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The study first sought to determine if students' self-reported scores on measures of personal epistemology and motivational and strategic components of self-regulated learning (a) changed over time and (b) were impacted by enrollment in an interdisciplinary course. Secondly, the study questioned how these measures impacted end-of-term GPA. Four hundred ninety traditional aged first-year students at a mid-sized private southeastern university, 287 females and 203 males, comprised the sample. Data were collected during a fall term in a pre-post format for this quasi-experimental research design. After scaling and adjusting to fit this study population, three scales were derived from the *Epistemic Beliefs Inventory* and seven scales were derived from the *Motivated Strategies for Learning Questionnaire.*

A repeated measures MANOVA was conducted for treatment (interdisciplinary course) x time (pre/post) for each of the 11 scales and found no interaction effect for treatment. Over time, significant within-group differences indicated that all students moved toward the naïve perspective for measures of Quick Learning and Innate Learning. Motivational measures of Task Value and Extrinsic Goal Orientation declined significantly. More significant use of Elaboration and Written Study Strategies were reported over time. Between groups differences indicated that students in the interdisciplinary course had more desirable mean scores for the following scales: Quick Learning, Self-Efficacy for Learning and Performance, Task Value, Intrinsic Goal

Orientation, Extrinsic Goal Orientation, Elaboration and Critical Thinking. Additional data analysis determined that significant differences existed between group means on entering academic record variables. However, there were no significant differences in the variance of pretest scores and only one significant difference for posttest scores. Consequently, these entering characteristics may only indirectly account for the between-groups significant main effects.

Correlation analysis between pre and post scores for the 11 scales and end-of-term cumulative GPA isolated significantly correlated variables to include in a stepwise multiple regression analysis. Analyses indicated that Quick Learning pretest scores and posttest scores for Self-Efficacy for Learning and Performance explained 8.8% of the variability of GPA.

THE IMPACT OF AN INTERDISCIPLINARY SEMINAR ON FIRST-YEAR UNIVERSITY STUDENTS' DEVELOPMENT OF PERSONAL EPISTEMOLOGY AND MOTIVATIONAL AND STRATEGIC COMPONENTS OF SELF-REGULATED LEARNING

by

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CHAPTER I

INTRODUCTION

General education requirements designed to create a core curriculum are a ubiquitous feature of colleges and universities across the nation. How those requirements are configured on individual campuses varies greatly, especially regarding the presence of interdisciplinary studies. The goal of interdisciplinary studies (IDS) courses or curricula is to create a comprehensive perspective on an issue by integrating disciplinary perspectives (Klein & Newell, 1997). Much curricular debate since the inception of American universities has focused on the value of integrating disciplines to create a core curriculum (Rury, 1996). Interdisciplinary studies became a dominant curricular reform movement during the 1970's and 1980' s and is still found on campuses today (Gaff & Ratcliff, 1997). In the first half of the twentieth century, interdisciplinary studies was mostly found in general education and promoted on the theoretical promise of its intellectual and educational value. As time went along, the 1984 National Institute of Education's report, "Involvement in Learning," called for knowledge in liberal education to be addressed beyond subject matter to include "capacities of analysis, problem solving, communication, and synthesis" (Klein & Newell, 1997, p. 396). Klein and Newell (1997) further reported that in 1990, the Association of American Colleges highlighted the need for curricular coherence and praised practices that "enable connection making and interdisciplinary skills of synthesis" (p. 396). IDS programs across the nation proliferated

ranging from majors such as women's studies, international studies, and computer information systems to learning communities of linked courses to single seminars housed in a core curriculum (Klein & Newell, 1997). Today, most interdisciplinary courses continue to be housed in general education programs (Ghnassia & Seabury, 2002).

Assessment efforts are another ubiquitous feature of college and university campuses that ultimately influence curriculum. Assessment may be motivated by such diverse forces as accreditation reviews, institutionally identified curricular weaknesses, market trends for new majors, economic considerations, and cries for accountability from various stakeholders (Cabrera, Colbeck, & Terenzini, 2001; Gaff & Ratcliff, 1997). Regardless of the motivating forces for assessment, the ultimate goal is to better understand and improve student learning. For general education programs with interdisciplinary studies features, assessment is both complex and ill-defined (Stowe, 2002).

Statement of the Problem

According to the Association for Integrative Studies, assessment is no easy task for such a diffuse construct as interdisciplinarity where the emphasis is on synthesizing and integrating cognition (Stowe, 2002). A survey conducted by the Higher Education Research Institute found that nearly 40% of college faculty report having taught an interdisciplinary course (Lindholm, Astin, Sax, & Korn, 2002). Yet, evidence of the impact of such courses on student learning is lacking. Few empirical studies have been conducted to determine if students are indeed developing more sophisticated thinking and learning behaviors as a result of interdisciplinary coursework (Lattuca, Voight, & Fath,

2004). More recently, Pascarella and Terenzini (2005) report on a third decade of research on how college affects students and note evidence suggesting that "a curriculum experience that requires the integration of ideas and themes across courses and disciplines enhances critical thinking over simply taking a distribution of courses without an integrative rationale" (p. 173). However, the empirical research for this claim is cited from only two sources.

First, Pascarella and Terenzini cite Schilling's (1991) report on a three-year FIPSE funded project at Miami University of Ohio that empirically studied students' intellectual and personal development. Data were collected on matched groups of students (N=84) choosing to meet general/liberal education requirements through either an interdisciplinary program of study or through a distribution of disciplinary courses. A wide-range of assessment procedures and instruments were used for a series of cross-sectional and longitudinal studies from freshman to senior year. Among these instruments was a measure of epistemological reflection. Epistemology has long been an object of philosophical study about the nature and justification of human knowledge. Within the last few decades, the systematic study of personal epistemologies that Perry (1970) began has captured the attention of psychologists and educators for its potential influence on cognitive processes of thinking and reasoning (Hofer & Pintrich, 1997, 2002; Schommer, 1994).

Schilling (1991) concluded that the interdisciplinary group demonstrated higher performance levels at both the freshman and senior years than did the disciplinary group. However, attrition left a final modified sample size of less than 40. Since students self-

selected into interdisciplinary studies, they may have already held a predisposition to more sophisticated cognitive processing making interpretation and generalization of these results problematic.

The second study cited by Pascarella and Terenzini (2005) used a pre-post test design measuring intellectual growth of first-year students after a year of study. In this research, Wright (1992) found a significant relationship between students' intellectual growth, as measured along the Perry scheme of epistemological development, and the number of interdisciplinary general education courses taken. Sophisticated epistemologies correlated positively with the number of IDS courses taken. Wright suggested that future research identify other cognitive and non-cognitive factors that impact intellectual development.

Motivational and strategic components of self-regulated learning are additional factors to consider. Empirical studies have linked epistemological beliefs to self-regulation (Butler & Winne, 1995) and motivation (Hofer, 1994; Hofer & Pintrich, 1997; Patrick & Pintrich, 2001; Paulsen & Feldman, 1999). Motivational beliefs and effective self-regulatory learning skills impact intellectual development through their influence on classroom performance and learning orientations that foster engagement with deep cognitive processing (Zimmerman & Martinez-Pons, 1986; Pintrich & De Groot, 1990; Pintrich, Roeser, & De Groot, 1994). However, no empirical studies have been found connecting interdisciplinary coursework to the development of both epistemological beliefs and motivational and strategic components of self-regulated learning.

Purpose of the Study

With this limited research on interdisciplinary course outcomes in mind, this study will explore to what extent a private mid-sized university's required interdisciplinary seminar, Global Experience, develops first-year students' epistemological beliefs, and motivational and strategic components of self-regulated learning during the first semester. Successful completion of the Global Experience seminar along with a distribution of courses in the arts and sciences are part of the university's general education requirements for graduation. The specific research questions developed to further pursue this problem are:

1. To what degree does one semester of college influence students' development of personal epistemology and motivational and strategic components of self-regulated learning?
    a. Does the inclusion of an interdisciplinary course influence students' development of personal epistemology more so than taking a traditional distribution of disciplinary coursework during the first semester?
    b. Does the inclusion of an interdisciplinary course influence students' development of motivational and strategic components of self-regulated learning more so than taking a traditional distribution of disciplinary coursework during the first semester?
2. How does personal epistemology and motivational and strategic components of self-regulated learning relate to performance as measured by end-of-semester cumulative GPA?

Contextual Background of the Study

This study took place at a mid-sized, private, four-year comprehensive university in the southeastern United States. The university enrolls approximately 5,200 students of which about 1,250 are first-year students. All undergraduate students complete a distribution of coursework for general education requirements as well as for the major. The university's General Studies Program is housed in the College of Arts and Sciences. The 58-hour program is conceptualized in three parts: the first-year core, studies in the arts and sciences, and advanced studies. The first-year core components that total 14 hours are college writing, either a statistics or a calculus math, a wellness course, and Global Experience. Studies in the arts and sciences make up 32 hours and are distributed into four areas of expression, civilization, society, and science/analysis. Traditional disciplines support these four area distribution requirements. The final area, Advanced Studies, is 12 hours of coursework at the 300/400 level with 8 hours outside students' major fields and chosen from the arts and science courses. The final 4 hours are selected from an advanced interdisciplinary seminar, GST 300 or 400 level. These are special topics, writing intensive seminars taught by faculty from across disciplines. Course topics for these advanced seminars are proposed by faculty and approved by the General Studies faculty committee. This general studies program was approved by the university in 1994 and nearly all courses are 4-credit hours.

Global Experience or GST 110, the first-year academic seminar, is the focus of this study. In Global Experience, perspectives on public responsibility in a global context are examined. The implications created by cultural and natural diversity and the

possibilities for human communication and cooperation within this diversity are also explored using multiple perspectives. Those perspectives may or may not be identified by discipline, but instruction focuses on integrating various perspectives to better understand the human condition and to develop effective thinking. In the Global Experience course students have opportunities to discuss ill-structured problems, are engaged in the discussion of controversial issues, and are challenged by faculty to examine their assumptions. The course is also writing intensive and frequently involves requirements to attend campus cultural events or guest lectures. A Director of General Studies oversees the entire program to include December and August workshops for faculty teaching GST 110. Faculty support for teaching this course during the semester includes weekly lunches with discussion topics related to course objectives. According to Haynes (2002) these types of pedagogical supports are significant since most university faculty have disciplinary terminal degrees, have little preparation for teaching, and their learning and teaching experiences have resided almost exclusively in disciplinary classrooms. This university's GST 110 faculty are no exception. They come from various disciplines and professional schools and serve a limited rotation teaching GST 110 each semester. There are approximately 24 sections of this course offered each fall and course enrollment is limited to 25 students per section. First-year students who are not in Global Experience in the fall are in English 110, College Writing. Consequently, half of first-year students (approximately 625) are taking GST 110 in the fall and the other half is taking English 110. On average, students complete their first-semester course load of 15-18 hours with either a math or the wellness class along with courses from the College of Arts and

Sciences and/or with introductory courses in their intended major. Major courses may be from the arts and sciences or from professional schools such as business, education, or communications. Since space is limited in introductory courses from the professional schools, a minority of first-year students have these courses their first semester.

Significance of the Study

Limited survey results on interdisciplinary studies assessment efforts at colleges and universities across the country reveal the lack of consensus on clear operationally defined outcomes to assess programs (Stowe, 2002). The Association for Integrative Studies (AIS) is a professional association dedicated to the promotion of interdisciplinary efforts. The AIS assessment study committee appointed in 1998 reviewed 80 surveys returned from institutions with IDS programs and determined that assessment of interdisciplinarity is in an embryonic state. What was striking to the study committee was the lack of assessment emphasis on synthesis or integration, the impetus for creating most interdisciplinary programs and courses. Instead, many respondents articulated more conventional outcomes for their programs such as writing, critical thinking, and computer literacy (Stowe, 2002). These results from the AIS assessment surveys are even more interesting since proponents of interdisciplinary studies (Lattuca et al., 2004) argue theoretically that interdisciplinary contexts have superior potential for encouraging effective thinking, developing multiple perspectives, motivating students to learn and self-regulate, and constructing meaning in the classroom.

Consequently, this study is significant for the following reasons. First, it will continue to use a measure of personal epistemology to indicate students' levels of

adaptive, complex thinking as was done in the Schilling (1991) and Wright (1992) studies. College assessment studies have used measures of epistemic cognition and reflective judgment (King & Kitchener, 2002; Wood, Kitchener, & Jensen, 2002) for this purpose. Secondly, it will add the variables of motivation and strategy use within self-regulated learning that have not appeared in empirical studies of IDS thus far. Both variables have been linked in significant ways to personal epistemology research (Butler & Winne, 1995; Hofer, 1994; Hofer & Pintrich, 1997; Patrick & Pintrich, 2001; Paulsen & Feldman, 1999) as well as cognition and learning (Kardash & Howell, 2000; Schommer, Crouse, & Rhodes, 1992). Third, it will be the university's first empirical assessment of first-year students' self-reported development of personal epistemology and self-regulated learning. More traditional types of assessments such as measuring writing skills are in place for the Global Experience seminar. This study will examine the first-semester development of personal epistemology and self-regulated learning both within groups and between groups—students who have GST 110, Global Experience, in their schedule and those who do not. Additionally, seminar instructors are full-time within their disciplines and rotate in and out of teaching responsibilities for the course. Departments sometimes question the value of IDS for student learning. This study may help answer some questions of value.

Hypotheses

The expectations for this study reflected in the research literature and the researcher's own experience teaching and advising students are (a) students, on average, in both distributions of first-semester coursework (one group with an interdisciplinary

course and one group without) will show gains from the beginning of the semester to the end on measures of epistemology and self-regulation; (b) students with coursework that includes the interdisciplinary seminar will show average gains greater than students with only disciplinary distributions of courses on measures of epistemology and motivational and strategic components of self-regulated learning; and (c) sophisticated epistemology along with motivational and strategic components of self-regulated learning will have predictive value for end-of-semester cumulative GPA.

This research can potentially serve both the broader literature on interdisciplinarity and specifically serve the general studies program at this university by identifying at least three factors that significantly influence students' thinking and learning behaviors as a result of including an IDS course for general studies requirements. If the researcher's assumptions are correct, college curriculums would better serve student learning by offering interdisciplinary courses that intentionally help students integrate knowledge.

Definition of Terms

Interdisciplinary Studies or IDS or Interdisciplinarity. Interdisciplinary Studies or IDS and interdisciplinarity are defined generally as curricular approaches to solving problems or answering questions that cannot be adequately addressed by a single methodology or discipline (Klein, 1990). Throughout this study, the interchangeable terms of interdisciplinary studies, IDS, and interdisciplinarity will reference this definition. The Global Experience course, GST 110, will be the specific illustration of interdisciplinarity under investigation.

Epistemology. Epistemology is the philosophical study of the origin, nature, limits, methods, and justification of human knowledge (Hofer, 2002).

Epistemic. This term relates to general knowledge and the conditions for acquiring it (Hofer, 2002).

Personal Epistemology. This term addresses individuals' beliefs about knowledge and knowing. It usually includes some or all of the following: "beliefs about the definition of knowledge, how knowledge is constructed, how knowledge is evaluated, where knowledge resides, and how knowing occurs" (Hofer, 2001, p. 355). Personal epistemology also serves as an "umbrella term" for research programs addressing "individual conceptions of knowledge and knowing" (p. 355).

Motivation. This is the process whereby goal-directed activity is instigated and sustained (Pintrich & Schunk, 1996). Motivation scales used in this study and surveyed using the *Motivated Strategies for Learning Questionnaire* (Pintrich et al., 1993b) were (a) value components (intrinsic goal orientation, extrinsic goal orientation and task value) and (b) expectancy components (control of learning beliefs, and self-efficacy for learning and performance).

Expectancy-Value Motivation Theory. This framework attempts to explain individuals' performance and choice in achievement. Expectancies for success involve beliefs and judgments about how well one might do on a task. Values involve reasons and justifications of why one might choose to do a task (Wigfield & Tonkin, 2002).

Self-Regulation. Self-regulation refers to "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (Zimmerman, 2000, p. 14).

Self-Regulated Learning or SRL. "Self-regulated learning is an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior in the service of those goals, guided and constrained by both personal characteristics and the contextual features in the environment" (Pintrich & Zusho, 2002, p.249). This model of SRL includes four phases and four areas of self-regulation. The phases are (a) forethought or planning and activation, (b) monitoring, (c) control, and (d) reaction and reflection. Four areas in which to self-regulate learning are (a) cognition, (b) motivation/affect, (c) behavior, and (d) context (Pintrich & Zusho, 2002).

Learning strategies. This term refers to the specific processes individuals use to monitor, regulate, and control their cognition, motivation, and behavior during learning. Learning strategy scales identified in this study and measured by the MSLQ are Cognitive and Metacognitive Strategies (Rehearsal, Elaboration, Organization, Critical Thinking, Metacognitive Self-Regulation), and Resource Management Strategies (Time and Study Environment Management, Effort Regulation, Peer Learning, and Help-Seeking).

Student Performance. Student performance will be operationalized as end-of-semester cumulative GPA and will be obtained through the university's data management system, Datatel.

Prior Knowledge. Prior knowledge concerns personal characteristics students bring to the learning environment. For this study, prior knowledge will be operationalized using academic record variables of SAT scores, including verbal and math scores, high school GPA for the courses the institution uses in the admissions process, and the number of advanced placement or co-curricular credits with which they enter the institution. An indirect measure of prior knowledge will also be obtained by asking students to indicate the level of education achieved by each parent.

Controversial Issues. Students also indicated their level of exposure to controversial issues in high school by answering two questions: To what degree did your high school courses present controversial issues? To what degree did your high school courses teach you how to analyze controversial issues? Students answered by indicating "regularly," "sometimes," "rarely," or "never."

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this review is twofold. First, it will provide a framework for understanding characteristics of interdisciplinarity within higher education. Secondly it will suggest that empirical research using measures of epistemology and motivational and strategic components of self-regulated learning may appropriately fill a void in the current assessment literature on interdisciplinarity. To accomplish these purposes, published works on interdisciplinarity, epistemology, and motivational and strategic components of self-regulated learning are reviewed and presented in three major sections. The first of these three sections addresses the literature on interdisciplinarity. Specifically, it will offer a historical perspective on the interdisciplinary movement within higher education, present an overview of the current trends and themes in the field of interdisciplinary studies, and examine the challenges of assessing interdisciplinary learning. The second section on epistemology will present a condensed historical perspective on the study of students' epistemological beliefs. It will also discuss current empirical research connecting college students' epistemological belief systems, often referred to as personal epistemology, to motivational and strategic components of self-regulated learning. The third major section will specifically introduce self-regulated learning in relation to the more general psychological construct of self-regulation. Due to the expansive literature on self-regulated learning, this review focuses on a four stage

cyclical model by Paul Pintrich (2000c) that integrates much of the research on SRL. Measurement of this construct will focus on achievement motivation with its inherent expectancy-value framework within self-regulated learning. Cognitive, metacognitive and resource management strategies frame the learning strategy component of measuring self-regulated learning. Finally, the concluding section addresses the theoretical connectedness of interdisciplinarity with personal epistemology and motivational and strategic components of self-regulated learning.

Understanding Interdisciplinarity

Defining Interdisciplinarity

Much of the early professional writing on interdisciplinarity corresponded with sweeping educational reform begun in the 1960's (Vess & Linkon, 2002). Concerned with overspecialization, academe sought to respond to "new demands for integrated approaches to complex social and technological problems as well as [respond] to changes in the forms and structures of contemporary intellectual activity" (Klein & Doty, 1994, p. 2). As university IDS programs and initiatives evolve, theorists continue to focus on what is and is not interdisciplinarity, even though defining the construct is often characterized as working with a moving target (Lattuca et al, 2004). Klein (1990), a respected professional in interdisciplinary education, offers this initial definition:

> Interdisciplinarity has been variously defined in this century: as a methodology, a concept, a process, a way of thinking, a philosophy, and a reflexive ideology. It has been linked with attempts to expose the dangers of fragmentation, to reestablish old connections, to explore emerging relations, and to create new subjects adequate to handle our practical and conceptual needs. Cutting across all these theories is one recurring idea. Interdisciplinarity is a means of solving

> problems and answering questions that cannot be satisfactorily addressed using single methods or approaches. (p. 196)

More recently, an empirical study of interdisciplinarity in practice by Lisa Lattuca (2001) offers a typology of four different forms of interdisciplinarity. The conceptual framework for this typology comes from questions and issues that drive the interdisciplinary teaching or research approach (Lattuca et al., 2004). In *informed disciplinarity*, a single discipline is the primary focus of instruction, but other disciplines may be called upon to illuminate course content. In *synthetic interdisciplinarity*, theories, concepts and even research methods from various disciplines are combined but remain clearly identifiable. On the other hand, *transdisciplinarity*, obscures disciplinary sources of theories and methods by applying them across disciplines without regard to their historical associations with a single field. Finally *conceptual interdisciplinary* courses include disciplinary perspectives, but have no dominant disciplinary focus (Lattuca et al., 2004). It is conceptual interdisciplinarity that best describes the university's Global Experience course. Regardless of nomenclature, a common heritage unites the typologies.

Tracing Interdisciplinarity

Klein (1990) proposes that the roots of interdisciplinarity can be traced either from Plato's advocacy for a unified science or from twentieth century educational reform when the term actually emerged. Prior to the 20th century reform movement, the academy had been responding to societal pressures of "professional, ecclesiastical and governmental needs" (Klein, 1990, p. 20). Scientific, value-neutral theories and empirical research was being valued above the development of grand philosophical systems.

