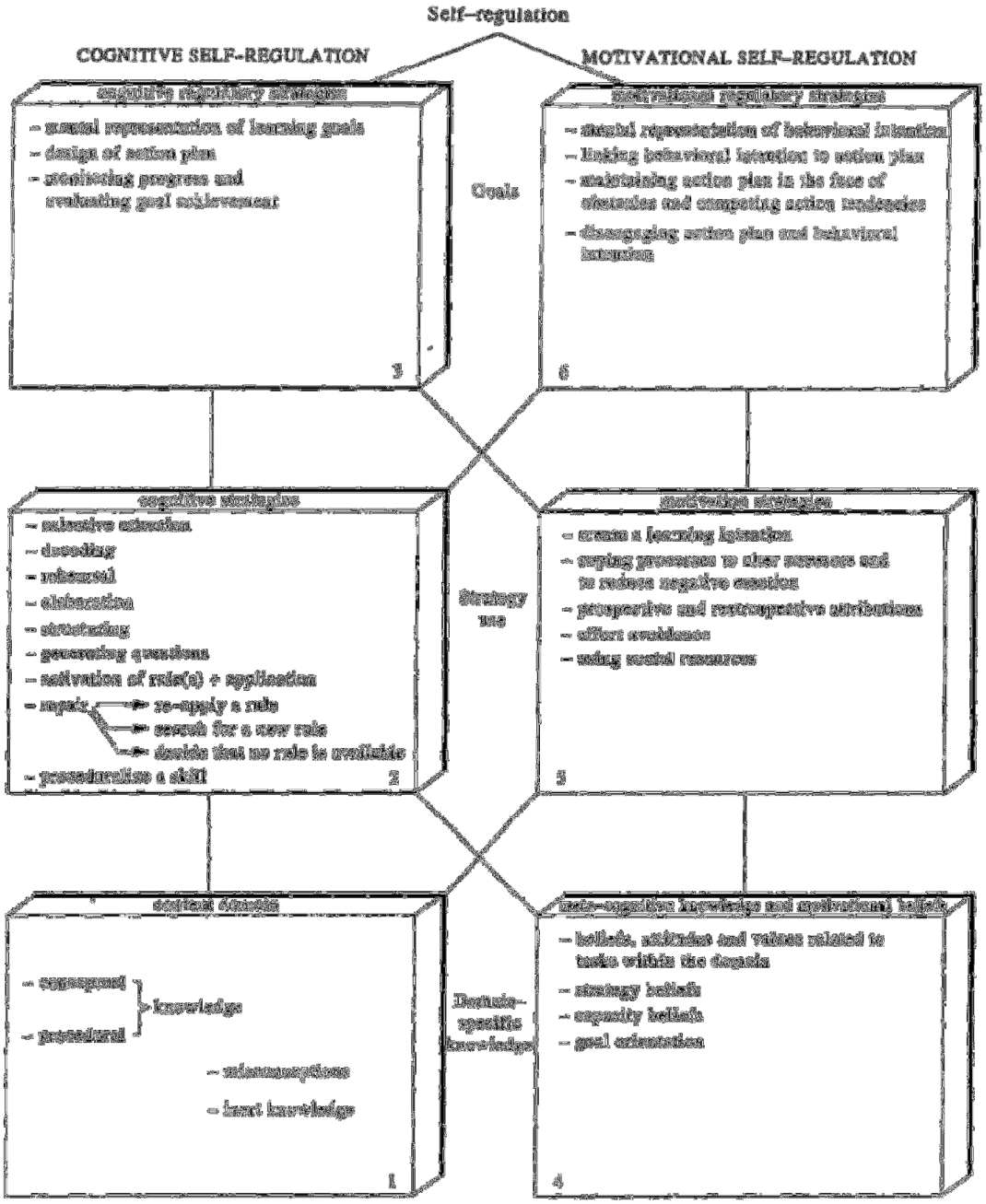


Figure 1. A six component model of self-regulated learning.

*Figure 5.* A six component model of academic self-regulation from Boekaerts (1997).

Table 4

*Comparison of Main Features of Three Models of Academic Self-Regulation*

| | **Boekaerts (1997)** | **Winne and Hadwin (1998)** | **Pintrich (2000)** |
|---|---|---|---|
| **Summary** | Covers cognitive and motivational regulation and to some extent shows the interaction between these two areas | Highlights four phases of cognitive self-regulation (task definition, goal-setting, enacting tactics, and adapting metacognition) | Lists learners' thoughts and actions during each of the four phases of self-regulation (forethought, monitoring, control, and reflection) in each area of self-regulation (cognition, motivation, behavior, and context) |
| **Distinguishing Characteristic(s)** | Demonstrates a three level hierarchy (goals, strategies, and knowledge) in which learners can regulate both their motivation and cognition | Views self-regulation as a series of cognitive phases that self-regulated learners go through | Demonstrates learners' regulation of behavior and context in addition to cognitive and motivational regulatory functions |
| **Unexplained** | Interaction of learners with the learning environment is not clearly addressed | Does not address motivational, contextual, and environmental factors | Does not show the interactions between any of the areas of self-regulation |

The model proposed by Boekaerts (1997) addresses cognitive and motivational areas of self-regulation; however, her model does not directly address the complex interrelation between these areas. Winne and Hadwin's (1998) cognitive model does not explicitly take into account motivational and environmental factors that are associated with academic self-regulation. The model proposed by Pintrich (2000) outlines theoretically, how learners regulate their cognition, motivation, behavior, and the context; however, it does not depict the interaction between these areas as learners regulate their learning.

Academic self-regulation has been viewed from the perspective of different learning theories and examined in the light of three frequently cited models of self-regulation. Different learning environments that can support academic self-regulation to various degrees were reviewed. These theories, models, and environments provide useful insights in designing a model of academic self-regulation. The model described below focuses on the phases of academic self-regulation as these phases help to explain the complex interactions between learners' cognitive, motivational, and volitional resources and their learning environment.

**MISEVE: A Comprehensive Model of Self-Regulation**

As illustrated in Table 4, each of the most frequently referenced models does not account for all of the variables that have been shown to influence academic self-regulation. In this section, a model of academic self-regulation which is intended to integrate the research evidence and theories on academic self-regulation and the rationale for this model, are presented along with an estimate of this model to explain academic self-regulation.

This model addresses the processes and actions which self-regulated learners use. By understanding these processes, educators can guide learners more effectively in using motivational and cognitive strategy resources, in using their volitional skills to control and protect intentions to act and to re-focus on academic tasks if distracted, monitor and control their learning actions, and to evaluate their achievements in reaching their academic goals.

A model of self-regulation that clearly connects the motivational, cognitive, and environmental aspects of academic self-regulation and illustrates the interrelations between these variables during the goal-setting, monitoring, and controlling phases of self-regulation should be useful for investigating and promoting academic self-regulation. This model may also indicate how learners design efficient learning environments. Learners and educators could use this kind of model to identify the areas that they need to regulate in order to achieve their goals.

The MISEVE model of self-regulation (see Figure 6) proposed here depicts the interrelationship between individual learners' motivational and cognitive constructs and the ways that learners can regulate their environments. These interrelations are engaged as intellectual actions that learners execute by monitoring and controlling motivation, cognition, and the controllable aspects of the learning environment.

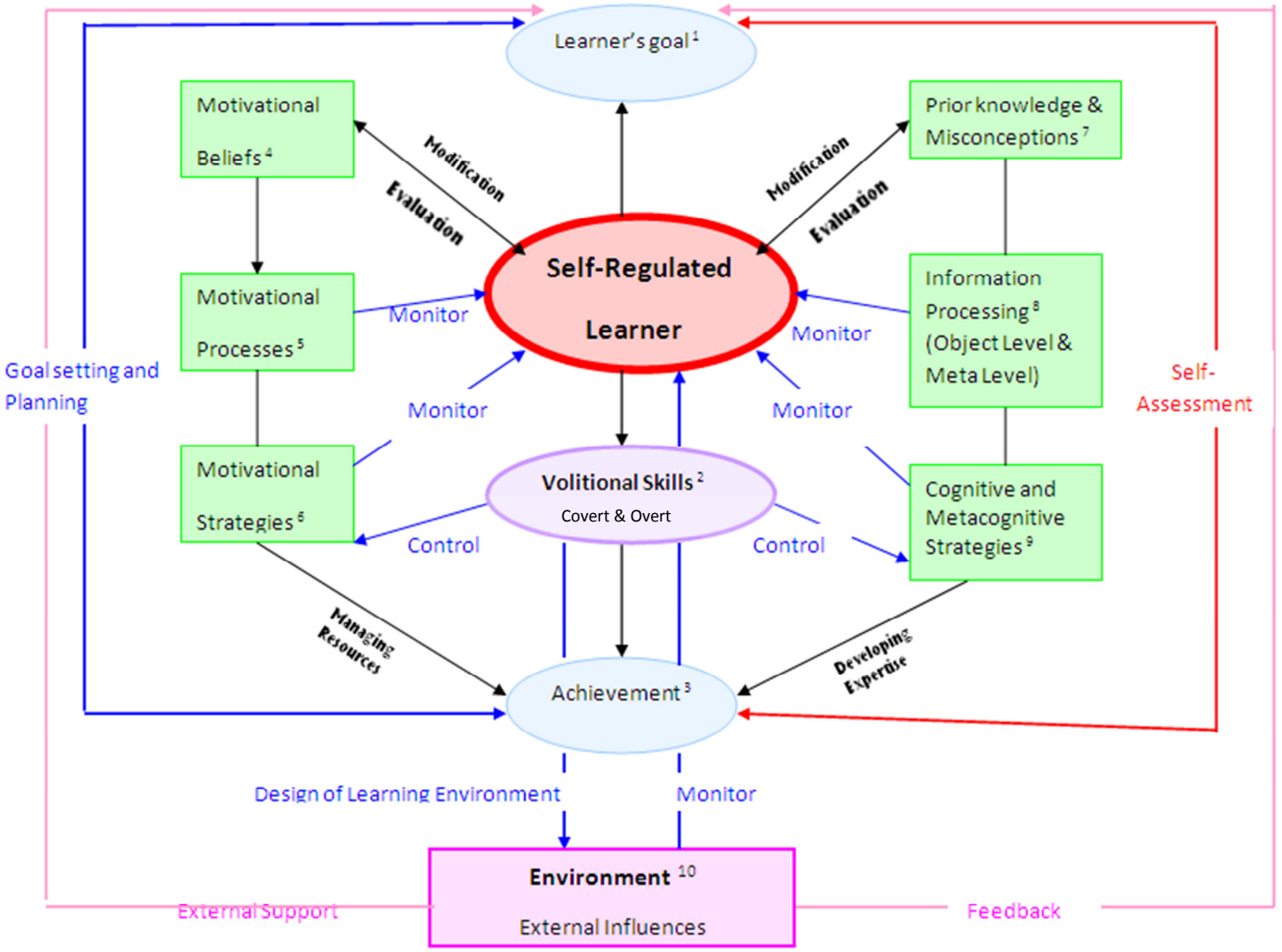


*Figure 6.* MISEVE: A model of academic self-regulation.

Table 5 summarizes elements and the interactions between these elements in the MISEVE model of academic self-regulation.

Table 5

*Summary of the Features of MISEVE as a Model of Academic Self-Regulation*

| Areas of Regulation | Elements | Knowledge, Processes, and Skills | Interaction Links between Elements |
|---|---|---|---|
| **Motivation** | Motivational Beliefs | • epistemological beliefs<br>• value beliefs<br>• efficacy beliefs<br>• identity beliefs<br>• beliefs about self<br>• domain general and domain specific beliefs | ◆ Modification (from "self" to motivational beliefs)<br>◆ Evaluation (from motivational beliefs to "self") |
| | Motivational Processes | • approach processes<br>• avoidance processes | ◆ Monitor (from motivational processes to "self") |
| | Motivational Strategies | • using coping processes<br>• using social resources | ◆ Monitor (from motivational strategies to "self")<br>◆ Managing Resources (from motivational strategies to achievement) |
| **Cognition and Information Processing** | Prior Knowledge | • prior conceptual knowledge (i.e. schema, misconception)<br>• prior procedural knowledge (i.e. scripts) | ◆ Modification (from "self" to prior knowledge)<br>◆ Evaluation (from prior knowledge to "self") |
| | Information Processing | • object level processes (encoding, retrieval)<br>• meta level processes (executive control processes: attention control, switching attention) | ◆ Monitor (from information processing to "self") |
| | Cognitive Strategies and Metacognitive Strategies | • rehearsal (object level)<br>• elaboration (object level)<br>• monitoring progress (meta level)<br>• design of action plan (meta level) | ◆ Monitor (from cognitive and metacognitive strategies to "self")<br>◆ Developing Expertise (from cognitive and metacognitive strategies to achievement) |

(table continued)

Table 5 (continued)

| Areas of Regulation | Elements | Knowledge, Processes, and Skills | Interaction Links between Elements |
|---|---|---|---|
| | Learner's Goal | • performance oriented<br>• mastery oriented | ◆ Goal Setting and Planning (from learner's goal to achievement -reciprocal interaction)<br>◆ Self-Assessment (from learner's goal to achievement -reciprocal interaction) |
| **Self and Volition** | Volitional Skills | • control of motivation<br>• control of cognition and metacognition<br>• control of emotion<br>• control of task<br>• control of environment | ◆ Control (from volitional skills to motivational strategies)<br>◆ Control (from volitional skills to cognitive and metacognitive strategies)<br>◆ Design of Learning Environment (from volitional skills to environment) |
| | Achievement | • learner's perception of academic success | ◆ Goal Setting and Planning (from achievement to learner's goal - reciprocal interaction)<br>◆ Self-Assessment (from achievement to learner's goal - reciprocal interaction) |
| **Learning Environment and External Influences** | Environment and External Influences | • impact of contextual factors on learner's goals<br>• impact of teachers, peers, social-interactions, feedback, and support<br>• impact of external influences on learner's emotions | ◆ Monitor (from environment to "self")<br>◆ External Support (from environment to learner's goal)<br>◆ Feedback (from environment to learner's goal) |

* "self" in this table refers to self-regulated learner in Figure 6.

In Figure 6, the left column represents the motivational characteristics of beliefs, processes and strategies of self-regulated learners, the right column represents cognitive and metacognitive characteristics of self-regulated learners, and the central column represents self-

regulated learners, their goals, volitional skills and achievement. The internal arrows signify learners' intellectual actions to control resources and monitor goal achievement. In addition, the characteristics and processes which are external to the learner and signify the environmental factors related to learning are represented at the bottom of Figure 6. The interrelation between learners and their motivational, cognitive, and volitional strategies and beliefs and the interaction between learners with their learning environments are illustrated with different phases of academic self-regulation: goal-setting and planning, control, monitoring, design of learning environment.

**Description of the elements of MISEVE and their interactions.**

***Elements of MISEVE.***

1. Learners' Goals: a central node in this model represents the goals that self-regulated learners set for themselves. Learners' goals are influenced by the learners' motivational, cognitive and metacognitive behaviors and strategies, and by the learning environment which consists of various external influences. Learners' perceived achievements also play an important role in how learners decide upon their goals.

Self-regulated learners have the ability to set intermediate goals for themselves that are consistent with their ultimate goals. Attaining these self-set ultimate goals would be considered by learners as "achievement". The learners would set their immediate goals based on the expectancy that they associate with the environmental and support variables and the value that they perceive from the attainment of these goals. These goals might be either performance oriented or mastery oriented based on the learners perceived achievement goal.

2. Volitional Skills: Volition is defined as controlling and protecting intentions to learn by applying specific skills to stay task-focused and avoid distractions. Learners who possess volitional skills are able to use action control strategies to deal with decreased motivation or negative emotions (Deimann & Bastiaens, 2010). In MISEVE, in addition to cognitive, metacognitive and motivational control strategies, volitional skills refer to the learners' ability and skills to control their emotions which are elicited from different stimuli in the environment, control of tasks and control of the environment. Self-regulated learners use their volitional skills to focus and if distracted refocus their attention on the task at hand and ultimately achieve their goals.

3. Achievement: Ainley and Patrick (2006) mentioned that achievement activity involves the learners' perception of cues associated with learning tasks. When tasks contain cues that can connect to learners' current cognitive and motivational tendencies, learners' interest is activated and they remain engaged in the task. Achievement refers to learners' perceived success in completing an achievement activity. Development of student self-regulatory skills can result in higher student achievement (Zimmerman, 1990).

4. Motivational Beliefs: Motivational beliefs include epistemological beliefs, value and efficacy beliefs, identity, beliefs about self and domain general and domain specific beliefs. These beliefs influence learners' motivational regulation at the process level and the strategy level.

5. Motivational Processes: Self-regulated learners generate intentions to either engage in learning tasks or avoid tasks partially or all together based on their perceived self-efficacy of the tasks and the value they associate with engaging in and eventually completing the task. Boekaerts (1997) noted that motivational processes that academically self-regulated learners activate include attributions, coping processes to overcome negative emotions and stressors, effort avoidance, and creating a learning intention. These processes can be domain general or domain specific.

6. Motivational Strategies: Self-Regulated learners use coping processes and social resources. Learners' motivational processes and motivational strategies represent intention to act although at two different levels of self-awareness. Self-regulated learners are aware to a greater extent of their choice of strategy use; their activation of motivational processes might be automatic and consistent to their prior experiences that shaped their motivational beliefs. Since motivational processes guide the utilization of motivational strategies, motivational beliefs also determine the motivational strategies that learners choose. Wolters (2003) noted that regulation of motivation depends on learners' level of awareness and purposefulness. Learners have multiple goals at the same time which might be conflicting with one another.

According to Boekaerts (1997), self-regulated learners use motivational strategies such as creating a learning intention for themselves, use coping strategies when faced with stressors, and reduce negative emotions. In order to comply with social demands learners need to adjust and constrain their wishes, interests and expectations (Boekaerts & Cascallar, 2006). Boekaerts and Corno (2005) argue that students' goals and their perceptions of learning environments are

affected by their perceptions of learning activities and by their perceptions of favorable and unfavorable cues in learning environments. These perceptions and interpretations will affect students' choices whether they are conscious or unconscious. In addition, students who are not well integrated with the social environment will be at risk of getting poor results. Therefore, self-regulation can be most beneficial when educators can accommodate students' different mental representations.

7. Prior Knowledge and Misconceptions: Self-Regulated learners can schematize their conceptual knowledge and organize their procedural knowledge into scripts. Learners' prior knowledge, including their misconceptions, is stored in their long-term memory. Self-regulated learners can access this organized stored knowledge efficiently.

8. Information Processing: Object level processing (Fernandez-Duque et al., 2000) represents retrieving prior knowledge from long-term memory, processing environmental stimuli into working memory. Self-regulated learners evaluate new information and, when necessary, encode it into long-term memory and integrate it with prior knowledge or modify their prior knowledge. Meta level processing involves learners' intentionality and awareness (executive functioning such as executive attention) of the underlying information processing.

9. Cognitive and Metacognitive Strategies: Elaborating and structuring information are examples of cognitive strategies that self-regulated learners use in the object level. Designing learning action plans is an example of metacognitive strategies that self-regulated learners use. These strategies can be either context specific or context free. Engagement in cognitive and metacognitive strategies reflects learners' highest degree of intentionality and is indicative of learners' goal-directed regulation of cognition and metacognition.

10. Environment: Self-regulated learners select, structure and create their learning environments (Zimmerman, 1990). In the model described here, environment refers to influences external to the learner that affect the learning process. The environment influences how learners set their goals. This influence is reflected in the model through external support from teachers, peers, social interactions, and feedback that learners receive from teachers and peers, especially the feedback provided by formative and summative assessments. External support and feedback help learners to monitor learning environments and set attainable goals which are in accordance with learners' perceived achievement whether they are performance or mastery oriented. Learners utilize their volitional skills to control cognitive and motivational strategies in order to

design learning environments that are in accordance with needs for learning. MISEVE addresses environmental cues that trigger learners' affective and emotional responses as part of the environment that can be regulated through volitional skills including emotional control.

***Interactions between MISEVE elements.***

The interactions between "self" and motivational and cognitive constructs are illustrated as intellectual actions that learners execute. These intellectual actions (which are the links between motivational, cognitive, volitional, and environmental regulatory areas, are presented in italics) include *monitoring* and *controlling* the aspects of the learning environment that learners are able to change in order to achieve their goals. Self-regulated learners monitor and control the attainment of their goals. *Monitoring* processes represent "metacognitive awareness of different aspects of the self or task and context", and *control* represents a range of "reactions and reflections on the self and the task or context" Pintrich (2000, p. 455).

Interactions between self-regulated learners' volitional skills and other elements in MISEVE represent learners' abilities and skills to control their emotions which are elicited from different stimuli in the environment, their abilities and skills to control the task at hand, and their abilities and skills to control the environment such as choice of time and place of engaging in learning tasks. Self-regulated learners use their volitional skills to "refocus" their attention on the task at hand and ultimately achieve their goals. While learners monitor their information processing and strategy use, their ability to control their strategies and actions depends on their volitional skills as shown in MISEVE by *control* links. Self-regulated learners can monitor cues from the environment and execute control through their volitional skills by adapting or altering the aspects of learning environments that they are able to control. MISEVE illustrates this control of the environmental cues by the *design of learning environment* link. Self-regulated learners design their learning environments in accordance with the factors that can contribute to achievement of their goals. These academically self-regulated learners monitor the outcomes of their performance by assessing the progress they have made through implementing selected cognitive, metacognitive, and motivational strategies that assist them in attaining their academic self-set goals which are shown in MISEVE by *monitor* links.

Academically self-regulated learners are aware of the general cognitive and motivational strategies that are effective for them to achieve their goals and can determine whether they have

the cognitive capacity and motivation to invest the necessary resources to meet their goals (Boekaerts, 1997). MISEVE shows these interactions between self-regulated learners' use of motivational strategies and their achievement by the *managing resources* link. In addition, a considerable amount of practice is needed for learners to develop expertise. Academically self-regulated expert learners can recognize meaningful patterns of information and their conceptual knowledge of different topics is organized and linked together very clearly. As a result, they are able to apply their knowledge in appropriate contexts and show flexibility in new situations (Winne, 2000; Bransford et al., 2000). MISEVE shows the interaction between learners' cognitive strategies and their achievement through the *developing expertise* link. Self-regulated learners evaluate their beliefs and their prior knowledge and when necessary, modify them to be able to achieve their self-set goals. These interactions of self-regulated learners and their prior knowledge and motivational beliefs are illustrated in MISEVE as *modification* and *evaluation* links.

As illustrated in MISEVE, self-regulated learners establish learning goals that are the focus of cognitions and actions. These self-set goals are directly connected to the learners' academic achievements. The link between the learners' goals and achievements can be explained by achievement goal theory and expectancy-value theory. Learners' perceptions of the purpose of achievement (mastering the subject or performing well and getting a good grade) influence their intention to engage in learning tasks. In addition, learners set their immediate goals based on the expectancy of success that they associate with environmental and support variables and the value that they associate with attainment of these goals. These interactions are illustrated in MISEVE by *external support* and *feedback* links. As part of the learning environment, controllable and uncontrollable external influences can impact self-regulated learners' goals as shown in MISEVE.

The *goal setting and planning* link addresses the connection between setting goals and achievement. Self-regulated learners have a well-integrated goal hierarchy system, strategically plan to reach their goals, and have a broad repertoire of strategies. They are experts in selecting, using, and acquiring different strategies depending on the context of the task at hand in order to achieve their goals (Boekaerts & Cascallar, 2006). Pintrich (2000) situates goal setting in a broader context of "forethought, planning and activation" as the first phase of academic self-regulation.

MISEVE illustrates the self-regulated learners' evaluation of their performance as the *self-assessment* link. This link represents processes in which self-regulated learners assess their goal attainment based on their perceived achievement which can potentially impact their future goal setting.

Although the MISEVE model illustrates a personal and unique application for individual learners, it is a normative conception which describes "ideal" academic self-regulation or learners who exercise the maximum potential self-regulation within any specific learning environment. This conceptual model of academic self-regulation can be used to analyze the potential maximum academic self-regulation possible in any specific learning environment. By taking into account the links and elements of MISEVE, educators and learners can identify the processes or interactions where learners' academic regulation needs to be improved and can plan remedial action to enhance academic self-regulation in order to increase learners' achievement.

Ideally, the cognitions and actions of self-regulated learners can be summarized as follows: Self-regulated learners plan, set goals, organize, self-monitor, and self-evaluate different aspects of their learning processes to attain the achievement goals they set. They are able to utilize their cognitive/metacognitive, motivational and environmental resources in order to pursue and achieve their goals. (Boekaerts, 1997; Boekaerts & Cascallar, 2006; Bransford et al., 2000; Ertmer & Newby, 2004; Garcia & Pintrich, 1994; Pintrich et al. 1991; Zimmerman, 1990).

MISEVE, as a Model of Academic Self-Regulation, identifies the cognitive constructs and intellectual actions that self-regulated learners use. It has implications for students as well as educators. Students need to engage in specific intentional intellectual actions to reach their academic goals (Zimmerman, 1990). This model also comprehensively and systematically covers variables in the areas of metacognition, volition, motivation, and external influences known to be associated with self-regulation. By understanding these variables, educators can guide learners to more effectively use their motivational and cognitive resources, improve their volitional skills to focus their resources and protect their intentions to learn, to monitor and control their actions, and to evaluate their achievement.

**Developing and Validating an Assessment Instrument Based on MISEVE**

MISEVE was used as a basis to develop a self-report questionnaire to measure academic self-regulation in accordance with the components and processes illustrated in the model. The

questionnaire was validated in three phases. In this section, the evidence and processes that have been used to assess academic self-regulation and an initial draft questionnaire to assess self-regulation related to MISEVE model are presented.

**Measuring academic self-regulation.** According to Winne and Perry (2000) academic self-regulation has been measured both as an aptitude and as an event. Boekaerts, Pintrich, and Zeidner (2000) noted that when academic self-regulation is thought of as an aptitude or trait, it is assumed to be a stable mental attribute of a person; whereas when it is considered to be an event, it is assumed that it is a temporary, transient occurrence that happens over a limited period of time. They noted, however, that these two approaches are not clearly differentiated in research. As an aptitude, academic self-regulation can be measured using three types of approaches: self-report questionnaires, structured interviews, and teacher ratings. Self-report questionnaire is the most frequently used format to measure academic self-regulation as an aptitude (Winne & Perry, 2000).

*Learning and Study Strategies Inventory* (LASSI; Weinstein, Schulte, & Palmer, 2002) and the *Motivated Strategies for Learning Questionnaire* (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991) are two of the most frequently used self-report questionnaires to measure academic self-regulation (Winne & Perry, 2000). These questionnaires measure self-regulation as an aptitude. The item format used in both LASSI and MSLQ were reviewed to develop a self-report questionnaire designed exclusively to measure academic self-regulation. Furthermore, MSLQ is based on social-cognitive and expectancy-value theories and LASSI's stated objective is to help students become more strategic and successful; therefore, these questionnaires provided indications for item-construction for developing the items on MISEVE-Q Pilot-Test I.

**MISEVE self-regulation questionnaire (MISEVE-Q-Pilot-Test I).** The objective of MISEVE-Q Pilot-Test I, a self-report questionnaire, was to measure self-regulation as an aptitude in order to test the validity of the MISEVE model. The MISEVE-Q Pilot-Test I was intended to assess students' goal development skills, which is consistent with using self-regulatory skills in academic learning.

The data collected with this questionnaire were analyzed using jMetrik, item analysis software (http://www.itemanalysis.com) and Winsteps, Rasch analysis software (http://www.winsteps.com). Structural validity of each section of the questionnaire was investigated to determine whether each section represented the corresponding construct in the

MISEVE model. In order to contribute to the content validity of the questionnaire, participants were asked to describe in writing their suggestions on their understanding and thought processes while responding to each item. To collect further evidence for content validity of the instrument, several experts were asked to review and provide comments on the questionnaire items. Based on the students' and experts' feedback, some items were revised (see Table 6).

Table 6

*Development of MISEVE-Q Pilot-Test I Items*

| Changes made in MISEVE-Q Pilot-Test I draft after review by expert 1 | |
|---|---|
| Note.<br>❖ After first expert's first review, the word "actively" was taken out of items 2, 7, 14, and 21 because it unnecessarily increased the intensity of verbs. | |
| **Draft Item** | **Item used in MISEVE-Q** Pilot-Test I |
| 2- I participate **actively** in the class because I want to understand the subject | 2- I participate in the learning activities of the class because I want to understand the subject |
| 7- I **actively** design my learning episodes (choose location, time and learning activities that take place during those learning episodes) | 7- I participate in the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes) |
| 14- I **actively** examine my progress in reaching my goals (as reflected in the course assessment and according to any measure that I have set for myself) | 14- I examine my progress in reaching my goals (based on the course assessment or according to any measure that I have set for myself) |
| 21- I **actively** change aspects of my learning environment that I perceive are not helping me achieve my goals | 21- I try to change aspects of my learning environment that I perceive are not helping me achieve my goals |
| Changes made in MISEVE-Q Pilot-Test I as part of MISEVE_Q Pilot-Test II development | |
| Note:<br>❖ Item-total correlations of all items were close to or above .3 (cut-off point chosen by instrument developers), therefore, none of the items were discarded.<br>❖ For item-total correlations please see appendix B-1 | |

(table continued)

Table 6 (continued)

| MISEVE-Q Pilot-Test I Item before Participant Feedback and Expert' Second Feedback | Decision about Item/ Revised Item Applied to MISEVE-Q Pilot-Test II |
|---|---|
| 1- I believe setting academic goals is important in learning the subject material | Definition of the term "academic goal" was added to the definition of terms. |
| 2- I participate in the learning activities of the class because I want to understand the subject | Expert's second feedback:<br>The item expresses two ideas: "participating in activities" and "understanding the subject".<br>After consulting with a second expert, item was revised. (see Table 13) |
| 4- I try to set academic goals that are within the range of my abilities | Definition of terms added. |
| 5- Regardless of the learning activity that I engage in or the class session that I participate in, I prefer academic goals that contribute to autonomy in learning the subject matter over those that are set by others | 5- I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others |
| 8- I can justify the decisions that I have made in designing my learning environment | Definition of term "designing learning environment" was added. |
| 13- I believe I can find out when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my goals | 13- I believe I can find out when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals and Definition of terms added.<br>The word "academic" added. |
| 14- I examine my progress in reaching my goals (based on the course assessment or according to any measure that I have set for myself) | 14- I examine my progress in reaching my academic goals based on grades or other measures that I believe are indicative of my progress and Definition of term was added. |
| 15- I can justify the selection of measures (i.e. course grade, teacher/peer feedback, other) used to monitor my progress | 15- I can justify the measures that I select (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress and Definition of term "monitoring academic progress" was added to the definition of terms. |
| 21- I try to change aspects of my learning environment that I perceive are not helping me achieve my goals | 21- I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals and Definition of term added. |
| 24- Based on my learning goals, I can explain why I can or cannot change elements in my learning environment | 24- I can explain why I can or cannot change elements in my learning environment to attain my academic goals |

- Definition of terms at the beginning of MISEVE-Q Pilot-Test I, were divided throughout MISEVE-Q_ Pilot-Test II. The terms used in each section were defined at the beginning of that section and terms that were not needed in that section, were deleted.
- Examples that were added directly into specific items to clarify the meaning of the item for participants remained unchanged.
- All items were reviewed by a second expert and some were slightly revised (see Table 13)

***Instrument development.***

MISEVE-Q Pilot-Test I was designed to measure students' academic self-regulation in a self-selected course that participants had recently taken in order for them to easily recall their experiences of strategy use and regulatory behavior.