Consequently, disciplinary specialties in higher education proliferated. Within the 19th century modern university, industry was demanding and receiving specialists, and in turn students were recruited into disciplinary ranks. University graduates aspired to the new professional and specialized research scholar model (Klein, 1990; Lattuca, 2001).

Subtle changes in this model began after World War I and up to the 1930's. The social sciences began to hybridize to address problems larger than the scope of a single discipline, such problems as war, social welfare, labor, and crime to name a few. Yet, there was still no direct challenge to the status quo of the disciplines for the following reasons. First, universities were structurally organized around the discipline. Second, the politics of individual disciplines guarded academic turf. Third, departments questioned whether or not connections could actually be made between the disciplines. Finally, many in the academy doubted whether one concept could be general enough to incorporate every discipline (Klein, 1990).

A second movement towards more curricular integration and away from disciplinary silos dates from the close of World War II when American universities developed "area" studies within the social sciences (Klein, 1990). Area studies were designed to integrate vast knowledge stores about other geographical areas, such as American studies, ethnic studies, women's studies, environmental studies, and international studies to name a few. Directories of programs and courses published in the mid-90's included area studies as well as capstone and integrative courses; interdisciplinary institutions as well as cluster colleges; and general education and major programs (Klein, 1999; Klein & Newell, 1997). Over time, however, many

disciplinarians defaulted back to their own disciplinary perspectives. Yet, one important outcome of the second push towards curricular integration was the conceptual birth of behavioral science (Klein, 1990).

Educational circles continued to tease out distinctions between interdisciplinary work and integration, a higher and more powerful category. The National Education Association's work during the 1930's asked educators to consider interdisciplinary work as a process of unifying rather than a complete, unified experience (Klein, 1990). Over time, technical distinctions evolved from groups of philosophers and scientists. They discussed content integration versus process integration and integration as synthesizing known postulates versus integrative building to fashion a holistic educational philosophy. Regardless, "interdisciplinary" remained an ill-defined term as arguments to distinguish interdisciplinary from the higher order concept of integration persisted.

During the 1970's, the British Group for Research and Innovation in Higher Education added the metaphors of "bridge building" and "restructuring" to the interdisciplinary discussion. Bridge building connected in tact disciplines and seemed the easiest to accomplish; whereas, restructuring indicated a criticism of the state of the discipline if not also criticism of the structure of knowledge surrounding it (Klein, 1990). The term "transdisciplinarity" also emerged during this time from the work of the Organization of Economic Cooperation and Development (OECD). Transdisciplinarity was a higher order level of integration subsuming theories and concepts of multiple disciplines thus functioning as the modern equivalent for the older arguments advocating a comprehensive unity of knowledge.

Mid-Century Promotions of Interdisciplinarity

By mid-century, interdisciplinarity was being promoted a number of ways. Undergraduate programs of general and interdisciplinary education begun at Harvard, Columbia, and Chicago to counteract over-specialization were emulated across the nation. Interdisciplinary aspects of general education included a revolt against fragmentation, organizing and integrating knowledge outside disciplinary lines, and using multiple disciplines to address human problems (Klein, 1990; Lattuca, 2001). Secondly, the wide use of synthetic theories such as Marxism, structuralism, and general systems theory impacted the structure of inquiry and eventually promoted a more holistic approach to conceptualizing reality and theorizing about cognition. Additionally, cross fertilization experienced in the natural sciences led to new fields such as radio astronomy and dendrochronology or tree-ring dating. The sharp distinction between science and humanism was called into question as interest in existentialism, phenomenology, and post-structuralism spread (Klein, 1990; Lattuca, 2001). Major texts for interdisciplinary discourse also supported the movement such as Thomas Kuhn's 1962 publication, *The Structure of Scientific Revolutions.* Scientific inquiry was being expanded beyond current notions of scientific rationality and truth criteria to include social, cultural, and political dimensions (Klein, 1990).

With this expansion came mission-oriented projects that supported collaboration across disciplines to accomplish objectives; however, the extent of cooperation varied by project over the years. Perhaps the most famous mission-oriented project was the Manhattan project that built the atomic bomb with cooperation from science, industry,

and the US Army. After this project and by the 1960's and 1970's, a visible interdisciplinary presence was on campuses in the form of organized research teams, institutes, and centers; thus, sociotechnical think tanks were born. The prominence of mission-oriented projects was due to available funding and the realization that real problems are not confined to a single discipline. This visible watershed era for interdisciplinary cooperation and innovation was supported by such key groups as the National Science Foundation, the Carnegie Foundation, the National Endowment for the Humanities, and the Fund for Improvement of Post-Secondary Education. In Europe, the Organization of Economic Cooperation and Development's Centre for Educational Research and Innovation offered seminars to address the problems of interdisciplinary teaching and research in universities. From their work came a seminal text, *Interdisciplinarity: Problems of Teaching and Research in Universitie* that compiled the previously dispersed discussions of interdisciplinarity. The text was dominated by major theorists Erich Jantsch, Guy Berger, Jean Piaget, and Leo Apostel, and the publication year of 1972 marks a major date in the history of interdisciplinarity (Klein, 1990).

Current Trends Supporting Interdisciplinarity

The mid-seventies emergence of two professional organizations supported the interdisciplinary movement and tried to put a "public face" on the diffuse construct of interdisciplinarity (Klein, 1990; Stowe & Elder, 2002). The Association for Integrative Studies (AIS) emerged and is still comprised mainly of educators. The International Association for Study of Interdisciplinary Research (Interstudy) was an international group of government and industry professionals. While most of higher education is

dominated by the disciplines, Klein (2006) indicates in more recent writing that interdisciplinary discussions are expanding as new fields and approaches develop in both research and educational realms. For example, the intersection of interdisciplinarity with curriculum design, team teaching, writing-intensive instruction, computer-assisted instruction, and collaborative learning are documented in Carolyn Haynes (2002) edited work. Haynes (2002) also provides evidence for the impact interdisciplinarity has had on learning communities, feminist and multicultural pedagogies, inquiry- and performance-based teaching and learning, study abroad, adult education, advising, and assessment. The impact of interdisciplinarity in the K-12 arena is documented through a collection of essays by experts who report on integrated and interdisciplinary curricula, course design, team teaching, use of technology and administration and assessment of IDS programs (Klein, 2002).

Another important trend in IDS is web-based services facilitating connections in other communities (Klein, 2006). For example, H-NET offers teachers and scholars an international forum to exchange ideas and resources in the arts, humanities, and social sciences. Transdisciplinarity-NET (Td-Net) is a multi-lingual information system devoted to transdisciplinary research that often connects academic research and the private sector for product development and social problem-solving (Klein, 2006).

From this brief historical tracing, interdisciplinarity remains both visible and varied as evidenced through overt interdisciplinary institutions and research centers, through interdisciplinary departments on university campuses, and through professional dialog in faculty forums and professional organizations. The dialog defining

interdisciplinarity frequently addresses the forms it takes, why it takes place, the processes of how disciplines interact or the identification of hierarchical terms to designate levels of integration (Klein, 1990). Conversations regarding the assessment of interdisciplinarity are also making their way into professional organizations and journals.

Assessing Interdisciplinarity

Interdisciplinary studies courses and programs are not exempt from the issues that define and plague the assessment movement in higher education. A series of reports, *Involvement in Learning* (1984) and *Integrity in the College Curriculum* (1985) spurred the reform movement. In the late 80's, Secretary of Education William Bennett's directive to link institutional outcomes to the criteria for accreditation intensified publicity to reform general education (Field & Stowe, 2002). Response to these curricular criticisms has produced various forms of assessment. For example, student learning outcome assessment differs from program assessment that may value faculty credentials and the number of library books. Teaching-based assessment may focus on pedagogical skill development whereas learning-based assessment seeks to measure enhanced student learning. Problems often arise when the dual roles of political accountability and educational reform cannot be accomplished with the same assessment techniques. Nonetheless, interdisciplinary program assessment efforts reflect a quest for mainstream credibility that national assessment efforts seem to suggest (Field & Stowe, 2002).

Challenges to Assessing Interdisciplinary Learning

This quest for credibility through assessment presents unique challenges for interdisciplinarity. For instance, Field and Stowe (2002) indicate there is "no single

widely accepted definition of interdisciplinarity, no accepted theory of interdisciplinarity, and no single model of an interdisciplinary program" (p. 263). As a result, IDS programs would be hard pressed to find a single assessment guideline or consensus on expected learning outcomes (Field & Lee, 1992; Field & Stowe, 2002). Additionally, the hallmarks of synthesis and integration so widely applauded in the IDS literature are ill-defined constructs for assessment (Field & Stowe, 2002; Mansilla, 2005; Stowe & Elder, 2002). Stakeholders may eagerly adopt the idealistic rhetoric of interdisciplinarity, but lack their own constructed and detailed mission statement to direct an assessment plan (Stowe & Elder, 2002). Indeed, this was apparent in results from the 1998 Assessment Committee formed within the Association for Integrative Studies. After reviewing 80 survey responses across the nation from AIS membership, Evergreen Conference participants, and AIS program directors, the committee determined that the ability to operationalize interdisciplinary rhetoric of integration and synthesis into learning outcomes and subsequent assessment plans was lacking (Stowe, 2002).

There is, however, some research to suggest that the integration espoused in IDS courses has identifiable positive learning outcomes (Astin, 1992; Wright, 1992). As mentioned earlier in this paper, Wright (1992) studied first-year college students using Perry's (1970) scheme of intellectual development. She found a positive relationship between intellectual growth and the number of interdisciplinary courses completed at the end of the first year of study. Astin (1993) noted the impact of interdisciplinary learning in *What Matters in College? Four Critical Years Revisited.* He indicated that unlike traditional courses where pedagogy had the largest impact, the interdisciplinarity of

integrative courses positively affected cognitive and academic development, critical thinking, GPA, intellectual self-concept, and disciplinary as well as general knowledge. Astin's work did not, however, explain the exact mechanisms of interdisciplinarity by which such widespread effects are achieved. The lack of specifying exact mechanisms continues to plague assessment of interdisciplinarity.

Field and Stowe (2002) outline five specific challenges to assessing interdisciplinarity. First, one must find a fit in the typical linear world of assessment. Secondly, it is advantageous to describe expected outcomes in non-utopian language while leaving discussion space for serendipitous findings. Next, researchers must define the constructs of synthesis or integration in measurable ways. Assessment techniques should be both conventional and creative. Finally, keep the assessment focus on improving cognition as well as improving affective and developmental outcomes. Stowe and Elder (2002) report The Association for Interdisciplinary Studies Assessment Committee believes working definitions of any assessment should begin with improving student learning. Assessment models also start by describing what is actually going on. Therefore, the Global Experience course at this university is the object of this study and will be described next.

The Global Experience Course

Six major themes are identified for all writing-intensive sections of Global Experience to explore. According to the program director, they are (a) the importance of individual responsibility (b) the relationship of humans to the natural world (c) globalization and tribalization as powerful world forces (d) the impact of imperialism and

colonialism, (e) the nature of culture, and (f) the plights of disempowered groups. While the actual content may vary by class and instructor, the six central themes provide a critical framework for interpreting, understanding, and discussing readings, films, and outside speakers. (J. Warman, personal communication, September 12, 2006). Those perspectives may or may not be identified by discipline, but instruction focuses on integrating various perspectives to better understand the human condition and to develop effective thinking. Ghnassia and Seabury (2002) believe education should teach students to live with doubts and uncertainties and come to value the questioning process for true civic responsibility. In the Global Experience course students have opportunities to discuss ill-structured problems, are engaged in the discussion of controversial issues, and are challenged by faculty to examine their assumptions—classroom activities supportive of developing epistemic cognition (King & Kitchener, 2002; Ivanitskaya, Clark, Montgomery, & Primeau, 2002). Not surprisingly, proponents of interdisciplinarity argue that this type of integrative work develops students' skills of synthesis and analysis thus allowing them to create new questions and perspectives (Vess & Linkon, 2002). This type of skill development is also documented in research on personal epistemology as students move from naïve perspectives to more sophisticated thinking (Schommer, 1990; Hofer & Pintrich, 2002). Proponents of interdisciplinarity also argue that motivation and self-regulation are enhanced through interdisciplinary study (Latucca et al., 2004). An information society places great demands on students to find, retrieve, understand, and use information. James Davis (1995) believes that synthesis, analysis, and application "are best carried out . . . in interdisciplinary courses, where the focus is on developing

critical thinking skills, employing multiple perspectives, and relating information to some larger conceptual framework than the concerns of a single discipline" (p. 38). Others may agree. For example, Schommer (1994), a widely cited researcher on the development of personal epistemology, has argued that college instruction should help students develop sophisticated views of knowledge through a process of connecting ideas and noting how they evolve. Lattuca (2001) indicates that redefining knowledge and reflecting on epistemological assumptions are integral to interdisciplinary research and teaching.

Given the theoretical connections among the interdisciplinary literature, the nature of the Global Experience course, and touted benefits of improved epistemic cognition and self-regulated learning, it follows that empirical measurement in these three areas would offer insights into the espoused benefits of interdisciplinary study. Additionally, Huba and Freed (2000) note that measures of student learning should focus on aspects that will develop and endure, but are also available for immediate assessment. The chosen measures of personal epistemology as well as motivational and strategic components of self-regulated learning appear to fit that tenet. An overview of personal epistemology and self-regulated learning with references to interdisciplinarity will continue to focus the literature review.

Understanding Personal Epistemology

The construct of personal epistemology originates from the philosophical study of the nature and justification of human knowledge and attempts to understand how this functions at the individual level. As far back as ancient Greece, Plato proposed justified

true belief based on three conditions of truth, belief, and evidence (Scheffler, 1965). Contemporary conceptualizations propose that the study of personal epistemology questions "how individuals come to know, the theories and beliefs they hold about knowing, and the manner in which such epistemological premises are a part of and an influence on the cognition processes of thinking and reasoning" (Hofer & Pintrich, 1997, p. 88).

Much of the current research on personal epistemology can be traced to William Perry's (1970) longitudinal work with male college students at Harvard University. He derived a scheme of intellectual and ethical development. Perry's scheme has been categorized into four sequences of dualism, multiplicity, relativism, and commitment within relativism (Moore, 1994) which essentially traces student thinking from an absolutist right-wrong view of the world to a more qualitative view that focuses on responsibility, engagement, and commitment "to values, careers, relationships, and personal identity" (Hofer & Pintrich, 1997, p. 91). Perry (1970) sought to understand the experiences of college undergraduates as they related to moral and intellectual development. His model suggested that an evolving developmental process, not students' personalities, determined how they made meaning from their educational experiences. While he did not explicitly study students' epistemological beliefs, his work laid the foundation for the contemporary conceptualizations that followed.

Conceptualizing Epistemological Beliefs

Since Perry, researchers have been interested in exploring individuals' conceptualizations of knowledge (Hofer & Pintrich, 1997; King & Kitchener, 1994).

Exploring knowledge beliefs of students in academic settings and how beliefs relate to various learner characteristics and outcomes have also been investigated (Jehng, Johnson, & Anderson, 1993; Qian & Alvermann, 1995). The subsequent sub-sections examine the theoretical underpinnings, both developmental and multidimensional, guiding many contemporary studies of personal epistemology.

Belenky et al.'s Women's Ways of Knowing

Belenky, Clinchy, Goldberger, and Tarule (1986) studied women as knowers and learners using an interview-case study approach with a cross-section of 135 women at various academic institutions and human service agencies. Believing that Perry's framework did not sufficiently explain the experience of women, the authors' research produced a model consisting of five different perspectives on knowledge and knowing used to explain aspects of women's lives beyond just academic contexts. The five perspectives include (a) *silence* as a voiceless existence, (b) *received knowledge* where ideas are true or false, (c) *subjective knowledge* where truth is personally experienced, (d) *procedural knowing* that is either separate (impersonal and detached) or connected (understanding emphasized over judgment) and finally, (e) *constructed knowledge* as an integration of subjective and objective knowing strategies (Belenky et al., 1986). Belenky focused more on the source of knowledge and truth rather than the nature of knowledge (Hofer & Pintrich, 1997). While Belenky's model suggested change, it did not follow a strict developmental approach that implies sequential movement through progressive stages.

Baxter Magolda's Epistemological Reflection Model

Attempting to quantify student thinking as evidenced in Perry's (1970) scheme, Baxter Magolda sought to develop and validate the Measure of Epistemological Reflection (MER) (Baxter Magolda, 1987). She later investigated gender related themes using both Perry and Belenky's work as a guide when patterns of responses from her research did not fit Perry's scheme. Not unlike Perry's research goals, Baxter Magolda's qualitative longitudinal study of epistemological development examined the effect epistemological assumptions have on students' interpretation of educational experiences. Consequently, the categories that emerged focused more on learning in college classrooms as opposed to assumptions about knowledge (Hofer & Pintrich, 1997). Ultimately, a model with four different positions emerged, and each position suggested a gender-related continuum of differences in how students justified their epistemic assumptions (Baxter Magolda, 1992a). For example, an absolute way of knowing ranged from *receiving* (found primarily among women) to *mastery* (more common among men). The transitional knowing position ranged from interpersonal (common for women) to impersonal (more common among men). Independent knowing ranged from the women's end of the continuum with *interindividual* to the more common male position of *individual.* Contextual knowing seemed to combine and/or mask gender patterns (Baxter Magolda, 1992a).

Reflective Judgment Model by King and Kitchener

Building on the work of both William Perry (1970) and John Dewey (1933), King and Kitchener (1994) studied epistemological foundations for effective reasoning.

Concerned with argumentative reasoning, their longitudinal cross-sectional study produced a seven-stage developmental model focusing on epistemic cognition. Within the seven-stage model are three levels: *pre-reflective* (stages 1, 2, 3), *quasi-reflective* (stages 4 & 5), and *reflective* (stages 6 & 7). From their research using an interview protocol built around ill-structured problems, King and Kitchener (1994, 2002, 2004) argue that the ability to reason and evaluate knowledge claims depends on reflective judgment. King and Kitchener's model (1994) is among the most extensive developmental schemes with epistemological elements and also appears to describe the upper levels of Perry's (1970) scheme (Hofer & Pintrich, 1997).

Kuhn's Model of Argumentative Reasoning

Deanna Kuhn (1991) was interested in how individuals reasoned through ill-structured problems in their everyday lives. Her research presented three ill-structured problems (e.g., what causes unemployment) to a cross-section of people with age cohorts of teens, 20s, 40s, and 60s. The interview protocols asked participants to state and justify their view, generate and rebut an opposing view, and then suggest a solution. The final interview segment asked participants to describe the epistemological standards that framed their reasoning. Kuhn reported three categories of epistemological views: *absolutists* who hold that knowledge is certain and factual, *multiplists* who are skeptical of certain knowledge and hold all views equally valid, and finally *evaluative* positions that recognize the comparative and evaluative quality of viewpoints (Kuhn & Weinstock, 2002). Kuhn's model appears to simplify Perry's (1970) into three stages which do not add significantly to empirical validation of a new scheme. However, her work does

connect epistemological theories to reasoning and suggests that argumentative skills presume levels of epistemological understanding that require "contemplation, evaluation, and judgment of alternative theories and evidence" (Hofer & Pintrich, 1997, p. 105).

Marlene Schommer-Aiken's Epistemological Belief System

Schommer-Aikins' (Schommer, 1990; Schommer et al., 1992) research program has attempted to quantify components of beliefs. Borrowing from earlier theorists who examined beliefs about knowledge, intelligence, and mathematics (Dweck & Leggett, 1988; Perry, 1970; Schoenfeld, 1983), Schommer-Aikins proposed a multidimensional set of five beliefs that did not develop in fixed stages (Hofer & Pintrich, 1997). A 63-item Likert-type questionnaire was developed to identify these beliefs on a continuum from naïve to sophisticated. Those beliefs are *innate ability* (sample item: "The really smart students don't have to work hard to do well in school"); *quick learning* (sample item: "Successful students learn things quickly"); *simple knowledge* (sample item: "Most words have one clear meaning"); *certain knowledge* (sample item: "Scientists can ultimately get to the truth"); and *omniscient authority* (sample item: "People who challenge authority are over-confident") (Schommer, 1990). Criticism of Schommer-Aikins' work includes concerns over (a) the rationale for including dimensions that appear to be related more to beliefs about intelligence than beliefs about knowledge, (b) the construct validity of items, (c) the lack of empirical validation for omniscient authority, and (d) the lack of confirmatory factor analysis on all 63 survey items (Hofer & Pintrich, 1997). Nonetheless, Schommer-Aikin's work has significantly contributed in the areas of examining independent epistemological belief systems, empirically investigating

these systems, and connecting them to academic learning and performance (Hofer & Pintrich, 1997).

Summary

Taken as a whole, these pioneering theories represent significant developments in conceptualizing and studying epistemological beliefs. Since Perry's initial work, epistemological views have expanded to include females as well as males (e.g., Baxter Magolda, 1992a). Epistemological beliefs are situated in both academic and non-academic contexts (Baxter Magolda, 1992b; Schommer, 1990; Kuhn, 1991; King & Kitchener, 1994). Beliefs may be multidimensional, vary in development and sophistication within individuals, and influence learning and performance in academic settings (Schommer, 1990). Finally, each of these theoretical conceptualizations of personal epistemology has directed contemporary research agendas.

Current Trends in Studying Personal Epistemology

Six general issues have been addressed in research agendas for epistemological study since William Perry's work. Hofer and Pintrich (1997) categorize those areas as (a) refining and extending Perry's work, (b) developing measurement tools for assessment, (c) exploring the impact of gender, (d) considering the impact of epistemology on thinking and reasoning, (e) identifying dimensions of epistemological beliefs, and finally (f) assessing how such beliefs connect to cognition and motivation. It is the connection to cognition and motivation for student learning in differing contexts that concerns this study. However, a look at measurement tools is required before addressing connections to cognition and motivation.

Measuring Personal Epistemology

Measures for studying personal epistemology have included interviews, vignette interpretation, and pencil and paper self-report surveys (Duell & Schommer-Aikins, 2001). Duell and Schommer-Aikins (2001) note that two different theories of epistemological beliefs underlie the development of various measures. They describe unidimensional theories as those assuming that epistemological beliefs are dependent on one another for development. Examples include William Perry's *Checklist of Educational Views (CLEV)*, King and Kitchener's *Reflective Judgment Interview*, Baxter Magolda's *Measure of Epistemological Reflection*, and Belenky and colleagues' (1986) *Attitudes toward Thinking and Learning Survey*. Multidimensional beliefs, by way of contrast, are independent and free to vary in their rate of development. A prominent example is Schommer-Aikens' *Schommer Epistemological Questionnaire (SEQ)* (Duell & Schommer-Aikens, 2001). Self-report, pencil and paper questionnaires have grown in popularity due to their ease of administration to both groups and individuals (Duell & Schommer-Aikens, 2001). Many self-report instruments are modeled after Schommer's (1990) Epistemological Questionnaire. For example, the *Epistemic Beliefs Inventory* (Schraw, Bendixen, & Dunkle, 2002) also identifies five factors: certain knowledge (absolute knowledge exists and will eventually be known), simple knowledge (knowledge consists of isolated facts), omniscient authority (authorities have the only access to some knowledge), quick learning (learning occurs quickly or not-at-all) and fixed ability (capacity for learning is innate). While this five factor structure is debated and open to further empirical testing (Hofer & Pintrich, 1997) the multidimensional

viewpoint, regardless of the measurement used, has more empirical support in the literature at this time (Schraw, 2001).

Connecting Epistemology and Learning

Barbara Hofer (2001) finds three general views in the literature connecting epistemology and learning. First, epistemology is developmental and therefore part of any educational goal should be to foster that development. This view has been influenced by the work of Baxter Magolda (1992b), King and Kitchener (1994) and Perry (1970). Secondly, epistemology exists in the form of individual beliefs that influence learning. Primarily, research by Schommer (1990) and Schommer et al. (1992) can be found here. It is worthy to note that while Perry did not pursue a research agenda connecting epistemology and learning, he did speculate whether or not students might change their ways of going about and getting knowledge once they revise their notions of knowledge (Hofer & Pintrich, 1997). Finally, epistemology is either theory-like (Hofer & Pintrich, 1997) or exits as a set of resources (Hammer & Elby, 2002) that during the process of learning are activated in context-dependent ways. All three models presume that learning and knowledge construction are influenced by epistemological theories and belief change can be fostered through educational experiences (Hofer, 2001). These connections seem to support this research study designed to examine how the context of interdisciplinarity might influence the development of personal epistemology and self-regulated learning.

Epistemological research has examined a number of educational experiences to date, including the following. Muis (2004) critically reviewed and synthesized 33 studies on students' epistemological beliefs about mathematics and concluded that significant

relationships exist between beliefs and cognition, motivation, and academic achievement. Such relationships have been found in science learning as well (Hammer & Elby, 2002). Hofer (2004b) qualitatively explored 25 first-year students' personal epistemology in differing classroom contexts and found that students "filter their perceptions of instructional practice through their own epistemological perspectives" and "such perceptions are malleable" (p. 161). Hofer conceded that one semester was a short period of time to study first-year students' epistemic change but she did find evidence that change was beginning for these students. Hofer (2004b) noted the desirability of future studies to engage a "larger number of participants enrolled in courses with distinctly differing epistemological assumptions to examine belief change in a pre- and post-test measure" (p. 161). Hofer (2000) also found evidence using a paper and pencil measure of epistemology modeled after Schommer's *Epistemological Questionnaire* (Schommer, 1990) suggesting that students' epistemological beliefs vary by discipline and certain dimensions of epistemology correlate with performance. Hofer (2004b) suggests that college instruction may be most effective when students' epistemological assumptions are acknowledged, addressed, and accounted for in instructional practice. Based on the literature theorizing the educational benefits of interdisciplinary studies (Lattuca et al., 2004), IDS should offer a more ideal context for enhancing epistemic change because of the presumed curricular approach that values instructors and students partnering in the construction of knowledge. The implication is that faculty disciplinary expertise is the focal point of instruction in disciplinary courses rather than co-construction of knowledge between professor and students in interdisciplinary curriculums and courses. Despite the

general lack of empirical evidence, Lattuca et al. (2004) further argue that epistemic change is more likely to occur because motivation and self-regulated learning are enhanced in IDS contexts as a "matter of degree" (p. 39). Interdisciplinary courses supposedly offer more interesting questions, more opportunities for choice of tasks, more opportunities for discussion and knowledge construction, and more engagement of student's prior knowledge and experience (Lattuca et al., 2004). Furthermore, the conceptual change literature suggests that epistemic change involves more than "cold cognition." Students' beliefs, attitudes, values, and motivations are crucial factors determining how they approach and process information that may either alter naïve conceptions or result in resistance to informed, sophisticated views (Pintrich, Marx, & Boyle, 1993a). Whether or not IDS offers a superior context for developing sophisticated thinking is in question. This study seeks to empirically test theoretical claims of interdisciplinary contexts' superior development of personal epistemology and related motivational and strategic components of self-regulated learning. A discussion of the role of self-regulation in cognition and learning with implications for epistemological study follows.

Understanding Self-Regulated Learning

For this study, "self-regulated learning 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 in the service of those goals, guided and constrained by both personal characteristics and the contextual features in the environment" (Pintrich & Zusho, 2002, p. 249). This definition of self-regulated

learning (SRL) borrows from Bandura's (1986) social cognitive perspective and research on self-regulation (Zimmerman, 2000; Carver & Scheier, 2000) that frame the general concept of self-regulation as a personal, behavioral, and environmental triadic process. This process (not trait or ability) is a self-directed, cyclical process of feedback loops from prior performance used to adjust future performance as it continually accommodates changing factors of person, behavior, and environment (Zimmerman, 2000; Zimmerman, 2001). This cyclical model is made up of three phases: forethought, performance, and self-reflection that explain causal links among acquired, interdependent, self-regulatory processes (Zimmerman, 1998b, 2001). Self-regulated learning theory borrows from general research on self-regulation to explain learning. Early attempts to explain student learning took either a mental ability approach that viewed cognition as a stable trait or assumed a social environmental view attributing much academic success or failure to a person's ethnic and cultural identities (Zimmerman, 2001). Self-regulated learning, however, assumes proactive personal agency to control aspects of the learning process and uses the feedback loops to increase self-efficacy, skill, and goal attainment (Pintrich 1995, 2000c; Zimmerman, 1995, 2001).

In self-regulation theory and research, students are evaluating and judging their own progress or competence. Students who believe they are capable of performing or learning the task (expectancy) are more likely to indicate the use of self-regulatory strategies (Pintrich & Zusho, 2002). When examining motivation within models of self-regulated learning, the focus is on how individuals control and regulate their own motivation in order to reach their goals. Pintrich and Schunk's (1996) work examining

motivation in education indicates that students' use of self-regulatory strategies mediates the relationship between motivation and performance.

For example, an individual who feels efficacious when approaching a task and values accomplishing the task (components of expectancy-value motivation theory) is more likely to self-regulate in the service of accomplishing his or her goals for the task. In models of self-regulated learning, self-efficacy is a type of metacognitive knowledge. Metacognition includes self knowledge of person, task, and strategy variables that guide and constrain the development of self-regulated learning or SRL (Pintrich & Zusho, 2002). Another type of metacognitive knowledge may be personal epistemology (Hofer, 2004a; Hofer & Pintrich, 1997). It is believed that personal epistemologies guide goal structures for self-regulated learning. For example, if a student holds a belief that knowledge is certain (absolute knowledge exists and will eventually be known) and simple (knowledge consists of discrete facts) such that there is only one right answer to strive for in solving a problem, then this belief system may impact learning goals that short circuit efforts at deeper cognitive processing and reflection. As a result, the individual may adopt a learning strategy favoring more memorization (Hofer & Pintrich, 1997; Pintrich, 2002). Evidence exists to suggest that students' beliefs or epistemologies do influence cognitive strategy use, reading comprehension, academic performance, and motivation (Kardash & Howell, 2000; Paulsen & Feldman, 1999; Schommer, 1990, 2002; Schommer et al., 1992).

In a cross-cultural study examining Norwegian postsecondary students' epistemological beliefs and self-regulated learning, Braten and Stromso (2005)

determined that epistemological beliefs predict self-regulated learning and the relationship may also vary with academic context. Pintrich and Zusho (2002) note the need for more empirical evidence linking epistemology with self-regulated learning and examining this in different disciplines. Work by Hofer (2000) suggests that students may hold different epistemologies depending on the discipline.

For now, a closer look at Pintrich's (2000c) four-stage cyclical model organizes much of the research on SRL. It is supported by other researchers (Butler & Winnie, 1995; Zimmerman, 1998c, 2000) and will frame further literature review on the construct of self-regulated learning. The four stages are forethought or planning, monitoring or metacognitive awareness, control, and reaction or reflection. An examination of what learners actually regulate through these four stages follows.

Components of Self-Regulated Learning

The components that will be discussed can be found in various researched models of SRL. They offer suitable construct validity and linkage to performance outcomes, and also link motivational and cognitive processes (Pintrich, 2000c).

Regulating Cognition

Cognition is regulated during the planning stage by setting task specific goals for learning, time use, and eventual performance. Goals may originate here and undergo change, or they may appear and alter during other phases of self-regulation as well. Metacognitive knowledge about the task such as memories concerning previous experience with a particular writing assignment may be activated automatically or undergo intentional self-regulation through a personal questioning process, i.e. "What do

I know about writing a chemistry lab report?" In addition to content knowledge, task and strategy knowledge are also part of metacognition (Pintrich, 2000c). Metacognitive knowledge involves knowing what strategies to use, how to perform them, and when and why their use is appropriate (Alexander, Schallert, & Hare, 1991). This is monitored during self-regulation by making judgments about the learning process such as readiness for taking a test or acknowledging feelings of knowing (Koriat, 1993; Nelson & Narrens, 1990). It is difficult to fully separate cognition and metacognition during the control phase, but perhaps students cognitively select strategies while metacognitively adapting them for thinking and learning. Self-regulated learners will finally reflect or react to make cognitive judgments about their success or failure that include adaptive attributions related to this success or failure. An adaptive attribution would be attributing failure to insufficient effort or inappropriate strategy use as opposed to seeing oneself as stupid or dumb (Pintrich 2000a; Zimmerman & Kitsantas, 1997).

Regulating Motivation and Affect

The regulation of motivation and affect is addressed in the achievement motivation literature (Pintrich & Schunk, 1996) and usually involves goal orientation, self-efficacy, task values and personal interest in the task (Pintrich, 2000c). These motivational beliefs are further seen as guiding and selecting self-regulatory strategies in the service of skill development (Zimmerman, 2000). Pintrich and Schunk's (1996) definition of motivation captures central elements consistent with beliefs of researchers and practitioners in that "motivation is the process whereby goal-directed activity is instigated and sustained" (p. 4). Learning and performance are reciprocally related to

motivation "because what one does and learns influences one's subsequent task motivation" (p. 21). Indices of motivation include individuals' choice of tasks, effort expended for success, time spent on a task, and indirectly, one's achievement level since a culmination of the three preceding variables would influence achievement (Pintrich & Schunk, 1996). Kuhl's (1984) work on motivation proposed that an individual's choice to self-regulate was guided by his or her value and expectancy for goal attainment. A model of achievement motivation in line with Kuhl's work that has explanatory power for this research study and self-regulated learning is the Eccles-Wigfield model of achievement task values with its more social cognitive nature (Pintrich & Schunk, 1996; Wigfield & Eccles, 1992). In this model, "expectancies and values are cognitive beliefs that are related to the conscious decisions and choices individuals make about their achievement" (Pintrich & Schunk, 1996, p. 293). Consequently, these internal cognitive beliefs, expectancy and task value, are important predictors of achievement behavior. Expectancies for success or "Can I do this task?" are determined by a person's self-schemata or internal assessments of efficacy, desirable goals (short-term/ long-term, intrinsic/extrinsic) and specific task demands. The value component of this theory or "Why am I doing this task?" suggests four more cognitive assessments individuals make as they plan. Those are importance of the task (attainment value), enjoyment of the task (intrinsic interest value), usefulness of task for accomplishing personal goals (extrinsic utility value), and finally what is given up to engage in this task (cost). A social cognitive aspect of this theory is that perceptions of competence within the self-schemata and the types of task valuing that occurs further develop as individuals learn to understand and

interpret others' feedback, and as they make more social comparisons with peers (Wigfield & Tonkin, 2002). The developmental nature of the model concurs with the cyclical stages in SRL to identify the feedback loop from achievement related choices and performance back to continue influencing an individual's assessment of expectancy and task value that continues to influence future performance (Wigfield & Tonkin, 2002). Expectancy-value motivation theory argues that in the absence of valuing the task, self-reflection needed to improve future performance on that task will be less likely to occur (Wigfield & Tonkin, 2002).

The regulation of students' goal orientations is closely connected to this achievement model of motivation and has received significant interest in the research literature (Pintrich, 2000b). A closer examination of goals will follow once two more areas for self-regulation during learning are reviewed: behavior and context.

Regulating Behavior and Context

In line with a triadic model that incorporates social cognition and general self-regulation (Bandura, 1986; Zimmerman, 1998a, 1998b), behavior and context are included for regulation in this SRL model because students can observe, monitor, and control it even though it might not be considered part of the internal self (Pintrich, 2000a). Intentional planning for time and effort management of academic learning is part of self-regulated learners' and high achievers' repertoire of success strategies (Zimmerman & Martinez-Pons, 1986). Students exhibit behavior monitoring when they recognize that the time set aside for a task during the planning phase is not sufficient, and they must now extend or shorten what was allotted. By the same token, students plan for

the regulation of context by activating cognitions about classroom norms (group work expected and not considered cheating) and classroom climate (equity and fairness) (Pintrich & Schunk, 1996). Students' awareness of context is part of the monitoring phase. Making accurate judgments about contextual differences between high school and college is frequently challenging for students (Pintrich, 2000c). Next, acting on these recognitions for regulating behavior and context is part of the control phase and strategies are varied depending on the goals that were established, and in the case of context, the level of direct control a student may have will vary. For a behavioral example, if a student wants to thoroughly learn the material, he or she may control behavior by engaging in help-seeking or expending more effort. If, on the other hand, a student wants to protect self-worth and expend minimal effort, he or she may engage in self-handicapping. That is, he chooses not to try so that he can explain failure as not trying rather than risk an ego involved goal of trying hard and still failing (Pintrich, 2000c). Controlling context is more difficult in academic settings that are strongly directed by the instructor. However, task negotiation with an instructor over testing formats (take-home or in-class) may be an example of controlling context. During the reflection stage for regulating both behavior and context, students make cognitive judgments about the effectiveness of their behavior or how well they sized up academic expectations in a given learning context. These reflections in turn inform future judgments regarding both behavior and learning environments. Thus the feedback loop inherent in SRL regardless of which component is being regulated is completed (Pintrich, 2000c). A closer look at goal orientations within SRL models follows.

Goal Orientations and SRL

Goals or standards are the criteria students use to monitor progress in learning. In self-regulated learning, goals (a) guide the learner to monitor and regulate efforts in a specific direction and (b) serve as criteria for performance evaluation. Goal setting is an important element of motivation and influences the attitude a learner has about learning and completing tasks. In short, goals significantly influence students' academic performance (Deci & Ryan, 1985; Garcia & Pintrich, 1994; Pintrich, 2000c ; Pintrich & Schunk, 1996). A number of different goal orientation models have been proposed by achievement motivation researchers that demarcate varied research programs and theoretical traditions. Before addressing performance and mastery goals, the two overarching goal orientations that concern this study, a brief discussion of goal definitions within the literature follows.

Carol Dweck's Social-Cognitive Approach to Personality

Emerging from the personality literature, Dweck and her colleagues (Dweck, 1975; Dweck & Leggett, 1988) wanted to understand psychological processes accounting for individual differences in cognition, affect, and behavior. A mastery-oriented behavioral pattern and a maladaptive, "helpless" response were identified. Further studies with children determined that these responses were not dependent on ability level. Consequently, Dweck and colleagues (Dweck & Elliot, 1983) considered behavioral variations guided by goals. Two classes of goals emerged from their work. *Learning goals* that appeared to direct desires of competence and mastery and *performance goals* that operated to gain favorable judgments and avoid negative ones were identified

(Dweck & Leggett, 1988). Significant to Dweck's goal identification system is the hypothesis that goals are a relatively stable trait influenced by either an incremental or entity view of intelligence.

Carol Ames' Social Psychology Perspective on Goals and Classrooms

Ames' interest in student's attributions in achievement settings was influenced by her social psychology training. She speculated that goals and behavioral response patterns could be manipulated by situational factors. Ames' (1984) research on children's puzzle solving abilities identified two conditions. Individualistic conditions encouraged solving as many puzzles as possible whereas competitive conditions focused on solving more puzzles than others. This led her to determine that different responses resulted from the goal structure of the achievement setting. Ames initially referred to these goals as *mastery-focused* and *ability-focused,* but later research (Ames, 1992) led her to use the terms *mastery goals* and *performance goals.* Individuals with mastery goals are characterized as desiring deeper levels of understanding and willing to expend necessary effort. On the other hand, individuals with performance goals focus on ability and self-worth with achievement efforts aimed at besting others by exerting minimal effort to gain favorable public recognition (Ames, 1992).

A research program drawing on the work of both Dweck and Ames was conducted by Maehr and Midgley and their colleagues (Maehr & Midgley, 1991, 1996; Midgley, Arunkumar, & Urdan, 1996). They mainly used the terms *task goals* and *performance goals* in their work with teachers and administrators to re-design school practices and policies to create mastery-focused learning environments. For both the

elementary and middle school settings that engaged in their work, environmental changes did result in students' use of mastery goals for academic achievement.

John Nicholls' Educational Psychology Perspective

Nicholls (1984) viewed goals in relation to the interactions between individuals' ability beliefs and their environment. *Task-involved* goals were activated when individuals engaged in moderately challenging tasks with no physical or mental stress and little to no extrinsic rewards. Nicholls believed that individuals had a natural desire to improve mastery levels. *Ego-involved* goals, by contrast, are activated when tasks are tests of valued skills and competition is promoted. At this time, individuals are focused on their ability. The notion of success is referenced differently for each goal. Task-involved goals reference success within the individual from personally gaining insight or skill. Ego-involved goals reference success externally in relation to outperforming others (Nicholls, 1984). Consequently, Nicholls goal structure addresses when individuals feel successful rather than the more general goal structures that address reasons or purposes for achievement (Pintrich, 2000c). In further research with upper-elementary students, Thorkildsen and Nicholls (1998) note the possibility for individuals to endorse varied goal orientations simultaneously thus allowing for complex goal profiles.

Approach and Avoidance Goal Structures

Elliot and Harackiewicz (1996) have investigated *mastery orientation* and *performance orientation* goals where mastery is defined as focusing on self-referential development of competence. By contrast, a performance orientation is focused externally and defined as demonstrating competence by outperforming peers. While this is not

unlike Nicholls' goal structures by other names, Elliot and his colleagues (Elliot & Church, 1997) made two important distinctions regarding performance goals. *Performance-approach* goals suggest a positive motivation to demonstrate superiority over peers. *Performance-avoidance* goals suggest negative motivation to avoid potential failure, avoid looking stupid, and avoid the appearance of incompetence (Pintrich, 2000c). Other researchers have found similar approach- and avoidance-performance goals (Midgley et al., 1996, 1998).

Summary

Different achievement motivation researchers have advanced models of goal orientation that evolved from their own training and research traditions. Definitions and labels for these models vary somewhat, but they also share common features. Most models assume that goal orientations are the product of both individual characteristics and features in the learning environment, even though relative emphasis between the two may vary among models. Two general goal orientations found in most models that explain reasons individuals would engage in a task are learning or mastery goals and performance goals. Further research has identified both approach and avoidance forms of performance goals. For purposes of this research study, Pintrich's (2000c) model of self-regulation that identifies mastery goals and avoidance and approach forms of performance goals will be used.

Goal Orientations within Pintrich's Model of SRL

The following section will briefly explain how two prominent types of goal orientations operate in SRL. Specifically, goal orientations influence the regulation of

cognition, motivation, behavior and context in Pintrich's model of self-regulated learning.