MISEVE-Q Pilot-Test I was based on the MISEVE model and had four sections that matched the four main interaction links in MISEVE which are based upon definitions in the self-regulation literature: goal-setting (Boekaerts & Niemivirta, 2000; Boekaerts & Cascallar, 2006), design of learning episodes and learning environments (Boekaerts & Minnaert, 1999), goal monitoring, and controlling factors that contribute to achievement (Winne & Perry, 2000). These four constructs have been confirmed as contributing to academic achievement (Zimmerman, 1990) and to make up academic self-regulatory skills (Boekaerts, 1997, 2000) .

In constructing MISEVE-Q Pilot-Test I the following operational definition of academic self-regulation was used: the extent that learners set their own academic goals, plan their learning based on these goals, and monitor and control attainment of their academic goals. Figure 7 illustrates the relationship between the degree of academic self-regulation exercised by learners and the extent to which this operational definition can be applied to them.

MISEVE-Q Pilot-Test I was designed to assess a representative sample of attitudinal responses on self-regulation and individuals' attitudes that fall under the affective domain of Bloom's taxonomy (Krathwohl, Bloom, Masia, 1973). The items in each section of MISEVE-Q Pilot-Test I were developed based on the four higher levels of Bloom's affective taxonomy: responding, valuing, organizing, and characterizing to evaluate the extent to which respondents internalized each section.

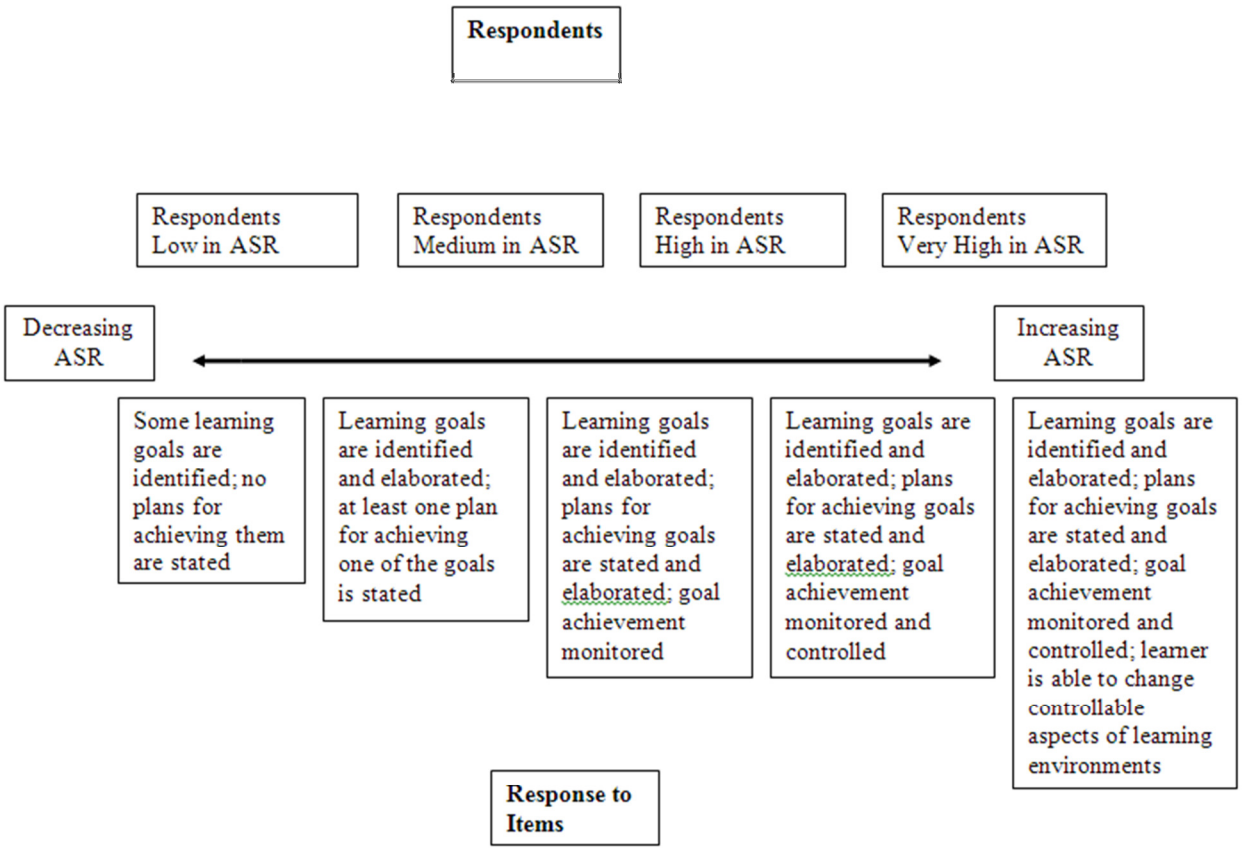


*Figure 7*. MISEVE-Q Score along the continuum of academic self-regulation construct.

By considering the above operational definition of academic self-regulation which is based on the interaction links in MISEVE and the extent that learners have internalized these interactions according to Bloom's affective taxonomy, a table of specifications for MISEVE-Q Pilot-Test I was constructed (see Table 7). This table of specifications shows the number of items for each section of the questionnaire (goal-setting and planning, design of learning

Table 7

*MISEVE-Q Pilot-Test I Table of Specifications for Constructing Items*

| | | **Content** *(based on the Interaction Links in MISEVE)* | | | |
|---|---|---|---|---|---|
| | | Goal Setting and planning (5 items) | Designing of learning episodes /learning environments (7 items) | Controlling (7 items) | Monitoring (7 items) |
| **Level** *(based on Bloom's Affective Taxonomy)* | Responding (4 items) | 1 | 1 | 1 | 1 |
| | Valuing (7 items) | 1 | 2 | 2 | 2 |
| | Organization (8 items) | 2 | 2 | 2 | 2 |
| | Characterization (7 items) | 1 | 2 | 2 | 2 |

environment/learning episode, monitoring, and controlling) at each level of Bloom's affective taxonomy. Goal-setting has received slightly less weight compared to other sub-topics. The reason for this decision is that some learners simply set their goals based on external motives without advancing to the higher levels of how they would design and evaluate their learning based on these goals. In the table of specifications, higher levels of affective taxonomy have received more weight to reflect the relative importance of forming judgments about academic self-regulation and integrating them into their views of learning.

The criteria for designing MISEVE-Q Pilot-Test I items for each of the four sections of the questionnaire (interaction links in MISEVE: goal-setting and planning, design of learning environment/learning episode, monitoring, and controlling) is shown in Table 8. Each section of MISEVE-Q Pilot-Test I is designed to include items that reflect the degree to which learners engage in each level of Bloom's affective taxonomy consistent with their intentionality and the value that they associate with that section.

Table 8

*Degrees of Intentionality in MISEVE-Q Pilot-Test I Items based on Bloom's Affective Taxonomy*

| **Levels of Taxonomy** | **Receiving Phenomena** | **Responding to Phenomena** | **Valuing** | **Organization** | **Internalizing values or Characterization** |
|---|---|---|---|---|---|
| **Description of Level** | Awareness, willingness to hear / selected attention. | Active participation on the part of the learners. Attends and reacts | Worth or value that a person attaches to a object/phenomenon/ behavior<br>Ranges from simple acceptance to the more complex state of commitment | Organizes values into priorities (contrasting different values/ resolving conflicts/creating a value system. The emphasis is on comparing, relating, and synthesizing values | Learner has a value system that controls their behavior. Behavior is pervasive, consistent, predictable, and most importantly, characteristic of the learner |
| **Degree of Intentionality and Engagement** | Not used in MISEVE-Q Pilot-Test I since this level is not indicative of intentionality to engage. | Active, Intentional | Value,<br>Commitment,<br>Start of volitional control | Priorities set based on value,<br>Actively using volitional control skills | Consistently behave based on value,<br>Consistent use of volitional control skills |
| **MISEVE-Q Pilot-Test I Section:**<br><br>***Goal Setting & Planning*** | | 1- I believe setting academic goals is important in learning the subject material | 2- I participate in the learning activities of the class because I want to understand the subject | 3- I put together my academic goals at the beginning of each study session<br><br>4- I try to set academic goals that are within the range of my abilities | 5- I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others |

(table continued)

Table 8 (continued)

| Levels of Taxonomy | Receiving Phenomena | Responding to Phenomena | Valuing | Organization | Internalizing values or Characterization |
|---|---|---|---|---|---|
| **MISEVE-Q Pilot-Test I Section:**<br><br>***Designing of Learning Episodes Learning/ Environments*** | | 6- I believe I can participate in designing my learning environment in a way that it helps me achieve my academic goal(s) | 7- I participate in the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes)<br><br>8- I can justify the decisions that I have made in designing my learning environment | 9- I design my learning environment according to criteria that include my perceived learning ability or difficulty of the learning task, at the time I set my goals for the course<br><br>10- I can explain how the elements of my plan for designing a learning environment relate to my goals | 11- I am confident that I can independently design my learning environment when I am not in a controlled environment such as a classroom.<br><br>12- I can explain why I am confident that I can design my learning environment context, task, teacher/peers/ media |
| **MISEVE-Q Pilot-Test I Section:**<br><br>***Monitoring*** | | 13- I believe I can find out when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals | 14- I examine my progress in reaching my academic goals based on grades or other measures that I believe are indicative of my progress<br><br>15- I can justify the measures that I select (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress | 16- I choose the aspects of the learning environment that I would like to monitor at the time I set my goals for the course<br><br>17- I can explain how the aspects of the learning environment that I would like to monitor relate to my goals | 18- I am confident that I can independently determine the aspects of the learning environment that I should monitor to reach my goals<br><br>19- I can explain why I am confident that I can determine the aspects of the learning environment that I should monitor to reach my goals |

(table continued)

Table 8 (continued)

| Levels of Taxonomy | Receiving Phenomena | Responding to Phenomena | Valuing | Organization | Internalizing values or Characterization |
|---|---|---|---|---|---|
| **MISEVE-Q Pilot-Test I Section:**<br><br>***Controlling*** | | 20- I believe I can influence my learning environment by changing aspect(s) of my learning activity or its context (i.e. changing study strategies, changing the location I am studying in) | 21- I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals<br><br>22- I can justify the changes that I intend to make in my learning environment that help me achieve my goals | 23- I decide what I can and what I cannot change (i.e. peer interactions, study time and location) in my learning environment at the time I set my goals for the course<br><br>24- I can explain why I can or cannot change elements in my learning environment to attain my academic goals | 25- I am confident that I can independently determine what I can and cannot change (i.e. peer interactions, study time and location) in my learning environment to help me achieve my goals<br><br>26- I can explain why I am confident that I can change my learning environment |

Descriptions of Bloom's Affective Taxonomy adapted from: http://www.nwlink.com/~donclark/hrd/bloom.html

Ranging from strongly disagree to strongly agree on a four point Likert-format scale, MISEVE-Q Pilot-Test I items asked students the extent to which they agree with a given statement. The "strongly agree" option of each statement corresponds to the ideal response of expert self-regulated learners (i.e., in the goal setting section, learners who have identified and elaborated academic goal(s) for learning the subject) and the "strongly disagree" option of each statement corresponds to learners who do not perceive much control over their own learning (i.e., have not set any specific academic goal(s), have no plans to reach them). Each of the four sections was defined at the beginning of each page in MISEVE-Q Pilot-Test I for participants' reference. A section at the end of the questionnaire was devoted to suggestions on participants' understanding of the wording of the items to ensure that the instrument was clear.

***Instrument administration.***

MISEVE-Q Pilot-Test I was administered electronically to a convenient sample of 40 graduate and undergraduate students at Virginia Tech (a large, public, state university). Participants were selected from a statistics course in the School of Education and members of the Iranian Society at Virginia Tech who were enrolled in engineering courses. After reviewing participants' comments, two of the participants' responses were dropped because they did not answer most of the items on the "design of learning environment and learning episode" and "goal setting" sections. In their comments, these students mentioned that due to the nature of their discipline, they did not feel they had any "choice" or "control" over their learning environments or learning episodes nor did they think they could have a goal when they did not know what would be taught to them in the future. The remaining 38 questionnaires were analyzed.

***Analysis.***

The Likert scale items were scored from 1-4. Each participant's scores for all of the four sections and for the entire questionnaire were computed by summing up that participant's score for the items of that section and the entire questionnaire. Statistical analysis software, jMetriks and SPSS, was used to analyze the psychometric properties of the instrument. Results of this analysis (seeTable 9 and Appendix B-1) indicated that all but a few items correlated well with the total score of other items in MISEVE-Q Pilot-Test I (.4 < corrected item-total correlation <

.8). Strong correlations (reflected in Table 9) show that most MISEVE-Q Pilot-Test I items were consistent with the entire questionnaire. Cronbach's Alpha if item deleted (seeTable 9) illustrated that by deleting each item, the reliability of the entire questionnaire stayed almost the same. Therefore, all items contribute to the internal consistency of MISEVE-Q Pilot-Test I. After item difficulty analysis and review of the wording of items, three items were slightly revised in the final version of the instrument.

Table 9

*Item-Total Statistics: Correlations of Participants' Scores in each Item and their Total Scores if Item Deleted & Cronbach's Alpha if Item Deleted*

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | **Corrected Item-Total Correlation** | **Cronbach's Alpha if Item Deleted** |
|---|---|---|---|---|
| **q1** | 74.34 | 138.231 | **.382** | **.923** |
| **q2** | 74.18 | 142.857 | **.272** | **.923** |
| **q3** | 75.26 | 136.361 | **.598** | **.919** |
| **q4** | 74.39 | 143.597 | **.224** | **.924** |
| **q5** | 75.08 | 134.129 | **.531** | **.920** |
| **q6** | 74.53 | 135.337 | **.672** | **.917** |
| **q7** | 74.68 | 135.952 | **.520** | **.920** |
| **q8** | 74.53 | 139.661 | **.469** | **.921** |
| **q9** | 74.97 | 129.918 | **.693** | **.917** |
| **q10** | 74.92 | 132.345 | **.758** | **.916** |
| **q11** | 74.61 | 138.299 | **.531** | **.920** |
| **q12** | 74.79 | 132.549 | **.732** | **.916** |
| **q13** | 74.45 | 141.497 | **.262** | **.924** |

(table continued)

Table 9 (continued)

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | **Corrected Item-Total Correlation** | **Cronbach's Alpha if Item Deleted** |
|---|---|---|---|---|
| **q14** | 74.47 | 141.716 | **.406** | **.921** |
| **q15** | 74.47 | 144.040 | **.210** | **.924** |
| **q16** | 74.89 | 134.259 | **.585** | **.919** |
| **q17** | 74.89 | 133.664 | **.664** | **.917** |
| **q18** | 75.00 | 129.081 | **.795** | **.915** |
| **q19** | 75.16 | 126.731 | **.802** | **.914** |
| **q20** | 74.37 | 136.131 | **.633** | **.918** |
| **q21** | 74.37 | 140.617 | **.415** | **.921** |
| **q22** | 74.47 | 139.661 | **.624** | **.919** |
| **q23** | 74.84 | 136.515 | **.505** | **.920** |
| **q24** | 74.66 | 138.718 | **.449** | **.921** |
| **q25** | 74.42 | 137.980 | **.570** | **.919** |
| **q26** | 74.68 | 136.222 | **.608** | **.918** |

Using participants' responses, the structural validity of the four sections of the instrument was investigated. Dimensionality evidence (Messick, 1995; Wolfe & Smith, 2007) was used to establish the structural validity of MISEVE-Q Pilot-Test I. To investigate the unidimensionality of each section of the questionnaire, dimensionality analysis was performed using Winsteps software. Based on the Rasch model of measurement (Linacre, 2004; Smith, 2004), dimensionality was investigated through principal component analysis (PCA) to determine whether most of the variance in each section score was due to one construct. Furthermore, to see if further exploration of dimensionality was needed, the amount of variance due to the components (contrasts) beyond that accounted for by the principal component of the Rasch model was computed (see Table 10 and Appendix B-2). This process was repeated until the fourth contrast was extracted. Finally, to investigate the internal consistency (reliability) of the questionnaire, Cronbach's Alpha was computed for each section and for the entire questionnaire (see Table 10).

Table 10

*Structural Validity and Internal Consistency of the Four Sections in the Academic Self-Regulation Instrument*

| Section | Internal Consistency (Cronbach's alpha) | Percentage of Variance due to Principal Components |
|---|---|---|
| **Goal setting and planning** | .67 | 54.3% |
| **Design of learning environment/ Learning episode** | .92 | 48.5% |
| **Monitor** | .90 | 44.1% |
| **Control** | .87 | 39.0% |
| **Entire Questionnaire** | .94 | 41.7% |

***** For Standardized Residual Variance of each section please see appendix B-2

***Results.***

As shown in Table 10, the goal-setting and planning and design of learning environment/learning episode sections of the questionnaire show unidimensionality characteristics consistent with a single construct. Out of the total variance of scores for these sections, 54.3% and 48.5% (50% is the threshold for unidimensionality according to Winsteps Manual, 2010) was explained by the main Rasch factor of each section. This is in accordance with MISEVE as a model of academic self-regulation that represents *goal setting and planning* and *design of learning environment/learning episode* as single constructs; each shown as a single interaction link in MISEVE. Furthermore, the monitor and control sections show multidimensionality and represent more than one construct. As seen in Table 10, 44.1% and 39% (less than 50%) of the total variance of scores for these sections respectively can be explained by the main Rasch factor of each section. This was expected based on the multiple *monitor* and *control* arrows in the model indicating multiple interactions between MISEVE elements where monitoring and controlling are needed by self-regulated learners. As observed in MISEVE, there are two types of interaction links for control: those linking self-regulated learners with their

motivational resources and those linking them with cognitive resources. Similarly, there are two types of interaction links for monitoring. The development and validation of MISEVE-Q Pilot-Test I, highlighted the four points that follow.

1. Use of Bloom's affective taxonomy to evaluate learners' attitudes towards regulating their learning. According to Krathwohl et al. (1973), the affective domain includes emotions such as valuing a task, motivation to get involved in the task, and attitudes toward the task. The affective domain taxonomy is structured based on how much the affect is internalized: receiving, responding, valuing, organizing, and internalizing (characterization). Accordingly, the attitude of participants who responded to MISEVE-Q Pilot-Test I, regarding the extent to which they internalized the interaction links of MISEVE was classified based on this taxonomy by including items regarding each level in MISEVE-Q Pilot-Test I (see Table 8).
2. High item-total correlation and strong internal consistency. Participants' responses for each MISEVE-Q Pilot-Test I item had a high correlation with the participants' total score on MISEVE-Q Pilot-Test I. Therefore, it can be concluded that each item was consistent with the remainder of the questionnaire. Each section and the questionnaire as a whole demonstrated strong internal consistency. In general, each participant's scores for items in each section were consistent and different participants scored differently from one another.
3. Dimensionality evidence for each of the four sections in the questionnaire is consistent with the representation of that section as an interaction link in MISEVE. Dimensionality analysis resulted in strong unidimensionality for the goal-setting and planning and design of learning environment/learning episode sections of MISEVE-Q Pilot-Test I and provided evidence of multidimensionality for the monitoring and controlling sections, all of which are consistent with single or multiple interaction links as illustrated in MISEVE.
4. Strong construct validity evidence. Validity is the extent to which an instrument measures what it claims to measure. MISEVE-Q Pilot-Test I proved to have strong evidence of construct validity which according to Messick (1995) includes content, substantive, and structural evidence of validity and well supported the structure of

the interaction links of the MISEVE model. Based on my review of the literature, MISEVE-Q Pilot-Test I, comprehensively covers all aspects of academic self-regulation included by various scholars. Experts in the field of self-regulation and instrument development reviewed the representativeness and content quality of MISEVE-Q Pilot-Test I to confirm that it measured the intended construct. Furthermore, to enhance construct validity evidence, the wording of items in MISEVE-Q Pilot-Test I were analyzed based on participants' comments to make sure participants interpreted the items as intended. The operational definition of academic self-regulation that MISEVE-Q Pilot-Test I follows was consistent with the proposed construct map (see Figure 7) which was based on theory and research.

Based on the results of the statistical analysis of the MISEVE-Q Pilot-Test I data, the model appears to have content, substantive, and structural evidence of validity and to hold promise to understand the components and complexity of academic self-regulation. In addition, MISEVE provides a conceptual framework that can facilitate systematic investigation of the relationships between variables that influence academic self-regulation and academic success. Finally, the model points to specific intellectual actions that learners engage to self-regulate as they learn, opening possibilities of developing specifically focused interventions to teach these self-regulating intellectual actions to learners.

**Validating MISEVE: MISEVE-Q Pilot-Test II**

In Pilot-Test I, MISEVE-Q was developed as a self-report questionnaire based on the interaction links of MISEVE to validate this model. In MISEVE-Q Pilot-Test II, items addressing motivational or cognitive strategies that learners use in different settings were separated to measure learners' use of each of these sets of strategies as illustrated in MISEVE. In this section, items were added that measure the skillfulness of learners in using their volitional strategies. With this knowledge, educators can advise learners on how to influence their learning environments so they can achieve their academic goals. The validity and reliability of MSLQ and LASSI questionnaires as two of the most frequently used self-regulation questionnaires, were examined to identify the measurement strategies and item types these instruments used. In addition, the validity and reliability of the Academic Motivational Scale (AMS) and the Academic Volitional Strategy Inventory (AVSI) were examined for the same purpose. Some

items that related to academic motivation and some items that emphasized the skillfulness of learners in managing their volitional skills were then drawn from these instruments (see Table 12). These added items more clearly reflected the theoretical frameworks of achievement-goal, expectancy-value, and self-efficacy as part of social cognitive theory, information processing, and theory of volition. Therefore, MISEVE-Q Pilot-Test II items provided a representative sample of self-regulatory intentions, thoughts, and actions.

Because there were some items added to the questionnaire, the validity of MISEVE-Q Pilot-Test II was investigated in a pilot-test. The participants were students enrolled in online and classroom-based courses in education, engineering, and economics. MISEVE-Q Pilot-Test II was administered electronically through SurveyMonkey (available at www.surveymonkey.com). Similar to the first pilot-test, a section at the end of the questionnaire was devoted to participants' suggestions and any comprehension issues that wording of the questionnaire might cause.

Data collected were analyzed using SPSS version 16. Exploratory factor analysis was applied to further investigate the factor structure of MISEVE-Q Pilot-Test II and to investigate how different items group together to load a common factor. This allowed further investigation of how MISEVE-Q Pilot-Test II items loaded on different factors and how the factor structure confirmed earlier conclusions of unidimensionality and multidimensionality of items in each section based on MISEVE. In addition, exploratory factor analysis was useful to investigate whether added items in each section of MISEVE-Q Pilot-Test II loaded on a common factor.

The objective of Pilot-Test I and Pilot-Test II was to validate MISEVE by developing MISEVE-Q according to the structure, content areas, and interaction links of MISEVE in addition to evaluate the psychometric properties including the internal consistency of MISEVE-Q.

**Review of Questionnaires Measuring Academic Motivation and Academic Volition**

A number of instruments have been developed to measure academic motivation. Because self-regulation is closely connected to academic motivation, reviewing the evidence for validity and reliability of these instruments contributed to designing MISEVE-Q Pilot-Test II for measuring self-regulated learning with good psychometric characteristics. Also, since these instruments were designed based on different theories of motivation, reviewing them provided insight for designing an instrument that incorporates motivational forms of self-regulated

learning from different theoretical viewpoints. In addition, administering these instruments to the same sample that will complete the final version of MISEVE-Q Pilot-Test II, may provide evidence for the criterion validity of the questionnaire.

According to Winne and Perry (2000), Motivated Strategies to Learn Questionnaire (MSLQ; Pintrich et al., 1991) and Learning and Study Strategies Inventory (LASSI; Weinstein, Palmer and Shulte, 2002) are two of the most used self-report questionnaires to measure self-regulated learning. In addition to these questionnaires, Academic Motivation Scale (AMS; Vallerand et al., 1993), and Academic Volitional Strategy Inventory (AVSI; McCann & Gracia, 1999) were reviewed to understand learners' intrinsic or extrinsic motivation and volitional control skills.

Investigating learners' motivation is important because academic self-regulation depends partly on learners' motivation on specific academic tasks. AMS probes a range of students' motivational attitudes to attend college. The three subscales of extrinsic motivation: external regulation, introjected regulation, and identified regulation in addition to the amotivation subscale are of particular interest for developing an academic self-regulation questionnaire.

Furthermore, volitional strategies regulate motivation and emotion and are important in helping students to stay focused on academic tasks and commit to them. Volitional strategies can contribute to academic achievement through motivational and emotional self-regulation (Shepherd, 2006); therefore, the AVSI questionnaire may be helpful in developing an academic self-regulation questionnaire.

**Motivated Strategies to Learn Questionnaire.** The Motivated Strategies to Learn Questionnaire (MSLQ) was developed by Pintrich et al. (1991) and is based on expectancy-value theory. This questionnaire consists of 81 Likert-format items (ranging from 1 [not at all true of me] to 7 [very true of me]). MSLQ is used for assessing college students' motivational orientations. The questionnaire is also used to assess students' different learning strategies, cognitive and metacognitive strategies, and to assess students' management of different resources. MSLQ is based on a general cognitive view of motivation and learning strategies. Consequently, it is comprised of a motivation section and a learning strategy section (Pintrich et al., 1991). The motivation section consists of 31 items that assess students' goals and value beliefs for a course. The learning strategies section includes 31 items addressing use of cognitive and metacognitive strategies and 19 items on management of different resources.

In Table 11 the division of the motivation scale of the instrument into subcategories and subscales within those categories is depicted. The subcategories of the motivation scale can be directly connected to the expectancy-value theory of motivation (Wigfield & Eccles, 2000), as well as to an "affect" component. The "Subcategories" column has been modified to show more accurately how the entries can be connected to the corresponding entries in the "Subscales" column based on different motivational theories.

Table 11

*MSLQ Motivation Scales: Subscales and Number of Items Within Each Subscale*

| **Category** | **Subcategories** | **Subscales (# of items)** |
|---|---|---|
| *Motivation Scales* | *Value* | *Intrinsic goal orientation (4)* |
| | | *Extrinsic goal orientation (4)* |
| | | *Task value (6)* |
| | | *Control of learning beliefs (4)* |
| | *Expectancy* | *Self-efficacy (8)* |
| | *Affect* | *Test anxiety (5)* |

Adapted from http://www4.ncsu.edu/~damcconn

Items on students' goal orientation, control and efficacy beliefs reflect the value that they associate with a task and the expectancy that learners will succeed in completing the task. Similarly, in MISEVE-Q Pilot-Test II items in the goal-setting and control sections were designed to collect students' beliefs on the expectancy of success and the value that they assign in completing tasks to contribute to the criterion validity of the questionnaire.

Benson (2004) reviewed the MSLQ by examining its reliability and validity evidence. He concluded that the validity data are limited; however, the internal consistencies for the motivational scales range from .62 to .93 and for the learning strategies scale from .52 to .80. Benson (2004) did not agree with the instrument's authors' claim of "reasonable" data fit for the confirmatory factor analysis (CFA) and noted there is very little support for the 15- factor model of the MSLQ.

Gable (2004) also reviewed MSLQ. He pointed out that MSLQ is supported through extensive literature on teaching and learning. He noted criterion related validity evidence based on correlations with final course grades. However, he noted that the Likert scale used in this instrument which only has anchors for the end-points (*not at all true of me* and *very true of me*) is problematic. Without having all options anchored, it is difficult to know what "internal" scale is used by each participant and this can lead to unreliability. In addition, Gable noted that there is lack of high level of model fit and that the instrument designers' claim of "sound structure" for the MSLQ scales is not supported by the CFA results. Gable (2004) concluded that more items should be added to scales with low reliability and additional supportive construct validity information should be provided.

Because MSLQ had acceptable reliability for each scale and content and criterion evidence of validity, it was decided to use a modified version of this instrument for providing evidence of criterion validity for MISEVE-Q. Fifty two items from MSLQ were chosen and reorganized into new scales based on how the wording of these items related to areas of regulation illustrated by MISEVE to specifically aim at measuring self-regulatory skills. The modified version of MSLQ is referred to as *MSLQ Constructed Scales*.

**Learning and Study Strategies Inventory.** The Learning and Study Strategies Inventory (LASSI) was developed by Weinstein, Palmer, and Shulte (2002) to help college students "develop or expand their awareness about how they study and learn". According to the authors, participants completing this questionnaire will benefit because it helps them to identify areas of their knowledge, skills, motivation, and attitudes they may need to improve to become more strategic and successful students. This questionnaire consists of 80 statements which participants reflect on by choosing one of five Likert Scale options ranging from "not at all typical of me" to "very much typical of me".

One objective of MISEVE-Q Pilot-Test II was to assess use of self-regulatory skills in academic learning. This objective is consistent with the stated objective of LASSI, helping students become more strategic and successful. Therefore, it was appropriate to review the validity and reliability evidence of LASSI as a possible instrument to investigate criterion validity.

LASSI consists of ten scales including motivation and attitude scales. According to the authors the motivation scale (MOT) assesses students' "diligence, self-discipline and

willingness" to make an effort in completing academic requirements. They also believe that students who score low on the scale "need to accept more responsibility for their academic outcomes" and learn how to set goals to complete academic tasks.

Based on the above, LASSI appears to have a performance-based goal orientation rather than a mastery based goal orientation. Furthermore, students' scores on the motivation scale relate to their goal setting skills. Participants' scores on items in this scale were useful as external validity evidence of the goal setting and planning section of MISEVE-Q Pilot-Test II. In addition, the wording of the motivation scale of LASSI, seems to indicate that the instrument measures motivation from different theoretical perspectives: "even if I am having difficulty in a course, I can motivate myself to complete the work" (intrinsic motivation), "I set high standards for myself in school" (goal orientation), "even if I do not like an assignment, I am able to get myself to work on it" (extrinsic motivation). Similarly, the items in the goal setting and planning section of MISEVE-Q_ Pilot-Test II were developed to cover different motivational theories for participants to identify and choose from as the basis of their goal setting.

The psychometric properties of LASSI have been analyzed by Carty (2004) and Wright (2004). These properties should be considered in light of the purpose of the instrument which is collecting valid and reliable scores for diagnosing and advising college-level and post-secondary students about their awareness of different cognitive, motivational, and affective characteristics that can contribute to enhancing their learning.

The motivation factor (MOT) of the instrument which consists of eight items, has a reliability of 0.84 when the instrument was administered to a sample of twelve institutions that represented different geographical regions and types of institution (university, community college, state college and technical institutions'). LASSI was claimed to have created national norm data base, however, norm statistics were not provided by type of institution, gender, ethnicity, age, and GPA and only an overall norm statistics was reported by the authors (Carty, 2004). In terms of validity evidence, Carty (2004) believed that the authors have not provided criterion related evidence for their instrument although they stated that LASSI scores have been validated against data collected over the years (SAT, GRE, GPA and high school rank variables). LASSI has been administered to students who had access to "structured, informed feedback and resources" in classroom settings. LASSI was not verified as an instrument that was administered to various ethnic groups of students. In addition, there was no explanation given for why 86

items were dropped from LASSI first edition except that dated items were eliminated to improve the psychometric properties of the instrument (Carty, 2004).

According to Wright (2004), LASSI is intended to be used as a tool for screening, diagnosing, planning, evaluating, and advising students about their awareness levels of learning and practice skills, however, the evidence provided by the LASSI authors is not dependable and is based on *anecdotal evidence*. Wright (2004) noted that the validity evidence of LASSI is restricted to face validity and, since it does not have the psychometric support for construction of the scales, its usefulness for research and for implementing remedial measures and student achievement is limited. Furthermore, LASSI lacks criterion and construct evidence of validity since the authors did not specifically identify any of the tests or measures that they used for validating LASSI and no statistics were reported (Wright, 2004).

In addition, Weinstein, Palmer, and Shulte (2002) provided no explanation for the items that make up each scale; only example items for each scale were provided and the basis for why particular items were chosen to be in any of the scales were not specified. Therefore, LASSI was excluded from the analysis due to questionable validity and reliability.

**Academic Motivation Scale.** Vallerand et al. (1993) constructed the Academic Motivation Scale (AMS) from the view point of self-determination theory (Deci & Ryan, 1987). The authors reported the validation of the Academic Motivation Scale, the English version translation of their original instrument written in French. The instrument consists of seven sub-scales: amotivation, three types of extrinsic motivation (external, introjected, and identified regulation) and three types of intrinsic motivation (motivation to know, to accomplish things, to experience stimulation). The authors conclude that they have created a multidimensional instrument for motivation research with strong validity and reliability evidence.

Vallerand et al. (1993) noted that the construct validity of AMS was investigated by computing three sets of correlations: (a) among the seven AMS subscales; (b) between the AMS subscales and motivational antecedents: perceived competence, informational, autonomy supportive and impersonal subscales of classroom climate (Deci, Nezlek, & Sheinman, 1981) , optimism (Dember & Brooks, 1989) in education and self-actualization autonomy (Jones & Crandall, 1986); and (c) between AMS subscales and motivational consequences: cognitive (concentration in classroom), affective (positive emotions in the classroom and academic satisfaction), behavioral (behavioral intentions of continuing schooling) and academic (self-

reported cumulative grades). Reported correlation values generally support a motivation continuum from amotivation to intrinsic motivation as suggested by the self-determination theory (Deci, & Ryan, 1985). Vallerand et al. (1993) concluded that the results of the confirmatory factor analysis supported the seven factor structure of the AMS.

Review of AMS resulted in the conclusion that learners' responses to items measuring intrinsic or extrinsic motivation should not be interpreted as low or high academic self-regulation according to MISEVE's framework. Learners can be intrinsically or extrinsically motivated to define and set their goals, to plan their actions, to monitor and to control their learning, and to design their learning environment to achieve their goals. Unlike AMS, the wording of the items in MISEVE-Q Pilot-Test II is such that it allows learners to reflect on their success in each of the four phases of self-regulation regardless of being intrinsically or extrinsically motivated. However, because amotivated learners might lack the ability or desire to develop intentions to learn and to define and set goals, their responses to MISEVE-Q Pilot-Test II should be interpreted with caution. These responses of amotivated students may indicate that they generally reject all aspects of the target course and never consider their opportunities to engage any academic self-regulation processes. For this reason, two of the AMS items were used in MISEVE-Q Pilot-Test II to measure participants' possible amotivation (see Table 12).

Furthermore, researchers have analyzed data collected by AMS to investigate its validity (Cokley et al., 2001; Fairchild et al., 2005). Cokley et al. (2001) investigated the psychometric properties of AMS by using confirmatory factor analysis (CFA). They studied a mixed-gender U.S. college student population enrolled in undergraduate psychology courses. These students' age ranged from 19 to 45 years old. The students were asked to complete the Academic Self-Concept Scale (ASCS; Reynolds, 1988) in addition to completing the AMS. Both Cokley et al. (2001) and Fairchild et al. (2005) concluded that the results of the confirmatory factor analysis supported the seven factor structure of the AMS. Cokley et al. (2001) noted correlations between the AMS subscales and the ASCS as evidence of construct validity for the AMS subscales.

The investigations by Cokley et al. (2001) and Fairchild et al. (2005) of the validity evidence of the AMS, provided important points to consider for validating the MISEVE-Q Self-Regulation questionnaire after it was administered. First, confirmatory factor analysis can be used to confirm if the data collected by MISEVE-Q Pilot-Test II fit MISEVE as a model of academic self-regulation with the following factors: (a) goal-setting and planning, (b) design of

learning environments/learning episodes, (c) monitoring, and (d) control. Second, it can be investigated if the data collected by MISEVE-Q Pilot-Test II would correlate with data collected by widely used instruments that measure related constructs. Correlation between the participants' scores in each of the four sections of MISEVE-Q Pilot-Test II and scales in other instruments related to academic self-regulation (i.e. motivation scale of MSLQ, strategy use of LASSI) can contribute to construct validity evidence of MISEVE-Q Pilot-Test II.

**Academic Volitional Strategy Inventory.** The Academic Volitional Strategy Inventory (AVSI; McCann & Gracia, 1999) assesses self-regulatory strategies used by college students to regulate their emotions and motivation when they encounter distractions while trying to achieve their goals. Learners engage these strategies by managing and maintaining their emotions and motivation during the goal-setting process. AVSI is a 30-item self-report questionnaire. Participants respond to each item with yes or no; a yes response is followed by a response on a Likert scale which ranges from 0 to 5 describing the frequency of the behavior in question. Internal reliability (Cronbach's alpha) was as follows: self-efficacy subscale (.82), negative-based incentives subscale (.73), and stress reducing strategies subscale (.87). The total scale score for the entire instrument was .78 (Shepherd, 2006).

According to McCann and Gracia (1999) exploratory factor analysis of AVSI resulted in three factors: (a) self-efficacy enhancement, (b) stress reduction actions, (c) negative-based incentives. Items that load on the self-efficacy enhancement factor are items that asses learners' abilities to remind themselves of their capability to complete an academic task (e.g. Q 9: I tell myself, "You can do this!"). Items that load the stress reduction actions factor assess learners' ability of choosing activities that can reduce their stress so that they can stay focused on an academic task (e.g. Q12: I exercise for about a half hour before I begin studying to clear my head and help me get relaxed). Items that load the negative-based incentives, focus on learners' perception of possible undesired consequences brought on by insufficient engagement in academic task at hand (e.g. Q13: I think about the kinds of jobs/career I may end up with if I flunk out of college.)

On the content validity evidence of AVSI, McCann and Gracia (1999) noted that the items are connected to regulatory actions reported by students in their interviews as reported in the literature and are consistent with discussions of self-regulatory behavior. McCann and Garcia concluded that AVSI items cover the connection to the conceptual and operational definitions of

volitional characteristics. Since according to Cronbach (1971), content validity indicates how well the selected items on an instrument adequately sample from all possible items reflecting the behaviors of interest, the items of AVSI support content validity evidence.

McCann and Gracia (1999) investigated construct validity of AVSI based on the assumption that the instrument reflects both motivation and emotion regulation. An exploratory factor analysis resulted dividing the 32 strategies into two factors. Items on strategies related to motivation such as thinking of possible negative consequences of doing poorly, disappointing others, and recalling one's goals and reasons for being in college loaded on the motivation control factor. Items on strategies related to emotion regulation such as concentrating on one's breathing when frustrated, scheduling study hours with classmates to avoid procrastination, thinking about things that make them feel better, and exercising prior to studying to release excess energy loaded on the emotion control factor. The authors concluded that the factor structure of AVSI agrees with operational definitions of emotion and motivation regulation which supports construct validity of the instrument.

The main contribution of the AVSI questionnaire is to address learners' emotion and motivation management unlike other self-regulation questionnaires which generally focus on learners' utilization of various cognitive, metacognitive, and motivational strategies. According to the MISEVE framework, volitional control (including emotional, cognitive, and motivational control) are considered important parts of regulated learning. Reviewing items and factor loadings of AVSI guided developing a more comprehensive questionnaire for assessing academic self-regulation that included emotion and motivation management.

**Instrument Review Summary**

Four self-report questionnaires in the areas of academic motivation and academic volition were reviewed. These instruments are based on different theoretical frameworks: expectancy-value (MSLQ), self-determination (AMS), goal orientation (LASSI), and theory of volition (AVSI). Regardless of the main theoretical perspective that these instruments have been based upon, it can be observed that all of them focus on:

1. how learners set academic goals (mastery or performance oriented goals that can also be related to the value and expectancy associated with such goals); and

2. how learners monitor and control the attainment of such goals (which can be based on intrinsic or extrinsic factors).

These important variables are also included in MISEVE and reflect learners' engagement in academic self-regulation. Adding items to MISEVE-Q Pilot-Test II based on these theories contributed to the evidence of construct and content validity of MISEVE-Q Pilot-Test II.

**MISEVE-Q Pilot-Test II: Developing Additional Items**

For each of the four sections of MISEVE-Q Pilot-Test II, six items have been added based on the reviewed four instruments and related literature.

**Section 1: Goal setting and planning.** The items added to this section investigated self-efficacy beliefs and task value beliefs on learners' goal-setting and planning. These items also addressed learners' goal orientation (performance vs. mastery) and their ability to define their goals, plan execution of their goals, and flexibility to revise goals according to their success in reaching them.

Efficacy beliefs must be considered in the study of self-regulation; these beliefs vary across different tasks as students' estimates of task difficulty differ (Ainley, Buckley, & Chan, 2009). To assess learners' task value beliefs the focus should be on the importance of learning the material since this indicates the value that learners associate with their learning material. Including an item on value beliefs investigates the assumption that learners are more likely to regulate learning subjects when they value them. Since there is a difference in goals that are set by learners who have a mastery orientation or performance orientation, adding items to distinguish these learners in the goal setting and planning phase of regulating their learning was consistent to the MISEVE model.

The following items are added to MISEVE-Q Pilot-Test II:

- "I expect to obtain a good grade in this course."
- "I expect I can master the subject of this course regardless of the grade that I receive in it."
- "I can adjust (revise) my academic goals based on my success in achieving them."
- "Learning the subject matter of this course is important to me."
- "I can design actions that I should take to reach my academic goals at the beginning of each study session."

**Section 2: Designing learning episodes/learning environments.** MISEVE illustrates Environment as an area which includes the impact of contextual factors on learners' goals, impacts of teachers, peers, social-interactions, feedback, and support, and impacts of external influences on learners' emotions. Learners can modify controllable aspects of their learning environments based on the amount of their perceived control.

According to Greene and Azevedo (2007) some aspects of learning tasks are external to learners. These aspects are a part of the learning environments and include resources, instructional cues, context, and time. Similarly, Pintrich (1999) noted that learners who acquire the skills to manage and control time, study environment, and other people (teachers and peers) can better adapt to their learning environment.

To more accurately measure how learners regulate their interactions with their learning environments the following four items were added to the Designing of Learning Episodes and Learning Environment section of MISEVE-Q Pilot-Test II:

- "I can use my instructors' hints about important parts of the learning material to help me achieve my academic goals."
- "I can use available instructional technology to help me achieve my academic goals."
- "I can arrange to study with peers (not necessarily friends) who can best contribute to the achievement of my academic goals."
- "I can identify the time to study the subject of this course that compared to other times can best advance my academic goals."

**Sections 3 and 4: Monitoring and controlling.** The MISEVE model emphasizes cognitive, metacognitive, and motivational strategies that learners might choose to reach their academic goals. Selection of these strategies vary depending on the context of the learning task, learning environment and learners' beliefs, goals, and emotions. MISEVE-Q Pilot-Test I validated MISEVE's structure that both monitoring and controlling are multidimensional constructs where each of these constructs is represented by more than one link in MISEVE. To more accurately measure the monitoring and controlling links illustrated in MISEVE, cognitive monitoring and cognitive controlling items (cognitive regulation) were separated from motivational monitoring and motivational controlling items (motivational regulation).

***Cognitive regulation.***

Pintrich (1999) noted the importance of cognitive strategies such as rehearsal, elaboration, and organization in learners' academic performance. Rehearsal strategies involve repeating the material to be learned so that they are constantly active in their working memory. Elaboration is a process in which learners use their prior knowledge to interpret novel situations and concepts. Paraphrasing, summarizing, and note-taking- when learners are able to use note-taking to connect ideas that they have learned- are considered elaboration strategies. Organizational strategies refer to selecting and organizing ideas into networks. Organizational strategies require the ability of learners to connect information and to find relationships between sets of connected information. Learners can use cognitive strategies to recall information or use them in more complex tasks that require comprehending information.

The following four items were added to monitor and control sections of MISEVE-Q_ Pilot-Test II:

***Cognitive monitoring.***

- "When I study a subject related to the course, I can continually check to identify the parts of the material that I do not understand completely."

***Cognitive controlling.***

- "When I study a subject related to the course, I repeat whatever needs to be remembered over and over again."
- "When I study a subject related to the course, I use my prior knowledge to interpret and expand on the subject."
- "When I study a subject related to the course, I am able to find connections and interrelationships within the material that I am studying."

***Motivational and volitional regulation.***

Boekaerts (1997) noted that cognitive and motivational regulations are closely linked and both will affect the amount of effort that learners spend on tasks. According to Boekaerts, educators should take into account the cognitive and motivational aspects of learning tasks to design the most effective learning environments for students to acquire strategic knowledge. In

addition to regulating cognition and motivation, regulating volition (controlling intentions and impulses in order to act and protecting intentions to refocus on tasks when faced with distractions and negative emotions) is an important aspect of academic self-regulation. Boekaerts and Corno (2005) noted that by acquiring volitional strategies learners will be more likely to invest effort in academic tasks. McCann and Garcia (1999) noted that one of the volitional strategies that self-regulated learners employ is being able to maintain concentration and effort and persist over lengthy periods of time to attain their goals whenever they feel it is necessary.

Self-regulated learners use volitional strategies to maintain motivation on academic tasks. Learners protect their intention to learn by initiating and maintaining their attention and effort. Use of volitional strategies indicates learners' commitment to tasks that help them reach their intended goals. Therefore, items that investigate learners' use of volitional strategies are important in assessing academic self-regulation.

The MISEVE model emphasizes learners' volitional skills to control motivational, cognitive, and metacognitive strategies as well as to control learning environments, tasks, and emotions. Therefore, adding items on volitional control skills contributed to the construct validity of MISEVE-Q Pilot-Test II.

The following three items were added to control section of MISEVE-Q Pilot-Test II:

***Volitional control: Protecting the intention to learn.***

- "I can maintain my attention on the task that I'm working on regardless of the time it takes."
- "When I confront distractions, I can initiate or maintain my effort to complete academic tasks."

The following item was added without change from AVSI questionnaire to determine possible strategy use by participants when faced with distractions:

- "I talk aloud to myself about the material I'm studying to keep me from getting distracted by other thoughts or activities."

Since the Design of Learning Environments and Learning Episodes link of MISEVE illustrates the interaction of self-regulated learners with their learning environments through volitional strategies, the following item on attention and effort expenditure were added to the

Design of Learning Environments and Learning Episodes section of MISEVE-Q Pilot-Test II to more accurately measure this aspect of learners' self-regulatory skills:

- "When I study, I change the location, time, or setting of my learning environment that I believe are distracting my attention."

The following four items were added to motivational monitoring and motivational controlling sections.

***Motivational monitoring.***

- "I am consciously aware of personal factors (stressors and negative emotions) that might interfere with my ability to stay on task even if I cannot do anything about them."
- "I can sense when environmental factors (noise, other interesting tasks) interfere with my ability to stay on task even if I cannot do anything about them."

***Motivational controlling.***

- "I can adjust my expectations of this course based on the stressors and negative emotions that might interfere with reaching my academic goals."
- "I can adjust my willingness to learn the subject of this course based on the stressors and negative emotions that might interfere with reaching my academic goals."

The following item was added to the controlling section without change from AVSI questionnaire to determine participants' possible use of available resources:

- I think about my strengths and the resources that I can draw upon to help me with difficult assignments or test information."

The following two items were adapted from AMS to determine the extent of possible amotivation of participants regarding the target course. These items were added at the end of the questionnaire to investigate the relationship between participants' responses to these items and their responses to the rest of the questionnaire. If participants' responses indicated that they were amotivated, for example, their answers to the other sections of the questionnaire should be interpreted with caution because low motivation may influence the perception of control,

defining and setting goals as well as initiative to engage academic self-regulation processes. As explained earlier, the scores for these two items were excluded from the total score of MISEVE-Q Pilot-Test II.

**Amotivation**.

- "I once had good reasons for taking this course; however, now I wonder whether I have wasted my time."
- "I can't see why I took this course and frankly, I couldn't care less."

The items that were added to each scale of MISEVE-Q Pilot-Test II are presented in Table 12.

Table 12

*MISEVE-Q Pilot-Test II: Added Items*

| MISEVE-Q Scales | Added Items |
|---|---|
| Goal Setting and Planning Section | <u>Motivational Beliefs</u><br><br>♦ "I expect to obtain a good grade in this course."<br>♦ "I expect I can master the subject of this course regardless of the grade that I receive in it."<br>♦ "I can adjust (revise) my academic goals based on my success in achieving them."<br>♦ "Learning the subject matter of this course is important to me."<br>♦ "I can design actions that I should take to reach my academic goals at the beginning of each study session." |
| Designing of Learning Episodes/<br>Learning Environment Section | <u>Interactions with Learning Environments</u><br><br>♦ "I can use my instructors' hints about important parts of the learning material to help me achieve my academic goals."<br>♦ "I can use available instructional technology to help me achieve my academic goals."<br>♦ "I can arrange to study with peers (not necessarily friends) who can best contribute to the achievement of my academic goals."<br>♦ "I can identify the time to study the subject of this course that compared to other times can best advance my academic goals."<br>♦ "When I study, I change the location, time, or setting of my learning environment that I believe are distracting my attention." |

(table continued)

Table 12 (continued)

| MISEVE-Q Scales | Added Items |
|---|---|
| Monitoring Section | <u>Cognitive Monitoring</u><br><br>♦ "When I study a subject related to the course, I can continually check to identify the parts of the material that I do not understand completely."<br><br><u>Motivational Monitoring</u><br><br>♦ "I am consciously aware of personal factors (stressors and negative emotions) that might interfere with my ability to stay on task even if I cannot do anything about them."<br><br>♦ "I can sense when environmental factors (noise, other interesting tasks) interfere with my ability to stay on task even if I cannot do anything about them." |
| Controlling Section | <u>Cognitive Controlling</u><br><br>♦ "When I study a subject related to the course, I repeat whatever needs to be remembered over and over again."<br>♦ "When I study a subject related to the course, I use my prior knowledge to interpret and expand on the subject."<br>♦ "When I study a subject related to the course, I am able to find connections and interrelationships within the material that I am studying."<br><br><u>Motivational Controlling</u><br><br>♦ "I can adjust my expectations of this course based on the stressors and negative emotions that might interfere with reaching my academic goals."<br>♦ "I can adjust my willingness to learn the subject of this course based on the stressors and negative emotions that might interfere with reaching my academic goals."<br><br><u>Volitional Control</u> (protecting the intention to learn)<br><br>♦ "I can maintain my attention on the task that I'm working on regardless of the time it takes."<br>♦ "When I confront distractions, I can initiate or maintain my effort to complete academic tasks." |

(tabled continued)

Table 12 (continued)

| MISEVE-Q Scales | Added Items |
|---|---|
| Controlling Section (motivational and volitional control)<br><br>*Items added without change from AVSI* | ♦ "I think about my strengths and the resources that I can draw upon to help me with difficult assignments or test information."<br>♦ "I talk aloud to myself about the material I'm studying to keep me from getting distracted by other thoughts or activities." |
| Amotivation Section<br><br>*Items adapted from Amotivation scale of AMS* | ♦ "I once had good reasons for taking this course; however, now I wonder whether I have wasted my time."<br>♦ "I can't see why I took this course and frankly, I couldn't care less." |

MISEVE-Q Pilot-Test I was reviewed by a second expert before it was Pilot-Tested for the second time. These changes are reflected in Table 13. Table 13 also illustrates items 47, 48, 49, and 50 that were adapted from AMS and AVSI and their revisions in the final version of MISEVE-Q.

Table 13

*MISEVE-Q Pilot-Test II: Items Following Second Expert Review*

| **Items in Goal Setting and Planning Scale** | **Revised Items in Goal Setting and Planning Scale** |
|---|---|
| 1- I believe setting academic goals is important in learning the subject material | Unchanged |
| 2- I participate in the learning activities of the class because I want to understand the subject | 2- I participate in the learning activities of the course to understand the material |
| 3- I put together (identify/arrange) my academic goals at the beginning of each study session | 3- I identify my academic goals at the beginning of each study session |
| 4- I try to set academic goals that are within the range of my abilities | 4- I set academic goals that are within the range of my abilities |
| 5- I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others | Unchanged |
| 6- I can design actions that I should take to reach my academic goals at the beginning of each study session | 6- I design actions that I should take to reach my academic goals at the beginning of each study session |
| 7- I expect to obtain a good grade in this course. | Unchanged |
| 8- I expect I can master the subject of this course regardless of the grade that I receive in it. | 8- I expect I can master the material of this course regardless of the grade that I receive in it. |

(table continued)

Table 13 (continued)

| **Items in Goal Setting and Planning Scale** | **Revised Items in Goal Setting and Planning Scale** |
|---|---|
| 9- I can adjust (revise) my academic goals based on my success in achieving them. | 9- I am able to adjust (revise) my academic goals based on my success in achieving them. |
| 10- Learning the subject matter of this course is important to me. | 10- I determine if learning the subject matter of this course is important to me. |
| **Items in Designing of Learning Episodes/ Learning Environment Scale** | **Revised items in Designing of Learning Episodes/ Learning Environment Scale** |
| 11- I believe I can participate in designing my learning environment in a way that it helps me achieve my academic goal(s) | Unchanged |
| 12- I participate in the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes) | 12**- I am able to influence** the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes) |
| 13- I can justify the decisions that I have made in designing my learning environment | Unchanged |
| 14- I design my learning environment according to criteria that include my perceived learning ability or difficulty of the learning task, at the time I set my goals for the course | 14- I design my learning environment according to my perceived learning ability **when** I set my goals for the course |
| 15- I can explain how the elements of my plan for designing a learning environment relate to my goals | Unchanged |
| 16- I am confident that I can independently design my learning environment when I am not in a controlled environment such as a classroom. | Unchanged |
| 17- I can explain why I am confident that I can design my learning environment<br>context, task, teacher/peers/ media | 17- I can explain why I am confident that I can design my learning environment |
| 18- I can use my instructors' hints about important parts of the learning material to help me achieve my academic goals. | Unchanged |
| 19- I can use available instructional technology to help me achieve my academic goals. | Unchanged |
| 20- I can arrange to study with peers (not necessarily friends) who can best contribute to the achievement of my academic goals. | 20- I can arrange to study with peers who can best contribute to the achievement of my academic goals. |
| 21- I can identify the time to study the subject of this course that compared to other times can best advance my academic goals. | 21- I can identify the best times to study the material of this course that can best advance my academic goals. |

(table continued)

Table 13 (continued)

| Items in Monitoring Scale | Revised items in Monitoring Scale |
|---|---|
| 22- When I study, I change the location, time, or setting of my learning environment that I believe are distracting my attention. | 22- When I study, I change the location, time, or setting of my learning environment if my attention is distracted. |
| 23- I believe I can find out when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals | 23- I believe I know when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals |
| 24- I examine my progress in reaching my academic goals based on grades or other measures that I believe are indicative of my progress | 24- I examine my progress in reaching my academic goals based on grades or other measures that I believe indicate my progress |
| 25- I can justify the measures that I select (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress | 25- I can justify **why I choose certain** measures (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress |
| 26- I choose the aspects of the learning environment that I would like to monitor at the time I set my goals for the course | 26- I choose the aspects of the learning environment that I can monitor when I set my goals for the course |
| 27- I can explain how the aspects of the learning environment that I would like to monitor relate to my goals | 27- I can explain how the aspects of the learning environment that I can monitor relate to my goals |
| 28- I am confident that I can independently determine the aspects of the learning environment that I should monitor to reach my goals | Unchanged |
| 29- I can explain why I am confident that I can determine the aspects of the learning environment that I should monitor to reach my goals | Unchanged |
| 30- When I study a subject related to the course, I can continually check to identify the parts of the material that I do not understand completely. | Unchanged |
| 31- I am consciously aware of personal factors (stressors and negative emotions) that might interfere with my ability to stay on task even if I cannot do anything about them. | Unchanged |
| 32- I can sense when environmental factors (noise, other interesting tasks) interfere with my ability to stay on task even if I cannot do anything about them." | Unchanged |

(table continued)

Table 13 (continued)

| **Items in Controlling Scale** | **Revised items in Controlling Scale** |
|---|---|
| 33- I believe I can influence my learning environment by changing aspect(s) of my learning activity or its context (i.e. changing study strategies, changing the location I am studying in) | Unchanged |
| 34- I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals | Unchanged |
| 35- I can justify the changes that I intend to make in my learning environment that help me achieve my goals | 35- I can justify the changes that I intend to make in my learning environment that **will** help me achieve my goals |
| 36- I decide what I can and what I cannot change (i.e. peer interactions, study time and location) in my learning environment at the time I set my goals for the course | Unchanged |
| 37- I can explain why I can or cannot change elements in my learning environment to attain my academic goals | Unchanged |
| 38- I am confident that I can independently determine what I can and cannot change (i.e. peer interactions, study time and location) in my learning environment to help me achieve my goals | Unchanged |
| 39- I can explain why I am confident that I can change my learning environment | Unchanged |
| 40- When I study a subject related to the course, I repeat whatever needs to be remembered over and over again. | 40- When I study **material** related to the course, I repeat whatever needs to be remembered over and over again. |
| 41- When I study a subject related to the course, I use my prior knowledge to interpret and expand on the subject. | 41- When I study **material** related to the course, I use my prior knowledge to interpret and expand on the subject. |
| 42- When I study a subject related to the course, I am able to find connections and interrelationships within the material that I am studying. | 42- When I study **material** related to the course, I am able to find connections and interrelationships within the material that I am studying. |
| 43- I can adjust my expectations of this course based on the stressors and negative emotions that might interfere with reaching my academic goals. | Unchanged |

(table continued)

Table 13 (continued)

| Items in Controlling Scale | Revised items in Controlling Scale |
|---|---|
| 44- I can adjust my willingness to learn the subject of this course based on the stressors and negative emotions that might interfere with reaching my academic goals. | 44- I can adjust my willingness to learn the **material** of this course based on the stressors and negative emotions that might interfere with reaching my academic goals. |
| 45- I can maintain my attention on the task that I'm working on regardless of the time it takes. | Unchanged |
| 46- When I confront distractions, I can initiate or maintain my effort to complete academic tasks. | Unchanged |
| **Items Adapted from AVSI and AMS** | **Revised Items in the Final Version (MISEVE-Q)** |
| 47- I talk aloud to myself about the material I'm studying to keep me from getting distracted by other thoughts or activities. | 47- I talk aloud to myself (repeating the material that I'm studying) to avoid getting distracted by other thoughts or activities. |
| 48- I think about my strengths and the resources that I can draw upon to help me with difficult assignments or test information. | 48- I think about the resources that I am provided with (both individual and environmental) when I'm about to engage in difficult assignments or tests. |
| 49- I once had good reasons for taking this course; however, now I wonder whether I should continue. | 49- I thought I had good reasons for taking this course; but I am coming to believe that I have wasted my time. |
| 50- I can't see why I took this course and frankly, I couldn't care less. | 50- I cannot understand why I took this course and I do not even care anymore. |

## MISEVE-Q Pilot-Test II: Factor Analysis

Participants were 1000 students in several classroom-based and online courses although the majority of the participants were enrolled in two online courses in an education department in a large, public, mid-Atlantic university. The participants were asked by their instructor to respond to MISEVE-Q for which they were awarded course credit. Participants completed MISEVE-Q online through SurveyMonkey.

An exploratory factor analysis of MISEVE-Q Pilot-Test II was conducted to determine the number of principal components that could explain variance in students' self-regulatory scores and what these components can be named. Furthermore, factor analysis was conducted to investigate the items of the instrument that loaded on different factors. Since the principal components explain different aspects of self-regulatory behavior and are correlated with each other, an oblique rotation (Promax method) was performed.