Mastery Goals

Research from both laboratory and classroom studies shows that students who adopt approach mastery goals that focus on learning and improvement engage in more self-regulated learning (Ames, 1992; Pintrich & Schunk, 1996). Conversely, studies have found negative correlations between mastery goals and surface processing strategies that are generally less effective for achievement (Pintrich & De Groot, 1990; Pintrich & Garcia, 1991). While little research has explicated the relationship between mastery goals and cognition during the planning stage, studies do report a connection between mastery goals and students' more effective monitoring and control of cognition (Pintrich, 2000c). For example, in classroom studies, students self-report more attempts to self-monitor cognition by checking for comprehension and understanding when they set mastery goals for achievement (Dweck & Leggett, 1988; Pintrich & De Groot, 1990). While there is arguably some problems with the use of self-report surveys to measure SRL, research results consistently report mastery goals accounting for 10% to 30% of the variance in cognitive outcomes for nearly all age groups and in many content areas (Pintrich, 2000c).

Mastery goals are linked to motivational beliefs of efficacy, value, interest, attribution, and affect. Much of the theoretical linkage of these motivational beliefs to SRL comes from research on achievement motivation (Pintrich, 2000c). Researchers have found that mastery goals support students' adaptive self-efficacy beliefs, perceptions of competence, and positive attributions that connect effort to success,

especially in the face of difficult tasks (Ames, 1992; Dweck & Leggett, 1988; Nicholls, 1984; Pintrich & Schunk, 1996). In further research studies, mastery goals are positively linked to interest and task value in that more personal interest and enjoyment in the task is reported as well as higher task value ratings of utility and importance of school work (Wolters, 1998). Increased pride and decreased anxiety is also connected to an approach-mastery orientation (Ames, 1992; Dweck & Leggett, 1988). Effective regulation of behavior and context is positively correlated with approach-mastery orientations in that students better manage time, effort, and help-seeking when mastery goals are adopted. Furthermore, it follows that classroom contexts focused on mastery-goal orientations such as reduced social comparisons, provision of feedback and appropriate reward structures will influence interest which in turn supports mastery goal orientations (Pintrich, 2000c). It is the intent of this research study to determine if the literature suggesting that this type of engaging classroom environment is inherent in interdisciplinary studies classrooms such that students improve between pre- and post-test measures of epistemology and self-regulated learning.

Avoidance-mastery goals have received little to no research attention in either achievement motivation research or SRL research. However, it seems plausible that such an orientation would have negative consequences for achievement. For example, an avoidance-mastery goal is hypothesized to create maladaptive help-seeking behaviors since the student would be more concerned with not looking incompetent rather than with deep learning (Pintrich, 2000c).

Performance Goal Orientations

Performance goals have historically been associated with negative cognitive, motivational, and behavioral outcomes (Ames, 1992; Dweck & Leggett, 1988; Pintrich & Schunk, 1996). However, research distinguishing between approach-performance goals and avoidance-performance goals indicates that an approach-performance orientation may lead to more task engagement and less withdrawal, especially when tasks are unchallenging with little opportunity for skill improvement (Harackiewicz, Barron, & Elliot, 1998). Other research is mixed (positive correlations, negative correlations, and no correlations) on the role of approach- and avoidance- performance goals for regulating cognition (Kaplan & Midgley, 1997; Middleton & Midgley, 1997; Wolters, Yu, & Pintrich, 1996) thus indicating a clear need for more studies to distinguish the two approaches (Pintrich, 2000c). The role of performance goals in regulating motivation is also mixed. This is perhaps reflective of differing research agendas and population samples ranging from elementary students where classrooms are more mastery focused to middle schools where the classroom climate is more performance oriented (Pintrich, 2000c). For example, the relation of approach-performance goals has been positively associated with competence (Anderman & Midgley, 1997) and self-efficacy (Wolters et al., 1996). However, Middleton and Midgley (1997) found self-efficacy unrelated to approach-performance goals but negatively related to avoidance-performance goals. For other motivational outcomes, many of these same correlation studies find positive relations between approach-performance goals and interest, intrinsic motivation and task value while avoidance-performance goals produce negative correlations for these same

outcomes (Pintrich, 2000c). As for affect, Wolters et al. (1996) found anxiety uncorrelated with approach-performance goals while Middleton and Midgley (1997) found low negative relations.

In reviewing the achievement goal literature, Pintrich (2000c) finds less research linking performance goal orientations to behavioral and contextual regulation. However, self-handicapping behaviors (procrastination and low effort) and help-seeking avoidance are more likely to occur among students using approach-performance goals (Midgley et al., 1996; Ryan & Pintrich, 1997).

In general, it appears that an approach-performance goal orientation is more adaptive than an avoidance-performance orientation. While an approach-performance goal orientation can positively connect to cognition and motivation (Harackiewicz et al., 1998), a focus on besting others may have its costs such as increased anxiety and decreased use of help-seeking strategies (Pintrich, 2000c). It is hoped that future research on approach-performance goals will identify factors that mediate the relationship between those goals and achievement. At this time, SRL researchers recognize the prominent role various goal orientations play in self-regulated learning (Pintrich, 2000b).

Measuring Self-Regulated Learning

For the most part, SRL is measured as an aptitude using self-report surveys (Winne & Perry, 2000). According to Muis, Winne, and Jamieson-Noel (2007), three widely used instruments in assessing self-regulation are *The Learning and Study Strategies Inventory* (Weinstein, 1987), *The Meta-cognitive Awareness Inventory* (Schraw & Dennison, 1994) and *The Motivated Strategies for Learning Questionnaire*

(Pintrich, Smith, Garcia, & McKeachie, 1993b). A brief look at the theoretical underpinnings of each survey and why the MSLQ was selected for this research study will follow.

The Learning and Study Strategies Inventory (LASSI)

The LASSI's cognitive theoretical framework measures the types of learning strategies individuals use when learning. Weinstein conceptualized learning strategies as both behaviors and thoughts intended to influence the learner's encoding processes (Weinstein & Mayer, 1986). Consequently, the LASSI focuses on learners' use of cognitive processing. These processing skills are measured along 10 subscales: attitude, motivation, time management, anxiety, concentration, information processing, selecting main ideas, study aids, self testing and test strategies. Using a five-point Likert-scale, learners select among five to eight items on each scale and indicate to what extent that item describes them (Weinstein, 1987).

Meta-Cognitive Awareness Inventory (MAI)

The MAI was developed from a meta-cognitive theoretical framework. This framework assumes that metacognition involves both knowledge of cognition and the regulation of cognition. Knowledge of cognition, for example, reflects stable information a learner possesses about how he or she stores and retrieves information. Regulation of cognition, however, engages more unstable processes that are task and situation specific such as planning prior to task engagement or checking outcomes against goals (Muis et al., 2007). The inventory is composed of 52-items with eight subcomponents to measure the two broad categories of metacognition. Students are instructed to rate how true an

item is for them by marking a point on a 100mm bipolar scale with true and false at opposite ends of the scale (Schraw & Dennison, 1994).

The Motivated Strategies for Learning Questionnaire (MSLQ)

A self-report, Likert-scaled instrument, the 81-item MSLQ was designed to assess college students' motivational orientation and use of learning strategies. Originally developed in 1982 to evaluate the "Learning to Learn" course at the University of Michigan, further refinement of the MSLQ has produced an instrument with desirable validity and reliability (Pintrich et al., 1993b).

Based on a social cognitive model of motivation, three general motivational constructs are proposed: expectancy, value, and affect. The two expectancy-related subscales measuring students' beliefs that they can accomplish a task are self-efficacy beliefs and control beliefs for learning. Three subscales measuring the value component or why students would engage in an academic task are (a) intrinsic goal orientation with its focus on mastery learning, (b) extrinsic goal orientation with its focus on grades and approval from others, and (c) task value beliefs that initiate judgments of how interesting, useful or important course material is to the student (Pintrich et al., 1993b). The third general motivational construct of affect is operationalized to measure test anxiety. Neither the LASSI nor the MAI attempts to capture motivational constructs. A general cognitive model, not wholly unlike the LASSI or MAI, frames the learning strategies section. The three general types of scales are cognitive, metacognitive and resource management. The cognitive subscales tap both surface and deeper processing strategies such as rehearsal (more surface) and elaboration and organization strategies (deeper). A

subscale of critical thinking is included to tap the more sophisticated strategy of applying previous knowledge and making evaluations. The second category of metacognition measures students' ability to control and regulate their own cognition. For example, this single subscale includes planning and goal setting, monitoring comprehension while reading, and adjusting learning behaviors to suit the task. Finally, the third general category of learning strategies is resource management and includes four subscales: managing time and study environment, regulating effort, peer learning, and help-seeking (Pintrich et al., 1993b).

The MSLQ presumes the learner to be an active processor of information whose beliefs and cognitions are important mediators of instructional input and task characteristics. The relationship between an expectancy-value model of motivation and cognition is acknowledged in this instrument. In its intended format, the MSLQ contextualizes motivation and learning strategies by assessing them within the specific course as opposed to generalization across several courses (Pintrich et al., 1993b). However, some research studies have adjusted the wording to make the MSLQ items work for more generalized assessments (Muis et al., 2007). Psychometric properties of the MSLQ will be addressed more fully in the methodology section of this document.

Since one focus of this research study is to determine whether or not an interdisciplinary studies course influences both motivational and strategic components of self-regulated learning, it seems more beneficial to use a measure of SRL that captures both of those components. Consequently, the *Motivated Strategies for Learning Questionnaire* (Pintrich, Smith, Garcia, & McKeachie, 1991) was used in this research

study. The following section will revisit the theoretical framework for this study by further connecting interdisciplinary studies, personal epistemology, and motivational and strategic components of self-regulated learning.

Connecting Interdisciplinarity, Personal Epistemology, and Self-Regulated Learning

In Hofer's (2001) discussion of the implications of personal epistemology research for learning and teaching, she indicates that models of epistemology are needed that will accommodate the complexity of the construct and connect it to other areas of research in educational psychology and cognitive development. In her own work, Hofer (2004b) has reconceptualized personal epistemology as a metacognitive process or "epistemic cognition." This has important connections to motivational and strategic components of self-regulated learning since metacognition and metacognitive processes figure prominently in models of SRL (Pintrich, 2000c; Pintrich & Zusho, 2002). Believing that more complexity offers more explanatory power, Schommer-Aikens (2004) has suggested an *embedded systems model* to broaden the research scope.

> The need for an *embedded systems model* of epistemological beliefs, that is, a model that includes many other aspects of cognition and affect, comes from the assumption that epistemological beliefs do not function in a vacuum. Indeed, at any given moment, learners' thoughts, actions, or motivations represent the convergence of multiple systems. (p. 23)

This proposed model assumes interactions among six systems: "(a) cultural relational views, (b) beliefs about 'ways of knowing,' (c) beliefs about knowledge, (d) beliefs about learning, (e) classroom performance, and (f) self-regulated learning"

(Schommer-Aikens, 2004, p. 24). Schommer-Aikens' earlier work on epistemology (Schommer, 1990) did not separate beliefs about knowledge from beliefs about learning. By separating the two in this model, Schommer-Aikens believes researchers can better examine their interrelationship and "the influence that systems of epistemological beliefs may have on classroom performance and self-regulated learning, and the potential feedback loop in which classroom performance and self-regulated learning may lead to revisions in epistemological beliefs" (pp. 25-26). This model's inclusion of self-regulated learning and its suggestions of a potential feedback loop lend credence to this proposed study that identifies both personal epistemology and motivational and strategic components of self-regulated learning for measurement in IDS contexts.

Bendixen and Rule (2004) have also proposed an integrative approach to personal epistemology that details mechanisms for change. In their model, individuals experience conditions evoking feelings of dissonance or feelings of personal relevance that may involve interest, self-efficacy, and emotional involvement. Either of these conditions may instigate epistemic doubt, the first mechanism for change. Affect and metacognition are necessary for these two conditions to arouse epistemic doubt. Epistemic volition or the will to change must follow in order to reach the third mechanism of change, resolution strategies. Successfully negotiating resolution strategies, which Bendixen and Rule (2004) believe involve both personal reflection and social interaction, potentially leads to more advanced beliefs. A reciprocal component is also suggested since more advanced beliefs beget the ability to generate more advanced beliefs. This is a "dynamic process driven by many factors including context, affect, and environment" (p. 73). The

classroom environment is implicated in their model for future educational research on epistemic change. With this model in mind, it might follow that interdisciplinary learning environments with their purported emphasis on cooperative and engaged learning might provide at least some of the components Bendixen and Rule believe are necessary for epistemic change to occur. For example, a university Global Experience class, with its emphasis on examining controversial global issues, may generate at least one condition for initiating epistemic change—dissonance. Bendixen's interest in epistemological development has also included a research agenda with colleagues to develop a measure of epistemology, the Epistemic Beliefs Inventory (Schraw et al., 2002).

An empirical testing of all components of either the Schommer-Aikens (2004) or the Bendixen and Rule (2004) model of integrated epistemology demands a complex, sophisticated research agenda beyond the scope of this research study. However, examining the impact of interdisciplinary coursework as compared to disciplinary coursework on students' development of personal epistemology and self-regulated learning finds some level of congruence within these two models.

Summary

Proponents of interdisciplinary studies argue theoretically that integrated learning occurs best in that context and also affords students a superior learning environment for developing sophisticated epistemologies as well as motivational and strategic components of self-regulated learning. Empirical validation of this claim is lacking. Educational researchers are beginning to explore the role personal epistemology plays in the constraint and facilitation of learning, particularly motivated strategies for self-

regulated learning. An exploratory study that examines the impact of both interdisciplinary and disciplinary coursework on first-year college students' development of personal epistemology and motivational and strategic components of self-regulated learning is proposed. It may possibly illuminate the types of contextual and personal factors that influence academic learning.

This study adds to the literature by examining whether or not engagement in interdisciplinary coursework provides a uniquely sufficient context for enhancing learning and performance. For example, would the tasks in Global Experience, an interdisciplinary first-year university seminar, that focus on ill-structured problems of global issues, critical thinking, and the questioning of assumptions provide a more ideal context for students to expect academic success and engender value? Does this IDS context seem to offer more opportunities for students to examine their self-schemata such that personal epistemologies are uncovered and examined? Do students' personal epistemologies and self-regulated learning develop to a greater extent when interdisciplinary coursework is part of their semester's work? Succinctly, a pre-test post-test format was used in this study to empirically explore linkages of the impact of both interdisciplinary and disciplinary coursework on first-year students' epistemologies, and motivational and strategic components of self-regulated learning.

CHAPTER III

METHODOLOGY

Literature theorizing the benefits of interdisciplinary studies argues its superiority over disciplinary contexts for promoting student learning, including the development of critical thinking, motivation, and self-regulated learning (Davis, 1995; Lattuca et al., 2004). Empirical studies testing this theory are lacking. Empirical studies examining the dimensions of personal epistemology, its connection to learning outcomes and learning processes, and its operation in varying contexts are increasing (Braten & Stromso, 2005; Kardash & Howell, 2000; Paulsen & Feldman, 1999; Schommer, 1990, 2002; Schommer et al., 1992). Consequently, this research study sought to examine the impact that inclusion of an interdisciplinary seminar in first-semester coursework has on university students' development of personal epistemology and motivational and strategic components of self-regulated learning.

Design

This study used a quasi-experimental research design because the participants, first-year students entering a mid-sized southeastern United States university in fall 2006, were not randomly assigned to groups (Mertens, 1998). Group assignment, enrollment in Global Experience or no enrollment, is the independent variable for this study. Embedded in this quasi-experimental design is a nonequivalent control group design (Mertens, 1998) because pre- and post-tests were administered for the dependent variables. Dependent

variables for this study are the measures of personal epistemology, motivational components of self-regulated learning, and strategic components of self-regulated learning.

Participants

The participants were first-year students who entered the university in the fall of 2006. Volunteers for the study were recruited within the first-year advising seminar by seminar instructors who agreed to use class time to conduct pre- and post-testing according to a written protocol (Appendices C and D). All volunteers signed Consent Forms (Appendix E). The final sample size, comprised of students who fully completed both the pre- and post-test surveys, was 490. Females (N = 287) represented 58.6% of the sample and males (N = 203) made up the remaining 41.4%. The corresponding gender distribution of that first-year class at the university was 58% female and 42% male. Therefore gender distribution in the sample for this study was typical of a first-year class. Among the 490 freshman volunteers the ethnic distribution percentages are 93% white (N=456), 3.3% African-American (N=16), 1.4% Hispanic (N=7), .4% Asian (N=2), 1.6% Multi-ethnic (N=8), and 1 student did not identify. Since students at this university are predominantly of traditional college age, most first-year students in this study were 18 (88%). The remaining 12% was 19 years old. The percentage of this study's sample that was enrolled in the interdisciplinary seminar, Global Experience, along with traditional disciplinary coursework was 57% (N=279). The remaining 43% (N=211) were only in a distribution of disciplinary coursework.

Other self-reported demographic data included the highest level of education of each parent. The distribution of educational attainment among the fathers was 8.4% high school, 11% some college, 33.9% college, 25.9% masters degree, 10.8% professional degree, 9.4% doctoral degree. Three students did not report. For mothers, the percentages were 5.5% high school, 12% some college, 45.9% college, 27.8% masters degree, 5.7% professional degree, 2.9% doctoral degree. One student did not report mother's education.

Using the university's data management system, Datatel, the following test summaries were extracted for the participants: SAT math mean was 615 and median was 620; SAT verbal mean was 603 and median was 600. The average high school GPA on course work considered for admission to the university was 3.9. This course work used to calculate GPA included math, science, English, foreign language, social studies, and full credit social sciences. The average number of AP, IB, or co-curricular credits earned prior to attending university was 4.5. However, 54% of the class did not bring any credits with them to the university.

When students were asked whether or not their high school course work presented controversial issues 34% said "regularly"; 54% marked "sometimes"; 12% said "rarely"; and less than 1% marked "never." On a related question of whether or not high school course work taught them how to analyze controversial issues 32% said "regularly"; 49% indicated "sometimes"; 17% marked "rarely"; and 1.8% indicated "never." Since epistemic doubt is frequently connected to studies of epistemic change (Bendixen, 2002),

these questions were added in order to get some sense of previous exposure to controversy thus potentially predisposing a student to consider alternative ideas.

Measures

Epistemic Beliefs Inventory or EBI

This is a 28-item self-report instrument designed to measure adults' beliefs about *Certain Knowledge* (example: The moral rules I live by apply to everyone.), *Simple Knowledge* (example: Instructors should focus on facts instead of theories.), *Quick Learning* (example: Working on a problem with no quick solution is a waste of time.), *Omniscient Authority* (example: People shouldn't question authority.), and *Innate Ability* (example: How well you do in school depends on how smart you are.) (Schraw et al., 2002, p. 263). Students respond to grammatically simple statements, each titled from the naïve perspective, by indicating their level of agreement using a five-point Likert scale: 1 corresponds to "strongly disagree" and 5 corresponds to "strongly agree." Unlike the MSLQ, low scores on the EBI are desirable and indicative of a more complex, sophisticated epistemological belief system. Consequently, all items for this measure were reverse scored to be directionally consistent with the MSLQ and thus facilitate clarity and ease of reporting for data analysis. The mean of the items that make up the factor is the factor score.

Items used in the EBI were constructed from criteria that matched Schommer's (1990) five epistemic factors with some items paraphrased from Schommer's 63-item *Epistemological Questionnaire* (EQ). Although Schommer's EQ is more widely used in the literature, the 28-item EBI was designed to be more efficiently administered than the

EQ and to offer other positive benefits. For example, during development and validation of the EBI, as compared to the EQ, analysis yielded five factors with eigenvalues greater than one that explained 60% of the variance whereas the first five factors on the EQ explained 35.5% of the variance (Schraw et al., 2002). Correlating the EBI with a test of reading comprehension produced better predictive validity than did correlation with the EQ. The EBI appeared more reliable over time in that "replication analysis revealed the same number of factors, the same item-to-factor loadings for each test item, the same amount of sample variation explained, and an acceptable test-retest correlation among the five factors" (Schraw et al, 2002, p. 272). While subsequent research and factor analysis using Schommer's EQ has not confirmed the hypothesized fifth factor of omniscient authority, the EBI did confirm that factor, and includes it as part of that survey (Schraw et al., 2002). Studies have reported reliabilities for scales in the *Epistemological Beliefs Inventory* (EBI) as ranging from .67 to .87 (Bendixen, Schraw, & Dunkle, 1998). Reliabilities for the *Epistemological Questionnaire* (EQ) have been reported lower and ranging from .63 to .85 (Schommer, Calvert, Gariglietti, & Baja, 1997) and from .51 to .78 (Schommer, 1993). More importantly scale scores for the EBI are calculated directly from item responses as opposed to the EQ item subset scores and sample-specific factor analysis (Debacker & Crowson, 2006). This researcher acknowledges that reliabilities on the EBI are lower than desirable. However, in the absence of self-report survey measures with stronger psychometric properties and in the presence of genuine concern for participant survey fatigue, this shorter measure of personal epistemology was chosen. See Appendix A for the survey.

Finally, participants for the validation of the EBI were 160 undergraduates. Nearly twice as many females as males were represented in that sample with ages ranging from 18-46. Only 4% (approximately 6 students) were freshman level. While this matches the sample used to validate Schommer's (1990) EQ and thus served Schraw et al.'s (2002) purposes for validating the EBI, it has the potential to affect the factor structure for this research study's participant population. The next chapter on results of the study will further address this issue.

Motivated Strategies for Learning Questionnaire or MSLQ

This is an 81-item, self-report instrument designed to measure college students' motivational orientations and their use of different learning strategies for college courses. It is designed to be given in class and takes approximately 20-30 minutes to complete. Two scales of the survey, motivation, and learning strategies are scored on a 7-point Likert scale, from 1 (not at all true of me) to 7 (very true of me).