Factor analysis was conducted to investigate whether the MISEVE-Q Pilot-Test II further supported the structure of MISEVE as its internal model, because the added items were based on MISEVE areas of regulation and to explore if additional revisions are needed. Furthermore, exploratory factor analysis was conducted to determine whether MISEVE-Q items loaded on meaningful factors that could explain the main Rasch factors for the four sections of MISEVE-Q Pilot-Test I as well as the first contrasts unexplained by the Rasch model. A number of items were added to MISEVE-Q Pilot-Test II based on cognitive, motivational, volitional, and environmental regulation areas of MISEVE. By investigating the factor loadings of MISEVE-Q Pilot-Test II, cognitive, motivational, volitional, and environmental factors could further confirm the structure of MISEVE and support the decision to add items to MISEVE-Q Pilot-Test II.

The first step in factor analysis is to determine whether the sample size is adequate for conducting factor analysis and to determine whether there is at least some correlations between items of the questionnaire. Therefore, the Kaiser-Meyer-Olkin test of sample size adequacy and Bartlett's test of sphericity were conducted.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) is used to examine the appropriateness of factor analysis for the sample size used in the analysis. High values (between 0.5 and 1.0) indicate factor analysis is appropriate. Small values of the KMO statistic (under 0.5) indicate that the correlations between pairs of variables cannot be explained by other variables and that factor analysis may not be appropriate. MISEVE-Q Pilot-Test II has a KMO of .943 (see Table 14-A).

Bartlett's Test of Sphericity is used to reject the null hypothesis that the population correlation matrix is an identity matrix. In other words, to test if each variable correlates perfectly with itself ($r = 1$) but has no correlation with the other variables ($r = 0$). If the null hypothesis is rejected, it means at least some correlation exists between items. As illustrated below the null hypothesis is rejected significantly (.000) for MISEVE-Q Pilot-Test II items (see Table 14-A).

Table 14-A

*KMO Test of Sampling Adequacy and Bartlett's Test of Sphericity*

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .943 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 15992.315 |
| | Df | 1225 |
| | Sig. | .000 |

Principle Component Analysis (PCA) has been chosen for conducting factor analysis. PCA is used when there is a need to determine the minimum number of factors that will result in explaining the maximum variance in the data. The factors are referred to as components in the SPSS tables. The number of factors extracted by exploratory factor analysis were determined (please see Appendix D-1). Ten factors that each account for at least one unit of variance in the total score (each item contributes to one unit of variance) were extracted. In MISEVE-Q Pilot-Test-II the factors together accounted for 51.37% of the total variance. The percentage of variance for each item explained by all the factors for MISEVE-Q Pilot-Test-II is between .327 and .653 –excluding the two amotivation items- (please see Appendix D-2 for the communalities).

The next step was to determine whether factor rotation was necessary. In rotating the factors, the goal is for each factor to have significant loadings for only some of the variables. Oblique rotation is used when factors are likely to be correlated. An oblique rotation was chosen according to the Component Correlation Matrix (see Table 14-B) which shows correlations between factors. The Promax rotation was chosen because it involves a simpler computation by SPSS and the results were produced in the default 25 steps of iteration by SPSS as shown in Pattern Matrix (see Table 14-C).

The next step was choosing the cutoff that load on each factor. Determining the cutoff for factor loading is subjective. Usually .3 is the cutoff point recommend (Comrey & Lee, 1992), although, Hair, Anderson, Tatham, and Black (1998) noted that factor loadings must be interpreted according to theory not arbitrary cutoff points. The cutoff point for MISEVE-Q Pilot-Test II was .3; however, a few items slightly below that level were allowed into the analysis. Factor loadings (correlations between items and factors) are shown in the Pattern Matrix (see Table 14-C). Factor loadings of around or above .3 are highlighted. The final step was to

interpret the extracted factors. Items in MISEVE-Q Pilot-Test II loaded on 10 factors. The factors were interpreted based on the items that loaded on each factor and subsequently named as follows:

**Promax rotation.**

Table 14-B

*Component Correlation Matrix: Correlations Between Factors*

| Component (Factor) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.000 | .561 | .439 | .520 | .403 | -.024 | .390 | .410 | .362 | .205 |
| 2 | .561 | 1.000 | .508 | .534 | .343 | -.032 | .406 | .381 | .275 | .112 |
| 3 | .439 | .508 | 1.000 | .335 | .276 | .117 | .416 | .356 | .175 | .005 |
| 4 | .520 | .534 | .335 | 1.000 | .451 | -.218 | .299 | .274 | .262 | .314 |
| 5 | .403 | .343 | .276 | .451 | 1.000 | -.160 | .110 | .183 | .153 | .335 |
| 6 | -.024 | -.032 | .117 | -.218 | -.160 | 1.000 | .175 | .054 | -.053 | -.295 |
| 7 | .390 | .406 | .416 | .299 | .110 | .175 | 1.000 | .406 | .019 | -.060 |
| 8 | .410 | .381 | .356 | .274 | .183 | .054 | .406 | 1.000 | .165 | -.002 |
| 9 | .362 | .275 | .175 | .262 | .153 | -.053 | .019 | .165 | 1.000 | .166 |
| 10 | .205 | .112 | .005 | .314 | .335 | -.295 | -.060 | -.002 | .166 | 1.000 |

Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.

Table 14-C

*Pattern Matrix[a]: Correlations Between Items and Factors*

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I believe setting academic goals is important in learning the subject material | .015 | .023 | .688 | .088 | .058 | .035 | -.174 | -.055 | -.050 | .122 |
| I participate in the learning activities of the course to understand the material | .066 | -.096 | .565 | .053 | -.030 | -.141 | -.068 | .096 | -.015 | .230 |
| I identify my academic goals at the beginning of each study session | .028 | -.119 | .761 | .024 | -.169 | -.105 | .079 | .082 | .049 | .032 |
| I set academic goals that are within the range of my abilities | -.131 | .020 | .511 | .089 | .145 | -.038 | .036 | -.140 | .181 | .129 |
| I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others | .133 | .140 | .457 | -.041 | -.052 | .166 | -.100 | -.080 | .032 | .250 |
| I design actions that I should take to reach my academic goals at the beginning of each study session | -.059 | .087 | .627 | -.023 | -.050 | -.090 | .033 | .010 | .148 | -.014 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I expect to obtain a good grade in this course | -.050 | -.032 | .263 | .328 | .063 | -.170 | -.025 | -.052 | -.043 | .269 |
| I expect I can master the material of this course regardless of the grade that I receive in it | -.013 | .095 | .132 | -.188 | -.273 | .021 | .148 | .234 | .147 | .693 |
| I am able to adjust (revise) my academic goals based on my success in achieving them | -.029 | .090 | .322 | .040 | .037 | .023 | .184 | -.058 | .035 | .402 |
| I determine if learning the subject matter of this course is important to me | -.039 | .147 | .186 | .061 | .023 | .140 | .019 | -.017 | -.127 | .606 |
| I believe I can participate in designing my learning environment in a way that it helps me achieve my academic goal(s) | -.128 | .564 | .103 | .106 | .220 | -.035 | -.024 | -.062 | -.053 | .137 |
| I am able to influence the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes) | -.190 | .663 | -.064 | .150 | .184 | -.006 | -.159 | .055 | -.033 | .015 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can justify the decisions that I have made in designing my learning environment | .055 | .547 | .051 | .054 | .159 | -.003 | -.013 | -.119 | -.023 | .059 |
| I design my learning environment according to my perceived learning ability when I set my goals for the course | -.013 | .674 | .145 | -.126 | .064 | -.048 | .130 | -.096 | -.085 | .021 |
| I can explain how the elements of my plan for designing a learning environment relate to my goals | .215 | .656 | .070 | -.151 | -.028 | .027 | -.057 | .044 | -.056 | .013 |
| I am confident that I can independently design my learning environment when I am not in a controlled environment such as a classroom | -.031 | .635 | -.135 | .047 | .084 | -.046 | -.073 | .020 | .117 | .152 |
| I can explain why I am confident that I can design my learning environment | .235 | .715 | -.079 | -.031 | -.131 | .033 | -.120 | -.030 | .051 | .109 |
| I can use my instructors' hints about important parts of the learning material to help me achieve my academic goals | -.071 | .010 | .107 | .631 | -.052 | -.077 | -.032 | .193 | -.051 | .011 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can use available instructional technology to help me achieve my academic goals | -.051 | .018 | .003 | .687 | -.005 | .031 | -.174 | .136 | .045 | .057 |
| I can arrange to study with peers who can best contribute to the achievement of my academic goals | -.205 | .106 | .083 | .669 | -.132 | .137 | .111 | .107 | -.099 | -.268 |
| I can identify the best times to study the material of this course that can best advance my academic goals | -.056 | .234 | -.085 | .464 | .034 | -.042 | .199 | -.025 | .178 | -.203 |
| When I study, I change the location, time, or setting of my learning environment if my attention is distracted | -.097 | .182 | .069 | .000 | .632 | -.023 | -.017 | -.014 | .206 | -.311 |
| I believe I know when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals | .124 | -.076 | -.146 | .324 | .238 | .132 | .220 | -.061 | -.005 | .178 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I examine my progress in reaching my academic goals based on grades or other measures that I believe indicate my progress | .235 | -.151 | .085 | .481 | .231 | -.049 | -.032 | -.062 | -.201 | -.013 |
| I can justify why I choose certain measures (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress | .298 | -.069 | -.017 | .537 | .113 | .190 | -.117 | -.005 | -.080 | .064 |
| I choose the aspects of the learning environment that I can monitor when I set my goals for the course | .241 | .154 | .143 | .141 | .002 | .014 | .112 | .046 | .055 | -.055 |
| I can explain how the aspects of the learning environment that I can monitor relate to my goals | .363 | .032 | .136 | .273 | -.065 | -.010 | .109 | -.095 | .176 | -.152 |
| I am confident that I can independently determine the aspects of the learning environment that I should monitor to reach my goals | .424 | .231 | -.146 | .153 | -.189 | -.048 | .124 | .142 | -.023 | .064 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can explain why I am confident that I can determine the aspects of the learning environment that I should monitor to reach my goals | .503 | .198 | -.065 | .214 | -.278 | -.026 | .118 | .061 | -.052 | -.015 |
| When I study a subject related to the course, I can continually check to identify the parts of the material that I do not understand completely | .089 | .068 | .024 | .051 | .149 | -.004 | .129 | .281 | .055 | .046 |
| I am consciously aware of personal factors (stressors and negative emotions) that might interfere with my ability to stay on task even if I cannot do anything about them | .073 | .039 | -.208 | -.053 | .462 | -.075 | .338 | .172 | -.180 | .192 |
| I can sense when environmental factors (noise, other interesting tasks) interfere with my ability to stay on task even if I cannot do anything about them | -.065 | .061 | -.139 | .035 | .668 | -.013 | .207 | .071 | -.130 | .156 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I believe I can influence my learning environment by changing aspect(s) of my learning activity or its context (i.e. changing study strategies, changing the location I am studying in) | .158 | .081 | .011 | .064 | .481 | -.098 | .137 | .020 | .081 | -.134 |
| I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals | .274 | .035 | .109 | -.097 | .579 | .042 | -.151 | .105 | .136 | -.210 |
| I can justify the changes that I intend to make in my learning environment that will help me achieve my goals | .574 | .077 | -.011 | -.095 | .215 | .033 | -.186 | .108 | .142 | -.039 |
| I decide what I can and what I cannot change (i.e. peer interactions, study time and location) in my learning environment at the time I set my goals for the course | .628 | -.069 | .080 | .037 | -.005 | -.016 | .300 | -.220 | -.097 | -.067 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can explain why I can or cannot change elements in my learning environment to attain my academic goals | .750 | .031 | .005 | -.134 | -.004 | -.070 | .054 | -.033 | .015 | -.001 |
| I am confident that I can independently determine what I can and cannot change (i.e. peer interactions, study time and location) in my learning environment to help me achieve my goals | .801 | -.096 | -.021 | -.024 | .104 | -.004 | -.046 | -.043 | -.016 | .044 |
| I can explain why I am confident that I can change my learning environment | .683 | .001 | .010 | -.021 | .084 | -.027 | -.087 | .101 | .012 | -.021 |
| When I study material related to the course, I repeat whatever needs to be remembered over and over again | .000 | -.018 | .254 | -.047 | .125 | .078 | .008 | .545 | -.254 | -.103 |
| When I study material related to the course, I use my prior knowledge to interpret and expand on the subject | -.003 | -.017 | -.118 | .184 | .023 | -.065 | -.117 | .744 | .057 | .165 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| When I study material related to the course, I am able to find connections and interrelationships within the material that I am studying | -.050 | -.097 | -.079 | .209 | .069 | -.093 | .025 | .607 | .197 | .095 |
| I can adjust my expectations of this course based on the stressors and negative emotions that might interfere with reaching my academic goals | .080 | -.121 | -.027 | -.057 | .106 | -.036 | .782 | -.036 | .220 | .090 |
| I can adjust my willingness to learn the material of this course based on the stressors and negative emotions that might interfere with reaching my academic goals | -.054 | -.060 | -.069 | -.023 | .098 | -.019 | .802 | -.049 | .307 | .120 |
| I can maintain my attention on the task that I'm working on regardless of the time it takes | -.006 | -.062 | .167 | -.075 | -.018 | .106 | .269 | .009 | .728 | -.004 |
| When I confront distractions, I can initiate or maintain my effort to complete academic tasks | .046 | .048 | .009 | -.053 | .070 | .083 | .232 | .026 | .667 | .003 |

(table continued)

Table 14-C (continued)

| MISEVE-Q Items | Component (Factor) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I talk aloud to myself (repeating the material that I'm studying) to avoid getting distracted by other thoughts or activities | -.058 | .016 | .168 | -.163 | .150 | .296 | .318 | .236 | -.139 | -.039 |
| I think about the resources that I am provided with (both individual and environmental) when I'm about to engage in difficult assignments or tests | .155 | -.108 | .215 | .085 | .074 | .090 | -.038 | .282 | .262 | .029 |
| I thought I had good reasons for taking this course; but now I wonder whether I should continue | -.036 | -.054 | -.054 | .076 | -.058 | .932 | -.010 | -.038 | .102 | .083 |
| I cannot understand why I took this course and I do not even care anymore | -.040 | .002 | -.110 | .048 | -.021 | .934 | -.029 | -.047 | .115 | .093 |

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization
a. Rotation converged in 22 iterations
* Please see Appendix D-3 for the Structure Matrix.

**Extracted factors based on their factor loading of around .3 or higher.**

- The first factor loaded on the control items of the questionnaire; this factor is called the *control* factor and explains 25.08 of the variance of MISEVE-Q Pilot-Test-II scores.

- The second factor loaded on the design of learning environments/learning episodes items of the questionnaire; this factor is called *design of learning environments/learning episodes* factor and explains 5.17 of the variance of MISEVE-Q Pilot-Test-II scores.

- The third factor loaded on the goal setting and planning items of the questionnaire; this factor is called the *goal setting and planning* factor and explains 3.55 of the variance of MISEVE-Q Pilot-Test-II scores.

- The fourth factor loaded on the use of resources and monitoring items of the questionnaire; this factor is called the *monitoring/use of resources* factor and explains 3.05 of the variance of MISEVE-Q Pilot-Test-II scores.

- The fifth factor loaded on the attention, motivational monitoring and control items of the questionnaire; this factor is called the *attention, motivational monitoring and control* factor and explains 2.89 of the variance of MISEVE-Q Pilot-Test-II scores.

- The sixth factor loaded on the two amotivation items. As discussed earlier, this was an indicator to analyze the remaining items carefully to see if there is an indication of lack of self-regulation. All other items have insignificant loadings on this factor except item 47 [*I talk aloud to myself (repeating the material that I'm studying) to avoid getting distracted by other thoughts or activities*]= .296. This factor is called *lack of self-regulation* factor and explains 2.55 of the variance of MISEVE-Q Pilot-Test-II scores.

- The seventh factor loaded on the emotion and motivational control items of the questionnaire; this factor is called the *emotion and motivational control* factor and explains 2.45 of the variance of MISEVE-Q Pilot-Test-II scores.

- The eighth factor loaded on the monitoring comprehension, rehearsal, organization, and elaboration items that were added to MISEVE-Q under cognitive monitoring and controlling. This factor is called the *cognitive monitoring and cognitive controlling* factor and explains 2.29 of the variance of MISEVE-Q Pilot-Test-II scores.

- The ninth factor loaded on the emotion, attention, and effort items of the questionnaire; this factor is called the *volitional control* factor and explains 2.23 of the variance of MISEVE-Q Pilot-Test-II scores.

- The tenth factor loaded on the mastery orientation, success, and value items of the questionnaire. These items were added to the goal-setting and planning section of MISVE-Q based on motivational beliefs. Therefore, this factor is called the *motivational beliefs* factor and explains 2.10 of the variance of MISEVE-Q Pilot-Test-II scores.

Table 15

*Results of Principal Component Analysis*

| **Sections of MISEVE-Q** | **Percentage of Variance of Scores for Sections of MISEVE-Q Pilot-Test I due to Principal Components (Rasch analysis)** | **Percentage of Variance of Scores for MISEVE-Q Pilot-Test II due to Principal Components (Factor analysis)** | **Results** |
|---|---|---|---|
| **Goal setting and planning** | Racsh Factor = 54.3%<br><br>First Contrast = 15.8% | F1 Control (25.08%)<br><br>F2 Design of learning environments/learning episodes (5.17%)<br><br>F3 Goal setting and planning (3.55%)<br><br>F4 Monitoring /use of resources (3.05%)<br><br>F5 attention, motivational monitoring and control factor. (2.89%)<br><br>F6 Lack of self-regulation (2.55%)<br><br>F7 emotion and motivational control (2.44%)<br><br>F8 cognitive monitoring and cognitive controlling (2.29%)<br><br>F9 Volitional control (2.23%)<br><br>F10 Motivational Beliefs (2.10%) | The instrument further supported the structure of MISEVE as its internal model (added items were based on areas of MISEVE: cognitive monitoring and control; motivational monitoring and control; volitional control, motivational beliefs, and interactions with learning environments. [see Table 12]).<br><br>MISEVE-Q II items load on meaningful factors that can explain the variance due to the main factors as well as some of the variance due to the contrasts extracted by Rasch analysis: The 10 principal components extracted by factor analysis together explain 51.37 % of the total variance of MISEVE-Q score. This number has improved by 9.67 %.<br><br>Based on the results of principal component analysis (Rasch and Exploratory Factor Analysis) MISEVE-Q |
| **Design of learning environment/ Learning episode** | Racsh Factor = 48.5%<br><br>First Contrast = 16.1% | | |
| **Monitor** | Racsh Factor = 44.1%<br><br>First Contrast = 25.1% | | |
| **Control** | Racsh Factor = 39.0%<br><br>First Contrast = 20.7% | | |

(table continued)

Table 15 (continued)

| **Sections of MISEVE-Q** | **Percentage of Variance of Scores for Sections of MISEVE-Q Pilot-Test I due to Principal Components (Rasch analysis)** | **Percentage of Variance of Scores for MISEVE-Q Pilot-Test II due to Principal Components (Factor analysis)** | **Results** |
|---|---|---|---|
| **Entire Questionnaire** | 41.7% | 51.37 % | Pilot-Test II was thought to be a valid measure for assessing academic self-regulation. Content, substantive, and structural evidence of validity for MISEVE-Q was provided. Criterion evidence of validity was investigated through correlation of MISEVE-Q scales with MSLQ-CS scales. |

* First Contrasts: The largest unexplained variance for each section of MISEVE-Q Pilot-Test I after the main factor is fit to the model.

Except for one item, all of the MISEVE-Q Pilot-Test II items loaded on a factor that could be interpreted based on the structure of MISEVE as they were presented in Table 12 under items added to MISEVE-Q Pilot-Test II. Therefore, excluding item 26 (*I choose the aspects of the learning environment that I can monitor when I set my goals for the course*), all items contribute to the variance of the extracted factors. In addition, eight items load on two factors. In most cases one of the loadings is noticeably larger than the second one except in two cases. It is noteworthy to mention that the close factor loadings in these two cases are supported by the structure of MISEVE as being closely related (factors 5 motivation and factor 7 volition control in one case and factor 3 goal-setting and factor 10 motivational beliefs in the other case). The remaining forty items each load on one unique factor.

The factors with the highest contribution in explaining the total variance of MISEVE-Q Pilot-Test II are the four phases of academic self-regulation which are the four sections that MISEVE-Q was based on and the four interaction links in MISEVE. The control factor in particular explains a large portion of the variance (25.08%) of the total score. Ten items load on this factor. This finding shows the importance of *control* in academic self-regulation. The next

factor is design of learning environments (5.17%). Seven items load on this factor. Goal setting is the third factor in explaining total variance (3.55%). Seven items load on this factor. Finally the fourth factor among the highest contributors to total variance explained, is monitoring and use of resources (3.05%). Eight items load on this factor. The remaining factors confirm the decision to add items based on the areas of MISEVE (cognition, motivation, volition, and environment) and motivational beliefs. These factors combined explain 14.51% of total variance explained.

**Summary**

A review of academic self-regulation literature yielded three frequently referenced models of self-regulation and four prominent questionnaires that measure academic self-regulation, academic motivation, and academic volitional skills. Because none of these models incorporated all the variables evidence-based research has shown to influence academic self-regulation, a framework that comprehensively integrated this evidence was constructed (MISEVE). In addition, all of the questionnaires reviewed only peripherally assessed academic self-regulation and resulted in scores of questionable validity. Thus, academic self-regulation, while a significant factor in academic achievement, lacked psychometrically sound assessment instruments based specifically on research and practice related to academic self-regulation.

Two strategies were implemented to create accurate and practical measurement of academic self-regulation. First, the proposed model of academic self-regulation (MISEVE) was investigated to ensure its validity. Second, a series of studies were conducted to establish content, substantive, and structural evidence of validity of the instrument based on MISEVE. The first study confirmed the structure of MISEVE through a questionnaire (MISEVE-Q) that was developed based on the four phases of self-regulation. Rasch analysis confirmed the multidimensionality or unidimensionality of these phases as they were illustrated in MISEVE. The second study (MISEVE-Q Pilot-Test I ) confirmed that MISEVE-Q had a high item-total correlation and a strong internal consistency in each section and as a whole. For the third study (MISEVE-Q Pilot-Test II) additional items were added to MISEVE-Q based on areas of regulation illustrated in MISEVE. Exploratory factor analysis confirmed the decision to add items and provided additional confirmation of the structure of MISEVE and MISEVE-Q because the emerged factors were consistent with the phases and areas of regulation in MISEVE. A

fourth study was conducted to provide further evidence of the validity (criterion) and reliability of MISEVE-Q as described in Chapter 3.

# Chapter 3
# Methodology

The purpose of this investigation was to develop and validate MISEVE-Q as a comprehensive assessment instrument to measure academic self-regulation as a personal trait. MISEVE-Q was the product of Pilot-Test I and Pilot-Test II as indicated in Tables 16-A, and 16B. To validate MISEVE-Q, a large scale administration of the instrument was planned (see Table 16-C). The criterion or external evidence for the validity of the MISEVE-Q was collected by correlating participants' scores on MISEVE-Q with their scores on a modified version of MSLQ (an instrument frequently used to assess students' self-regulatory skills). Furthermore, because academic self-regulation is directly related to student achievement, correlating students' scores with their course grades can provide further evidence of criterion validity. Finally, to ensure that the instrument measures the construct it was designed for, participants were asked to identify items that they found to be confusing and to offer suggestions to clarify items.

## MISEVE-Q Large-Scale Administration

Criterion validity is established when a questionnaire is demonstrated to be effective in predicting criteria or indicators of a construct such as academic self-regulation. Administration of MISEVE-Q alone would not provide evidence of criterion validity. Investigating the correlation between participants' scores with their scores from another validated instrument used for measuring academic self-regulation would contribute to criterion related evidence of validity.

Participants were students in four courses in the School of Education in a large, public, mid-Atlantic university. The participants who were enrolled in these courses were given the option to respond to MISEVE-Q by their instructors for which they were awarded course credit and the opportunity to win one of three prizes in a lottery from the investigator. All participants were sent two reminders to complete each questionnaire.

In addition, the correlation between participants' MISEVE-Q scores and their course grades, as one measure of academic achievement, was to be computed. A high correlation contributes to the criterion or external related evidence of validity (Messick, 1995) because academic self-regulation is closely linked to academic achievement.

MISEVE-Q was designed to assess self-regulatory skills and, eventually, used in designing academic interventions; it is thus appropriate to consider the consequential validity

evidence. The results of the data collected by this instrument will be used anonymously to assess the extent that students' engage in academic self-regulation in a certain subject; it will not become the basis of any intervention or decision that can have potential consequences for the students.

Capturing participants' thought processes in answering items of MISEVE-Q provided additional evidence for content validity since the participants' thought processes identified their perceptions of the relevance of items to academic self-regulation. In MISEVE-Q Pilot-Test I, Pilot-Test II, and large scale administration of MISEVE-Q this was done by asking participants to write down the items that were confusing to them or if they had suggestions for changing the wording of the items. Tables 16A, 16B, and 16C present the timelines for development and validation of MISEVE-Q and Table 17 summarizes the validity evidence for MISEVE-Q.

Table 16-A

*MISEVE-Q Pilot-Test I Development and Validation Timeline*

| MISEVE-Q Pilot-Test I | Time | Items | Source | Action |
|---|---|---|---|---|
| Development | Spring 2010 | Please refer to Table 6: Development of MISEVE-Q Items and Table 8: Degrees of Intentionality in MISEVE-Q Items Based on Bloom's Affective Taxonomy | ◆ Self-regulation literature (i.e. Boekaerts, 1997 model of academic self-regulation; Boekaerts, 1999 and 2000; Boekaerts and Corno, 2005; Boekaerts and Cascallar 2006; Corno 2001, Pintrich 2000; Schunk, 2004; Winne and Hadwin, 1998; Winne and Perry 2000; Zimmerman, 2000; Zimmerman and Schunk, 2001; )<br><br>◆ Bloom's affective taxonomy (Krathwohl, Bloom, Masia, 1973)<br><br>◆ Review of item-format in the most frequently used self-regulation questionnaires (LASSI and MSLQ)<br><br>◆ Interaction links in MISEVE (goal setting and planning, design of learning environment/learning episodes, monitor, and control) | ◆ Compare to LASSI and MSLQ<br><br>◆ Expert 1 review (see Table 6) |

(table continued

Table 16-A (continued)

| | |
|---|---|
| Administration | ◆ Participants: a convenience sample of 40 graduate and undergraduate students<br><br>◆ Electronic administration |
| Results | ◆ Strong item-total correlation (see Table 9 and Appendix B-1)<br><br>◆ Strong internal consistency for each section and the instrument as a whole (see Table 10)<br><br>◆ Unidimentionality or multidimentionality of each section (see Table 10 and Appendix B-2) which is in accordance with interaction links in MISEVE. |

Table 16-B

*MISEVE-Q Pilot-Test II Development and Validation Timeline*

| MISEVE-Q Pilot-Test II | Time | Items | Source | Action |
|---|---|---|---|---|
| Development | Spring 2011 | Table 12: MISEVE-Q_II: Added items and Table 13: MISEVE-Q_II: After Second Expert Review | ◆ Literature in regards with cognitive, motivational, and volitional skills that learners must possess to be able to proficiently self-regulate their learning was reviewed. (i.e. Greene and Azevedo, 2007; Pintrich, 1999; Garcia and McCann, 1999; Shepherd, 2006)<br><br>◆ Complete review of Self-Regulation Questionnaires: MSLQ, LASSI; Motivation Questionnaire: AMS; and Volitional Strategies Questionnaire: AVSI for their validity and reliability evidence and specific items<br><br>◆ Interaction links in addition to cognitive, motivational, and volitional areas of academic self-regulation illustrated in MISEVE | ◆ Additional items (please see Table 12)<br><br>◆ Expert 2 review (please see Table 13) |

(table continued)

Table 16-B (continued)

| | |
|---|---|
| Administration | ◆ Participants: graduate and undergraduate students enrolled in Psychological Foundations for Teachers, Motivation and Cognition, Psychological Foundations of Education, The Iranian Society at Virginia Tech (ISVT), Drug Education, Personal Health.<br><br>◆ Electronic administration |
| Results | ◆ Strong evidence of content and structural validity (Table 15)<br><br>◆ Exploring the factor structure of the construct of academic self-regulation (Please refer to Table 14 C, Table 15, and Appendix D) |

Table 16-C

*MISEVE-Q Development and Validation Timeline*

| MISEVE-Q Large-scale administration | Time | Items | Source | Action |
|---|---|---|---|---|
| Development | Spring 2011 | MISEVE-Q as it was in Pilot-Test II | Results from Pilot-Test I and Pilot-Test II | ◆ Correlation analysis<br><br>◆ Multiple regression analysis |
| Administration | Summer I, Summer II, and Fall 2011 | ◆ Participants: Undergraduate students enrolled in two online courses and graduate students enrolled in two classroom-based courses<br><br>◆ Electronic administration<br><br>◆ All participants completed MISEVE-Q Pilot-Test II; in addition, participants were asked to complete MSLQ-CS | | |
| Results | ◆ High correlation with validated existing instruments can be interpreted as evidence for external validity (anticipated)<br><br>◆ Correlation between participants' MISEVE-Q Pilot-Test II scores and their course grade, as one measure of academic achievement is computed (anticipated) | | | |

Table 17

*A Summary of MISEVE-Q Validity Evidence*

| Type of evidence Messick (1995), Wolfe & Smith (2007) | Supporting Data | Analysis |
|---|---|---|
| Construct Validity:<br><br>Substantive | 1. The instrument is based on a construct map that represents the development of the construct being supported by theory and research. | Construct map (Figure 7) is based on academic self-regulation literature and Bloom's affective taxonomy. |
| Empirical evidence that the theoretical processes are actually engaged by respondents in the assessment tasks. | 2. The instrument is based on an operational definition which is consistent with the construct map, theory, and research. | Operational definition consists with the construct map and Figure 6 (MISEVE) |
| | 3. Theoretical framework of the construct: | |
| | • The internal model follows the construct map, operational definition, theory, and research. | The internal model for this instrument (MISEVE) was based on theories of cognition, motivation, volitional strategies, and academic self-regulation. MISEVE was used as a basis to develop the construct map and operational definition. |
| | • Theory and research support the external model. | Theories of cognition and motivation were used to support the external model of academic self-regulation in regards with other constructs (i.e. academic achievement and self-efficacy). |
| | 4. Verifying of use of the proposed processes by respondents. | Analysis of participants' responses to open-ended questions. More definition of terms were added to the instrument to further clarify the meaning of items. |

(table continued)

Table 17 (continued)

| Type of evidence Messick (1995), Wolfe & Smith (2007) | Supporting Data | Analysis |
|---|---|---|
| Construct Validity:<br><br>Structural<br><br>The degree to which relationships between items conforms to the theoretical view of the trait. | The internal model defines a structure for the instrument:<br>• Interaction links and areas of MISEVE support the Dimensionality evidence for the instrument and vice versa. | Interaction links of MISEVE were used to develop sections of the instrument which dimensionality results by Winsteps supported. (see Table 10 and Appendix B-2)<br><br>*Using SPSS software, Factor analysis was used to further support the structure of the instrument (see Table 14, Table 15, and Appendix D).* |
| Construct Validity:<br><br>Content<br><br>Evidence of content relevance, representativeness, and technical quality. | 1. Two experts reviewed representativeness and content quality of the instrument in measuring the construct (academic self-regulation) | Two experts reviewed the instrument. (see Table 6 and 13) |
| | 2. Participants interpreted the construct the way it was intended. | *Participants' responses to open-ended questions were analyzed (see Table 21).* |
| | 3. Sections of the instrument were based on theory and research. | The four sections of MISEVE-Q were based on cognition, motivation, volition, and academic self-regulation literature |

(table continued)

Table 17 (continued)

| Type of evidence Messick (1995), Wolfe & Smith (2007) | Supporting Data | Analysis |
|---|---|---|
| Criterion/ External Validity<br><br>How the construct is expected to relate to other constructs and variables. | 1. Scores from a modified version of MSLQ (as a frequently used instrument for measuring academic self-regulation) (please refer to Table 19, Appendix E-2) | Using SPSS software:<br><br>*Correlation between MSLQ-CS and MISEVE-Q scores (see Table 22-B,Table 27)*<br><br>*Multiple Regression between MSLQ-CS and MISEVE-Q scores (see Tables 23-B, 24-B, 25-B, 26-B, and Table 27)* |
| | 2. Grades as a measure of academic achievement, related to academic self-regulatory skills in the literature. | *Correlation between MISEVE-Q scores and course grades for all participants.* |
| Internal Reliability | | Using SPSS software: |
| | 1. Cronbach's alpha | *Cronbach's alpha of the instrument was reported (see Table 20, Appendix F-1).* |
| | 2. Item-total correlation | *Item-total correlation was reported (see Table 21, Appendix F-2).* |

***** Italic font represents analysis to be performed.

**Participants.** To run statistical analyses including examining the correlations between students' responses to MISEVE-Q scales and their responses to MSLQ Constructed Scales (MSLQ-CS), students who responded to both questionnaires were identified. Guidelines sent to students (see Appendix C-2 and C-3) varied slightly in the way that the instructors of the courses wanted to implement the surveys; however, all of the guidelines specified that students had to respond to both of the surveys to receive course credit and to enter the prize lotteries. Of the 850 students who responded to MISEVE-Q and the 832 students who responded to MSLQ-CS during Fall 2011, 711 responses were complete and could be matched.

MISEVE-Q Pilot-Test II data were collected from students enrolled in eight courses in addition to the Iranian Society during Spring, Summer I, Summer II, and Fall 2011 (see Table 18). Four of these courses were online and the remaining were classroom-based courses at a large, public, mid-Atlantic university. To establish validity and reliability, all participants in the studies were drawn from four courses at the same university during Fall 2011 (see Table 18). All participation was voluntary and anonymous. All participants were offered some course credit for their participation and the opportunity to win one of three prizes in a lottery from the investigator.

**Procedures.** Participants were asked to complete two instruments (MISEVE-Q and MSLQ-CS, as described in the last section of this chapter) thorough separate links provided on SurveyMonkey, a web-based survey administration software. All responses were collected online. Upon agreement, the instructor of each course was provided with the conditions to be followed by students who chose to participate in the investigation. For all instructors, these conditions were essentially the same. First, the instructors reviewed and agreed to a description of the investigation to be distributed to their students. Second, instructors informed all enrolled students about the investigation and the opportunity to participate through an e-mail which included the course credit award, the opportunity to enter the lottery and the SurveyMonkey URL (please see Appendix C). Third, two follow-up e-mails were sent to students through the instructors. Upon completing each survey, participants were directed to a second site in which they could record their names and enter the lottery. All procedures were submitted to and approved by the Institutional Review Board of the university. Following the announced deadlines, the SurveyMonkey sites were closed, the instructors were informed which of their

students participated, and the lottery was executed. The lottery winners were contacted and were presented with their prizes.

**Data organization and management.** Data analysis began by matching participants' scores on each instrument. There were eight survey links for each of these courses. Through two of these survey links identifying information for participants such as first names, last names, and the last four digits of students' ID number were collected. These two links were completely separated from the other two links which contained participants' responses to the questionnaires to preserve anonymity. MISEVE–Q and MSLQ-CS survey links contained only the IP addresses of computers that individual students used as their identifiers. These IP addresses were used to match participants' responses to MISEVE–Q to their responses to MSLQ-CS. Two survey links were used for people who failed to complete the surveys based on the provided guidelines. The remaining four survey links were created at the end of each of the main survey links to anonymously collect participants' information. These were separate links that students could enter when they reached the end of each questionnaire and click on an uppercased, bold faced, underlined, and red word "HERE" in the sentence "Thank you for completing our survey! If you are interested in receiving 5 extra credits by your instructor and/or winning one of the prizes (an iPod Shuffle, $30, or $20) please click HERE and enter your name."

The multi-link setup was necessary and intentional to collect responses since it was emphasized to students that their responses were collected anonymously and that their names and their responses would not be associated. On the other hand, since students were given incentives and course credits for completing the surveys, it was necessary to have a system in place to identify students who responded to all surveys so that they could receive course credit and be entered into the random drawing. Asking students to provide personal information such as name or student ID would have made student responses identifiable and therefore may have prevented them from responding to the questionnaires. This assumption was confirmed after it was revealed that even with the separate link setup and the emphasis that was put on the responses being anonymous, many students completed the surveys but did not enter their names into the separate links. These students inevitably were excluded from the analysis since their responses to both surveys could not be matched.

Students who did not want to enter their names in the separate links, forgot to enter their names, were unsure about whether they took the surveys, or were unsure which surveys they

completed, contacted the researcher. Two strategies were implemented for such problems. One strategy was that the questions in the four separate links at the end of the main surveys (which contained participants' information) were different in number and in content to assist participants to recall which survey they had completed. Second, the extra links that were created for each of the courses were intended to assist participants who encountered problems the first time to respond to the surveys an additional time without being counted twice in the analysis.

Despite these predictions, students made different mistakes in responding:

- Some students filled out the surveys twice. The surveys were set up so that students could only enter their names once, therefore, it is believed that these students used two different computers to respond to the surveys an additional time. Students' names were sorted in an Excel sheet and the repetitive names were identified. The number of students who responded twice was insignificant; however, these students' additional responses were excluded.
- There were students who answered only one of the surveys, students who answered only one survey twice, and students who did not write their names in one or in both of the separate links at the end of the main surveys. These students were excluded from the analysis because their responses to both surveys could not be matched.
- Some students wrote their first and last names in a reverse order, forgot to write their full names, or used their given names in one of the surveys and their nicknames in the other survey. These students' ID numbers in the second survey was searched for in the first survey, the matched ID numbers were then matched with the students' names (as mentioned earlier, students were asked to provide the last four digits of their student ID number.).

Several functions in Excel and in SPSS were used to prepare the data for analysis.

### *Application of MS Excel in matching responses to MISEVE-Q and MSLQ-CS.*

Many participants entered their information in the reverse order of what was requested; VLOOKUP function was used to search for all information in all the questionnaires for the 1000 participants to correct these errors. Because MISEVE-Q and MSLQ-CS did not contain any identifying information, VLOOKUP function was again used to match the IP addresses of individuals' responses to the links containing the identifying information to MSLQ-CS responses

of individuals, and, then, to match identifying information to IP addresses, and, finally, match that IP to MISEVE-Q responses of the same individuals. This action was needed to match the two anonymous responses as well as to find out who completed both questionnaires so that their information could be later reported to the instructor of the course to receive course credit. In addition, because selected items of MSLQ that addressed areas of self-regulation were used and reorganized into new scales, an Excel spreadsheet mapping the original numbering and scales of MSLQ items to the new numbering and scales of MSLQ-CS was constructed. The purpose of this spreadsheet was to identify the item numbers in each scale of MSLQ-CS for future analysis with SPSS.

Furthermore, reverse coded items were color-marked, the responses were transformed to regular scores, and the average of items within each scale was computed. Concatenation was employed to construct a unique identifier for each individual. IFNA was used to determine the correct responses from the incorrect responses and therefore identifying incorrect information. The two latter functions were also used to identify respondents who used two different computers (thus different IPs) to respond to the questionnaires. IFLEN was used to convert textual responses to numbers.

***Application of SPSS in data analysis.***

Missing items which were the incomplete responses to either of the surveys were deleted. Responses of participants who completed one questionnaire and did not complete the second questionnaire were deleted. Listwise deletion was used for this purpose. All responses of these students to either survey were aligned and if any response in either survey was missing, the data for that row was deleted. At this point, the matched responses to both surveys were reviewed and duplicate IPs were identified. Because there was no identifying information, there was no way of knowing which respondent completed which of the redundant surveys; therefore, to ensure accuracy, all duplicate IPs were deleted. In addition to items, average of scales, including the reverse items were computed for both questionnaires. Sort was used to ensure that MSLQ-CS and MISEVE responses corresponding to the same individual were matched for every item. All of the quantitative data analysis (factor analysis, internal consistency, correlation, and regression) was conducted with SPSS.

The organization, timing, and source of participants' responses are summarized in Table 18. The following analyses were conducted:

- Factor analysis- MISEVE-Q Pilot-Test II;
- Cronbach's alpha MISEVE-Q and MSLQ-CS;
- Item-total reliability- MISEVE-Q;
- Correlations between MISEVE-Q scales and MSLQ-CS subscales; and
- Multiple regression analysis- predicting MSLQ-CS subscales from MISEVE-Q scales.

Table 18

*Number of Participants and Administration Timeline for MISEVE-Q and MSLQ-CS*

| Source | Number of Participants | Analysis | Time of Data Collection |
|---|---|---|---|
| Random Sampling; Statistics course Iranian Students | 38 | MISEVE-Q Pilot-Test I:<br>- Rasch Analysis (dimensionality)<br>- Internal Consistency<br>- Item-Total Correlations with jMetrik<br>- Analysis of open-ended Questions | Spring 2010 |
| Motivation and Cognition; Psychological Foundations for Teachers; Iranian Society at Virginia Tech; Drug Education; Personal Health; Psychological Foundations of Education | 1000 | MISEVE-Q Pilot-Test II:<br>- Factor Analysis<br><br>MISEVE-Q<br>- Internal Consistency<br>- Item-Total Correlations | Spring, Summer I, Summer II, and Fall 2011 |
| Drug Education; Personal Health; Psychological Foundations of Education | 832 | - Internal Consistency of MSLQ constructed scales for assessing academic self-regulation | Fall 2011 |
| Drug Education; Personal Health; Psychological Foundations of Education | 623* | MISEVE-Q Large Scale Administration:<br>- Correlation Analysis<br>- Multiple Regression | Fall 2011 |
| Motivation and Cognition; Psychological Foundations for Teachers; Iranian Society at Virginia Tech; Drug Education; Personal Health; Psychological Foundations of Education | 325 | MISEVE-Q Pilot-Test II and MISEVE-Q<br><br>Participants' responses to the open-ended questions were analyzed. A summary of the results are presented in Table 21. | Spring, Summer I, Summer II, and Fall 2011 |

** 711 participants' responses to both surveys could be matched; however, some of these participants had the same IP address. These participants were excluded from the analysis because the surveys were anonymous and there was not a way to be certain if a correct match had taken place.*

**Scales Constructed Based on MSLQ-CS Items Related to Academic Self-Regulation Areas of MISEVE**

To ensure that MSLQ-CS and MISEVE-Q were assessing the same academic self-regulation constructs, all MSLQ items were examined to separate academic self-regulation related items from those that did not address academic self-regulation.

MSLQ was designed to measure motivation and learning strategies (Pintrich, Smith, Garcia & McKeachie, 1991; Pintrich, Smith, Garcia, & McKeachie, 1993). MSLQ items were divided into eight subscales: Self-Efficacy for Learning & Performance, Task Value, Effort Regulation, Rehearsal, Elaboration, Organization, Metacognitive Self-Regulation, and Time/Study Environmental Management (Artino, 2005; Duncan & McKeachie, 2005).

The structure of MISEVE was used for selecting items from MSLQ to measure self-regulatory skills in cognitive, motivational, volitional, and environmental areas of regulation. *Rehearsal, Elaboration,* and *Organization* are among cognitive strategies that self-regulated learners use (Pintrich, 1999, Greene & Azevedo, 2007). *Effort regulation* has been recognized as a volitional strategy used by self-regulated learners (Corno, 1993; McCann and Garcia, 1999; Wolters 2003). The *value* that learners attribute to academic tasks impacts their motivation to engage in academic tasks (Bong, 2004, Eccles & Wigfield, 2002). *Time management* is considered to be a strategy used by academically self-regulated learners to design optimal learning environments (Pintrich, 1999; Boekaerts & Corno, 2006, Winne, 2001). *Self-Efficacy for Learning* has been associated with skillful *performance* and academic achievement (Ainley, Buckley, & Chan, 2009; Schunk, 1995; Schunk & Usher, 2011).

Fifty two items were chosen from MSLQ as the *areas* of self-regulation (cognition/metacognition, motivation, volition, and environment) and perceived achievement as

proposed in the MISEVE model to measure academic self-regulatory skills. These items were categorized under the following scales: achievement, cognition regulation, motivation and volition regulation, and environment regulation (see Table 19).

MSLQ scales, subscales, items within each subscale, and corresponding Cronbach's alphas for each subscale in addition to MSLQ-CS scales, items, and Cronbach's alphas are shown in Table 19. Each of the highlights identifies one of the constructed scales of self-regulation. Blue: perceived achievement; Red: cognition regulation; Yellow: motivation and volition regulation; and Pink: environment regulation.

Table 19

*MSLQ Subscales and Constructed Scales Related to Academic Self-Regulation (each constructed scale is highlighted in a different color)*

* MSLQ scales, subscales, items within each subscale, and Cronbach's alphas as reported in Artino (2005) and Duncan & McKeachie (2005).

* For a complete list of MSLQ items please refer to Appendix E-1.

| MSLQ Scale | Items in the Subscale | α |
|---|---|---|
| **Motivation Subscales** | | |
| 1. Intrinsic Goal Orientation | 1, 16, 22, 24 | .74 |
| 2. Extrinsic Goal Orientation | 7, 11, 13, 30 | .62 |
| 3. Task **Value** | **4, 10, 17, 23, 26, 27** | .90 |
| 4. Control of Learning Beliefs | 2, 9, 18, 25 | .68 |
| 5. Self-**Efficacy** for Learning & Performance | **5, 6, 12, 15, 20, 21, 29, 31** | .93 |
| 6. Test Anxiety | 3, 8, 14, 19, 28 | .80 |
| **Learning Strategies Subscales** | | |
| 1. **Rehearsal** | **39, 46, 59, 72** | .69 |
| 2. **Elaboration** | **53, 62, 64, 67, 69, 81** | .75 |
| 3. **Organization** | **32, 42, 49, 63** | .64 |
| 4. Critical Thinking | 38, 47, 51, 66, 71 | .80 |
| 5. **Metacognitive** Self-Regulation | **33r, 36, 41, 44, 54, 55, 56, 57r, 61, 76, 78, 79** | .79 |
| 6. **Time**/Study Environmental Management | **35, 43, 52r, 65, 70, 73, 77r, 80r** | .76 |
| 7. **Effort** Regulation | **37r, 48, 60r, 74** | .69 |
| 8. Peer Learning | 34, 45, 50 | .76 |
| 9. Help Seeking | 40r, 58, 68, 74 | .52 |

(table continued)

Table 19 (continued)

| **MSLQ Constructed Scale** | **Items chosen based on their wording and MISEVE to assess academic self-regulatory skills** | **α** |
|---|---|---|
| Achievement | MSLQ Self-**Efficacy** for Learning & Performance:<br>5. I believe I will receive an excellent grade in this class.<br>6. I'm certain I can understand the most difficult material presented in the readings for this course.<br>12. I'm confident I can learn the basic concepts taught in this course.<br>15. I'm confident I can understand the most complex material presented by the instructor in this course.<br>20. I'm confident I can do an excellent job on the assignments and tests in this course.<br>21. I expect to do well in this class.<br>29. I'm certain I can master the skills being taught in this class. Review of the MSLQ 16<br>31. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class. | .990 |
| Cognitive Regulation | **Rehearsal**<br>39. When I study for this class, I practice saying the material to myself over and over.<br>46. When studying for this course, I read my class notes and the course readings over and over again.<br>59. I memorize key words to remind me of important concepts in this class.<br>72. I make lists of important items for this course and memorize the lists. | .981 |

(table continued)

Table 19 (continued)

| MSLQ Constructed Scale | Items chosen based on their wording and MISEVE to assess academic self-regulatory skills | α |
|---|---|---|
| Cognitive Regulation (continued) | **Elaboration**<br>53. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions. Review of the MSLQ 18<br>62. I try to relate ideas in this subject to those in other courses whenever possible.<br>64. When reading for this class, I try to relate the material to what I already know.<br>67. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.<br>69. I try to understand the material in this class by making connections between the readings and the concepts from the lectures. Review of the MSLQ 19<br>81. I try to apply ideas from course readings in other class activities such as lecture and discussion.<br>**Organization**<br>32. When I study the readings for this course, I outline the material to help me organize my thoughts.<br>42. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.<br>49. I make simple charts, diagrams, or tables to help me organize course material.<br>63. When I study for this course, I go over my class notes and make an outline of important concepts. | |

(table continued)

Table 19 (continued)

| MSLQ Constructed Scale | Items chosen based on their wording and MISEVE to assess academic self-regulatory skills | α |
|---|---|---|
| Cognitive Regulation (continued) | **Metacognitive** Self-Regulation<br>33. During class time I often miss important points because I'm thinking of other things. (reverse coded)<br>36. When reading for this course, I make up questions to help focus my reading.<br>41. When I become confused about something I'm reading for this class, I go back and try to figure it out.<br>44. If course readings are difficult to understand, I change the way I read the material.<br>54. Before I study new course material thoroughly, I often skim it to see how it is organized.<br>55. I ask myself questions to make sure I understand the material I have been studying in this class.<br>56. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.<br>57. I often find that I have been reading for this class but don't know what it was all about. (reverse coded)<br>61. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.<br>76. When studying for this course I try to determine which concepts I don't understand well.<br>78. When I study for this class, I set goals for myself in order to direct my activities in each study period.<br>79. If I get confused taking notes in class, I make sure I sort it out afterwards | |

(table continued)

Table 19 (continued)

| **MSLQ Constructed Scale** | **Items chosen based on their wording and MISEVE to assess academic self-regulatory skills** | ***α*** |
|---|---|---|
| Motivational and Volitional Regulation | Task **Value**<br>4. I think I will be able to use what I learn in this course in other courses.<br>10. It is important for me to learn the course material in this class. Review of the MSLQ 15<br>17. I am very interested in the content area of this course.<br>23. I think the course material in this class is useful for me to learn.<br>26. I like the subject matter of this course.<br>27. Understanding the subject matter of this course is very important to me.<br>**Effort** Regulation<br>37. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do. (reverse coded) Review of the MSLQ 17<br>48. I work hard to do well in this class even if I don't like what we are doing.<br>60. When course work is difficult, I either give up or only study the easy parts. (reverse coded)<br>74. Even when course materials are dull and uninteresting, I manage to keep working until I finish. | .963 |
| Environment Regulation | **Time**/Study Environmental Management<br>35. I usually study in a place where I can concentrate on my course work.<br>43. I make good use of my study time for this course.<br>52. I find it hard to stick to a study schedule. (reverse coded)<br>65. I have a regular place set aside for studying.<br>70. I make sure that I keep up with the weekly readings and assignments for this course.<br>73. I attend this class regularly.<br>77. I often find that I don't spend very much time on this course because of other activities. (reverse coded)<br>80. I rarely find time to review my notes or readings before an exam. (reverse coded) | .939 |

## Summary

The MISEVE-Q schedule of development and sources of participants' responses in addition to its content, substantive, and structural validity evidence were discussed in this chapter. MISEVE-Q was externally validated by demonstrating its effectiveness in predicting criteria or indicators of academic self-regulation. For this purpose, MSLQ, a frequently used measure for assessing students' self-regulatory skills, was modified by selecting 52 items that addressed academic self-regulation. These items were reorganized to form new scales. These constructed scales proved to have strong internal consistency. The investigation reported here extended validity data through a larger administration to a group of graduate and undergraduate students. These data were analyzed as described above. The results are reported in the next chapter.

# Chapter 4

## Results

The purpose of this investigation was to develop and validate MISEVE-Q as a comprehensive assessment instrument to measure academic self-regulation as a personal trait. As evidence of criterion validity, the correlations between participants' scores on MISEVE-Q with their scores on MSLQ-CS were investigated. Criterion validity is established when an instrument is demonstrated to be effective in predicting future performance through estimating current performance of a construct such as academic self-regulation.

### Reliability Analysis of MSLQ-CS and MISEVE-Q

To ensure that MSLQ-CS and MISEVE-Q were reliable as measures of academic self-regulation, Cronbach's alpha and item-total correlations were computed.

**Cronbach's alpha.** Cronbach's alpha for MSLQ Constructed Scales (MSLQ-CS) and MISEVE-Q scales as well as the entire questionnaire are presented in Table 20. For the complete results of the analyses please refer to Appendix E-2 for MSLQ-CS Cronbach's alpha tables and Appendix F-1 for MISEVE-Q Cronbach's alpha tables.

Table 20

Cronbach's alpha for MSLQ-CS and MISEVE-Q Scales

| **Constructed Scales from MSLQ items Based on MISEVE areas of regulation and perceived achievement** | | **MISEVE-Q scales Organized based on MISEVE phases of regulation** | |
|---|---|---|---|
| Number of Participants= 832 | | Number of Participants= 1000 | |
| Achievement | α= .990<br>N of items= 8 | Goal-Setting and Planning | α= .770<br>N of items= 10 |
| Cognitive Regulation | α= .981<br>N of items= 26 | Design of Learning Environments | α= .832<br>N of items= 12 |
| Motivational Volitional Regulation | α= .963<br>N of items= 10 | Monitoring | α= .807<br>N of items= 10 |
| Environmental Regulation | α= .939<br>N of items= 8 | Controlling | α= .844<br>N of items= 16 |
| Entire Questionnaire | α= .991<br>N of items= 52 | Entire Questionnaire | α= .935<br>N of items= 48 |

**Item-total correlation.** Item-total correlation of MISEVE-Q was investigated (see Appendix F-2). Cronbach's alpha for MISEVE-Q is .935. Cronbach's alpha if Item Deleted varies between .933 and .936. Total score is the total of participants' scores in 48 items because the amotivation items were not included in the analysis. Corrected item-total correlation is the correlation between participants' scores in each item and the total score excluding that item. A high correlation means that students who did well on these items also received a high total score on their MISEVE-Q scores. There are 48 item-total correlations reported which vary between 0.236 and .581. Corrected item-total correlations of larger than .3 are discriminating (Nunnally & Bernstein, 1994); although some scholars accept item-total correlations of equal or larger than 0.4, (Gliem & Gliem, 2003). MISEVE-Q has six items with corrected item-total correlation of less than .4. One of these items has a corrected item-total correlation of less than .3. A summary of item-total correlations and the participants' responses to open-ended questions at the end of MISEVE-Q are presented in Table 21. In addition, this table contains possible interpretations of the results of both analyses.

Table 21

Interpretation of MISEVE-Q Corrected Item-Total Correlations and Open-Ended Responses

| **Items with corrected item-total correlation higher than .4** | **Results:** |
|---|---|
| Goal-setting and planning section<br>1, 2, 3, 4, 5, 6, 9 **> .4**<br><br>Design of Learning Environment section<br>11, 13, 14, 15, 16, 17, 21 **> .5**<br>12, 18, 19, 22 **> .4**<br><br>Monitoring Section<br>25, 26, 27, 28, 29 **>.5**<br>23, 24, 30, 31, 32 **>.4**<br><br>Control section<br>33, 34, 35, 37, 38, 39 **> .5**<br>36, 41, 42, 43, 44, 45, 46, 48 **>.4** | 1. **Blooms' affective taxonomy**- Except items 11 and 33 (which are in the Design of learning environment and Controlling sections) items in the design of learning environment, monitoring, and controlling sections with higher than .5 corrected item-total correlation, are at the higher levels of Bloom's affective taxonomy.<br><br>2. **Online vs. classroom-based**- Items that relate to design, monitor, or control of learning environment have high corrected item-total correlation (.5 -.581 > .4). It should be noted that:<br>♦ Most of 1000 participants were students in online courses.<br>♦ Results from factor analysis with 140 students enrolled in classroom-based courses showed a difference in students' responses to goal-setting and design of learning environment items compared with the results from the two online courses.<br><br>These results might be an indication that students in online courses set goals and design their learning environment more intentionally. This finding is worthy of further investigation. |

(table continued)

Table 21 (continued)

| Items with corrected item-total correlation Less than 0.4 | Item-total correlation | Results |
|---|---|---|
| 7. I expect to obtain a good grade in this course | 0.395 | 3. As shown by the item-total correlation, these items (representing areas of ASR) show deviation from the original items in the questionnaire (representing phases of ASR). It might be an indication that although part of the same construct, students' scores in areas of self-regulation vary compared to their scores in phases of self-regulation.<br><br>MISEVE-Q Pilot-Test I was based on the phases of self-regulation as illustrated by MISEVE. In MISEVE-Q Pilot-Test II, areas of self-regulation based on MISEVE were added to the questionnaire. |
| 8. I expect I can master the material of this course regardless of the grade that I receive in it. | 0.313 | |
| 10. I determine if learning the subject matter of this course is important to me | 0.368 | |
| 20. I can arrange to study with peers who can best contribute to the achievement of my academic goals | 0.345 | |
| 40. When I study material related to the course, I repeat whatever needs to be remembered over and over again. | 0.332 | |
| 47. I talk aloud to myself (repeating the material that I am studying) to avoid getting distracted by other thoughts or activities. | 0.236 | |

Another conclusion yielded after reading participants' open-ended questions. participants' responses seemed to fall under two distinct themes:

1- Students who reported that the survey was helpful to them, indicated that it made them evaluate their learning, examine their strategy use (which strategies are useful/not useful), consider if they need to adapt new strategies, improve their "study habits"/strategy use, examine why they change location/goals, consider how they are/could be in control of their learning, challenge them to think about their actions in specific courses, that the reported survey provided good feedback since responding to the items needed more in depth thinking, and indicated that they had to think to be able to determine if they could explain their responses.
2- Students who thought the items were redundant and reported that they felt like answering the same items over and over expressed either confusion or frustration by the redundancy of items.

These findings suggest that students in the first group may have thought more deeply about the items and saw distinctions among items at different levels of Bloom's taxonomy. Because these responses are anonymous, there is not a way to find out how these two groups of students might differ in their MISEVE-Q score in terms of being more intentional or self-regulated in their use of strategies, setting goals, monitor and control, or design of their learning environments; however, this is an area worthy of further investigation.

**Criterion Validity Analysis**

Correlations between scores in scales of MISEVE-Q and MSLQ-CS and multiple regression analysis predicting scores in MSLQ-CS scales based on MISEVE-Q scales was investigated as two types of evidence for criterion validity.

**Correlation analysis of MISEVE-Q and MSLQ-CS**. Participants completed MISEVE-Q and MSLQ-CS online through SurveyMonkey. The scores of these questionnaires were collected and the Pearson coefficient of correlation between participants' MISEVE-Q scores and their scores in MSLQ-CS was computed. In addition, pairwise correlations between subscales of MSLQ-CS that measure participants' skillfulness in regulating areas of self-regulation and sections of MISEVE-Q that measure participants skillfulness in regulating phases and areas of self-regulation were computed.

Table 22-A

Means, Standard Deviations, and Number of Respondents for Each Scale in MSLQ-CS and MISEVE-Q

| Scales | Referred to in the analysis | Mean | Std. Deviation | N |
|---|---|---|---|---|
| Achievement | Average_Ach | 5.89 | .841 | 623 |
| Cognitive Regulation | Average_Cog_Reg | 4.42 | .869 | 623 |
| Environmental Regulation | Average_Env_Reg | 4.86 | .964 | 623 |
| Motivational Volitional Regulation | Average_Mot_Vol_Reg | 5.00 | .846 | 623 |
| Goal-Setting and Planning | Average_GS | 3.15 | .357 | 623 |
| Design of Learning Environments | Average_DL | 3.20 | .375 | 623 |
| Monitoring | Average_Mn | 3.20 | .372 | 623 |
| Controlling | Average_Cr | 3.08 | .350 | 623 |

Table 22-B

Correlations between MSLQ-CS and MISEVE-Q Scales

| | | Average_Ach | Average_Cog_Reg | Average_Env_Reg | Average Mot_Vol_Reg | Average_GS | Average_DL | Average_Mn | Average_Cr |
|---|---|---|---|---|---|---|---|---|---|
| Average_Ach | Pearson Correlation | 1.000 | .268** | .432** | .523** | .357** | .360** | .359** | .291** |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 | .000 | .000 | .000 |
| Average_Cog_Reg | Pearson Correlation | .268** | 1.000 | .463** | .583** | .351** | .242** | .258** | .374** |
| | Sig. (2-tailed) | .000 | | .000 | .000 | .000 | .000 | .000 | .000 |
| Average_Env_Reg | Pearson Correlation | .432** | .463** | 1.000 | .690** | .252** | .288** | .283** | .287** |
| | Sig. (2-tailed) | .000 | .000 | | .000 | .000 | .000 | .000 | .000 |
| Average_Mot_Vol_Reg | Pearson Correlation | .523** | .583** | .690** | 1.000 | .317** | .279** | .294** | .277** |
| | Sig. (2-tailed) | .000 | .000 | .000 | | .000 | .000 | .000 | .000 |
| Average_GS | Pearson Correlation | .357** | .351** | .252** | .317** | 1.000 | .663** | .577** | .616** |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | | .000 | .000 | .000 |
| Average_DL | Pearson Correlation | .360** | .242** | .288** | .279** | .663** | 1.000 | .704** | .649** |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | | .000 | .000 |
| Average_Mn | Pearson Correlation | .359** | .258** | .283** | .294** | .577** | .704** | 1.000 | .718** |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | .000 | | .000 |
| Average_Cr | Pearson Correlation | .291** | .374** | .287** | .277** | .616** | .649** | .718** | 1.000 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | .000 | .000 | .000 | |

**. Correlation is significant at the 0.01 level (2-tailed).
a. Listwise N=623

Correlations between the scales of MSLQ-CS varied between .268 (correlation between average score in achievement and average score in cognitive regulation) to .690 (correlation

between average score in motivation and volition regulation and average score in environment regulation). This relatively large variation in correlations between areas of regulation (see Table 22-B) is in accordance with literature that suggests a well-established triadic distinction between affection, conation (motivation and volition), and cognition in psychological functioning (Snow, Corno, & Jackson, 1996). Furthermore, individuals' ability in controlling and regulating their own cognition, motivation, and behavior vary (Pintrich, 2000).