> The motivation section consists of 31 items that assess students' goals and value beliefs for a course, their beliefs about their skills to succeed in a course, and their anxiety about tests in a course. The learning strategy section includes 50 questions: 31 items regarding students' use of different cognitive and metacognitive strategies and 19 items concerning student management of different learning resources. (Pintrich et al., 1993b, p. 804)

The mean of the item that makes up the scale is the scale score. For negatively worded items, ratings are reversed before individual scores are computed. The 15 different scales on the MSLQ are designed to be modular and can be used together or separately. Pintrich et al.'s (1993b) analysis on the MSLQ suggests it has relatively good reliability in terms of internal consistency. Two confirmatory factor analyses indicate that the general

theoretical framework and the scales that measure it appear to be valid. “The six motivational subscales and the nine learning strategies subscales represent a coherent conceptual and empirically validated framework for assessing student motivation and use of learning strategies in the college classroom” (Pintrich et al., 1993b, p. 812).

Three different waves of data collection in the late 1980’s involving over 1600 college students along with the last validation study in 1990 yielded the final version of the MSLQ that was used in this study (Pintrich et al., 1991). Used extensively to measure motivational and strategic components of self-regulated learning, the MSLQ is widely published in research articles (Duncan & McKeachie, 2005). However, caution is still encouraged when interpreting self-report data. Duncan and McKeachie (2005) report different factor structures emerging when assessing junior high students and college students, even though the results still fit within the overall conceptual model. It seems to follow that factor structure may also vary within the college population when the range of ages is significantly restricted. More will be said about factor structure for this study’s population in the next chapter.

For this research, the MSLQ was reworded to reference courses or classes taken rather than a specific course. Also, the affective component of test anxiety will not be included for analysis in the motivation scale since the focus of this study will be efficacy beliefs, goal orientation, and interest. See Appendix B for the MSLQ survey.

Procedures

Data from the 490 first-year student volunteers were gathered over the course of one semester in a pre-test, post-test format. At pre-testing session 1, students provided

informed consent, completed the *Epistemic Beliefs Inventory* and then the *Motivated Strategies for Learning Questionnaire*. Students also provided demographic data. This initial session occurred the second week of September. At post-testing session 2, students again completed the EBI and then the MSLQ. Session 2 was conducted after Thanksgiving break in November. At each test session conducted in the first-year advising seminar class, faculty was asked to read the protocol statements found in Appendices C and D prior to survey distribution. To reiterate, students answered the MSLQ based on a general orientation to their first-semester coursework and not in relation to a specific course. The measure was reworded to reflect that general orientation. For example, the statement "It is important for me to learn the course material in this class" was reworded to a more general statement of "It is important for me to learn the course material in my classes." This change was made to accommodate the lack of access to specific classes for this study. Many faculty in the one-credit first-year advising seminar course, however, agreed to allocate class time for pre- and post-testing.

Data Analysis

Initial Data Analysis

Data analyses were conducted on both survey instruments, EBI and MSLQ, prior to answering the specific research questions. Using SPSS software, a factor analysis was conducted on the *Epistemic Beliefs Inventory* and the *Motivated Strategies for Learning Questionnaire* to see if the structure matched the sample. Cronbach's alpha was used as a measure of scalability. Adjustments were made to individual measures since the

populations on which both the EBI and MSLQ were validated differed from this study's population. More specifics will be detailed in the following chapter. Since the research design involved pre- and post-testing, factor analysis determined the structure for each inventory, but scale scores were used to measure pre-post changes. Scales for both the EBI and the MSLQ were constructed after identifying variables that loaded on both pre- and post-test factor structures. Scale scores were constructed from the mean of the items that made up each scale. Reliability was determined by correlating pretest scores with posttest scores for each scale within the two primary measures, EBI and MSLQ.

Data Analysis for Research Question 1 and Sub Questions

The first research question and sub questions asked if there are significant pre-post mean changes during the first semester for measures of epistemic beliefs and motivated and strategic components of self-regulated learning that are accounted for by the inclusion of Global Experience, the interdisciplinary course. To discover change over time and whether or not the Global Experience course influenced change over time, SPSS software was used to conduct repeated measures MANOVA for each resulting scale of the EBI and MSLQ. In this design, repeated measures multivariate analysis of variance used time (pre, post) as a within-subjects measure and treatment group (GST 110 course, no GST 110 course) as a between-subjects measure.

Data Analysis for Research Question 2

The third research question asks if factor scores on the EBI and MSLQ influence end-of-semester grades. Using SPSS software, bivariate correlations were conducted with first-term cumulative GPA as the dependent variable and pre-test and post-test scale

scores for EBI and MSLQ as independent variables. Scales that indicated significance from the bivariate correlation were then used in a stepwise multiple regression analysis to determine which significantly influenced end-of-term GPA. Results and discussion of these analyses follow.

CHAPTER IV

RESULTS

The purpose of this research study was twofold. First, this study explored the level of change first-year students experienced during the first semester on measures of personal epistemology and motivated and strategic components of self-regulated learning. To accomplish this task, the Epistemic Beliefs Inventory and the Motivated Strategies for Learning Questionnaire were administered to students in a pre-post testing format during the 2006 fall semester. As a subsection of the first level concern, this study explored whether or not a required interdisciplinary seminar, Global Experience, included as part of students' first term course load, significantly contributed to the development of these measures at levels different from students whose course loads did not include Global Experience. Finally, this study explored whether or not scales within each measure, EBI and MSLQ, influenced end-of-semester cumulative grade point averages for all students. Preliminary analysis will address the factor structure of each survey instrument, how scale scores were constructed, and reliability. The main analysis will address the two research questions and present statistical analyses performed on data collected from 490 first-year student participants.

Preliminary Factor Analysis of Surveys

Epistemic Beliefs Inventory

As indicated earlier in this document, the EBI was chosen as a self-report paper and pencil survey offering greater ease and efficiency of administration compared to the more common *Epistemological Questionnaire* by Schommer (1990). During validation, varimax rotation analysis of the EBI yielded five factors with eigenvalues greater than one that explained 60% of the total sample variation. These five factors were labeled Omniscient Authority, Certain Knowledge, Quick Learning, Simple Knowledge, and Innate Ability. These resulting factors were accomplished with a 28-item survey compared to Schommer's 63-item *Epistemological Questionnaire*. When coupled with an additional survey of significant length, such as the 81-item MSLQ, a survey with fewer items would seem to minimize survey fatigue during a testing session. Factor analysis was conducted on the EBI for this study's population.

Factor analysis assumes that a "battery of intercorrelated variables has common factors running through it and that the scores of an individual can be represented more economically in terms of these reference factors" (Fruchter, 1954, p. 44). Fruchter (1954) goes on to say that an individual's score on a test is dependent on two things: the specific abilities the test is assessing and the amount of these abilities possessed by the examinee. The five factors that emerged during the Schraw et al. (2002) validation of the EBI were drawn from a student sample whose ages ranged from 18-46, with only 4% at the freshman level. The population for this study, however, was comprised of 490 students whose ages were 18-19; thus, 100% were freshman level. Additionally, 58% of this

study's sample was female compared to a 65% female sample for validating the EBI. These combined differences may account for the variability in item-to-factor loadings that emerged between the two populations. The results of factor analyses of the EBI for this study follow.

Cronbach's alpha was used as a measure of scalability for the entire survey. For the survey as a whole, pre-test coefficient α (.49) and post-test coefficient α (.51) were weak. As mentioned earlier in this document, pencil and paper measures of epistemology with strong psychometric properties are still lacking in the field. However, each scale score created from the EBI for this study presented a stronger coefficient α. Using the varimax rotation feature for data reduction in SPSS, this researcher initially found eleven factors with eigenvalues greater than one. However, factors 4-11 had only one to two variable loadings per factor with weak coefficient α. To achieve conceptual clarity and acceptable scalability, final data reduction was conducted specifying four factors. From this analysis, three factors emerged with eigenvalues of one or greater. Those factors were also accompanied by a low, but acceptable reliability statistic of .6 or higher: Quick Learning (E = 3.89; α = .64), Innate Ability (E = 2.44; α = .70), and Omniscient Authority (E = 1.97; α = .65). These three factors accounted for 22.6% of the variance. The fourth factor had an eigenvalue greater than one, but reliability coefficient α was below .6; therefore, it was not included. Items that did not load together at .5 or higher on both pre- and post-testing were excluded from the creation of scale scores. It is important to note, that while item-to-factor loadings differed, the conceptual features of the EBI remained intact. That is, the characteristic names of the factors were unchanged,

even though all five factors did not emerge. Factor analysis seemed to offer a viable method for evaluating construct validity of the instrument with the participants of this study according to their academic experiences and age (see Table 1).

Table 1

Factor Structure of the Epistemic Beliefs Inventory (EBI) for this Study

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Factor 1: Quick Learning (Eigenvalue = 3.87; α = .64)

Q 27. Working on a problem with no quick solution is a waste of time. (.64)
Q 15. If you don't learn something quickly, you won't ever learn it (.60)
Q 18. If two people are arguing about something, at least one of them must be wrong. (.55)
Q 20. If you haven't understood a chapter the first time through, going back over it won't help. (.54)

Factor 2: Innate Ability (Eigenvalue = 2.44; α =.65)

Q 24. Smart people are born that way. (.67)
Q 5. People's intellectual potential is fixed at birth. (.62)
Q 14. How well you do in school depends on how smart you are. (.60)
Q 16. Some people just have a knack for learning and others don't (.58)
Q 8. Really smart students don't have to work as hard to do well in school. (.50)

Factor 3: Omniscient Authority (Eigenvalue = 1.97; α =.65)

Q 26. People shouldn't question authority. (.68)
Q 4. People should always obey the law. (.66)
Q 19. Children should be allowed to questions their parents' authority (.58)*
Q 25. When someone in authority tells me what to do, I usually do it (.56)

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* = reverse keyed

With the forced four-factor structure for data reduction, a minimum of 4 items loaded onto each factor unlike the minimum of three for the validation study by Schraw,

et al. (2002). Items that loaded appeared to have acceptable face validity. Both survey populations (Schraw et al., 2002 study and this study) shared the same marker variables for Quick Learning and Omniscient Authority. The three items that were present in Schraw et al. (2002) factor for Innate Ability were also present in the factor structure for this research population. Item-to-factor loadings indicated in Table 1 held for both pre- and post-testing such that scale scores were created by taking the mean of those items. Therefore, scales from the EBI used to measure personal epistemology were Innate Ability, Quick Learning, and Omniscient Authority. Given the limitations mentioned previously, the test-retest reliability statistic was also weak with coefficient α ranges at .40 (Omniscient Authority), .50 (Innate Learning), and .65 (Quick Learning).

Motivated Strategies for Learning Questionnaire

The MSLQ was also developed and validated on a population with greater age and academic variability than this study's population. For example, the last validation sample of students for the 1991 version used in this study (N=380), identified 20 freshmen (Pintrich et al., 1991). In the manual, Pintrich et al. (1991) note that there are no normative data for the MSLQ and users are encouraged to develop norms for their respective campuses with repeated use. Therefore, it is perhaps not surprising that scales emerged differently during factor analysis for this study population. While item-to-factor loadings were different for this study, the conceptual distinction between the motivation scales and the learning strategies scales held. That is, none of the variables designed to measure motivation loaded onto the learning strategies scales and vice versa. The

following discussion will address the motivation section and the learning strategies section of the MSLQ separately.

Motivation Scales

Using Cronbach's alpha as a measure of scalability, pre-test coefficient α (.85) and post-test coefficient α (.86) for the entire survey were acceptable. Again using the varimax rotation feature for data reduction in SPSS, this researcher identified five factors with eigenvalues of one or greater and acceptable coefficient α (≥ .65). These five factors accounted for 48% of the variance.

Scales scores were constructed for the factors by taking the mean of the items that made up that scale as long as the items loaded together for both pre- and post-test factor analyses. For example, question number 31 (Q31) did not load on the post test with the other items for the Self-Efficacy for Learning and Performance scale. Consequently, it was omitted from the creation of that scale score. However, a different adjustment was made in the creation of a scale score for factor 4, Extrinsic Goal Orientation. The first two variables listed under Extrinsic Goal Orientation in Table 2 (Q's 7 and 11) split apart from Q 13 and Q 30 on the post-test. No other variables loaded with this split. Because of acceptable face validity for these four variables and a post-test coefficient α of .69 when they were force-loaded together, these four variables were kept together in the creation of a scale score for Extrinsic Goal Orientation. With the exception of what was just discussed for Self-Efficacy and Extrinsic Goal Orientation, all other item-to-factor loadings represented in Table 2 remained unchanged from pre- to post-testing.

Table 2

Factor Structure for the MSLQ: Motivation

Factor 1: Self-Efficacy for Learning and Performance (Eigenvalue = 7.73; α = .87)

Q 5. I believe I will receive excellent grades in my classes. (.73)
Q 6. I'm certain I can understand the most difficult material presented in the reading for my courses. (.60)
Q15. I'm confident I can understand the most complex material presented by the instructor in my courses. (.61)
Q 20. I'm confident I can do an excellent job on the assignments and tests in my courses. (.79)
Q 21. I expect to do well in my classes. (.68)
Q 29. I'm certain I can master the skills being taught in my classes. (.72)
Q 31. Considering the difficulty of my courses, the teachers, and my skills, I think I will do well in my classes. (.70)

Factor 2: Task Value (Eigenvalue = 3.41; α = .82)

Q 4. I think I will be able to use what I learn in my courses. (.69)
Q 17. I am very interested in the content area of my courses. (.72)
Q 23. I think the course material in my classes is useful for me to learn. (.70)
Q 26. I like the subject matter of my courses. (.78)
Q 27. Understanding the subject matter of my courses is very important to me. (.61)

Factor 3: Test Anxiety (Eigenvalue = 2.44; α = .78)

Q 3. When I take a test I think about how poorly I am doing compared with other students. (.70)
Q 8. When I take a test I think about items on other parts of the test I can't answer. (.65)
Q 14. When I take tests I think of the consequences of failing. (.61)
Q 19. I have an uneasy upset feeling when I take an exam. (.80)
Q 28. I feel my heart beating fast when I take an exam (.79)

Factor 4: Extrinsic Goal Orientation (Eigenvalue = 1.50; α = .70)

Q 7. Getting good grades in my classes is the most satisfying thing for me right now. (.77)
Q 11. The most important thing for me right now is improving my overall grade point average, so my main concern in my classes is getting good grades. (.85)
Q 13. If I can, I want to get better grades in my classes than most of the other students. (.55)
Q 30. I want to do well in my classes because it is important to show my ability to my family, friends, employer, or others. (.56)

Factor 5: Intrinsic Goal Orientation (Eigenvalue = 1.35; α = .65)

Q 1. In my classes, I prefer course material that really challenges me so I can learn new things. (.60)
Q 16. In my classes, I prefer course material that arouses my curiosity, even if it is difficult to learn. (.64)
Q 24. When I have the opportunity in my classes, I choose course assignments that I can learn from even if they don't guarantee a good grade. (.71)

The resulting four scales used to measure motivation in this study were Self-Efficacy for Learning and Performance (often referred to as Efficacy), Task Value, Extrinsic Goal Orientation, and Intrinsic Goal Orientation. Test-retest reliability statistics were acceptable with coefficient α ranges from .75 to .77. Test anxiety was excluded in the creation of a scale score. It would not be used in further analyses in keeping with an expectancy-value conceptualization of motivation.

Learning Strategy Scales

Using Cronbach's α as a measure of scalability for the entire survey, pre-test coefficient α (.91) and post-test coefficient α (.91) were strong. Data reduction using varimax rotation yielded 11 factors with eigenvalues of one or greater. However, only the first five factors had more than two item-to-factor loadings and strong coefficient α (≥ .75) as illustrated in Table 3. These five factors also explained 42.4% of the variance.

Analysis of factors 1, 4, and 5 for this study yielded combinations of variables from other scales in Pintrich's MSLQ manual (Pintrich et al., 1991). The first factor name combined two labels from the original MSLQ: Effort Management plus Time and Study. However, factors 4 and 5 were relabeled to better represent the common feature of all the variables that loaded onto that factor, i.e. Written Study Behaviors and Peer Learning. In order to create scale scores from the factors, a second factor analysis using varimax rotation was conducted on post-test scores to see if the structure and item-to-factor loadings were the same. They remained consistent except for the first factor, effort management and time and study. On the post-test, this factor structure disappeared because five of the eight pre-test variables did not load at all and the remaining three did

not load with each other. Consequently, no scale score was created for this factor. Scale scores were created for the remaining factors listed in Table 3 because each held the same item-to-factor loadings on both the pre- and post-tests. The four remaining scales used in this study to measure learning strategies were Elaboration, Critical Thinking, Written Study Behaviors, and Peer Learning. Test-retest reliability statistics were acceptable with coefficient α ranges from .71 to .82.

Table 3

Factor Structure for MSLQ: Learning Strategies

Factor 1: Effort Management and Time & Study (Eigenvalue = 9.98; α = .82)

Q 41. When I become confused about something I'm reading for my classes, I go back and try to figure it out. (.51)
Q 43. I make good use of my study time for my courses. (.54)
Q48. I work hard to do well in my classes even if I don't like what we are doing. (.61)
Q 60. When course work is difficult I either give up or only study the easy parts. (.55)
Q 70. I make sure I keep up with the weekly readings and assignments for my courses. (.71)
Q 73. I attend my classes regularly. (.65)
Q74. Even when course materials are dull and uninteresting, I manage to keep working until I finish. (.71)
*Q 80. I rarely find time to review my notes or readings before an exam. (.53)

Factor 2: Elaboration (Eigenvalue = 3.92; α = .77)

Q 53. When I study for my classes, I pull together information from different sources, such as lectures, readings, and discussion. (.51)
Q 62. I try to relate ideas in my course subjects to those in other courses whenever possible. (.62)
Q 64. When reading for my classes, I try to relate the material to what I already know. (.60)
Q 69. I try to understand the material in my classes by making connections between the readings and the concepts from the lectures. (.66)
Q 81. I try to apply ideas from course readings in other class activities such as lecture and discussion. (.67)

Table 3—Cont'd

Factor Structure for MSLQ: Learning Strategies

Factor 3: Critical Thinking (Eigenvalue = 3.28; α = .79)

Q 38. I often find myself questioning things I hear or read in my courses to decide if I find them convincing. (.73)
Q47. When a theory, interpretation, or conclusion is presented in my classes or in the readings, I try to decide if there is good supporting evidence. (.70)
Q 51. I treat course material as a starting point and try to develop my own ideas about it. (.60)
Q 66. I try to play around with ideas of my own related to what I am learning in my courses. (.56)
Q 71. Whenever I read or hear an assertion of conclusion in my classes, I think about possible alternatives. (.74)

Factor 4: Written Study Behaviors (Eigenvalue = 2.05; α = .75)

Q 32. When I study the reading for my courses, I outline the material to help me organize my thoughts. (.68)
Q 49. I make simple charts, diagrams, or tables to help me organize course material. (.58)
Q 63. When I study for my courses, I go over my class notes and make an outline of important concepts. (.77)
Q 67. When I study for my courses, I write brief summaries of the main ideas from the readings and my class notes. (.59)
Q 72. I make lists of important items for my courses and memorize the lists. (.61)

Factor 5: Peer Learning (Eigenvalue = 1.98; α = .75)

Q 45. I try to work with other students from my classes to complete the course assignments. (.81)
Q 50. When studying for my courses, I often set aside time to discuss course material with a group of students from the class. (.72)
Q 68. When I can't understand the material in my courses I ask another student from my classes for help. (.73)
Q 75. I try to identify students in my classes whom I can ask for help if necessary. (.59)

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* = reversed scored

Descriptive statistics for each measure are presented next. Then primary data analyses used to answer the two research questions follow.

Descriptive Statistics for Scale Scores

Prior to reporting statistical analyses for each research question, descriptive statistics for all scales of the EBI and MSLQ indicate general trends and observations for means of the data (see Table 4).

Table 4

Descriptive Statistics: Pretest and Posttest Means and Standard Deviations by Group for the Epistemic Beliefs Inventory

	Epistemic Beliefs Inventory Scales*					
	Quick Learning		Innate Learning		Omniscient Authority	
	Pre	Post	Pre	Post	Pre	Post
Global	3.78 (.79)	3.61 (.78)	3.21 (.60)	3.10 (.58)	2.95 (.53)	2.90 (.53)
No Global	3.64 (.78)	3.49 (.75)	3.11 (.61)	3.06 (.58)	2.93 (.53)	2.98 (.55)
Total	3.72 (.79)	3.56 (.77)	3.17 (.61)	3.08 (.56)	2.94 (.53)	2.94 (.54)

*Range: 1 (Strongly agree) to 5 (Strongly disagree)

Epistemic Beliefs Inventory

The possible range of scores was 1 to 5 with high scores indicating a more sophisticated epistemology. A mid-point score on this scale would be 2.5 and all students self-reported above the mid-point for each of the three scales. Taken as a whole, students held the most sophisticated epistemological views on the scale of Quick Learning. High

scale scores indicate a belief that being successful does not depend on how quickly one learns material. The next level of sophistication was Innate Learning. High scale scores here suggest beliefs that success does not depend on being born smart. The least sophisticated epistemological stance compared to the other two was in the area of Omniscient Authority. A naïve epistemology in this area indicates that students were more likely to believe that knowledge resides with experts than to see knowledge as constructed. To reemphasize, none of the scores were well below the mid-range. Self-reported scores for all scales ranged within 1.3 points of the lowest to the highest score indicating some measure of similarity among the student sample regardless of group affiliation. With one exception, all students moved towards the naïve perspective at the end of fall semester. On the measure of Omniscient Authority, however, students without the global experience course, GST 110, moved slightly towards the sophisticated perspective. Later in this document, these differences will be further analyzed for significance.