Also, environmental factors such as peers and teachers can influence regulation in these areas (Pintrich, 2000). The correlation between environment regulation with the average score in motivation and volition regulation and with the average score in cognitive regulation is .690 and .463 respectively. Perception of achievement had the highest correlation with the average score in motivation and volition (.523) which is in accordance with literature that self-efficacy for learning influences academic achievement (Schunk, 1995, Schunk & Pajares, 2001). Constructed scales of MSLQ-CS, in addition to having high internal consistencies, show intercorrelations in accordance with the literature; thus, these variations of intercorrelations show relevancy for measuring the areas of regulation and perceived academic achievement. These intercorrelations are evidence of content validity for MSLQ-CS.

Correlations between MISVE-Q scales varied between .577 (correlation between the average score in monitoring and the average score in goal setting and planning) to .718 (correlation between the average score in monitoring and the average score in controlling). This relatively small variation, in addition to these high correlations between participants' scores in phases of self-regulation are in accordance with literature that suggests learners can engage in phases of self-regulation (forethought, planning, and activation; monitoring; control; and reaction) interactively and they can be engaged in more than one phase simultaneously (Pintrich, 2000; Schunk, 2005).

The highest correlations among MISEVE-Q scales are between the monitoring and controlling phases (.718). Pintrich (2004) pointed out that the monitoring and controlling phases are closely associated by participants based on think aloud interviews and self-report questionnaires. Pintrich (2004) believed that there might not be a way to reliably distinguish among phases of regulation. MISEVE-Q results from factor analysis, internal consistency, item-total correlations, and correlation analysis challenge this claim.

Correlations between MISEVE-Q scales and the scales of MSLQ-CS varied between .242 (correlation between average score in design of learning environments and average score in cognitive regulation) to .374 (correlation between average score in controlling and average score in cognitive regulation). This relatively small variation is an indication that there is a moderate correlation between the scales of MSLQ-CS (based on areas of self-regulation and perceived achievement) and the scales of MISEVE-Q (although included items related to areas of academic self-regulation, was organized around phases).

Academic self-regulation involves engaging in different phases of self-regulation (goal setting and planning, design of learning environments, monitoring, and controlling) in different areas for regulation (cognition/metacognition, motivation, volition, and environment) to achieve academically. It can be concluded that phases and areas of self-regulation are a part of the same construct but measure different aspects of the construct (as shown by the moderate correlations).

***Regression analysis.***

To illustrate the amount of contribution of each MISEVE-Q scale in predicting participants' scores in the areas of self-regulation, regression analysis was conducted. Furthermore, regression analysis can be used to show criterion validity (Cronbach, 1971). Criterion validity can be illustrated in two ways: predictive validity or concurrent validity. Predictive validity is used when "researchers are interested in assessing the predictive utility of an instrument" (Fairchild, 2003, p. 16).

Criterion validity was established by using four multiple regression equations to "predict" each of the dependent variables (scales of MSLQ-CS) from a set of independent variables (MISEVE-Q scales). Because the number of the items in each scale varied, the average of items in each scale was used. Each of the four regression models illustrate one of these constructed scales and the power of MISEVE-Q scales which are organized based on the *phases* of self-regulation that significantly "predict" participants' scores in the areas of self-regulation. Collinearity diagnostics shows that the predictor variables do not highly correlate with one another. The tolerance was higher than 0.1 for all independent variables, therefore, multicollinearity is not a concern and none of the independent variables are redundant.

***Dependent variable: Average_Ach.***

The proportion of variance of Average Achievement explained by Average Control, Average Goal Setting, Average Design of Learning Environments, and Average Monitoring and the significance of the regression model is shown in Table 23-A and Table 23-B respectively. As shown in Table 23-C, Average_Goal Setting and Planning, (sig= .000); Average_Design of learning environments and Learning episodes, (sig= .026); and Average_Monitoring, (sig= .001) from MISEVE-Q scales significantly predicted Average Achievement from the MSLQ-CS scales at the .05 level. These results indicate that Goal Setting and Planning, Design of Learning Environment and Learning Episode, and Monitoring phases of self-regulation can be predictors of the Achievement scale.

Table 23-A

*Model Summary: Proportion Variance of Dependent Variable Explained by Independent Variables*

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .411[a] | .169 | .164 | .768 |

a. Predictors: (Constant), Average_Cr, Average_GS, Average_DL, Average_Mn
Dependent Variable: Average_Ach

Table 23-B

*ANOVA[b]: Significance of the Regression Model*

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 74.458 | 4 | 18.615 | 31.539 | .000[a] |
| | Residual | 365.342 | 619 | .590 | | |
| | Total | 439.800 | 623 | | | |

a. Predictors: (Constant), Average_Cr, Average_GS, Average_DL, Average_Mn
Dependent Variable: Average_Ach

Table 23-C

*Regression Coefficients*[a]*: Significance of the Unique Contribution of Each MISEVE-Q Scale in Predicting Average Achievement*

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | T | Sig. | Tolerance | VIF |
| 1 | (Constant) | 2.525 | .314 | | 8.050 | .000 | | |
| | Average_GS | .444 | .122 | .189 | 3.652 | .000 | .499 | 2.004 |
| | Average_DL | .291 | .130 | .130 | 2.234 | .026 | .395 | 2.530 |
| | Average_Mn | .435 | .133 | .193 | 3.261 | .001 | .385 | 2.600 |
| | Average_Cr | -.117 | .137 | -.049 | -.853 | .394 | .412 | 2.426 |

a. Dependent Variable: Average_Ach

***Dependent variable: Average_C_Reg.***

The proportion of variance of Average Cognitive Regulation explained by Average Control, Average Goal Setting, Average Design of Learning Environments, and Average Monitoring and the significance of the regression model is shown in Table 24-A and Table 24-B respectively. As shown in Table 24-C, Average_Goal Setting and Planning, (sig=.000) and Average_Control, (sig= .000) from MISEVE-Q scales significantly predicted Average Cognitive Regulation from the MSLQ-CS scales at the .05 level. These results indicate that Goal Setting and Planning and Controlling phases of self-regulation can be predictors of Cognitive Regulation.

Table 24-A

*Model Summary: Proportion Variance of Dependent Variable Explained by Independent Variables*

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .412[a] | .170 | .165 | .794 |

Predictors: (Constant), Average_Cr, Average_GS, Average_DL, Average_Mn

Dependent Variable: Average_Cog_Reg

Table 24-B

*ANOVA[b]: Significance of the Regression Model*

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 79.843 | 4 | 19.961 | 31.676 | .000[a] |
| | Residual | 389.431 | 618 | .630 | | |
| | Total | 469.274 | 622 | | | |

a. Predictors: (Constant), Average_Cr, Average_GS, Average_DL, Average_Mn

b. Dependent Variable: Average_Cog_Reg

Table 24-C

*Regression Coefficients[a]: Significance of the Unique Contribution of Each MISEVE-Q Scale in Predicting Average Cognition Regulation*

| | | Unstandardized Coefficients | | Standardized Coefficients | | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| Model | | B | Std. Error | Beta | T | Sig. | Tolerance | VIF |
| 1 | (Constant) | 1.158 | .324 | | 3.569 | .000 | | |
| | Average_GS | .592 | .126 | .244 | 4.702 | .000 | .499 | 2.002 |
| | Average_DL | -.221 | .135 | -.095 | -1.637 | .102 | .395 | 2.529 |
| | Average_Mn | -.099 | .138 | -.042 | -.718 | .473 | .385 | 2.599 |
| | Average_Cr | .785 | .141 | .317 | 5.550 | .000 | .413 | 2.423 |

a. Dependent Variable: Average_Cog_Reg

***Dependent variable: Average_Mot_Vol_Reg.***

The proportion of variance of Average Motivation and Volition Regulation explained by Average Control, Average Goal Setting, Average Design of Learning Environments, and Average Monitoring and the significance of the regression model is shown in Table 25-A and Table 25-B respectively. As shown in Table 25-C, Average_Goal Setting and Planning, (sig=.000) and Average_Monitoring, (sig= .037) from MISEVE-Q scales significantly predicted Average Motivation and Volition Regulation from the constructed MSLQ-CS scales at the .05 level. These results indicate that Goal Setting and Planning and Monitoring phases of self-regulation can be predictors of the Motivation and Volition Regulation.

Table 25-A

*Model Summary: Proportion Variance of Dependent Variable Explained by Independent Variables*

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .347[a] | .121 | .115 | .796 |

Predictors: (Constant), Average_Cr, Average_GS, Average_DL, Average_Mn

Dependent Variable: Average_Mot_Vol_Reg

Table 25-B

*ANOVA[b]: Significance of the Regression Model*

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 53.630 | 4 | 13.408 | 21.173 | .000[a] |
| | Residual | 391.340 | 618 | .633 | | |
| | Total | 444.970 | 622 | | | |

a. Predictors: (Constant), Average_Cr, Average_GS, Average_DL, Average_Mn

b. Dependent Variable: Average_Mot_Vol_Reg

Table 25-C

*Regression Coefficients*[a]*: Significance of the Unique Contribution of Each MISEVE-Q Scale in Predicting Average Motivation and Volition Regulation*

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | T | Sig. | Tolerance | VIF |
| 1 | (Constant) | 2.057 | .325 | | 6.326 | .000 | | |
| | Average_GS | .459 | .126 | .194 | 3.643 | .000 | .499 | 2.002 |
| | Average_DL | .070 | .135 | .031 | .517 | .605 | .395 | 2.529 |
| | Average_Mn | .289 | .138 | .127 | 2.095 | .037 | .385 | 2.599 |
| | Average_Cr | .111 | .142 | .046 | .783 | .434 | .413 | 2.423 |

a. Dependent Variable: Average_Mot_Vol_Reg

***Dependent variable: Average_Env_Reg.***

The proportion of variance of Average Environment Regulation explained by Average Control, Average Goal Setting, Average Design of Learning Environments, and Average Monitoring and the significance of the regression model is shown in Table 26-A and Table 26-B respectively. As shown in Table 26-C, Average_Design of Learning Environments/Learning Episodes, (sig=.058) and Average_Control, (sig= .048) from MISEVE-Q scales significantly predicted Average Environmental Regulation from the MSLQ-CS scales at the .05 level. These results indicate that Design of Learning Environments/Learning Episodes and Controlling scales of MISEVE-Q (phases of self-regulation) can be predictors of the Environment Regulation scale of MSLQ-CS. This is not surprising since there is a close relationship between students' beliefs about being able to design their learning environments and the amount of control that they perceive to possess over their learning as extracted from their open ended questions in MISEVE-Q Pilot-Test I.

Table 26-A

*Model Summary: Proportion Variance of Dependent Variable Explained by Independent Variables*

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .324[a] | .105 | .099 | .915 |

Predictors: (Constant), Average_Cr, Average_GS, Average_DL, Average_Mn

Dependent Variable: Average_Env_Reg

Table 26-B

*ANOVA[b]: Significance of the Regression Model*

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 60.509 | 4 | 15.127 | 18.082 | .000[a] |
| | Residual | 517.017 | 618 | .837 | | |
| | Total | 577.526 | 622 | | | |

a. Predictors: (Constant), Average_Cr, Average_GS, Average_DL, Average_Mn

b. Dependent Variable: Average_Env_Reg

Table 26-C

*Regression Coefficients*[a]*: Significance of the Unique Contribution of Each MISEVE-Q Scale in Predicting Average Environment Regulation*

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. | Tolerance | VIF |
| 1 | (Constant) | 1.749 | .374 | | 4.679 | .000 | | |
| | Average_GS | .143 | .145 | .053 | .987 | .324 | .499 | 2.002 |
| | Average_DL | .294 | .155 | .115 | 1.896 | .058 | .395 | 2.529 |
| | Average_Mn | .226 | .159 | .087 | 1.422 | .155 | .385 | 2.599 |
| | Average_Cr | .323 | .163 | .117 | 1.980 | .048 | .413 | 2.423 |

a. Dependent Variable: Average_Env_Reg

Correlations between MISEVE-Q scales and MSLQ-CS scales were computed, in addition to the multiple regression analyses, to investigate the amount of contribution of each of the MISEVE-Q scales (phases of regulation) in predicting scales of MSLQ-CS (areas of regulation); these correlations are summarized in Table 27. Correlation and multiple regression analyses were used to provide criterion validity for MISEVE-Q. It should be noted that, as illustrated in Table 27, there are variable(s) in each regression model that despite having correlations with the independent variables, are excluded from the regression model because their contribution has already been accounted for by the other independent variables already in the model. In other words, variable(s) that are excluded from the regression models do not provide a statistically significant unique contribution for predicting the dependent variables in each model.

Table 27

*Summary of Results of Correlations and Multiple Regression Analysis of the Scales in MISEVE-Q and MSLQ-CS*

| **MSLQ-CS Scales** / **MISEVE-Scales** | **Achievement** (dependent variable; predicted) | **Cognitive Regulation** (dependent variable; predicted) | **Motivation and Volition Regulation** (dependent variable; predicted) | **Environment Regulation** (dependent variable; predicted) |
|---|---|---|---|---|
| | $R^2$=. 169 | $R^2$=. 170 | $R^2$=. 121 | $R^2$=. 105 |
| | Regression model consisting of goal setting and planning, design of learning environment, and monitoring contribute significantly to the prediction of perceived Achievement. | Regression model consisting of goal setting and planning and controlling contribute significantly to the prediction of Cognitive Regulation. | Regression model consisting of goal setting and monitoring contribute significantly to the prediction of Motivation and Volition Regulation. | Regression model consisting of design of learning environments and controlling contribute significantly to the prediction of Environment Regulation. |
| **Goal setting and Planning** (independent variable 1) | Correlation coef. *r*=.357 | Correlation coef. *r*=.351 | Correlation coef. *r*=.252 | Correlation coef. *r*=.317 |
| | Regression standardized coefficient = .189 | Regression standardized coefficient = .244 | Regression standardized coefficient = .194 | Was not included in the regression model. |
| | Goal setting and planning adds significantly to the prediction of perceived Achievement in addition to the contribution of other independent variables already in the model. | Goal setting and planning adds significantly to the prediction of Cognitive Regulation in addition to the contribution of other independent variables already in the model. | Goal setting and planning adds significantly to the prediction of Motivation and Volition Regulation in addition to the contribution of other independent variables already in the model. | Goal setting and planning does not add significantly to the contribution of other variables in prediction of Environment Regulation. |

(table continued)

Table 27 (continued)

| MSLQ-CS Scales / MISEVE-Scales | Achievement (dependent variable; predicted) | Cognitive Regulation (dependent variable; predicted) | Motivation and Volition Regulation (dependent variable; predicted) | Environment Regulation (dependent variable; predicted) |
|---|---|---|---|---|
| **Design of Learning Environment/ Learning Episode** (independent variable 2) | Correlation coef. *r*=.360 Regression standardized coefficient = .130 Design of learning environment adds significantly to the prediction of perceived Achievement in addition to the contribution of other independent variables already in the model. | Correlation coef. *r*=.242 Was not included in the regression model. Design of learning environment does not add significantly to the contribution of other variables in prediction of Cognitive Regulation. | Correlation coef. *r*=.288 Was not included in the regression model. Design of learning environment does not add significantly to the contribution of other variables in prediction of Motivation and Volition Regulation. | Correlation coef. *r*=.279 Regression standardized coefficient = .115 Design of learning environment adds significantly to the prediction of Environment Regulation in addition to the contribution of other independent variables already in the model. |
| **Monitoring** (independent variable 3) | Correlation coef. *r*=.359 Regression standardized coefficient = .193 Monitoring adds significantly to the prediction of perceived Achievement in addition to the contribution of other independent variables already in the model. | Correlation coef. *r*=.258 Was not included in the regression model. Monitoring does not add significantly to the contribution of other variables in prediction of Cognitive Regulation. | Correlation coef. *r*=.283 Regression standardized coefficient = .127 Monitoring adds significantly to the prediction of Motivation and Volition Regulation in addition to the contribution of other independent variables already in the model. | Correlation coef. *r*=.294 Was not included in the regression model. Monitoring does not add significantly to the contribution of other variables in prediction of Environment Regulation. |

(table continued)

Table 27 (continued)

| MSLQ-CS Scales / MISEVE-Scales | Achievement (dependent variable; predicted) | Cognitive Regulation (dependent variable; predicted) | Motivation and Volition Regulation (dependent variable; predicted) | Environment Regulation (dependent variable; predicted) |
|---|---|---|---|---|
| **Controlling** (independent variable 4) | Correlation coef. *r*=.291 Was not included in the regression model. Controlling does not add significantly to the contribution of other variables in prediction of perceived Achievement. | Correlation coef. *r*=.374 Regression standardized coefficient = .317 Controlling adds significantly to the prediction of Cognitive Regulation in addition to the contribution of other independent variables already in the model. | Correlation coef. *r*=.287 Was not included in the regression model. Controlling does not add significantly to the contribution of other variables in prediction of Motivation and Volition Regulation. | Correlation coef. *r*=.277 Regression standardized coefficient = .117 Controlling adds significantly to the prediction of Environment Regulation in addition to the contribution of other independent variables already in the model. |

**Correlation with course grades.** As a measure for construct validity, it was proposed that the correlation between participants' MISEVE-Q scores and their course grades as one measure of academic achievement would be computed. Participants were asked to report the grade that they believe they would get in the courses that they were enrolled in. The reported grades did not have sufficient variation (mostly varied between A and A-, and a very low percentage of Bs). Therefore, the correlation between participants' MISEVE-Q scores with their course grade was not computed because these grades would not provide a meaningful variation.

## Summary

The results of investigating reliability and validity for MISEVE-Q and MSLQ-CS discussed in this chapter are as follows: Cronbach's alpha, item-total correlations between each item in MISEVE-Q and the total score for the instrument, correlations between scales of MSLQ-CS and MISEVE-Q, and regression models predicting scores on scales of MSLQ-CS based on the scores on scales of MISEVE-Q.

MISEVE-Q had high Cronbach's alpha for each scale and for the entire questionnaire. In addition, MISEVE-Q had high item-total correlations for most items, generally these correlations were higher for items in the higher levels of Bloom's Affective Taxonomy. Since a higher item-total correlation for an item can be thought of as how well that item represents the entire instrument, this result shows that, as expected, higher scores on items in the higher levels of the taxonomy for each scale are better indicators of how respondents have internalized that scale and correlate stronger with the total score than items in the lower levels of the taxonomy.

Three sets of correlations were computed: correlation between the scales of MSLQ-CS themselves, correlations between the scales of MISEVE-Q themselves, and correlations between the scales of MSLQ-CS and MISEVE-Q.

Correlations between scales of MSLQ-CS, which represent areas of academic self-regulation and achievement (.268-.690) are on average smaller than correlations between scales of MISEVE-Q (.577-.718). This agrees with the literature that distinct areas of regulation are less correlated with each other and different phases of regulation, especially monitoring and control are more related to each other. The correlation between scales of MSLQ-CS and MISEVE-Q (.242-.374) are on average smaller than correlations between scales of either instrument. This shows that although respondents perceptions of their ability to academically self-regulate in areas and phases of academic self-regulation are related, the correlations between them were not very strong confirming that they can vary independently. Multiple regression was used to further explore this relation.

Four multiple regression models were found to be significant to predict scale scores of MSLQ-CS from the scale scores of MISEVE-Q. The first model found goal setting and planning, design of learning environments, and monitoring scales of MISEVE-Q contributed significantly to the achievement scale of MSLQ-CS. This result can be interpreted that all the contributions of all phases of academic self-regulation except controlling are significant in predicting the perception of achievement (controlling does not have a contribution that is not already accounted for by other scales).

The second model found that goal setting and planning and controlling contributed significantly to the cognitive regulation scale of MSLQ-CS. The third model found that goal setting and planning and monitoring contributed significantly to the motivation and volition regulation scale of MSLQ-CS. The result of the second and third models show that apart from

goal setting and planning, controlling plays a unique role in cognitive regulation and monitoring plays a unique role in motivational and volitional regulation.

The fourth model found that design of learning environment and controlling contributed significantly to the environment regulation scale of MSLQ-CS. This result shows that among the phases of academic self-regulation, design of learning environment and control have unique contributions in predicting environment regulation.

## Chapter 5

## Summary

Researchers have established that academic self-regulation is important in successful learning as well as one key to success in society (Posner & Rothbart, 1998). In recent years, researchers have proposed that self-regulation appears necessary to guide and direct independent and self-directed learning. Research in the area of academic self- regulation has provided insights into how learners can employ their cognitive and motivational resources to regulate their learning and how supportive learning environments can contribute to enhancing learning and achievement.

Three theoretical models of academic self-regulation (Boekaerts, 1997; Pintrich, 2000; Winne & Hadwin, 1998) highlight one or more areas where regulation of learning can take place (motivation, cognition, and context). In addition, these models have addressed different phases of academic self-regulation (planning, monitoring, and controlling). While these models emphasize different aspects of academic self-regulation, none include all of the variables that have been connected to academic self-regulation. For this investigation, I proposed a more comprehensive model to address the complexity of the intellectual actions and interactions needed to regulate academic thoughts, intentions, and behavior.

Using the MISEVE model of academic self-regulation, I proposed the cognitive constructs and intellectual actions that self-regulated learners use to engage in academic self-regulation. Development of MISEVE was based on reviews of evidence based academic self-regulation literature, including areas of regulation (cognition, motivation, volition, and environment) and phases through which regulation can take place (goal-setting and planning, design of learning environments/learning episodes, monitoring, and controlling). In MISEVE areas of academic self-regulation are elements and the phases of self-regulation are the interaction links between these elements.

Academic self-regulation has been measured both as an aptitude and as an event (Winne & Perry, 2000). This investigation measured academic self-regulation as an aptitude or a personal trait because then it can be assumed to be a stable dispositional attribute of a person. It can also be assumed that it is not a temporary, transient occurrence. Although it is apparent that self-regulated learners improve their approaches to learning by adapting new strategies and modifying their goals based on specific learning environments over time, the present

investigation measured academic self-regulation at a specific time to create a "snapshot" of individual and group profiles of academic self-regulation.

Four self-report questionnaires in the areas of academic motivation and academic volition were reviewed. These instruments are based on different theoretical frameworks; however, there are two important points that all of these instruments cover. One is the way that learners define and set their academic goals and the other is the way that learners monitor and control the attainment of their goals. Because these issues are included in MISEVE, this model was used as a framework to develop a comprehensive instrument to assess academic self-regulation called MISEVE-Q.

Moreover, MISEVE-Q which is a self-report questionnaire was designed to validate the practical implications of the MISEVE model. The four distinct phases of self-regulation illustrated as interaction links in MISEVE, which constitute the four sections of the questionnaire, showed strong structural, substantive, content, and criterion validity.

MISEVE-Q was based on the four higher levels of Bloom's affective taxonomy: responding, valuing, organizing and characterizing/internalizing to evaluate the extent to which respondents internalized each section of this instrument. Each section was based upon interaction links in MISEVE (goal setting and planning, design of learning environments/learning episodes, monitoring, and controlling) which are the phases of academic self-regulation. Learners' recognition and internalization of the higher levels of the affective taxonomy reflected the importance of forming judgments about the phases of academic self-regulation and the degree to which learners were able to integrate each of these phases into their conceptions of learning. For example, items 34 and 37 are at two different levels of the affective taxonomy in the controlling section of MISEVE-Q. Valuing is the level in which learners attach values to manipulating controllable aspects of their learning and organization is the level in which learners compare different values that they associate with controlling such as selecting strategies and plans. If learners value controlling their learning but have not organized their values, they will score high on item 34,"I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals," and low on item 37, "I can explain why I can or cannot change elements in my learning environment to attain my academic goals." Stronger item-total correlations for MISEVE-Q items representing the higher levels of Bloom's affective taxonomy supported the decision to design MISEVE-Q based on this taxonomy. In addition, stronger item-

total correlations indicated that respondents who received higher scores on MISEVE-Q were more likely to have received higher scores on the items designed based on the higher levels of Bloom's affective taxonomy. These participants were likely to have formed judgments about their perceptions on phases of academic self-regulation and organized and internalized their values. This might explain the two distinct themes in participants' responses to MISEVE-Q items as evident in their open ended responses. These two themes discriminated between two groups of students in that one group probably thought more deeply about the items and saw a distinction among items at different levels of Bloom's taxonomy while the other group did not.

Because MISEVE-Q was based on the structure of MISEVE, examining the internal consistency and structure of MISEVE-Q sheds light on the interrelationship between phases and areas of academic self-regulation and their importance in learners' ability to regulate their learning. The evidence of validity for this instrument was examined in three studies. The analysis of MISEVE-Q Pilot-Test I and Pilot-Test II provided the structural, substantive, and content evidence of validity while the analysis of the large scale administration of MISEVE-Q (the final version) provided evidence of criterion validity.

The representativeness of each item for the entire questionnaire and the wording of MISEVE-Q Pilot-Test I items were examined. Although, the internal consistency of MISEVE-Q Pilot-Test I was very strong, after examining item total correlations the wordings of three items with lower item total correlations were revised. This was the beginning of the development of MISEVE-Q Pilot-Test II.

In addition, the results of Rasch analysis conducted on each section of MISEVE-Q Pilot-Test I confirmed the existence of a main factor for each section. The main Rasch factor for each section explained a large portion of the variance of participants' scores for that section, which was consistent with the structure of MISEVE, confirming the decision to use phases of self-regulation as the sections of MISEVE-Q Pilot-Test I. In each section, there was some variance that was not explained by the main Rasch factor. The unexplained variance was further investigated through exploratory factor analysis. In addition, based on areas of MISEVE, more items were added to MISEVE-Q Pilot-Test II. The results of factor analysis were 10 factors which were ordered based on their contribution to explaining the variance of MISEVE-Q Pilot-Test II scores. Extracted factors were named based on the items that loaded on each factor. The first four factors were named goal setting and planning, design of learning environments/learning

episodes, monitoring, and controlling which are the interaction links in MISEVE as well as the four phases of self-regulation. This finding further confirmed the organization of MISEVE-Q based on phases of self-regulation. Furthermore, the next six factors were named based on the items that loaded on them which proved to be the areas of self-regulation confirming the structure of MISEVE and supporting the decision to add items based on these areas to MISEVE-Q Pilot-Test II. The validated instrument was named MISEVE-Q. This instrument was administered to a large sample of participants to investigate its criterion validity.

Among the extracted factors, control explained close to one fourth of the variance of MISEVE-Q scores. The educational implication of this finding can be that providing students with more choices can strongly influence their perceptions of academic self-regulation which might in turn influence academic achievement. Design of learning environments/learning episodes had the second highest contribution to the variance of MISEVE-Q scores. This finding may indicate that presenting students with autonomy in *when, where, and with whom* to learn can be influential in their perceptions of academic self-regulation and possibly in their academic achievement. Goal setting and planning and monitoring explained the next two highest portions of the variance of MISEVE-Q scores. These two constructs are the remaining phases of academic self-regulation and sections of MISEVE-Q. The implication of emergence of phases of academic self-regulation as factors confirms the decision to use phases of academic self-regulation as the basis of MISEVE-Q. These phases are the most tangible and malleable to intervention in academic self-regulation compared to the areas of academic self-regulation which are less observable. Areas of academic self-regulation were also represented in MISEVE-Q and emerged as factors in this investigation although their contributions for explaining the variance of MISEVE-Q scores were less than the phases of academic self-regulation.

MISEVE-Q was validated externally through comparison with a modified version of MSLQ because it is one of the frequently used instruments for measuring academic self-regulation. Fifty two items in selected scales of MSLQ were chosen and reorganized to construct scales that measure areas of academic self-regulation and achievement (MSLQ-CS). The strong internal consistency and the agreement between intercorrelations of MSLQ-CS scales and literature on each of the constructs representing these scales (achievement, cognitive regulation, motivation and volition regulation, and environment regulation) are evidence for reliability and validity of the new MSLQ-CS scales. Furthermore, intercorrelations between MISEVE-Q scales

(goal setting and planning, design of learning environments/learning episodes, monitoring, and controlling) were in agreement with the literature that learners can engage in phases of self-regulation interactively and they can be engaged in more than one phase simultaneously.

Reliability of MISEVE-Q was investigated through item total correlations and Cronbach's alpha. Participants' scores on each MISEVE-Q item were strongly correlated with their total scores on MISEVE-Q. Therefore, all of the MISEVE-Q items were representative of the entire instrument. In addition, each section of MISEVE-Q demonstrated high Cronbach's alpha. This finding indicated participants' consistency in their responses to items in each section of MISEVE-Q in addition to the entire questionnaire and that different participants differed in their scores for each section.

The evidence for criterion validity of MISEVE-Q was collected through correlations between scales of MISEVE-Q and the constructed scales of MSLQ-CS and by predicting scales of MSLQ-CS from scales of MISEVE-Q through multiple regression.

The results of correlation analysis indicated moderate correlations between constructed scales of MSLQ-CS and scales of MISEVE-Q. Because MSLQ-CS scales are based on areas of regulation but MISEVE-Q scales (although covering areas of regulation) are organized around phases of regulation, the moderate correlations indicated areas and phases of regulation to be part of the same construct; however, the relatively low correlations indicated that there were differences between how participants' viewed regulation in areas and the phases of academic self-regulation and how areas and phases represent different aspects of the same construct. This finding was confirmed with factor analysis that showed distinct factors that represent areas and phases of academic self-regulation.

The results of multiple regression illustrated that MISEVE-Q scales had the collective power to predict MSLQ-CS scales. Goal setting and planning, design of learning environments, and monitoring had the power to predict perceived achievement. Goal setting and planning and controlling had the power to predict cognitive regulation. Goal setting and planning and monitoring have the power to predict motivation and volition regulation. Finally, design of learning environments and controlling have the power to predict environment regulation. Particularly, MISEVE-Q scales had a better predictive power for perceived achievement and cognitive regulation and explained a higher proportion of variance for these two constructs compared with their predictive power for motivation and volition regulation and environment

regulation. This may mean that educators or learners themselves can enhance their goal setting and planning skills and control the aspects of their learning that can be manipulated to improve their cognitive regulation. In addition, goal setting and planning skills, developing skills in designing optimal learning environments, and monitoring the attainment of goals are ways that learners can improve achievement.

## Implications

The data collected with MISEVE-Q, an academic self-regulation questionnaire, can be used to design academic interventions to improve students' self-regulatory skills in four distinct phases. Reviewing students' scores on different items of each section that measures students' perceptions at different levels of Bloom's affective taxonomy, can reveal students' deficiencies in self-regulating their learning at each level of the taxonomy. For example, high scores on the items targeting the lower levels and low scores on items targeting the higher levels of the affective taxonomy for the *design of learning environment* section, indicate that, although participants value having choices in designing their learning environments, they did not internalize designing the environment as a part of their learning. Using the results of this instrument, it may be possible to make decisions on designing optimal learning environments and to find effective ways to guide students to set and reach their academic goals, thus becoming better academic achievers. MISEVE-Q may be useful to identify students with poor self-regulatory strategies in order to teach them how to improve their evaluation of learning opportunities and strategy use in different contexts in order to enhance their academic achievement.

MISEVE has implications for students as well as educators because it comprehensively and systematically covers the variables known to be associated with self-regulation. By understanding these variables, educators can guide learners to use more effectively their motivational and cognitive resources, their volitional skills to focus their resources, to monitor and control their actions, and to evaluate their achievement.

## Future Directions

MISEVE-Q was designed to assess academic self-regulatory skills and, with additional validation, it may be useful in designing academic interventions; thus, it is appropriate to

consider the evidence for consequential validity such as positive or negative impact on students in future research. In addition, the intended outcomes of interpreting MISEVE-Q scores should be realized. The interventions for students who score low on MISEVE-Q should be limited to modeling for them how to define and set academic goals, how to change strategies if they prove ineffective, and how to monitor and control the attainment of their self-set goals. In general, interpretations of MISEVE-Q scores should not result in stigmatization of students.

Another area worthy of further investigation is how MISEVE-Q could be used to identify the differences that might be present in online versus classroom-based learning environments. It appeared that the students in online courses may have responded more intentionally to items on setting goals and designing their learning environments. Students in online courses may have a stronger need to define their goals, plan, and monitor the attainment of their goals. More importantly, these students may have been provided with more choices in designing their learning environments and learning episodes and have more autonomy and control over their strategy use and learning. MISEVE-Q might be used to identify students at varying degrees of forming judgments, valuing, organization, and internalization of goal setting and design of learning environments. By having insight as to the degree online students are able to set goals and design learning environments, educators can identify where individual learners might have deficiencies, design interventions, and create more optimal learning environments for individual learners both in online or classroom-based courses.

The context in which learning takes place is another area for further investigation. It is of interest to investigate how much students' perceptions about the amount of control they have might differ in various contexts (e.g. engineering courses versus education courses). Because it was established that students' perceptions about the amount of control that they are provided influences their perceptions of achievement, MISEVE-Q might be used to investigate the amount of control perceived by students in different contexts.

In addition, MISEVE-Q scores can indicate how skillful learners are in the four phases of self-regulation. Particularly as illustrated by MISEVE and confirmed by regression analysis, monitoring and controlling phases influence cognition and motivation regulation strategies. Therefore, MISEVE-Q monitoring and controlling scores can be indicators of strategy use which can be measured across different contexts. Monitoring and controlling domain general strategies (which can be used across different tasks) and domain specific strategies (which need to be

taught for specific tasks) both can be measured by administering MISEVE-Q in different contexts. By distinguishing similarities in MISEVE-Q scores, similar tasks can be recognized and the applicability of domain general strategies can be investigated. Similarities in scores would encourage the feasibility of transfer of knowledge, strategies, goals, and efficacy beliefs in similar tasks.

Finally, it would be of interest to investigate whether there is a logical sequence to the phases of regulation when trying to teach academic self-regulatory skills. Setting goals, defining and adapting personal standards, and evaluating the values that individual learners attach to specific academic tasks as well as their self-efficacy for being able to complete certain tasks are all important components in academic self-regulation and achievement. Further investigation is needed to determine whether the variables involved with academic self-regulation can be taught sequentially based on their importance in the ability to self-regulate and their importance in the degree to which students can be made aware of the value that these variables might have in their academic success. Also of interest would be to investigate whether female students differ from male students in regulating phases of academic self-regulation, value system and goal hierarchy, and self-efficacy beliefs.

**Summary**

MISEVE-Q appears psychometrically sound and may be useful to assess learners' degree of academic self-regulation, diagnose skill and strategy strengths, and develop support programming to build students' academic self-regulation.

MISEVE-Q as a valid and reliable measure of academic self-regulation can provide investigators dependable information about the impact of interventions on learners' academic self-regulation skills and strategies as well as the conditions under which academic self-regulation is enhanced. In addition, MISEVE-Q can help instructors design environments that are most likely to support learners' engaging in academic self-regulation. Instructors can audit the opportunities they provide for learners to self-regulate as well as monitor the impacts of environmental modifications on the degree and number of learners who engage self-regulation. Finally, MISEVE-Q can assist teachers and counselors identify specific intellectual actions that learners engage to academically self-regulate as they learn, opening possibilities of developing focused interventions to teach these academic self-regulating intellectual actions to learners.

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**Appendix A**

**MISEVE-Q Pilot-Test I**

**This survey will take about 15-20 minutes. Please e-mail your completed responses to parastoo@vt.edu , Thank you.**

- **Please rate each item according to the context of "the Last Course that you have taken in school until now". (If you are enrolled in more than one course, please select one of them)**
- **Please "Underline" your answer choices.**
- **Please choose Only One of the answer choices based on each statement.**
- **There is No correct/incorrect response for this survey. Please respond to All of the Questions.**

**In the actual survey, at the beginning of each page, based on the questions in each section, relevant definitions from this chart was repeated for participants' reference.**

- "**Learning episode**" refers to any time interval, inside a classroom or outside, that one perceives learning has taken place.
- "**Learning environment**" refers to any location (class, home, library, coffee shop,…) or context (browsing through a desired website with the intent to learn, turning TV's volume up with the intent to learn) that one perceives learning has taken place.
- "**Academic goal**" academic goals set by the learner to enhance his/her learning, as opposed to "teacher-set" goals.
- "**Designing learning environment**" consciously choosing/influencing elements of a learning episode or learning environment to improve one's learning.
- "**Monitoring the learning environment**" observing the impact of different aspects of the learning environment (time, location, content, social/individual context) on one's learning.
- "**Monitoring academic progress**" observing the progress or lack thereof in attaining self-set goals.
- "**Controlling learning environment**" modifying different aspects of the learning environment (time, location, content, social/individual context) to enhance one's learning.

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**** Answer choices for this questionnaire are:**

1- ☐ Strongly Disagree
2- ☐ Disagree
3- ☐ Agree
4- ☐ Strongly Agree

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**Goal Setting:**

1- I believe setting academic goals is important in learning the subject material

2- I participate in the learning activities of the class because I want to understand the subject

3- I put together my academic goals at the beginning of each study session

4- I try to set academic goals that are within the range of my abilities

5- I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others

**Designing of Learning Episodes/ Learning Environment:**

6- I believe I can participate in designing my learning environment in a way that it helps me achieve my academic goal(s)

7- I participate in the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes)

8- I can justify the decisions that I have made in designing my learning environment

9- I design my learning environment according to criteria that include my perceived learning ability or difficulty of the learning task, at the time I set my goals for the course

10- I can explain how the elements of my plan for designing a learning environment relate to my goals

11- I am confident that I can independently design my learning environment when I am not in a controlled environment such as a classroom.

12- I can explain why I am confident that I can design my learning environment

**Monitoring:**

13- I believe I can find out when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals

14- I examine my progress in reaching my academic goals based on grades or other measures that I believe are indicative of my progress

15- I can justify the measures that I select (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress

16- I choose the aspects of the learning environment that I would like to monitor at the time I set my goals for the course

17- I can explain how the aspects of the learning environment that I would like to monitor relate to my goals

18- I am confident that I can independently determine the aspects of the learning environment that I should monitor to reach my goals

19- I can explain why I am confident that I can determine the aspects of the learning environment that I should monitor to reach my goals

**Controlling:**

20- I believe I can influence my learning environment by changing aspect(s) of my learning activity or its context (i.e. changing study strategies, changing the location I am studying in)

21- I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals

22- I can justify the changes that I intend to make in my learning environment that help me achieve my goals

23- I decide what I can and what I cannot change (i.e. peer interactions, study time and location) in my learning environment at the time I set my goals for the course

24- I can explain why I can or cannot change elements in my learning environment to attain my academic goals

25- I am confident that I can independently determine what I can and cannot change (i.e. peer interactions, study time and location) in my learning environment to help me achieve my goals

26- I can explain why I am confident that I can change my learning environment

Please add any comment(s) about the clarity of the questions along with a reference to the question number.

Please add any suggestion(s) that you might have below:

**Thank You for Your Time**
Please send your completed responses to parastoo@vt.edu

## Appendix B

## MISEVE-Q Pilot-Test I Statistical Tables

### B-1: Item-Total (biserial) Correlation for Revised Items:

| **Original Item** | | **1-** I believe setting academic goals is important in learning the subject material | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.32 | 74.34 | 138.231 | .382 | .94 | .923 | 0.3827 | Definition of terms added. |

| **Original Item** | | **2-** I participate in the learning activities of the class because I want to understand the subject | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.47 | 74.18 | 142.857 | .272 | .94 | .923 | 0.2757 | Revised |
| Revised Item | | 2- I participate in the learning activities of the course to understand the material | | | | | | |

| **Original Item** | | **4**- I try to set academic goals that are within the range of my abilities | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.26 | 74.39 | 143.597 | .224 | .94 | .924 | 0.2262 | Definition of terms added. |

| **Original Item** | | **5-** Regardless of the learning activity that I engage in or the class session that I participate in, I prefer academic goals that contribute to autonomy in learning the subject matter over those that are set by others | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 2.5789 | 75.08 | 134.129 | .531 | .94 | .920 | 0.5331 | Shortened and More focused |
| **Revised Item** | | 5- I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others | | | | | | |

| **Original Item** | | **8-** I can justify the decisions that I have made in designing my learning environment | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.13 | 74.53 | 139.661 | .469 | .94 | .921 | 0.4584 | Definition of terms added. |

| **Original Item** | | **13**- I believe I can find out when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my goals | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.21 | 74.45 | 141.497 | .262 | .94 | .924 | 0.2633 | Revised And Definition added |
| **Revised Item** | | **13**- I believe I can find out when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals | | | | | | |

| **Original Item** | | **14**- I examine my progress in reaching my goals (based on the course assessment or according to any measure that I have set for myself) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.18 | 74.47 | 141.716 | .406 | .94 | .921 | 0.4072 | Revised and Definition added |
| **Revised Item** | | **14**- I examine my progress in reaching my academic goals based on grades or other measures that I believe are indicative of my progress | | | | | | |

| **Original Item** | | **15**- I can justify the selection of measures (i.e. course grade, teacher/peer feedback, other) used to monitor my progress | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.18 | 74.47 | 144.040 | .210 | .94 | .924 | 0.2222 | Revised |
| **Revised Item** | | **15**- I can justify the measures that I select (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress | | | | | | |

| **Original Item** | | **21**- I try to change aspects of my learning environment that I perceive are not helping me achieve my goals | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.29 | 74.37 | 140.617 | .415 | .94 | .921 | 0.4163 | Revised and Definition of terms added. |
| **Revised Item** | | **21**- I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals | | | | | | |

| **Original Item** | | **24**- Based on my learning goals, I can explain why I can or cannot change elements in my learning environment | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Scale Mean** | **Item Mean** | **Scale Mean if Item Deleted** | **Scale Variance if Item Deleted** | **Corrected Item-Total Correlation** | **Cronbach Alpha** | **Cronbach Alpha If Item Deleted** | **Overall Biserial Corr.** | **Decision about item** |
| 77.66 | 3.00 | 74.66 | 138.718 | .449 | .94 | .921 | 0.4478 | Revised |
| **Revised Item** | | **24**- I can explain why I can or cannot change elements in my learning environment to attain my academic goals | | | | | | |

### B-2: Standardized Residual Variance

| **Goal-setting and Planning** Section STANDARDIZED RESIDUAL Variance | |
|---|---|
| Total variance in observations | 100.0% |
| **Variance explained by measures** | **54.3%** |
| **Unexplained variance (total)** | **45.7%** |
| **Unexplained variance in 1st contrast** | **15.8%** |
| Unexplained variance in 2nd contrast | 12.4% |
| Unexplained variance in 3rd contrast | 11.1% |
| Unexplained variance in 4th contrast | 6.4% |
| Unexplained variance in 5th contrast | .1% |

| **Design of Learning Environment/Learning Episode** Section STANDARDIZED RESIDUAL Variance | |
|---|---|
| Total variance in observations | 100.0% |
| **Variance explained by measures** | **48.5%** |
| **Unexplained variance (total)** | **51.5%** |
| **Unexplained variance in 1st contrast** | **16.1%** |
| Unexplained variance in 2nd contrast | 14.1% |
| Unexplained variance in 3rd contrast | 8.3% |
| Unexplained variance in 4th contrast | 5.9% |
| Unexplained variance in 5th contrast | 4.5% |

| **Monitoring** Section STANDARDIZED RESIDUAL Variance | |
|---|---|
| Total variance in observations | 100.0% |
| **Variance explained by measures** | **44.1%** |
| **Unexplained variance (total)** | **55.9%** |
| **Unexplained variance in 1st contrast** | **25.1%** |
| Unexplained variance in 2nd contrast | 14.6% |
| Unexplained variance in 3rd contrast | 5.4% |
| Unexplained variance in 4th contrast | 4.9% |
| Unexplained variance in 5th contrast | 3.3% |

| **Controlling** Section STANDARDIZED RESIDUAL Variance | |
|---|---|
| Total variance in observations | 100.0% |
| **Variance explained by measures** | **39.0%** |
| **Unexplained variance (total)** | **61.0%** |
| **Unexplained variance in 1st contrast** | **20.7%** |
| Unexplained variance in 2nd contrast | 12.0% |
| Unexplained variance in 3rd contrast | 9.3% |
| Unexplained variance in 4th contrast | 7.1% |
| Unexplained variance in 5th contrast | 6.7% |

## Appendix C

## MISEVE-Q Pilot-Test II and MISEVE-Q

### C-1: MISEVE-Q Items:

PHS 1514 Personal Health

This is a questionnaire about how you study. Researchers have found that students who learn well study differently from students who do not. The purpose of this questionnaire is to measure or predict how students will study. Your participation may contribute to understanding how to identify and assist learners to study more effectively.

This questionnaire is part of a research project conducted by Dr. Thomas M. Sherman, Professor of Educational Psychology at Virginia Tech and Parastou Mokri, graduate student at Virginia Tech.

• The risks associated with participating in this research are minimal similar to responding to any self-report questionnaire.

• The data collected from participants during this research will be developed into a dissertation; in addition, one or more papers for publication in academic journals and for presentation at professional meetings may be developed.

• **Your responses are anonymous. No identifying information is requested or collected.**

• The data will be stored electronically in a password protected location.

• It is possible that the Institutional Review Board (IRB) at Virginia Tech will view collected data for auditing purposes. The IRB is responsible for overseeing the protection of people who are involved in research at Virginia Tech.

• Participation in this research is entirely voluntary; refusing to participate will involve no penalty. You are free to withdraw at any time by exiting the web site.

• If you have any questions about the study please contact Professor Thomas Sherman at tsherman@vt.edu, (540) 231-8342 or Parastou Mokri at parastoo@vt.edu, (540) 961-2779.

**To participate you must be 18 years or older. Please complete the questionnaire by clicking "Next". Doing so indicates that you consent to participate in this study.**

This questionnaire presents you with statements about studying. Please read each statement in the questionnaire carefully. Indicate the extent to which you agree that each statement applies to you **as you study for PHS 1514 Personal Health using the scale below**.

- **Strongly Disagree:** The statement almost never applies to me.
- **Disagree:** The statement rarely applies to me.
- **Agree:** The statement often applies to me.
- **Strongly Agree:** The statement almost always applies to me.

- **There are <u>NO</u> correct or incorrect responses for this survey. While we want you to consider each statement and indicate the extent it applies to you, your first impression is likely your best response. So, please be thoughtful but it is not necessary to make fine distinctions.**

Responding should take less than 45 minutes.

Thank you for your participation.

Please use your study in **PHS 1514 Personal Health** to base your estimates of the extent to which you agree that each statement applies to you.

- "**Setting academic goals**" defining, setting, and planning ways and strategies to reach self-set goals that learners perceive can enhance their learning.
- "**Autonomy in Learning**" when learners take control of different aspects of their learning as opposed to follow "teacher-set" goals.

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**Goal Setting and Planning:**

1- I believe setting academic goals is important in learning the subject material
2- I participate in the learning activities of the course to understand the material
3- I identify my academic goals at the beginning of each study session
4- I set academic goals that are within the range of my abilities
5- I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others
6- I design actions that I should take to reach my academic goals at the beginning of each study session
7- I expect to obtain a good grade in this course.
8- I expect I can master the material of this course regardless of the grade that I receive in it.
9- I am able to adjust (revise) my academic goals based on my success in achieving them.
10- I determine if learning the subject matter of this course is important to me.

- "**Learning episode**" refers to any time interval, inside a classroom or outside, that one perceives learning has taken place.
- "**Learning environment**" refers to any location (class, home, library, coffee shop,…) or context (browsing through a desired website with the intent to learn, turning TV's volume up with the intent to learn) where learners perceive learning has taken place.
- "**Designing learning environment**" intentionally choosing or influencing elements of a learning episode or learning environment to improve learning.
- "**Academic goal**" academic goals set by learners to enhance their learning.

**Designing of Learning Episodes/ Learning Environment:**

11- I believe I can participate in designing my learning environment in a way that it helps me achieve my academic goal(s)
12- I am able to influence the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes)
13- I can justify the decisions that I have made in designing my learning environment
14- I design my learning environment according to my perceived learning ability when I set my goals for the course
15- I can explain how the elements of my plan for designing a learning environment relate to my goals
16- I am confident that I can independently design my learning environment when I am not in a controlled environment such as a classroom.
17- I can explain why I am confident that I can design my learning environment
18- I can use my instructors' hints about important parts of the learning material to help me achieve my academic goals.
19- I can use available instructional technology to help me achieve my academic goals.
20- I can arrange to study with peers who can best contribute to the achievement of my academic goals.
21- I can identify the best times to study the material of this course that can best advance my academic goals.
22- When I study, I change the location, time, or setting of my learning environment if my attention is distracted.

- "**Monitoring the learning environment**" observing the impact of different aspects of the learning environment (time, location, content, social/individual context) on learning.
- "**Monitoring academic progress**" observing the progress or lack of progress in attaining self-set academic goals.
- "**Academic goal**" academic goals set by learners to enhance their learning.
- "**Learning activity**" any learning task inside or outside of classroom

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- "**Learning episode**" refers to any time interval, inside a classroom or outside, that one perceives learning has taken place.
- "**Learning environment**" refers to any location (class, home, library, coffee shop,…) or context (browsing through a desired website with the intent to learn, turning TV's volume up with the intent to learn) where learners perceive learning has taken place. ("**Learning environment" in the following section, also includes "Learning episode")**
- "**Designing learning environment**" intentionally choosing or influencing elements of a learning episode or learning environment to improve learning.

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**Monitoring:**

23- I believe I know when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals

24- I examine my progress in reaching my academic goals based on grades or other measures that I believe indicate my progress

25- I can justify why I choose certain measures (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress

26- I choose the aspects of the learning environment that I can monitor when I set my goals for the course

27- I can explain how the aspects of the learning environment that I can monitor relate to my goals

28- I am confident that I can independently determine the aspects of the learning environment that I should monitor to reach my goals

29- I can explain why I am confident that I can determine the aspects of the learning environment that I should monitor to reach my goals

30- When I study a subject related to the course, I can continually check to identify the parts of the material that I do not understand completely.

31- I am consciously aware of personal factors (stressors and negative emotions) that might interfere with my ability to stay on task even if I cannot do anything about them.

32- I can sense when environmental factors (noise, other interesting tasks) interfere with my ability to stay on task even if I cannot do anything about them.

- "**Controlling learning environment**" modifying aspects of the learning environment (time, location, content, social/individual context) to enhance learning.
- "**Academic goal**" academic goals set by learners to enhance their learning.
- "**Learning activity**" any learning task inside or outside of classroom

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- "**Learning episode**" refers to any time interval, inside a classroom or outside, that one perceives learning has taken place.
- "**Learning environment**" refers to any location (class, home, library, coffee shop,…) or context (browsing through a desired website with the intent to learn, turning TV's volume up with the intent to learn) where learners perceive learning has taken place. ("**Learning environment" in the following section, also includes "Learning episode")**
- "**Designing learning environment**" intentionally choosing or influencing elements of a learning episode or learning environment to improve learning.

**Controlling:**

33- I believe I can influence my learning environment by changing aspect(s) of my learning activity or its context (i.e. changing study strategies, changing the location I am studying in)
34- I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals
35- I can justify the changes that I intend to make in my learning environment that will help me achieve my goals
36- I decide what I can and what I cannot change (i.e. peer interactions, study time and location) in my learning environment at the time I set my goals for the course
37- I can explain why I can or cannot change elements in my learning environment to attain my academic goals
38- I am confident that I can independently determine what I can and cannot change (i.e. peer interactions, study time and location) in my learning environment to help me achieve my goals
39- I can explain why I am confident that I can change my learning environment
40- When I study material related to the course, I repeat whatever needs to be remembered over and over again.
41- When I study material related to the course, I use my prior knowledge to interpret and expand on the subject.
42- When I study material related to the course, I am able to find connections and interrelationships within the material that I am studying.
43- I can adjust my expectations of this course based on the stressors and negative emotions that might interfere with reaching my academic goals.
44- I can adjust my willingness to learn the material of this course based on the stressors and negative emotions that might interfere with reaching my academic goals.
45- I can maintain my attention on the task that I'm working on regardless of the time it takes.
46- When I confront distractions, I can initiate or maintain my effort to complete academic tasks.
47- I repeat the material that I'm studying (talk aloud to myself) to avoid getting distracted by other thoughts or activities.
48- I think about the resources that I am provided with (both individual and environmental) when I'm about to engage in difficult assignments or tests.

49- I thought I had good reasons for taking this course; but I am coming to believe that I have wasted my time.
50- I cannot understand why I took this course and I do not even care anymore.

51- What is your expected grade in this course?

52- What is your gender?
Male Female

53- Please provide us with any suggestion(s) about the survey or your thought process while answering specific items in this survey.

54- Please provide us with any comment(s) about the clarity of items in this survey.

**55- Please click on the link below and enter your full name and student ID number. Your name is needed exclusively to award you extra credit for participating in this survey and <u>WILL NOT</u> be associated with your responses.**

**url _____**

Thank you for your participation. We appreciate your input

If you have any questions about this study please contact Parastou Mokri at: parastoo@vt.edu, (540) 961-2779 or Professor Thomas Sherman at tsherman@vt.edu, (540) 231-8342.

**C-2: MISEVE-Q Guidelines:**

**PHS 1514 Personal Health**

Parastou Mokri, an advanced graduate student in Educational Psychology, is collecting data for research she is doing on studying and learning. One facet of this research is responding to two questionnaires that will each take less than 25 minutes to complete.

I encourage you to contribute to the success of this research by completing the questionnaire as described below.

Researchers have found that students who learn well study differently from students who do not. The purpose of this questionnaire is to measure or predict how students will study.

Your participation may contribute to understanding how to identify and assist learners to study more effectively. Participation involves answering two 54 item questionnaires which should take less than 25 minutes each.

When you complete both surveys presented by this research team, you can enter your name for a drawing to win one of the following prizes: **an iPod Shuffle, a $ 30, or a $ 20 cash prize; in addition to receiving 5 extra credits by your instructor.** Your responses are anonymous and your name WILL NOT be associated with your responses. You will enter your name directly into the pool for the prize drawing. The drawing will be done through a computer based random drawing program from all of the entered names in the pool.

To respond to the First Questionnaire please go to

Personal Health First Survey:

https://www.surveymonkey.com/s/CG3BR9V_Personal_Health_First_Survey

The directions and consent information will be at that site. If you have questions, please contact Parastou Mokri (parastoo@vt.edu) 540-961-2779, or Professor Thomas M. Sherman (tsherman@vt.edu) 317 War Memorial Hall or 231-8342.

Thank you for participating in this research.

**C-3: MSLQ-CS Guidelines:**

**PHS 1514 Personal Health**

As you recall,
Parastou Mokri, an advanced graduate student in Educational Psychology, is collecting data for research she is doing on studying and learning. One facet of this research is responding to two questionnaires that will each take less than 25 minutes to complete.

I encourage you to contribute to the success of this research by completing the questionnaire as described below.

Researchers have found that students who learn well study differently from students who do not. The purpose of this questionnaire is to measure or predict how students will study.

Your participation may contribute to understanding how to identify and assist learners to study more effectively. Participation involves answering two 54 item questionnaires which should take less than 25 minutes each.

When you complete both surveys presented by this research team, you can enter your name for a drawing to win one of the following prizes: **an iPod Shuffle, a $ 30, or a $ 20 cash prize; in addition to receiving 5 extra credits by your instructor.** Your responses are anonymous and your name WILL NOT be associated with your responses. You will enter your name directly into the pool for the prize drawing. The drawing will be done through a computer based random drawing program from all of the entered names in the pool.

To respond to the Second Questionnaire please go to

Personal Health **Second Survey**:

https://www.surveymonkey.com/s/C3RXQC8_Personal_Health_Second_Survey

IF YOU HAVE NOT COMPLETED THE FIRST QUESTIONNAIRE AND WISH TO BE INCLUDED IN THE PRIZE DRAWING AND/OR THE EXTRA CREDITS,YOU CAN GO TO THE LINK BELOW AND FOLLOW THE DIRECTIONS:

Personal Health **First Survey:**

https://www.surveymonkey.com/s/CG3BR9V_Personal_Health_First_Survey

The directions and consent information will be at that site. If you have questions, please contact Parastou Mokri (parastoo@vt.edu) 540-961-2779, or Professor Thomas M. Sherman (tsherman@vt.edu) 317 War Memorial Hall or 231-8342.

Thank you for participating in this research.