Motivated Strategies for Learning Questionnaire

Descriptive statistics for both groups of students on measures of motivation and learning strategies are represented in Table 5. The possible range of scores on either of these scales was 1 (not at all true of me) to 7 (very true of me). A mid-range score for these scales was 3.5.

Table 5

Descriptive Statistics: Means and Standard Deviations for the Motivated Strategies for Learning Questionnaire

	Motivation Scales*							
	Self-Efficacy		Task Value		Extrinsic		Intrinsic	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Global	4.91 (.89)	4.90 (.92)	5.31 (.91)	5.17 (.89)	5.45 (.96)	5.34 (.97)	4.94 (.99)	4.95 (.94)
No Global	4.58 (.94)	4.60 (.92)	5.01 (.88)	4.85 (1.0)	5.33 (.96)	5.15 (.98)	4.66 (.99)	4.59 (.98)
Total	4.76 (.93)	4.77 (.93)	5.18 (.91)	5.03 (.95)	5.40 (.96)	5.26 (.98)	4.82 (1.0)	4.78 (.97)
	Learning Strategies Scales*							
	Elaboration		Critical Thinking		Written Study Behaviors		Peer Help Seeking	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Global	4.97 (.98)	5.04 (.97)	4.32 (1.0)	4.38 (1.0)	3.97 (1.3)	4.14 (1.3)	4.05 (1.1)	4.13 (1.2)
No Global	4.61 (1.0)	4.74 (.96)	4.11 (1.1)	4.14 (1.1)	3.95 (1.2)	3.99 (1.2)	4.14(1.2)	4.17 (1.2)
Total	4.82 (1.0)	4.91 (.98)	4.23 (1.0)	4.28 (1.0)	3.96 (1.2)	4.08 (1.2)	4.09 (1.2)	4.15 (1.2)

*Range: 1 (not at all true of me) to 7 (very true of me)

Motivation

Among the four motivation scales, no student self-reported a score below 4.59, and the highest self-report was 5.45. Consequently, the overall difference between the lowest mean score and this highest mean score was less than one. All pre and post scores were above the mid-range. Students rated themselves higher on Task Value (I am very interested in the content area of my courses.) and Extrinsic Goal Orientation (Getting good grades in my classes is the most satisfying thing for me right now.) respectively, than their ratings for Intrinsic Goal Orientation and Self-Efficacy for Learning and Performance. That is, students were slightly less likely to identify with statements such as "In my classes I prefer material that arouses my curiosity, even if it is difficult to learn" (Intrinsic Goal Orientation) or with "I believe I will receive excellent grades in my classes" (Self-Efficacy for Learning and Performance). Again, given the range of possible scores, 1 through 7, students' self-reports clustered above the mid-range with limited variation.

Learning Strategies

The range of self-report scores on learning strategies is barely greater than the range for the motivation scales (Table 5). The lowest learning strategy report was 3.97 and the highest reported score was 5.04, thus creating a score range barely over 1 point. The full range of scores was still above the mid-point of 3.5. However, compared to the motivation scales, students' self-ratings were lower on learning strategy use than what was indicated for motivation. Students rated themselves highest on Elaboration strategies (Example: "I try to relate ideas in my course subjects to those in other courses whenever

possible."). Of the four scales, they were least likely to identify with the Written Study Behavior scale (Example: "I make simple charts, diagrams, or tables to help me organize course material.").

Summary

It was hypothesized that a semester of study would result in all students making some level of desirable gain for each measure. However, students moved toward the naïve perspective on two of the three scales measuring personal epistemology: Innate Learning and Quick Learning. By the end of the term, students also moved in an undesirable direction on self-ratings of the motivational scale, Task Value. Yet, gains were recognized on each learning strategy scale. Whether or not these changes were significant and influenced by enrollment in the interdisciplinary studies seminar, Global Experience, will be discussed in the next section.

Primary Data Analyses to Answer Research Questions

Research Question 1

The first research question asked to what degree does one semester of college influence students' development of personal epistemology and motivational and strategic components of self-regulated learning? Sub questions included the following: (a) does the inclusion of an interdisciplinary course influence students' development of personal epistemology more so than taking a traditional distribution of disciplinary coursework during the first semester, and (b) does the inclusion of an interdisciplinary course influence students' development of motivational and strategic components of self-

regulated learning more so than taking a traditional distribution of disciplinary coursework during the first semester?

A repeated measures multivariate analysis of variance (MANOVA) was conducted for each scale. In a repeated measures MANOVA, "vectors of mean differences are compared across levels of the independent variable" (Weinfurt, 1995, p. 269). For this study, time (pre, post) was a within-subjects measure and treatment condition (Global Experience course, no Global Experience course) was a between-subjects measure. Two main effects and one interaction effect were produced. The main effect for time (within subjects) indicates if students' mean scale scores differed over time. That is, was there a pre-post change in the means for all students? The main effect for treatment (between subjects) indicates whether or not group affiliation, defined by either having GST 110 in the schedule or not, accounts for difference on mean scale scores. Finally, the interaction of time (pre/post) with treatment (GST 110 course/no GST 110 course) indicates if the means change over time at different rates for one group over another. Results of the repeated measures MANOVA follows in three parts: *Epistemic Beliefs Inventory* scales, MSLQ: Motivation scales, and MSLQ: Learning Strategies scales.

Results for EBI Scales

Main effects within-subjects and between-subjects varied by scale. Interaction effects were uniform across scales. The ANOVA source table for time x treatment x measure will follow discussion of the results for each scale.

Quick learning. A significant main effect was found for time [F (1,488) = 18.401, $p < .001$, $\eta^2 = .036$]. Students' mean scores moved towards a naïve epistemology (pre = 3.72; post = 3.56) with time accounting for 3.6% of the variance. A significant main effect was also found between groups [F (1,488) = 4.612, $p = .032$, $\eta^2 = .009$]. Ignoring the effects of time, global students' mean score (3.69) indicated more sophistication than non-global students' score (3.56). Group affiliation, however, accounted for less than 1% of the variance. There was no significant interaction effect for treatment (GST 110/ no GST 110) x time (pre/post) [F (1,488) = .093, $p = .761$] (see Table 6).

Innate learning. The main effect for time was significant [F (1,488) = 6.538, $p = .011$, $\eta^2 = .013$]. Students' mean scores moved toward a naïve epistemology (pre = 3.17; post = 3.08). Time accounted for 1.3% of the variance. No significant main effect emerged between subjects [F (1,488) = 2.626, $p = .106$]. Though not significant, students in the global class held less naïve positions on Innate Learning (3.16) than students not taking the course (3.08). There was no significant treatment x time interaction for innate learning [F (1,488) = .957, $p = .328$] (see Table 7).

Omniscient authority. The main effect for time did not reach significance [F (1,488) = .036, $p = .849$] as the pretest mean (2.94) was the same as posttest mean (2.94). Additionally, no significant main effects emerged between subjects [F (1,488) = .656, $p = .418$]. Although insignificant, global students continued to hold less naïve positions (3.69) than non-global students (3.56). Again, there was no significant treatment x time interaction for Omniscient Authority [F (1,488) = 2.611, $p = .107$] (see Table 8).

Table 6

ANOVA Source Table for Time by Treatment for EBI: Quick Learning

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Quick	5.818	5.818	18.401*	.036	.990
Quick x V115	0.029	0.029	0.093	.000	.061
Error	154.296	0.316			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	4.108	4.108	4.612*	.009	.573
Error	434.683	0.891			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

Table 7

ANOVA Source Table for Time by Treatment for EBI: Innate Learning

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Innate	1.532	1.532	6.538*	.013	.723
Innate x V115	0.224	0.224	0.957	.002	.164
Error	114.324	0.234			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	1.218	1.218	2.626	.005	.366
Error	226.335	0.464			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

Table 8

ANOVA Source Table for Time by Treatment for EBI: Omniscient Authority

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Authority	.008	.008	0.036	.000	.054
Authority x V115	.571	.571	2.611	.005	.364
Error	106.741	.219			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	.233	.233	.656	.001	.128
Error	173.220	.355			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

Results for MSLQ: Motivation Scales

Within-subjects and between-subjects main effects varied according to scale. Interaction effects, however, remained uniform across scales. Each independent variable for motivation is discussed separately below.

Self-efficacy for learning and performance. No significant main effect was found for time [F (1,488) = .052, p = .819] as mean scores changed minimally from pretest (4.76) to posttest (4.77). A significant main effect emerged between subjects [F (1,488) = 17.925, $p < .001$, $\eta^2 = .035$]. Ignoring the effects of time, the mean for global students was 4.91 compared to 4.59 for non-global students. Group affiliation accounted for 3.5% of the variance. There was no significant treatment x time interaction [F (1,488) = .096, p = .756] for efficacy (see Table 9).

Task value. A significant main effect was found for time [F (1,488) = 17.287, $p < .001$, $\eta^2 = .034$]. Mean changes over time decreased from pretest (5.18) to posttest (5.03) with 3.4% of the variance explained by time. A significant main effect emerged between subjects for group affiliation or treatment [F (1,488) = 17.270, $p < .001$, $\eta^2 = .034$]. Ignoring the effects of time, the mean for the treatment group was 5.24 compared to the non-treatment mean of 4.93. Group affiliation accounted for 3.4% of the variance in the main effect for treatment. There was no significant treatment x time interaction [F (1,488) = .168, p = .682] (see Table 10).

Table 9

ANOVA Source Table for Time by Treatment for MSLQ Motivation: Efficacy for Learning and Performance

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Efficacy	.017	.017	.052	.000	.056
Efficacy x V115	.031	.031	.096	.000	.061
Error	157.235	.322			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	24.424	24.424	17.925*	.035	.988
Error	664.952	1.363			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

Table 10

ANOVA Source Table for Time by Treatment for MSLQ Motivation: Task Value

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Task Value	5.603	5.603	17.287*	.034	.986
Task Value x V115	0.055	.055	0.168	.000	.069
Error	158.168	.324			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	23.492	23.492	17.270*	.034	.986
Error	663.819	1.360			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

Extrinsic goal orientation. A significant main effect for time emerged [F (1,488) = 13.959, $p < .001$, $\eta^2 = .028$] as mean scores decreased from the pretest (5.40) to the posttest (5.26). The percentage of variance explained by time was 2.8%. A significant main effect for group affiliation (treatment) was also found [F (1,488) = 3.823, $p = .051$, $\eta^2 = .008$]. Ignoring the effects of time, the mean score for students in the treatment condition of GST 110 course enrollment was 5.40 compared to the non-treatment condition mean of 5.24. Students in the GST 110 course identified more with extrinsic motivation. Group affiliation explained less than l% of the variance in the means. There was no significant time x treatment interaction [F (1,488) = 1.488, $p = .366$] (see Table 11).

Intrinsic goal orientation. No significant main effect for time was found [F (1,488) = 1.123, $p = .290$] as the pretest mean was 4.82 and the posttest mean was 4.78. A significant main effect emerged for the treatment of group affiliation [F (1,488) = 17.943, $p < .001$, $\eta^2 = .035$]. The mean for students in the treatment group (GST 110) was 4.95 compared to 4.61 for the non-treatment group indicating students in Global Experience identified more with intrinsic motivation. Group affiliation accounted for 3.5% of the variance in mean scores. No significant interaction effect was found for time x treatment for intrinsic goal orientation [F (1,488) = 1.864, $p = .173$] (see Table 12).

Results for MSLQ: Learning Strategies Scales

Within-subjects and between-subjects main effects continued to vary by scale. Interaction effects were consistent across scales. As formatted previously, the ANOVA source table follows discussion of each independent variable for learning strategies.

Table 11

ANOVA Source Table for Time by Treatment for MSLQ Motivation: Extrinsic Goal Orientation

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Extrinsic	5.251	5.251	13.959*	0.028	0.962
Extrinsic x V115	0.308	0.308	0.820	0.002	0.147
Error	183.567	0.376			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	5.714	5.714	3.823*	0.008	0.497
Error	729.373	1.495			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

Table 12

ANOVA Source Table for Time by Treatment for MSLQ Motivation: Intrinsic Goal Orientation

Within-Subjects Effects					
Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Intrinsic	0.412	0.412	1.123	0.002	0.185
Intrinsic x V115	0.684	0.684	1.864	0.004	0.276
Error	179.143	0.367			

Between-Subjects Effects					
Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	27.261	27.261	17.943*	0.035	0.988
Error	741.428	1.519			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

Elaboration. A significant main effect for time emerged [F (1,488) = 5.377, p = .021, η^2 = .011]. Over time, mean score comparisons indicate more use of Elaboration strategies at the end of the semester (4.91) than at the beginning (4.82). However, time accounted for only 1.1% of the variance in mean score changes. A significant main effect also emerged between-subjects [F (1,488) = 17.286, $p < .001$, η^2 = .034]. The mean score for the treatment condition of enrollment in the Global Experience course was 5.0 compared to 4.67 for the non-enrollment condition. Group affiliation accounted for 3.4% of the variance between the mean scores. There was no significant interaction effect of time x treatment for Elaboration [F (1,488) = .561, p = .45] (see Table 13).

Critical thinking. No significant main effect for time emerged [F (1,488) = 1.244, p = .265]. The pretest mean was 4.23 and the posttest mean was 4.28. A significant main effect was found between groups [F (1,488) = 7.227, p = .007, η^2 = .015]. Mean for the treatment condition of enrollment in GST 110 was 4.35 compared to the mean of 4.13 for non-enrolled students. Group affiliation explained 1.5% of the variance. There was no significant interaction effect for time x treatment for Critical Thinking [F (1,488) = .058, p = .81] (see Table 14).

Written study behaviors. The main effect for time was significant [F (1,488) = 5.857, p = .016, η^2 = .012]. The pretest mean of 3.96 increased at posttest to 4.08. Time explained 1.2% of the variance between the means. There was no significant main effect for treatment [F (1,488) = .722, p = .396] as the mean of the treatment group (4.06) differed minimally from the non-treatment group mean (4.00). There was no significant

Table 13

ANOVA Source Table for Time by Treatment for MSLQ Learning Strategies: Elaboration

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Elaboration	2.182	2.182	5.377*	0.011	0.638
Elaboration x V115	0.228	0.228	0.561	0.001	0.116
Error	198.003	0.406			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	26.150	26.150	17.286*	0.034	0.986
Error	738.233	1.513			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

Table 14

ANOVA Source Table for Time by Treatment for MSLQ Learning Strategies: Critical Thinking

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Critical Thinking	0.562	0.562	1.244	0.003	0.200
Critical Thinking x V115	0.026	0.026	0.058	0.000	0.057
Error	220.286	0.451			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	11.824	11.824	7.227*	0.015	0.765
Error	798.424	1.636			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

time x treatment interaction effect for Written Study Behaviors [F (1,488) = 2.54, p = .11] (see Table 15).

Peer learning. There was no significant main effect for time [F (1,488) = 1.219, p = .270]. The pretest mean of 4.09 differed minimally from the posttest mean of 4.15. Also, no main effect for treatment emerged [F (1,488) = .486, p = .486]. GST 110 group mean was 4.09 and the Non-GST 110 group mean was 4.16. Finally, there was no significant time x treatment interaction effect for Peer Learning [F (1,488) = .19, p = .66] (see Table 16).

Summary

The data from the repeated measures MANOVA for all scales of the EBI and MSLQ indicate that within-group changes over time were often in unexpected directions. For example, it was hypothesized that over time all students would make desirable gains on all measures. Results were mixed. On personal epistemology measures of Quick Learning and Innate Ability, all students shifted significantly toward a naïve perspective. Mixed results were also found for the motivation scales. For example, no change occurred over time for Self-Efficacy and Intrinsic motivation. However, students exhibited less Task Value and less Extrinsic motivation by the end of the semester. Changes over time for learning strategy scales were also mixed. There was no significant pre-post change for Critical Thinking and Peer Learning. Yet, by the end of the semester significance was reached for all students identifying more strongly with the use of Elaboration strategies and the use of Written Study Behaviors.

Table 15

ANOVA Source Table for Time by Treatment for MSLQ Learning Strategies: Written Study Behaviors

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Written	2.673	2.673	5.857*	0.012	0.676
Written x V115	1.159	1.159	2.540	0.005	0.356
Error	222.675	0.456			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	1.857	1.857	0.722	0.001	0.136
Error	1255.678	2.573			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

* $p < .05$

Table 16

ANOVA Source Table for Time by Treatment for MSLQ Learning Strategies: Peer Learning

Within-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
Peer Learning	0.782	0.782	1.219	0.002	0.197
Peer Learning x V115	0.124	0.124	0.193	0.000	0.072
Error	313.051	0.641			

Between-Subjects Effects

Source	SS	MS	F (1,488)	Partial Eta Squared	Power
V 115	1.067	1.067	0.486	0.001	0.107
Error	1070.883	2.194			

Note: V 115 = grouping variable (GST 110 course or NO GST 110 course)

It was also clear from the analyses that the inclusion of Global Experience did not influence students' development of personal epistemology and motivational and strategic components of self-regulated learning more so than more traditional configurations of coursework. There was no treatment x time interaction for any of the 11 scales. However, significant differences between groups emerged with subjects in the treatment group exhibiting stronger belief in Quick Learning. On the motivation scales, there were higher mean score values for Self-Efficacy for Learning and Performance, Task Value, Extrinsic Goal Orientation as well as Intrinsic Goal Orientation and more identification with Elaboration and Critical Thinking as learning strategies. Because of these between-subjects differences, additional data analysis will follow research question 2.

Research Question 2

How does personal epistemology and motivational and strategic components of self-regulated learning relate to performance as measured by end-of-semester cumulative GPA? To begin answering this question, a bivariate correlation was conducted with GPA as the dependent variable and each pre-test scale score and each post-test scale score of EBI and MSLQ entered as independent variables. Correlations were run separately for pre-test scales and post-test scales. Results are shown in Table 17 as a split correlation table. All statistics presented correlate with cumulative GPA. The top row of the matrix, above the diagonal, correlates pre-test scales with cumulative GPA. The bottom half, left side of the matrix, below the diagonal, correlates post-test scale scores with cumulative GPA. The bold statistics on the diagonal represent Cronbach's coefficient α test-retest

Table 17

Correlations for Pre-Test Scales (Above Diagonal) and Post-Test Scales (Below Diagonal) with GPA and Test-Retest Reliability Statistic on the Diagonal

	GPA	Quick	Innate	Authority	Efficacy	Task Value	Extrinsic	Intrinsic	Elaboration	Critical Thinking	Writing	Peer Learning
GPA	1.0	.188*	.051	.011	.132**	.186**	.083	.151**	.113*	-.007	.067	-.042
Quick	.132**	**.65**										
Innate	.018		**.50**									
Authority	-.027			**.40**								
Efficacy	.266**				**.77**							
Task Value	.180**					**.77**						
Extrinsic	.103*						**.75**					
Intrinsic	.177**							**.77**				
Elaboration	.107*								**.74**			
Critical Thinking	-.069									**.73**		
Writing	.018										**.82**	
Peer Learning	-.056				*$p < .05$ **$p < .01$							**.71**

reliability statistic. As indicated earlier in this document, test-retest reliabilities for MSLQ measures were acceptable while the EBI reliabilities were weak.

Correlations for EBI

From the EBI scales, positive correlations between end-of-term GPA and both pre-test scale scores and post-test scale scores for Quick Learning reached significance ($p < .01$). As scores increased to indicate belief that people must learn quickly, end-of-term GPA also increased. No significant correlations emerged between GPA and Innate Learning or Omniscient Authority for either the pretest or posttest.

Correlations for MSLQ: Motivation

Significant positive correlations were obtained between the MSLQ: motivation scales and GPA. Those scales were Self-Efficacy for Learning and Performance, Task Value, and Intrinsic Goal Orientation for both pretest and posttest scores ($p < .01$). Only posttest scores for Extrinsic Goal Orientation reached significance ($p < .05$). As students' self-ratings of academic confidence, valuing of tasks, interest in getting good grades, and interest in learning the material increased, GPA also increased. Of the motivation scales, the pretest score on Extrinsic Goal Orientation was the only one that did not correlate at any level of significance with GPA.

Correlations for MSLQ: Learning Strategies

Only one significant positive correlation was obtained between the MSLQ: learning strategies scales and GPA. Pretest and posttest scale scores for Elaboration were positively correlated with GPA ($p < .05$). As scores increased indicating students' efforts to make meaningful connections among all types of material they were learning,

cumulative GPA also increased. No correlations resulted for GPA and scales for Critical Thinking, Written Study Behaviors, and Peer Learning.

Multiple Regression Results

A stepwise multiple regression analysis using SPSS was conducted between the dependent variable (cumulative GPA) and the 11 independent variables that reached significance from the bivariate correlation analyses: pretest and posttest Quick Learning, pretest and posttest Self-Efficacy for Learning and Performance, pretest and posttest Task Value, posttest Extrinsic Goal Orientation, pretest and posttest Intrinsic Goal Orientation, and pretest and posttest Elaboration. Regression analysis attempts to explain the variability of a dependent variable using information about one or more independent variables (Vogt, 1999). Stepwise multiple regression analysis in SPSS is a technique that instructs the computer to find the ideal equation by entering independent variables in a variety of combinations and multiple ordering. Variables are selected and eliminated according to the criteria for removal: a combination of backward elimination and forward selection (Vogt, 1999).

Two models emerged with the greatest R square explained by the second model. Results revealed that two variables, Self-Efficacy posttest and Quick Learning pretest, significantly predicted end-of-semester GPA, [F (1, 488) = 9.283, $p < .05$]. R^2 for this model was .088 and adjusted R^2 was .084. Table 18 displays the model summary and coefficients table.

Table 18

Stepwise Multiple Regression Analyses for Cumulative GPA and Scales of EBI and MSLQ

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	0.266[a]	0.071	0.069	0.580576	0.071	37.035	1	488	0.000
2	0.297[b]	0.088	0.084	0.575710	0.017	9.283	1	488	0.002

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations		
	B	Std. Error	β	t	Sig.	Zero-Order	Partial	Part.
1 (Constant)	2.338	0.137		17.077	0.000			
Efficacy: Post[**]	0.171	0.028	0.266	6.086	0.000	0.266	0.266	0.266

[a]Predictors: (Constant), Efficacy: post
[b]Predictors: (Constant), Efficacy: post, Quick learning: pre
[*] $p < .05$
[**] $p < .001$

In terms of individual relationships between the independent variables and GPA, the best model fit showed that posttest Self-Efficacy ($t = 5.303$, $p < .001$), pretest Quick Learning ($t = 3.047$, $p < .05$) each significantly predicted end-of-semester GPA. Together, these two variables contributed 8.8 % in shared variability with the dependent variable, GPA. Conversely, 91.2% of the variability in GPA is yet unexplained (see Table 18).

Summary

In order to answer the question of whether end-of-term cumulative GPA was influenced by measures of personal epistemology and motivational and strategic components of self-regulated learning, a bivariate correlation was first conducted to locate significance between GPA and pretest and posttest scale scores. Significant correlations were found for 11 of the 22 scales. Quick Learning (pre and post) reached significance for the personal epistemology scales. For the motivation scales, pretests and posttests for Self-Efficacy for Learning and Performance, Task Value, and Intrinsic Goal Orientation reached significance while only the posttest for Extrinsic Goal Orientation emerged as significant. Elaboration (pre and post) were the only scales significantly correlated with GPA from the learning strategies measure. Results of stepwise multiple regression analyses indicated that Quick Learning pretest scores and posttest scores for Self-Efficacy for Learning and Performance predict end-of-term GPA. Taken together, the two variables accounted for 8.8% of the variability of GPA.

Additional Data Analysis

For the focus of this study, this researcher expected that the GST 110 course, Global Experience would account for students' mean changes at rates greater than mean changes for students not in the course. However, the repeated measures MANOVA analyses indicated no significant interactions for time x treatment on any measure. Yet, there were significant mean differences between groups on certain scales: Quick Learning, Intrinsic Goal Orientation, Extrinsic Goal Orientation, Task Value, Self-Efficacy for Learning and Performance, Elaboration, and Critical Thinking. Even with some less desirable changes over the semester, GST 110 students exhibited more desirable profiles on these measures. For that reason, additional data analyses were conducted to explore group composition variability.

Using the independent samples t-test function in SPSS, significant differences between the groups were analyzed for academic record variables and demographic variables (see Table 19).

From the analysis of academic record variables, this researcher notes that the means of the number of advanced placement and co-curricular credits, SAT-Math scores, SAT-Verbal scores, and High School GPA are significantly different between the two groups. However, the Levene Statistic from a one-way ANOVA indicated no significant differences between the variances on the pre-test. A one-way ANOVA was also conducted on all 11 post-test scales. Only the MSLQ learning strategy scale of Written Study Behaviors indicated a significant difference for the variance between groups ($p < .05$) as indicated again by the Levene Statistic. It seems to follow that whatever changes

from pre-test to post-test occurred within and between the groups are possibly not directly attributable to either academic background characteristics or the lack of significant interaction with the treatment condition (Global Experience course) as indicated in the results.

Table 19

Descriptive Statistics: Comparisons of Academic Record Variables and Demographic Variables for GST 110 Students and Non-GST 110 Students

	Means & SD	
Variable	GST 110 (N=279) M (sd)	No-GST 110 (N=211) M (sd)
Number of AP/co-curricular credits brought to university**	6.19 (7.88)	2.26 (4.31)
SAT-Math**	624.59 (66.30)	602.51 (70.80)
SAT-Verbal**	615.84 (74.88)	585.88 (62.40)
High School GPA**	4.10 (.63)	3.75 (.56)
Age	18.1 (.33)	18.1 (.31)
Father's Education (rating of 3 or higher = minimum of a college education)	3.42 (1.37)	3.52 (1.33)
Mother's Education (same scale)	3.24 (1.02)	3.24 (1.06)
	Percentages	
Sex	61% (F) 39% (M)	56% (F) 44% (M)
Ethnicity	95% white	90% white
High school coursework presented controversial information (regularly to sometimes)	86%	90%
High school coursework taught students how to analyze controversy (regularly to sometimes)	82%	79%

df = 1,488 $^{**}p < .001$

Summary of Analyses

Two research questions directed the analyses for this chapter. The first question asked if students' self-reported scores on measures of personal epistemology and motivational and strategic components of self-regulated learning changed over time. Specific sub questions asked if enrollment in an interdisciplinary course, GST 110, influenced change. The *Epistemic Beliefs Inventory* and the *Motivated Strategies for Learning Questionnaire* were used for gathering data from 490 first-year students. Measures were scaled and adjusted to fit this study's sample population. Using SPSS software, a repeated measures MANOVA was conducted for treatment (GST 110 or no GST 110) x time (pre/post) for each of the 11 scales for EBI and MSLQ. While significant differences emerged within-subjects and between-subjects, there was no interaction effect for treatment. That is, the interdisciplinary course itself did not account for any of the variance in mean scores. However, additional data analysis determined that significant differences existed between group means on academic record variables. Yet, no significant difference in the variance of pretest means for any measure was found. Therefore, these differences may only indirectly account for the between-groups significant main effects.

The second research question asked if measures of personal epistemology, motivation, and learning strategies influenced end-of-semester GPA. Correlation analysis between pre and post scores for the 11 scales and GPA isolated significantly correlated variables to include in a stepwise multiple regression analysis. Analyses indicated that Quick Learning pretest scores and posttest scores for Self-Efficacy for Learning and

Performance predict end-of-term GPA. Taken together, the two variables account for 8.8% of the variability of GPA.

The following chapter will draw conclusions from the results. Implications for policy, practice, and future studies will be addressed as well as the limitations of this study.

CHAPTER V

DISCUSSION

Conclusions

Based on a review of the interdisiciplinary, epistemological and self-regulation literatures, a quasi-experimental research design was proposed to explore the answers to two questions. First, the study asked if first-year students' personal epistemology and motivational and strategic components of self-regulated learning changed over the course of their first semester of college. More specifically, the question probed whether or not the inclusion of an interdisciplinary course impacted any change in ways not evident in students whose schedules excluded the interdisciplinary course. Secondly, this study explored the influence personal epistemology and motivational and strategic components of self-regulated learning have on end-of-term cumulative GPA. In this section, the results of Chapter IV are summarized and their meanings discussed in the context of university culture and practice as well as in the context of relevant literature. The two main research questions and resulting statistical analyses will frame the discussion.

Relationship between Epistemology, Self-regulated Learning, and Participation in the Interdisciplinary Global Experience Course

Based on the interdisciplinary studies literature suggesting IDS is a superior context for the development of more sophisticated personal epistemologies, increased motivation, and more self-regulated learning, this researcher questioned whether students

in the Global Experience course would have more desirable scores on those measures as a result of participation in that class. This was not the case. There were no significant interaction effects on any of the 11 scales for treatment by time. One possible explanation for this lack of significant interaction effects may be measurement sensitivity regarding survey length and additional sensitivity regarding the lack of a more fine-grained approach to data collection. For example, the Epistemic Beliefs Inventory's efficient length may have accommodated survey fatigue to the detriment of having enough items to fully capture epistemological constructs. For the Motivated Strategies for Learning Questionnaire, measurement sensitivity may have been impeded when the questions were changed to indicate a general orientation rather than a fine-grained focus on the course, Global Experience. Thus parceling out the effects of the IDS course using a broadly worded survey asking students' to make general assessments regarding their entire semester course schedule was potentially problematic.

A second possible explanation for the lack of interaction effects may be explained by students having been exposed to only one IDS course during a single semester. Studies indicate that sophisticated epistemological development occurs over long periods of time and often in connection with advanced schooling (Hofer & Pintrich, 1997). It follows that the short duration of a semester and one IDS course may be neither enough time nor enough treatment for significant interaction effects to emerge. Where effects have been documented for the impact of interdisciplinary studies on students' development of sophisticated epistemologies, a positive correlation existed between the numbers of IDS courses taken over time and movement towards sophisticated

epistemologies (Wright, 1992). Therefore, a single course and the duration of one semester may not be enough to produce significant interaction effects.

Mean Changes in Personal Epistemology and Self-Regulated Learning over Time

This researcher also questioned the nature of change students might experience during a semester on measures of personal epistemology and self-regulated learning. Results were often in unexpected directions. For example, significance was found for all students' movement toward the naïve perspective on measures of Quick Learning and Innate Ability by the end of the term. One possible explanation is that the field of personal epistemology continues to wrestle with the pure measurement of epistemology as separate from attitudes about school and learning (Hofer, 2005; Hofer & Pintrich, 1997). Given the challenges of adjusting to collegiate performance expectations, the post-test movement towards the naïve perspective in this study may be more a measure of belief that school success depends on learning quickly and innate abilities rather than measuring a pure belief about knowledge.

A second explanation deals with the reciprocal nature of education and personal epistemology development. Researchers (Hofer, 2005; Hofer & Pintrich, 1997) indicate that epistemic development is recursive, and students retreat to safer, more established positions when affective conditions of new environments are involved. The new environment of college and the looming exam period at the end of the semester may qualify for creating a recursive impact. If so, this underscores the possibility that first-semester transition challenges may have influenced movement towards the naïve perspective for Quick Learning and Innate Learning.

For measures of motivation, all students regressed on Task Value and Extrinsic Goal Orientation. By the end of the term, students were less likely to value the work they were doing in terms of interest and utility. They were also less likely to identify with a strong desire to demonstrate their abilities to others through superior grades. These results may be explained partially by initial perceptions of university work that may have been unrealistic and by the timing of the posttest so close to stressful final exams. Regarding initial perceptions, university admissions' videos and campus tours highlight campus involvement and engaged learning. While these hallmarks of this particular university's education are real for the vast majority of graduates (participating in internships, leadership of organizations, student undergraduate research, etc.), they do not all happen in the first semester. Much of the classroom work during the first semester is more traditional with a mixture of discussion, lecture, papers, and tests. The evolving realization of a conceptual mismatch between what students thought their first semester would be like and the reality of hard work, may account for the drop in task value.

The decrease in Extrinsic Goal Orientation, on the other hand, would be a positive move as long as the change was indicative of the desire for more mastery learning rather than simply caring less about grades. Yet an alternative explanation should be examined here also. Perhaps students realized by the end of the term that their classmates also have strong academic backgrounds; therefore, the range of abilities from high to low is not as great as it was in high school. Many of their classmates are just as competent and hard working as they perceive themselves to be. Extrinsic Goal Orientation, which favors performing better than others can perform, is likely to drop given the realization

outperforming others will take significantly more effort than what was expended in high school. Academic competitiveness is keener in college. Although this study cannot offer definitive evidence to explain the decrease in Extrinsic Goal Orientation, it is plausible that students' recognition of the academically talented pool of students they now compete against might also explain the drop.

The culture of this particular university may again explain the improvement in the use of Elaboration and Written Study Behaviors on the learning strategies scales. All first year students are either in the Global Experience course or English composition, two courses that require a significant amount of writing. The university also has a very active writing across the curriculum program that supports writing to learn pedagogy over short answer or multiple choice testing formats for grading. Consequently, those experiences would support students' increased use of elaboration strategies that make meaningful learning connections among subjects. Those experiences would also support their increased use of written study strategies such as outlining, note taking, etc. Improvements on those two scales may have been the result of university-wide emphasis on writing to learn. In other words, what was proposed in the literature as a benefit of a Global Experience type interdisciplinary course might be found in a variety of first-year coursework for this group of students.

Mean Group Differences for Personal Epistemology and Self-regulated Learning

Significant main effects for group affiliation were found on the epistemic measure of Quick Learning; the motivation measures of Self-Efficacy for Learning and Performance, Task Value, Intrinsic Goal Orientation, and Extrinsic Goal Orientation; and

the learning strategy measures of Elaboration and Critical Thinking. However, group affiliation explained less than 4% of the variance of any given scale. By comparison, students in the Global Experience course also began and ended the semester with more sophisticated epistemologies, more desirable levels of motivation, and more use of learning strategies than students not in the Global Experience course. Consequently, concern for significant differences in group composition prompted additional data analysis. Academic record variables such as high school grades and SAT scores along with demographic characteristics were compared. The groups were significantly different on the academic record variables with the Global Experience students presenting stronger entering academic characteristics (see Table 19 again for comparisons). However, there were no significant differences on the variances between the groups on the pretests for any scales and only one significant difference in the variance for a single posttest scale. While this leads one to doubt the direct contribution academic variables had on group differences, it does open up questions regarding indirect relationships. For example, the different value system of schools and parents that might support and encourage strong academic performance was not measured as a matter of degree. Perhaps underlying value systems, exhibited through the strong academic characteristics of students, could have indirectly accounted for the group differences.

In order to summarize, a look at the hypotheses generated from the first research question and sub questions follows. First, the hypothesis that the interdisciplinary Global Experience course would account for gains on personal epistemology and self-regulated learning was not supported. There were no interaction effects for any of the eleven scales

for those measures. The second hypothesis that all students would demonstrate sophisticated epistemologies, more desirable motivation, and more use of learning strategies by the end of the term was only partially supported. Significance was found for students reporting more use of Elaboration and Written Study Behaviors for learning strategies as well as less Extrinsic Goal Orientation. Significance was also found for students' movement in the unexpected direction of naïve epistemologies for Quick Learning and Innate Learning as well as reports of less Task Value on the motivation scale.

Additional analysis was conducted to examine between group differences since some main effects were found for group affiliation and since students in the Global Experience course began and ended the semester with more desirable profiles for all measures. It was discovered that the cohort of students enrolled in the IDS course entered the university with stronger academic profiles. However, with no significant difference in the variances between groups on any pretest and only one of the posttests, it is possible that entering academic characteristics had only indirect effects on group differences.

Relationship of Scales of EBI and MSLQ to Cumulative GPA

The second research question asked about the relationship measures of personal epistemology and motivational and strategic components of self-regulated learning had to end-of-term grade point average. Using stepwise multiple regression analysis, this researcher found two variables that reached significance for predicting GPA. The more sophisticated pretest score for Quick Learning was significant in predicting end-of-term GPA. The posttest scores on Self-Efficacy for Learning and Performance also had

predictive value for the semester's GPA. In a previous section, the idea that Quick Learning may be an attitude toward learning and school success rather than a true epistemological measure of the nature of knowledge was introduced. Combine that possibility with the Efficacy scale and these two scales may have predictive value in that together they portray a confident student. This student might say, "I am confident I can learn college material no matter how much time it may take to do so." Since 60% of this study population ended their first semester with a 2.56 GPA or higher, it seems possible that sophisticated beliefs in Quick Learning and Self-Efficacy for Learning and Performance may have merged to create a positive self-schema for effort management to impact GPA.

None of the learning strategies scales emerged significant in the stepwise multiple regression analysis. It is important to note here that one scale, Elaboration, did positively correlate with end-of-term GPA. Regression analysis is used primarily for prediction purposes and does not specifically address the theoretical importance of each variable in the predication (Asher, 1997). It is possible that for individual students, some learning strategies may have impacted end-of-term GPA.

To summarize results from the second research question, it was hypothesized that sophisticated epistemology, positive motivation, and use of learning strategies would have predictive value for end-of-term grade point average. This hypothesis held true for two scales. A stepwise multiple regression analysis using significantly correlated pretest and posttest scales indicated two variables that accounted for 8.8% of the variance in end-of-term cumulative GPA. Those variables were pretest for Quick Learning and the

posttest for Self-Efficacy for Learning and Performance. None of the learning strategies scales had significant predictive value.

Limitations

Limitations were related to the design of the study which this researcher realized prior to data collection. Other limitations emerged from reflections on the data. Both are discussed in this section.

The original conceptualization of the study was to physically situate half of the data collection within the interdisciplinary Global Experience course and the other half in social science disciplinary courses. Lack of sufficient participation by faculty teaching these courses meant an alternative collection method was used. Faculty and staff teaching the one-credit hour advising seminar agreed to use class time to administer all pre and post surveys. This affected the wording of the Motivated Strategies for Learning Questionnaire. The MSLQ was originally designed to tap student self-ratings on motivation and learning strategy scales referencing a specific course. Consequently, a question that read "When reading for this course, I make up questions to help focus my reading" was changed to "When reading for my courses, I make up questions to help focus my reading." It is possible that students would have answered these questions differently in the direct context of the Global Experience course or a social science course.

Secondly, one semester is a short time period to assess changes in personal epistemology. The literature suggests that most sophisticated epistemological views are developed in graduate school compared to undergraduate (Hofer & Pintrich, 1997).

However, Hofer (2004b) found that first-year students' epistemologies do undergo some limited change during the first semester. Given the restraints of this investigation for data collection in a single semester, the short time period is acknowledged as a limitation for measuring pre-post changes.

Another limitation is the first-year class at this institution does not reflect the broad range of students in the larger higher education arena. These students are more homogeneous in ethnicity, in parental educational backgrounds, and in entering academic characteristics. For this reason, the results of this study are limited in how they may be generalized.

Finally, the majority of attrition from the study due to incomplete surveys or obvious set response patterns occurred during the post testing. Posttests were conducted between Thanksgiving and the close of semester classes in December, roughly a two week time period. Upon reflection, this researcher questioned how intentionally students answered the posttest surveys. Given the pressures associated with end-of-semester papers and tests as well as impending exams, students may not have taken the posttests as seriously as the pretests. Additionally, the exuberance and optimism that often accompanies students' initial foray into higher education might have been tempered with more realism later in the term. Consequently, this researcher also questions whether or not the initial scores on the MSLQ scales might reflect more intentions for college work than actual reality of practice. Conversely, by the end of the semester, students may have marked themselves lower on motivation measures to reflect the pressures of that particular time period rather than reflect their typical motivational orientations to college

tasks. On a final note, the research design did not include opportunities for free response from students, either through the surveys or through focus groups. Qualitative data could possibly have illuminated some of the concerns for how students approached those surveys.

Implications

Despite these limitations, the findings from the current study have implications for educational policy, research, and practice. Given the exploratory character of the study, however, the implications for practice are perhaps more speculative.

First, research on the benefits of interdisciplinary studies has been more analytical than empirical (Klein, 1990). However, this study attempted to empirically examine the contributions an interdisciplinary course makes to students' development of personal epistemology as well as motivational and strategic components of self-regulated learning. While results from this study did not conclude direct benefits as a result of the IDS course, neither did the course influence lower student ratings on any of the three measures. Still, policy in the interdisciplinary studies field supporting and promoting empirical research might enhance program credibility through intentional efforts to measure student learning. Such policy could offer insights into meaningful data gathering techniques. If the theoretical claims of IDS benefits are to be realized and further embraced in higher education settings, policy support calling for more empirical assessments are needed for the future establishment of more consistent, logical frameworks for campus assessment.

Secondly, the theoretical arguments claiming the benefits of interdisciplinary coursework for the development of more sophisticated epistemologies, motivation, and self-regulated learning warrant more empirical testing than this study afforded. It does appeal to one's sensibilities that courses proposing ill-structured problems and the co-construction of knowledge between students and faculty would be ripe territory for developing critical thinking and self-regulated learning. Some challenges for the researcher are what to measure, how to measure, and ultimately how to interpret.

In considering what to measure, this study primarily addressed pre and post changes in students' self-reported epistemic beliefs and self-regulated learning. It is possible that the true impact of IDS may be intimately bound up in pedagogical style. As an example, Hofer (1999) found that an active, collaborative pedagogy within a math class produced more sophisticated beliefs in students than math offered by traditional lecture. This researcher visited several Global Experience classes and noted that pedagogy ranged from lecture to collaborative group interactions. Since modeling self-regulated learning is more likely to occur in an interactive classroom compared to more lecture, engaging pedagogy has implications for the development of motivation and learning strategies as well. Studies utilizing students' reports of engaged learning or classroom observations guided by rubrics might offer insights into what aspects of pedagogy best support IDS principles when accompanied with outcome measures of student learning. Measuring the contribution of pedagogical styles has strong political undertones in a university setting, but research identifying and connecting beneficial styles to the realization of IDS principles is needed. Otherwise, the current research on

IDS that more is better (Wright, 1992) may never uncover the exact mechanisms that make it so.