## Appendix D

## Factor analysis results

### D-1 Total Variance Explained

**Total Variance Explained**

| | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings[a] |
|---|---|---|---|---|---|---|---|
| Component | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total |
| 1 | 12.540 | 25.080 | 25.080 | 12.540 | 25.080 | 25.080 | 8.959 |
| 2 | 2.585 | 5.170 | 30.250 | 2.585 | 5.170 | 30.250 | 8.422 |
| 3 | 1.777 | 3.554 | 33.805 | 1.777 | 3.554 | 33.805 | 6.400 |
| 4 | 1.524 | 3.049 | 36.853 | 1.524 | 3.049 | 36.853 | 7.620 |
| 5 | 1.446 | 2.892 | 39.745 | 1.446 | 2.892 | 39.745 | 5.490 |
| 6 | 1.276 | 2.552 | 42.297 | 1.276 | 2.552 | 42.297 | 2.253 |
| 7 | 1.225 | 2.449 | 44.747 | 1.225 | 2.449 | 44.747 | 4.566 |
| 8 | 1.145 | 2.289 | 47.036 | 1.145 | 2.289 | 47.036 | 4.558 |
| 9 | 1.114 | 2.228 | 49.263 | 1.114 | 2.228 | 49.263 | 3.299 |
| 10 | 1.052 | 2.104 | 51.368 | 1.052 | 2.104 | 51.368 | 2.576 |
| 11 | .968 | 1.936 | 53.303 | | | | |
| 12 | .938 | 1.876 | 55.180 | | | | |
| 13 | .894 | 1.788 | 56.968 | | | | |
| 14 | .859 | 1.718 | 58.686 | | | | |
| 15 | .838 | 1.676 | 60.362 | | | | |
| 16 | .833 | 1.665 | 62.028 | | | | |
| 17 | .818 | 1.637 | 63.664 | | | | |
| 18 | .785 | 1.570 | 65.234 | | | | |
| 19 | .783 | 1.567 | 66.801 | | | | |
| 20 | .771 | 1.542 | 68.343 | | | | |
| 21 | .748 | 1.496 | 69.839 | | | | |

(table continued)

Factor analysis results - D-1 Total Variance Explained (continued)

| | | | |
|---|---|---|---|
| 22 | .727 | 1.453 | 71.292 |
| 23 | .712 | 1.424 | 72.717 |
| 24 | .704 | 1.407 | 74.124 |
| 25 | .683 | 1.366 | 75.490 |
| 26 | .653 | 1.306 | 76.797 |
| 27 | .642 | 1.284 | 78.081 |
| 28 | .632 | 1.264 | 79.345 |
| 29 | .608 | 1.215 | 80.560 |
| 30 | .599 | 1.198 | 81.758 |
| 31 | .587 | 1.175 | 82.933 |
| 32 | .587 | 1.173 | 84.107 |
| 33 | .566 | 1.132 | 85.238 |
| 34 | .548 | 1.096 | 86.334 |
| 35 | .541 | 1.082 | 87.416 |
| 36 | .513 | 1.026 | 88.443 |
| 37 | .510 | 1.020 | 89.463 |
| 38 | .499 | .999 | 90.461 |
| 39 | .492 | .983 | 91.445 |
| 40 | .482 | .964 | 92.409 |
| 41 | .449 | .898 | 93.307 |
| 42 | .438 | .876 | 94.183 |
| 43 | .428 | .855 | 95.038 |
| 44 | .425 | .849 | 95.887 |
| 45 | .403 | .806 | 96.693 |
| 46 | .387 | .775 | 97.468 |
| 47 | .360 | .720 | 98.188 |
| 48 | .349 | .698 | 98.885 |
| 49 | .338 | .675 | 99.561 |
| 50 | .220 | .439 | 100.000 |

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

**Appendix D**

**Factor analysis results**

**D-2 Communalities**

**Communalities**

| | Initial | Extraction |
|---|---|---|
| I believe setting academic goals is important in learning the subject material | 1.000 | .491 |
| I participate in the learning activities of the course to understand the material | 1.000 | .409 |
| I identify my academic goals at the beginning of each study session | 1.000 | .584 |
| I set academic goals that are within the range of my abilities | 1.000 | .395 |
| I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others | 1.000 | .371 |
| I design actions that I should take to reach my academic goals at the beginning of each study session | 1.000 | .465 |
| I expect to obtain a good grade in this course | 1.000 | .395 |
| I expect I can master the material of this course regardless of the grade that I receive in it | 1.000 | .541 |
| I am able to adjust (revise) my academic goals based on my success in achieving them | 1.000 | .415 |
| I determine if learning the subject matter of this course is important to me | 1.000 | .452 |
| I believe I can participate in designing my learning environment in a way that it helps me achieve my academic goal(s) | 1.000 | .533 |
| I am able to influence the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes) | 1.000 | .473 |
| I can justify the decisions that I have made in designing my learning environment | 1.000 | .462 |
| I design my learning environment according to my perceived learning ability when I set my goals for the course | 1.000 | .528 |

(table continued)

Factor analysis results D-2 Communalities (continued)

| | | |
|---|---|---|
| I can explain how the elements of my plan for designing a learning environment relate to my goals | 1.000 | .535 |
| I am confident that I can independently design my learning environment when I am not in a controlled environment such as a classroom | 1.000 | .496 |
| I can explain why I am confident that I can design my learning environment | 1.000 | .573 |
| I can use my instructors' hints about important parts of the learning material to help me achieve my academic goals | 1.000 | .485 |
| I can use available instructional technology to help me achieve my academic goals | 1.000 | .495 |
| I can arrange to study with peers who can best contribute to the achievement of my academic goals | 1.000 | .507 |
| I can identify the best times to study the material of this course that can best advance my academic goals | 1.000 | .487 |
| When I study, I change the location, time, or setting of my learning environment if my attention is distracted | 1.000 | .515 |
| I believe I know when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals | 1.000 | .373 |
| I examine my progress in reaching my academic goals based on grades or other measures that I believe indicate my progress | 1.000 | .460 |
| I can justify why I choose certain measures (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress | 1.000 | .490 |
| I choose the aspects of the learning environment that I can monitor when I set my goals for the course | 1.000 | .405 |
| I can explain how the aspects of the learning environment that I can monitor relate to my goals | 1.000 | .488 |
| I am confident that I can independently determine the aspects of the learning environment that I should monitor to reach my goals | 1.000 | .496 |
| I can explain why I am confident that I can determine the aspects of the learning environment that I should monitor to reach my goals | 1.000 | .541 |
| When I study a subject related to the course, I can continually check to identify the parts of the material that I do not understand completely | 1.000 | .327 |

(tabled continued)

Factor analysis results D-2 Communalities (continued)

| | | |
|---|---|---|
| I am consciously aware of personal factors (stressors and negative emotions) that might interfere with my ability to stay on task even if I cannot do anything about them | 1.000 | .507 |
| I can sense when environmental factors (noise, other interesting tasks) interfere with my ability to stay on task even if I cannot do anything about them | 1.000 | .590 |
| I believe I can influence my learning environment by changing aspect(s) of my learning activity or its context (i.e. changing study strategies, changing the location I am studying in) | 1.000 | .504 |
| I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals | 1.000 | .583 |
| I can justify the changes that I intend to make in my learning environment that will help me achieve my goals | 1.000 | .535 |
| I decide what I can and what I cannot change (i.e. peer interactions, study time and location) in my learning environment at the time I set my goals for the course | 1.000 | .501 |
| I can explain why I can or cannot change elements in my learning environment to attain my academic goals | 1.000 | .521 |
| I am confident that I can independently determine what I can and cannot change (i.e. peer interactions, study time and location) in my learning environment to help me achieve my goals | 1.000 | .569 |
| I can explain why I am confident that I can change my learning environment | 1.000 | .536 |
| When I study material related to the course, I repeat whatever needs to be remembered over and over again | 1.000 | .517 |
| When I study material related to the course, I use my prior knowledge to interpret and expand on the subject | 1.000 | .627 |
| When I study material related to the course, I am able to find connections and interrelationships within the material that I am studying | 1.000 | .533 |
| I can adjust my expectations of this course based on the stressors and negative emotions that might interfere with reaching my academic goals | 1.000 | .612 |

(table continued)

Factor analysis results D-2 Communalities (continued)

| | | |
|---|---|---|
| I can adjust my willingness to learn the material of this course based on the stressors and negative emotions that might interfere with reaching my academic goals | 1.000 | .618 |
| I can maintain my attention on the task that I'm working on regardless of the time it takes | 1.000 | .653 |
| When I confront distractions, I can initiate or maintain my effort to complete academic tasks | 1.000 | .592 |
| I talk aloud to myself (repeating the material that I'm studying) to avoid getting distracted by other thoughts or activities | 1.000 | .464 |
| I think about the resources that I am provided with (both individual and environmental) when I'm about to engage in difficult assignments or tests | 1.000 | .411 |
| I thought I had good reasons for taking this course; but I am coming to believe that I have wasted my time | 1.000 | .818 |
| I cannot understand why I took this course and I do not even care anymore | 1.000 | .805 |

Extraction Method: Principal Component Analysis.

**Appendix D: Factor analysis results**

D-3 Structure Matrix

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I believe setting academic goals is important in learning the subject material | .315 | .355 | .655 | .315 | .300 | .019 | .135 | .162 | .120 | .169 |
| I participate in the learning activities of the course to understand the material | .333 | .281 | .542 | .317 | .252 | -.154 | .166 | .258 | .151 | .285 |
| I identify my academic goals at the beginning of each study session | .331 | .322 | .733 | .245 | .081 | .015 | .361 | .330 | .166 | .013 |
| I set academic goals that are within the range of my abilities | .259 | .330 | .526 | .336 | .335 | -.067 | .180 | .089 | .275 | .222 |
| I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others | .356 | .367 | .514 | .231 | .194 | .132 | .163 | .143 | .197 | .227 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I design actions that I should take to reach my academic goals at the beginning of each study session | .303 | .402 | .656 | .247 | .157 | -.003 | .286 | .260 | .252 | .012 |
| I expect to obtain a good grade in this course | .257 | .265 | .297 | .490 | .351 | -.303 | .089 | .084 | .117 | .425 |
| I expect I can master the material of this course regardless of the grade that I receive in it | .238 | .227 | .213 | .137 | .016 | -.055 | .210 | .295 | .256 | .560 |
| I am able to adjust (revise) my academic goals based on my success in achieving them | .340 | .377 | .444 | .366 | .308 | -.048 | .316 | .177 | .181 | .421 |
| I determine if learning the subject matter of this course is important to me | .241 | .289 | .269 | .319 | .297 | -.029 | .140 | .103 | .042 | .579 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I believe I can participate in designing my learning environment in a way that it helps me achieve my academic goal(s) | .353 | .645 | .385 | .487 | .468 | -.142 | .213 | .186 | .150 | .285 |
| I am able to influence the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes) | .257 | .616 | .237 | .431 | .378 | -.121 | .094 | .211 | .145 | .164 |
| I can justify the decisions that I have made in designing my learning environment | .426 | .636 | .363 | .439 | .400 | -.078 | .232 | .164 | .184 | .200 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I design my learning environment according to my perceived learning ability when I set my goals for the course | .375 | .692 | .457 | .312 | .272 | -.019 | .378 | .221 | .090 | .069 |
| I can explain how the elements of my plan for designing a learning environment relate to my goals | .502 | .701 | .425 | .301 | .229 | .037 | .295 | .330 | .178 | .060 |
| I am confident that I can independently design my learning environment when I am not in a controlled environment such as a classroom | .380 | .633 | .207 | .436 | .346 | -.168 | .134 | .217 | .311 | .296 |
| I can explain why I am confident that I can design my learning environment | .514 | .711 | .294 | .384 | .194 | -.035 | .194 | .240 | .300 | .189 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can use my instructors' hints about important parts of the learning material to help me achieve my academic goals | .341 | .394 | .315 | .662 | .277 | -.188 | .235 | .343 | .140 | .194 |
| I can use available instructional technology to help me achieve my academic goals | .331 | .355 | .206 | .677 | .318 | -.158 | .078 | .249 | .238 | .270 |
| I can arrange to study with peers who can best contribute to the achievement of my academic goals | .179 | .369 | .316 | .510 | .051 | .133 | .376 | .289 | -.006 | -.196 |
| I can identify the best times to study the material of this course that can best advance my academic goals | .384 | .518 | .273 | .592 | .261 | -.081 | .378 | .253 | .302 | -.002 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| When I study, I change the location, time, or setting of my learning environment if my attention is distracted | .289 | .390 | .314 | .307 | .601 | -.042 | .130 | .183 | .277 | -.057 |
| I believe I know when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals | .374 | .254 | .129 | .481 | .418 | -.011 | .287 | .136 | .131 | .322 |
| I examine my progress in reaching my academic goals based on grades or other measures that I believe indicate my progress | .419 | .269 | .260 | .583 | .473 | -.176 | .166 | .133 | .009 | .230 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can justify why I choose certain measures (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress | .509 | .345 | .248 | .622 | .412 | .013 | .163 | .203 | .161 | .261 |
| I choose the aspects of the learning environment that I can monitor when I set my goals for the course | .535 | .509 | .449 | .437 | .263 | .025 | .396 | .349 | .247 | .055 |
| I can explain how the aspects of the learning environment that I can monitor relate to my goals | .593 | .468 | .425 | .503 | .226 | -.004 | .366 | .251 | .364 | .016 |
| I am confident that I can independently determine the aspects of the learning environment that I should monitor to reach my goals | .605 | .518 | .249 | .463 | .155 | -.074 | .392 | .403 | .218 | .163 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can explain why I am confident that I can determine the aspects of the learning environment that I should monitor to reach my goals | .634 | .522 | .310 | .474 | .087 | -.023 | .421 | .365 | .198 | .076 |
| When I study a subject related to the course, I can continually check to identify the parts of the material that I do not understand completely | .419 | .388 | .319 | .353 | .328 | -.019 | .344 | .454 | .202 | .140 |
| I am consciously aware of personal factors (stressors and negative emotions) that might interfere with my ability to stay on task even if I cannot do anything about them | .341 | .282 | .117 | .322 | .541 | -.143 | .372 | .317 | -.051 | .320 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can sense when environmental factors (noise, other interesting tasks) interfere with my ability to stay on task even if I cannot do anything about them | .291 | .296 | .148 | .387 | .710 | -.143 | .247 | .212 | -.007 | .353 |
| I believe I can influence my learning environment by changing aspect(s) of my learning activity or its context (i.e. changing study strategies, changing the location I am studying in) | .501 | .448 | .342 | .457 | .606 | -.133 | .308 | .289 | .242 | .123 |
| I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals | .514 | .382 | .377 | .306 | .634 | .010 | .115 | .313 | .304 | .033 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can justify the changes that I intend to make in my learning environment that will help me achieve my goals | .665 | .417 | .298 | .331 | .431 | -.021 | .115 | .333 | .384 | .155 |
| I decide what I can and what I cannot change (i.e. peer interactions, study time and location) in my learning environment at the time I set my goals for the course | .620 | .346 | .359 | .338 | .221 | .039 | .470 | .154 | .093 | .036 |
| I can explain why I can or cannot change elements in my learning environment to attain my academic goals | .712 | .397 | .309 | .298 | .263 | -.051 | .295 | .271 | .259 | .132 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I am confident that I can independently determine what I can and cannot change (i.e. peer interactions, study time and location) in my learning environment to help me achieve my goals | .735 | .331 | .265 | .366 | .378 | -.056 | .201 | .233 | .253 | .226 |
| I can explain why I am confident that I can change my learning environment | .719 | .412 | .325 | .380 | .361 | -.055 | .225 | .360 | .281 | .155 |
| When I study material related to the course, I repeat whatever needs to be remembered over and over again | .240 | .257 | .426 | .121 | .183 | .173 | .343 | .605 | -.138 | -.143 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| When I study material related to the course, I use my prior knowledge to interpret and expand on the subject | .357 | .300 | .160 | .394 | .264 | -.154 | .165 | .707 | .234 | .262 |
| When I study material related to the course, I am able to find connections and interrelationships within the material that I am studying | .350 | .280 | .190 | .412 | .279 | -.156 | .232 | .629 | .325 | .220 |
| I can adjust my expectations of this course based on the stressors and negative emotions that might interfere with reaching my academic goals | .402 | .292 | .304 | .276 | .212 | .055 | .725 | .296 | .238 | .110 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I can adjust my willingness to learn the material of this course based on the stressors and negative emotions that might interfere with reaching my academic goals | .338 | .301 | .264 | .286 | .195 | .052 | .707 | .268 | .296 | .135 |
| I can maintain my attention on the task that I'm working on regardless of the time it takes | .356 | .283 | .359 | .187 | .095 | .157 | .324 | .254 | .716 | .033 |
| When I confront distractions, I can initiate or maintain my effort to complete academic tasks | .419 | .359 | .288 | .265 | .204 | .088 | .303 | .274 | .700 | .096 |

(table continued)

**Factor analysis results** D-3 Structure Matrix (continued)

**Structure Matrix**

| | Component | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| I talk aloud to myself (repeating the material that I'm studying) to avoid getting distracted by other thoughts or activities | .156 | .200 | .364 | -.014 | .102 | .415 | .487 | .383 | -.123 | -.179 |
| I think about the resources that I am provided with (both individual and environmental) when I'm about to engage in difficult assignments or tests | .463 | .324 | .418 | .338 | .281 | .071 | .235 | .451 | .406 | .120 |
| I thought I had good reasons for taking this course; but I am coming to believe that I have wasted my time | -.063 | -.093 | .021 | -.180 | -.186 | .887 | .092 | -.021 | .034 | -.183 |
| I cannot understand why I took this course and I do not even care anymore | -.063 | -.076 | -.016 | -.183 | -.157 | .873 | .064 | -.035 | .049 | -.161 |

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

## Appendix E

## Motivated Strategies for Learning Questionnaire (MSLQ)

### E-1: Scales and Items of MSLQ

**Part A. Motivation**

The following questions ask about your motivation for and attitudes about this class. Remember there are no right or wrong answers, just answer as accurately as possible. Use the scale below to answer the questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| *Not at all true of me* | | | | | | *Very true of me* |

1. In a class like this, I prefer course material that really challenges me so I can learn new things.
2. If I study in appropriate ways, then I will be able to learn the material in this course.
3. When I take a test I think about how poorly I am doing compared with other students.
4. I think I will be able to use what I learn in this course in other courses.
5. I believe I will receive an excellent grade in this class.
6. I'm certain I can understand the most difficult material presented in the readings for this course.
7. Getting a good grade in this class is the most satisfying thing for me right now.
8. When I take a test I think about items on other parts of the test I can't answer.
9. It is my own fault if I don't learn the material in this course.
10. It is important for me to learn the course material in this class.
11. The most important thing for me right now is improving my overall grade point average, so my main concern in this class is getting a good grade.
12. I'm confident I can learn the basic concepts taught in this course.
13. If I can, I want to get better grades in this class than most of the other students.
14. When I take tests I think of the consequences of failing.
15. I'm confident I can understand the most complex material presented by the instructor in this course.
16. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.
17. I am very interested in the content area of this course.
18. If I try hard enough, then I will understand the course material.
19. I have an uneasy, upset feeling when I take an exam.
20. I'm confident I can do an excellent job on the assignments and tests in this course.
21. I expect to do well in this class.
22. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.
23. I think the course material in this class is useful for me to learn.
24. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.

25. If I don't understand the course material, it is because I didn't try hard enough.
26. I like the subject matter of this course.
27. Understanding the subject matter of this course is very important to me.
28. I feel my heart beating fast when I take an exam.
29. I'm certain I can master the skills being taught in this class.
30. I want to do well in this class because it is important to show my ability to my family, friends, employer, or others.
31. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.

**Part B. Learning Strategies**

The following questions ask about your learning strategies and study skills for this class. Again, there are no right or wrong answers. Answer the questions about how you study in this class as accurately as possible. Use the same scale to answer the remaining questions. If you think the statement is very true of you, circle 7; if a statement is not at all true of you, circle 1. If the statement is more or less true of you, find the number between 1 and 7 that best describes you.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| *Not at all true of me* | | | | | | *Very true of me* |

32. When I study the readings for this course, I outline the material to help me organize my thoughts.
33. During class time I often miss important points because I'm thinking of other things. (reverse coded)
34. When studying for this course, I often try to explain the material to a classmate or friend.
35. I usually study in a place where I can concentrate on my course work.
36. When reading for this course, I make up questions to help focus my reading.
37. I often feel so lazy or bored when I study for this class that I quit before I finish what I planned to do. (reverse coded)
38. I often find myself questioning things I hear or read in this course to decide if I find them convincing.
39. When I study for this class, I practice saying the material to myself over and over.
40. Even if I have trouble learning the material in this class, I try to do the work on my own, without help from anyone. (reverse coded)
41. When I become confused about something I'm reading for this class, I go back and try to figure it out.
42. When I study for this course, I go through the readings and my class notes and try to find the most important ideas.
43. I make good use of my study time for this course.
44. If course readings are difficult to understand, I change the way I read the material.
45. I try to work with other students from this class to complete the course assignments.
46. When studying for this course, I read my class notes and the course readings over and over again.

47. When a theory, interpretation, or conclusion is presented in class or in the readings, I try to decide if there is good supporting evidence.
48. I work hard to do well in this class even if I don't like what we are doing.
49. I make simple charts, diagrams, or tables to help me organize course material.
50. When studying for this course, I often set aside time to discuss course material with a group of students from the class.
51. I treat the course material as a starting point and try to develop my own ideas about it.
52. I find it hard to stick to a study schedule. (reverse coded)
53. When I study for this class, I pull together information from different sources, such as lectures, readings, and discussions.
54. Before I study new course material thoroughly, I often skim it to see how it is organized.
55. I ask myself questions to make sure I understand the material I have been studying in this class.
56. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.
57. I often find that I have been reading for this class but don't know what it was all about. (reverse coded)
58. I ask the instructor to clarify concepts I don't understand well.
59. I memorize key words to remind me of important concepts in this class.
60. When course work is difficult, I either give up or only study the easy parts. (reverse coded)
61. I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.
62. I try to relate ideas in this subject to those in other courses whenever possible.
63. When I study for this course, I go over my class notes and make an outline of important concepts.
64. When reading for this class, I try to relate the material to what I already know.
65. I have a regular place set aside for studying.
66. I try to play around with ideas of my own related to what I am learning in this course.
67. When I study for this course, I write brief summaries of the main ideas from the readings and my class notes.
68. When I can't understand the material in this course, I ask another student in this class for help.
69. I try to understand the material in this class by making connections between the readings and the concepts from the lectures.
70. I make sure that I keep up with the weekly readings and assignments for this course.
71. Whenever I read or hear an assertion or conclusion in this class, I think about possible alternatives.
72. I make lists of important items for this course and memorize the lists.
73. I attend this class regularly.
74. Even when course materials are dull and uninteresting, I manage to keep working until I finish.
75. I try to identify students in this class whom I can ask for help if necessary.
76. When studying for this course I try to determine which concepts I don't understand well.
77. I often find that I don't spend very much time on this course because of other activities. (reverse coded)

78. When I study for this class, I set goals for myself in order to direct my activities in each study period.
79. If I get confused taking notes in class, I make sure I sort it out afterwards.
80. I rarely find time to review my notes or readings before an exam. (reverse coded)
81. I try to apply ideas from course readings in other class activities such as lecture and discussion.

## Appendix E

## Motivated Strategies for Learning Questionnaire (MSLQ)

## E-2: MSLQ Constructed Scales Reliability Analysis (MSLQ-CS)

### Entire constructed questionnaire

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 917 | 98.7 |
| | Excluded[a] | 12 | 1.3 |
| | Total | 929 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .991 | 52 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 218.35 | 8632.983 | 92.914 | 52 |

### Scale: Achievement

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 917 | 98.7 |
| | Excluded[a] | 12 | 1.3 |
| | Total | 929 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .990 | 8 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 40.79 | 298.110 | 17.266 | 8 |

**Scale: Cognitive_Regulation**

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 917 | 98.7 |
| | Excluded[a] | 12 | 1.3 |
| | Total | 929 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .981 | 26 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 100.25 | 2023.108 | 44.979 | 26 |

**Scale: Motivation_Volition Regulation**

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 917 | 98.7 |
| | Excluded[a] | 12 | 1.3 |
| | Total | 929 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .963 | 10 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 43.59 | 359.704 | 18.966 | 10 |

**Scale: Environment_Regulation**

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 917 | 98.7 |
| | Excluded[a] | 12 | 1.3 |
| | Total | 929 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .939 | 8 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 33.71 | 228.403 | 15.113 | 8 |

## Appendix F

## MISEVE-Q Reliability Analysis

### F-1: Cronbach's Alpha

**Entire Questionnaire**

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 1000 | 96.7 |
| | Excluded[a] | 34 | 3.3 |
| | Total | 1034 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .935 | 48 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 151.4470 | 240.920 | 15.52160 | 48 |

## Scale: Goal setting and Planning

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 1034 | 100.0 |
| | Excluded[a] | 0 | .0 |
| | Total | 1034 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .770 | 10 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 31.5986 | 13.621 | 3.69066 | 10 |

## Scale: Design of learning environments/learning episodes

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 1018 | 98.5 |
| | Excluded[a] | 16 | 1.5 |
| | Total | 1034 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .832 | 12 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 38.4509 | 21.685 | 4.65676 | 12 |

**Scale: Monitoring**

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 1009 | 97.6 |
| | Excluded[a] | 25 | 2.4 |
| | Total | 1034 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .807 | 10 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 31.9604 | 14.489 | 3.80638 | 10 |

**Scale: Controlling**

**Case Processing Summary**

| | | N | % |
|---|---|---|---|
| Cases | Valid | 1000 | 96.7 |
| | Excluded[a] | 34 | 3.3 |
| | Total | 1034 | 100.0 |

a. Listwise deletion based on all variables in the procedure.

**Reliability Statistics**

| Cronbach's Alpha | N of Items |
|---|---|
| .844 | 16 |

**Scale Statistics**

| Mean | Variance | Std. Deviation | N of Items |
|---|---|---|---|
| 49.4040 | 34.079 | 5.83771 | 16 |

**Appendix F**

**MISEVE-Q Reliability Analysis**

**F-2: Item-total Correlation Table**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| I believe setting academic goals is important in learning the subject material | 148.0840 | 231.809 | .451 | .934 |
| I participate in the learning activities of the course to understand the material | 148.2700 | 232.410 | .440 | .934 |
| I identify my academic goals at the beginning of each study session | 148.5620 | 230.220 | .455 | .934 |
| I set academic goals that are within the range of my abilities | 148.2340 | 232.474 | .434 | .934 |
| I choose academic goals that contribute to autonomy in learning the subject matter over those that are set by others | 148.4470 | 232.336 | .419 | .934 |
| I design actions that I should take to reach my academic goals at the beginning of each study session | 148.4840 | 230.777 | .450 | .934 |
| I expect to obtain a good grade in this course | 147.8040 | 234.196 | .395 | .934 |
| I expect I can master the material of this course regardless of the grade that I receive in it | 148.4710 | 233.204 | .313 | .935 |
| I am able to adjust (revise) my academic goals based on my success in achieving them | 148.2680 | 232.200 | .489 | .933 |

(table continued)

MISEVE-Q Reliability Analysis F-2: Item-total Correlation Table (continued)

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| I determine if learning the subject matter of this course is important to me | 148.2140 | 233.149 | .368 | .934 |
| I believe I can participate in designing my learning environment in a way that it helps me achieve my academic goal(s) | 148.1600 | 231.021 | .562 | .933 |
| I am able to influence the design of my learning episodes (choose location, time and learning activities that take place during those learning episodes) | 148.1840 | 231.596 | .444 | .934 |
| I can justify the decisions that I have made in designing my learning environment | 148.2200 | 230.828 | .547 | .933 |
| I design my learning environment according to my perceived learning ability when I set my goals for the course | 148.3050 | 230.715 | .523 | .933 |
| I can explain how the elements of my plan for designing a learning environment relate to my goals | 148.4060 | 230.067 | .551 | .933 |
| I am confident that I can independently design my learning environment when I am not in a controlled environment such as a classroom | 148.2360 | 230.086 | .507 | .933 |
| I can explain why I am confident that I can design my learning environment | 148.3250 | 230.037 | .540 | .933 |

(table continued)

MISEVE-Q Reliability Analysis F-2: Item-total Correlation Table (continued)

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| I can use my instructors' hints about important parts of the learning material to help me achieve my academic goals | 148.0770 | 231.030 | .498 | .933 |
| I can use available instructional technology to help me achieve my academic goals | 148.1200 | 231.805 | .460 | .934 |
| I can arrange to study with peers who can best contribute to the achievement of my academic goals | 148.3480 | 232.157 | .345 | .935 |
| I can identify the best times to study the material of this course that can best advance my academic goals | 148.2630 | 229.988 | .521 | .933 |
| When I study, I change the location, time, or setting of my learning environment if my attention is distracted | 148.2730 | 230.621 | .423 | .934 |
| I believe I know when the learning activities that I am involved with (i.e. attending class and participating in study sessions) are not helping me achieve my academic goals | 148.3000 | 231.604 | .421 | .934 |
| I examine my progress in reaching my academic goals based on grades or other measures that I believe indicate my progress | 148.1400 | 232.261 | .449 | .934 |

(table continued)

MISEVE-Q Reliability Analysis F-2: Item-total Correlation Table (continued)

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| I can justify why I choose certain measures (i.e. course grade, teacher/peer feedback, other) to monitor my academic progress | 148.2300 | 230.848 | .513 | .933 |
| I choose the aspects of the learning environment that I can monitor when I set my goals for the course | 148.3440 | 230.404 | .574 | .933 |
| I can explain how the aspects of the learning environment that I can monitor relate to my goals | 148.3700 | 230.245 | .576 | .933 |
| I am confident that I can independently determine the aspects of the learning environment that I should monitor to reach my goals | 148.3000 | 230.583 | .554 | .933 |
| I can explain why I am confident that I can determine the aspects of the learning environment that I should monitor to reach my goals | 148.3430 | 230.240 | .553 | .933 |
| When I study a subject related to the course, I can continually check to identify the parts of the material that I do not understand completely | 148.2880 | 230.716 | .497 | .933 |
| I am consciously aware of personal factors (stressors and negative emotions) that might interfere with my ability to stay on task even if I cannot do anything about them | 148.1590 | 231.675 | .421 | .934 |

(table continued)

MISEVE-Q Reliability Analysis F-2: Item-total Correlation Table (continued)

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| I can sense when environmental factors (noise, other interesting tasks) interfere with my ability to stay on task even if I cannot do anything about them | 148.0320 | 231.885 | .438 | .934 |
| I believe I can influence my learning environment by changing aspect(s) of my learning activity or its context (i.e. changing study strategies, changing the location I am studying in) | 148.1710 | 229.926 | .581 | .933 |
| I try to change aspects of my learning environment that I perceive are not helping me achieve my academic goals | 148.2420 | 230.940 | .523 | .933 |
| I can justify the changes that I intend to make in my learning environment that will help me achieve my goals | 148.2380 | 231.303 | .546 | .933 |
| I decide what I can and what I cannot change (i.e. peer interactions, study time and location) in my learning environment at the time I set my goals for the course | 148.3880 | 230.968 | .483 | .933 |
| I can explain why I can or cannot change elements in my learning environment to attain my academic goals | 148.3540 | 231.128 | .523 | .933 |

(table continued)

MISEVE-Q Reliability Analysis F-2: Item-total Correlation Table (continued)

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| I am confident that I can independently determine what I can and cannot change (i.e. peer interactions, study time and location) in my learning environment to help me achieve my goals | 148.2310 | 231.065 | .530 | .933 |
| I can explain why I am confident that I can change my learning environment | 148.2840 | 229.733 | .571 | .933 |
| When I study material related to the course, I repeat whatever needs to be remembered over and over again | 148.2790 | 232.372 | .332 | .935 |
| When I study material related to the course, I use my prior knowledge to interpret and expand on the subject | 148.1460 | 231.859 | .449 | .934 |
| When I study material related to the course, I am able to find connections and interrelationships within the material that I am studying | 148.2010 | 231.951 | .460 | .934 |
| I can adjust my expectations of this course based on the stressors and negative emotions that might interfere with reaching my academic goals | 148.4440 | 231.142 | .469 | .934 |
| I can adjust my willingness to learn the material of this course based on the stressors and negative emotions that might interfere with reaching my academic goals | 148.3970 | 231.623 | .450 | .934 |

(table continued)

MISEVE-Q Reliability Analysis F-2: Item-total Correlation Table (continued)

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| I can maintain my attention on the task that I'm working on regardless of the time it takes | 148.7430 | 230.117 | .411 | .934 |
| When I confront distractions, I can initiate or maintain my effort to complete academic tasks | 148.5300 | 230.846 | .472 | .934 |
| I talk aloud to myself (repeating the material that I'm studying) to avoid getting distracted by other thoughts or activities | 148.7510 | 233.464 | .236 | .936 |
| I think about the resources that I am provided with (both individual and environmental) when I'm about to engage in difficult assignments or tests | 148.3490 | 231.080 | .510 | .933 |

# Appendix G

# IRB Approval Memo

**Office of Research Compliance**
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24060
540/231-4606 Fax 540/231-0959
e-mail irb@vt.edu
Website: www.irb.vt.edu

**MEMORANDUM**

**DATE:** October 17, 2011

**TO:** Thomas M. Sherman, Parastou Mokri

**FROM:** Virginia Tech Institutional Review Board (FWA00000572, expires May 21, 2014)

**PROTOCOL TITLE:** Introducing and Validating a Model of Academic Self Regulation

**IRB NUMBER:** 11-130

Effective October 17, 2011, the Virginia Tech IRB Administrator, Carmen T. Green, approved the amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at http://www.irb.vt.edu/pages/responsibilities.htm (please review before the commencement of your research).

**PROTOCOL INFORMATION:**
Approved as: **Expedited, under 45 CFR 46.110 category(ies) 7**
Protocol Approval Date: **4/13/2011**
Protocol Expiration Date: **4/12/2012**
Continuing Review Due Date*: **3/29/2012**
*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

**FEDERALLY FUNDED RESEARCH REQUIREMENTS:**
Per federally regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

| Date* | OSP Number | Sponsor | Grant Comparison Conducted? |
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*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.

cc: File