Research studies carefully examining how to measure learning outcomes from IDS coursework deserve attention. For example, the Epistemic Beliefs Inventory and other pencil and paper measures of epistemology may not be the best options for examining hypothetical conceptual change connected to interdisciplinary coursework. If one goal of IDS is to expose students to real world problems and develop students' facility for solving real world issues, then their abilities to do that may need to be demonstrated through ill-structured problem solving instead of a pencil and paper survey of epistemology. Studies using both types of measurement and even local assessments can potentially yield valuable comparative data. Additionally, studies may need to be fine grained enough to situate measurement within the interdisciplinary classroom in order to better connect research results to IDS principles.

Interpreting surveys and resulting data may take unexpected turns. For example, all students indicated significant movement toward the naïve perspective on epistemological measures of Quick Learning and Innate Learning by the end of the term. Students also valued their academic tasks less in December than in September. In addition, this study found that the more sophisticated pretest of Quick Learning and the posttest of Self-Efficacy for Learning and Performance had predictive value for end-of-term GPA, albeit a small percentage of the variance. This researcher has suggested that those two scales could have combined to create a positive self-schema of confidence for academic work and effort management. Since effort management is usually measured as

a learning strategy, this possible conceptualization is not explicitly addressed in the literature. More studies in a variety of academic settings are needed to better understand the relationships among personal epistemology, motivation, and self-regulated learning.

As indicated earlier, the current investigation was designed to use measures of epistemology, motivation, and learning strategies as learning outcomes and compare those outcomes between groups of students who had an interdisciplinary course in their schedule and those who did not. While data analyses did not indicate any significant interaction effects of the Global Experience course to develop those outcomes, some interesting findings with speculative implications for practice did emerge.

For example, all students moved toward the naïve perspective by the end of the semester on measures of Quick Learning and Innate Ability. Lower scores on Task Value for the motivation scale were present at the end as well. For college faculty with primary responsibilities for teaching first-year students, this seems to highlight the importance of examining the kinds of tasks students are asked to complete. What exactly is going on in classrooms during the first semester to cause even the academically stronger students to regress towards a naïve epistemology and devalue tasks? Task value is bound up in the expectancy-value component of motivation and goal setting. Classroom pedagogy that makes corporate learning goals overt might better clarify course objectives as well as support students' personal goal setting for learning and performance. In an era of concern for grade inflation in higher education, educators still need to consider appropriate challenge and support for designing learning outcomes. Tasks with appropriate challenge

and support afford students learning opportunities that encourage both motivation and self-regulated learning.

Finally, where significant mean differences did emerge within and between groups, the percentage of variance explained was minimal. Perhaps these findings suggest that the overall strength of entering academic characteristics for this study population may have produced more differences than classroom experiences. If so, gains that did appear may understandably exist at lower levels. Consequently, obtaining greater gains might involve identifying students with weaker entry level characteristics to be the focus for measuring IDS course experiences and learning outcomes. Even so, the minimal variance explained also highlights how much more classroom educators and researchers need to know about student learning. After all, most of the significant mean changes cannot be fully explained from the data collected for this study.

Summary

This investigation was designed to empirically test whether or not students' participation in an interdisciplinary course impacted the development of personal epistemology and motivational and strategic components of self-regulated learning over more traditional configurations of coursework. The study also examined the impact those measures might have on end-of term GPA. For this research design, evidence did not support the theoretical claims that interdisciplinary contexts are superior for the development of sophisticated epistemologies and more self-regulated learning. Additionally, only two scales had predictive value for GPA and those two explained less than 10% of the variance. This investigation is but a single contribution towards attempts

to empirically understand the theoretical claims IDS makes for enhancing student learning. Additional work is needed to refine both measurement choices and data collection techniques before those theoretical propositions can be either proven or disproven.

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Appendix A

Epistemic Beliefs Inventory (EBI)

The following questions ask about your beliefs. There are no right or wrong answers. Please circle the number that most nearly indicates your belief. Circle 1 if you strongly disagree and 5 if you strongly agree. Use numbers 2, 3, and 4 to indicate beliefs that fall somewhere in between.

1. Most things worth knowing are easy to understand.

Strongly Disagree				Strongly Agree
1	2	3	4	5

2. What is true is a matter of opinion.

Strongly Disagree				Strongly Agree
1	2	3	4	5

3. Students who learn things quickly are the most successful.

Strongly Disagree				Strongly Agree
1	2	3	4	5

4. People should always obey the law.

Strongly Disagree				Strongly Agree
1	2	3	4	5

5. People's intellectual potential is fixed at birth.

Strongly Disagree				Strongly Agree
1	2	3	4	5

6. Absolute moral truth does not exist.

Strongly Disagree				Strongly Agree
1	2	3	4	5

7. Parents should teach their children all there is to know about life.

Strongly Disagree				Strongly Agree
1	2	3	4	5

8. Really smart students don't have to work as hard to do well in school.

Strongly Disagree				Strongly Agree
1	2	3	4	5

9. If a person tries too hard to understand a problem, they will most likely end up being confused.

Strongly Disagree				Strongly Agree
1	2	3	4	5

10. Too many theories just complicate things.

Strongly Disagree				Strongly Agree
1	2	3	4	5

11. The best ideas are often the most simple.

Strongly Disagree				Strongly Agree
1	2	3	4	5

12. Instructors should focus on facts instead of theories.

Strongly Disagree				Strongly Agree
1	2	3	4	5

13. Some people are born with special gifts and talents.

Strongly Disagree				Strongly Agree
1	2	3	4	5

14. How well you do in school depends on how smart you are.

Strongly Disagree				Strongly Agree
1	2	3	4	5

15. If you don't learn something quickly, you won't ever learn it.

Strongly Disagree				Strongly Agree
1	2	3	4	5

16. Some people just have a knack for learning and others don't.

Strongly Disagree				Strongly Agree
1	2	3	4	5

17. Things are simpler than most professors would have you believe.

Strongly Disagree				Strongly Agree
1	2	3	4	5

18. If two people are arguing about something, at least one of them must be wrong.

Strongly Disagree				Strongly Agree
1	2	3	4	5

19. Children should be allowed to questions their parents' authority.

Strongly Disagree				Strongly Agree
1	2	3	4	5

20. If you haven't understood a chapter the first time through, going back over it won't help.

Strongly Disagree				Strongly Agree
1	2	3	4	5

21. Science is easy to understand because it contains so many facts.

Strongly Disagree				Strongly Agree
1	2	3	4	5

22. The more you know about a topic, the more there is to know.

Strongly Disagree				Strongly Agree
1	2	3	4	5

23. What is true today will be true tomorrow.

Strongly Disagree				Strongly Agree
1	2	3	4	5

24. Smart people are born that way.

Strongly Disagree				Strongly Agree
1	2	3	4	5

25. When someone in authority tells me what to do, I usually do it.

Strongly Disagree				Strongly Agree
1	2	3	4	5

26. People shouldn't question authority.

Strongly Disagree				Strongly Agree
1	2	3	4	5

27. Working on a problem with no quick solution is a waste of time.

Strongly Disagree				Strongly Agree
1	2	3	4	5

28. Sometimes there are no right answers to life's big problems.

Strongly Disagree				Strongly Agree
1	2	3	4	5

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Appendix B

Motivated Strategies for Learning Questionnaire (MSLQ)

Part A: Motivation

The following questions ask about your motivation for and attitudes about your classes. **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. Circle *one number* per statement.

		not at all true of me						very true of me
1.	In my classes, I prefer course material that really challenges me so I can learn new things.	1	2	3	4	5	6	7
2.	If I study in appropriate ways, then I will be able to learn the material in my courses.	1	2	3	4	5	6	7
3.	When I take a test I think about how poorly I am doing compared with other students.	1	2	3	4	5	6	7
4.	I think I will be able to use what I learn in my courses.	1	2	3	4	5	6	7
5.	I believe I will receive excellent grades in my classes.	1	2	3	4	5	6	7
6.	I'm certain I can understand the most difficult material presented in the readings for my courses.	1	2	3	4	5	6	7
7.	Getting good grades in my classes is the most satisfying thing for me right now.	1	2	3	4	5	6	7
8.	When I take a test I think about items on other parts of the test I can't answer.	1	2	3	4	5	6	7
9.	It is my own fault if I don't learn the material in my courses.	1	2	3	4	5	6	7
10.	It is important for me to learn the course material in my classes.	1	2	3	4	5	6	7
11.	The most important thing for me right now is improving my overall grade point average, so my main concern in my classes is getting good grades.	1	2	3	4	5	6	7
12.	I'm confident I can learn the basic concepts taught in my courses.	1	2	3	4	5	6	7

	not at all true of me						very true of me
13. If I can, I want to get better grades in my classes than most of the other students.	1	2	3	4	5	6	7
14. When I take tests I think of the consequences of failing.	1	2	3	4	5	6	7
15. I'm confident I can understand the most complex material presented by the instructor in my courses.	1	2	3	4	5	6	7
16. In my classes, I prefer course material that arouses my curiosity, even if it is difficult to learn.	1	2	3	4	5	6	7
17. I am very interested in the content area of my courses.	1	2	3	4	5	6	7
18. If I try hard enough then I will understand the course material.	1	2	3	4	5	6	7
19. I have an uneasy upset feeling when I take an exam.	1	2	3	4	5	6	7
20. I'm confident I can do an excellent job on the assignments and tests in my courses.	1	2	3	4	5	6	7
21. I expect to do well in my classes.	1	2	3	4	5	6	7
22. The most satisfying thing for me in my courses is trying to understand the content as thoroughly as possible.	1	2	3	4	5	6	7
23. I think the course material in my classes is useful for me to learn.	1	2	3	4	5	6	7
24. When I have the opportunity in my classes, I choose course assignments that I can learn from even if they don't guarantee a good grade.	1	2	3	4	5	6	7
25. If I don't understand course material, it is because I didn't try hard enough.	1	2	3	4	5	6	7
26. I like the subject matter of my courses.	1	2	3	4	5	6	7
27. Understanding the subject matter of my courses is very important to me.	1	2	3	4	5	6	7
28. I feel my heart beating fast when I take an exam.	1	2	3	4	5	6	7
29. I'm certain I can master the skills being taught in my classes.	1	2	3	4	5	6	7
30. I want to do well in my classes because it is important to show my ability to my family, friends, employer, or others.	1	2	3	4	5	6	7

	not at all true of me						very true of me
31. Considering the difficulty of my courses, the teachers, and my skills, I think I will do well in my classes.	1	2	3	4	5	6	7

Motivated Strategies for Learning Questionnaire (MSLQ)

Part B: Learning Strategies

The following questions ask about your learning strategies and study skills for your classes. **Remember there are no right or wrong answers.** 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. Circle *one number* per statement.

	not at all true of me						very true of me
32. When I study the readings for my courses, I outline the material to help me organize my thoughts.	1	2	3	4	5	6	7
33. During class time I often miss important points because I'm thinking of other things.	1	2	3	4	5	6	7
34. When studying for my courses, I often try to explain the material to a classmate or a friend.	1	2	3	4	5	6	7
35. I usually study in a place where I can concentrate on my course work.	1	2	3	4	5	6	7
36. When reading for my courses, I make up questions to help focus my reading.	1	2	3	4	5	6	7
37. I often feel so lazy or bored when I study for my classes that I quit before I finish what I planned to do.	1	2	3	4	5	6	7
38. I often find myself questioning things I hear or read in my courses to decide if I find them convincing.	1	2	3	4	5	6	7
39. When I study for my classes, I practice saying the material to myself over and over.	1	2	3	4	5	6	7
40. Even if I have trouble learning the material in my classes, I try to do the work on my own, without help from anyone.	1	2	3	4	5	6	7
41. When I become confused about something I'm reading for my classes, I go back and try to figure it out.	1	2	3	4	5	6	7

	not at all true of me						very true of me
42. When I study for my courses, I go through the readings and my class notes and try to find the most important ideas.	1	2	3	4	5	6	7
43. I make good use of my study time for my courses.	1	2	3	4	5	6	7
44. If course readings are difficult to understand, I change the way I read the material.	1	2	3	4	5	6	7
45. I try to work with other students from my classes to complete the course assignments.	1	2	3	4	5	6	7
46. When studying for my courses, I read my class notes and the course readings over and over again.	1	2	3	4	5	6	7
47. When a theory, interpretation, or conclusion is presented in my classes or in the readings, I try to decide if there is good supporting evidence.	1	2	3	4	5	6	7
48. I work hard to do well in my classes even if I don't like what we are doing.	1	2	3	4	5	6	7
49. I make simple charts, diagrams, or tables to help me organize course material.	1	2	3	4	5	6	7
50. When studying for my courses, I often set aside time to discuss course material with a group of students from the class.	1	2	3	4	5	6	7
51. I treat course material as a starting point and try to develop my own ideas about it.	1	2	3	4	5	6	7
52. I find it hard to stick to a study schedule.	1	2	3	4	5	6	7
53. When I study for my classes, I pull together information from different sources, such as lectures, readings, and discussions.	1	2	3	4	5	6	7
54. Before I study new course material thoroughly, I often skim it to see how it is organized.	1	2	3	4	5	6	7
55. I ask myself questions to make sure I understand the material I have been studying in my classes.	1	2	3	4	5	6	7
56. I try to change the way I study in order to fit the course requirements and the instructor's teaching style.	1	2	3	4	5	6	7
57. I often find that I have been reading for my classes but don't know what it was all about.	1	2	3	4	5	6	7

	not at all true of me						very true of me
58. I ask my instructors to clarify concepts I don't understand well.	1	2	3	4	5	6	7
59. I memorize key words to remind me of important concepts in my classes.	1	2	3	4	5	6	7
60. When course work is difficult, I either give up or only study the easy parts.	1	2	3	4	5	6	7
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 my courses.	1	2	3	4	5	6	7
62. I try to relate ideas in my course subjects to those in other courses whenever possible.	1	2	3	4	5	6	7
63. When I study for my courses, I go over my class notes and make an outline of important concepts.	1	2	3	4	5	6	7
64. When reading for my classes, I try to relate the material to what I already know.	1	2	3	4	5	6	7
65. I have a regular place set aside for studying.	1	2	3	4	5	6	7
66. I try to play around with ideas of my own related to what I am learning in my courses.	1	2	3	4	5	6	7
67. When I study for my courses, I write brief summaries of the main ideas from the readings and my class notes.	1	2	3	4	5	6	7
68. When I can't understand the material in my courses I ask another student from my classes for help.	1	2	3	4	5	6	7
69. I try to understand the material in my classes by making connections between the readings and the concepts from the lectures.	1	2	3	4	5	6	7
70. I make sure that I keep up with the weekly readings and assignments for my courses.	1	2	3	4	5	6	7
71. Whenever I read or hear an assertion or conclusion in my classes, I think about possible alternatives.	1	2	3	4	5	6	7
72. I make lists of important items for my courses and memorize the lists.	1	2	3	4	5	6	7
73. I attend my classes regularly.	1	2	3	4	5	6	7
74. Even when course materials are dull and uninteresting, I manage to keep working until I finish.	1	2	3	4	5	6	7

	not at all true of me						very true of me
75. I try to identify students in my classes whom I can ask for help if necessary.	1	2	3	4	5	6	7
76. When studying for my courses I try to determine which concepts I don't understand well.	1	2	3	4	5	6	7
77. I often find that I don't spend very much time on my courses because of other activities.	1	2	3	4	5	6	7
78. When I study for my classes, I set goals for myself in order to direct my activities in each study period.	1	2	3	4	5	6	7
79. If I get confused taking notes in my classes, I make sure I sort it out afterwards.	1	2	3	4	5	6	7
80. I rarely find time to review my notes or readings before an exam.	1	2	3	4	5	6	7
81. I try to apply ideas from course readings in other class activities such as lecture and discussion.	1	2	3	4	5	6	7

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie,W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ).* Ann Arbor, MI: The Regents of the University of Michigan.

Demographics

Please circle a response for each item below:

A. Your sex: Female Male

B. Your age: 18 19 20 other_____

C. Your ethnicity: White African-American Hispanic Asian Multi-ethnic Other_____(please indicate)

D. Circle the highest level of father's education attained: high school some college college degree masters degree professional degree doctoral degree

E. Circle is the highest level of mother's education attained: high school some college college degree masters degree professional degree doctoral degree

F. Are you currently taking Global Studies, GST 110? yes no

G. Please indicate to what degree your courses in *high school* presented controversial issues:

regularly sometimes rarely never

H. Please indicate to what degree your courses in *high school* taught you how to analyze controversial issues:

Regularly sometimes rarely never

Appendix C

Note to Instructors and Protocol for Administering Pre-Tests

To: Course instructor

You have agreed to help Becky Olive-Taylor collect data in a pre- and post-test format that will support her doctoral dissertation research study and support a better understanding of first-year students and their learning orientations. The pre-test should be administered during the third week of September. Post-tests should be administered between Thanksgiving break and the last day of classes for fall term. Post-test booklets will be delivered to you in a timely fashion for administration. This study has been approved by IRB's at two institutions. Your help is greatly appreciated!

A. Please read aloud the following statement before distributing pre-test booklets to your students.

You are being asked to participate in a risk-free study that will yield valuable information about first-year students' beliefs about knowledge and their skill at understanding and using learning strategies. You will be asked to complete a test booklet that contains two surveys and a few demographic questions. Completion of both surveys is estimated to take no more than 40 minutes. Many of you will finish in less time. The surveys can be completed in either pen or pencil. The surveys will be collected during fall 2006, coded for statistical analysis, and kept by Becky Olive-Taylor, staff member in Academic Advising. Personal identifies such as name and Datatel number will be known only to Ms. Olive-Taylor. Personal identifies will not be used in any reporting format so that your privacy is guaranteed. The data may also be used in follow-up studies while you are a student at Elon. At the conclusion of any follow-up studies and your departure from the university, the printed surveys with identifiers will be shredded and stored computer analyses with personal identifiers will be erased.

Your participation is voluntary, but you must be at least 18 years old to participate. If you are of age and agree to participate, please raise your hand so you can receive a test booklet. Do not open the booklet yet.

B. Distribute test booklets and dismiss those who do not wish to participate. Continue by saying the following:

First, carefully read and sign the Informed Consent form in the front of your test booklet. Next, complete the surveys based on your understanding of the questions at this point in the semester. After you have completed both surveys and answered the demographic questions, return the booklet to me.

C. Please collect all booklets and return to Becky Olive-Taylor, Duke 108, or CB 2117.

Appendix D

Note to Instructors and Protocol for Administering Post-Tests

To: Course instructor

You have agreed to help Becky Olive-Taylor collect data in a pre- and post-test format that will support her doctoral dissertation research study and support a better understanding of first-year students and their learning orientations. You administered the pre-test in September. Now it is time for the second round of data collection. Post-tests should be administered between Thanksgiving break and the last day of classes for fall term. This study has been approved by IRB's at two institutions. Your help is greatly appreciated!

A. Please read aloud the following statement before distributing post-test booklets to your students.

You are being asked to participate in the final phase of a risk-free study that will yield valuable information about first-year students' beliefs about knowledge and their skill at understanding and using learning strategies. You will be asked to complete a test booklet that contains two surveys and two open-ended questions. Both surveys are estimated to take no more than 40 minutes. Many of you will finish in less time. The surveys can be completed in either pen or pencil. The surveys will be collected during fall 2006, coded for statistical analysis, and kept by Becky Olive-Taylor, staff member in Academic Advising. Personal identifies such as name and Datatel number will be known only to Ms. Olive-Taylor. Personal identifies will not be used in any reporting format so that your privacy is guaranteed. The data may also be used in follow-up studies while you are a student at this university. At the conclusion of any follow-up studies and your departure from the university, the printed surveys with identifiers will be shredded and stored computer analyses with personal identifiers will be erased. After you have completed both surveys and answered the short open-ended questions, return the booklet to me.

B. Distribute booklets to the correct students. Names are on the booklets to indicate who also took the pre-test.

C. Please collect all booklets and return to Becky Olive-Taylor, Duke 108, or CB 2117

APPENDIX E

INFORMED CONSENT FORM

We are asking you to participate in a research study about first-year students using the Epistemic Beliefs Inventory and the Motivated Strategies for Learning Questionnaire. Your participation in the study is totally voluntary. However, your participation is extremely valuable and may enable the researcher to improve the college experience for future students as well as support instruction at this institution. Volunteers must be at least 18 years old to participate. There are no risks associated with this study.

1. a) **Purpose of the Study:** The purposes of this study are to: 1) increase our understanding of how certain factors influence performance during college; and 2) analyze which factors correlate highly with each other and GPA.

b) **Benefits:** The information you provide may allow us to help students do better academically as they enter and complete their college studies. Participating in this study has the indirect benefit of allowing you to understand the research process better.

2. **Method:** After you sign this consent form and provide contact information, you will be asked to take the Epistemic Beliefs Inventory and the Motivated Strategies for Learning Questionnaire. These are estimated to take no more than 40 minutes to finish. Variables such as age, gender, ethnicity, high school GPA, SAT/ACT scores, number of AP or co-curricular credits completed, and parental education may also be compared. You will be asked to take these surveys again at the end of fall term to determine if your opinions have changed. Becky Olive-Taylor is the researcher who will protect and utilize this information for analysis while you are a student at this university.

3. **Need More Information?:** I am available to answer any questions regarding the study or your participation in it at any time. Please feel free to contact me using the information below:

Becky Olive-Taylor (oliveb@elon.edu), Duke Building, 108G (Phone: 278-6500)

Questions regarding your rights as a participant in this project can be answered by calling Mr. Eric Allen at (336) 256-1482.

4. Withdrawal from the Study: You may decide to withdraw from the study at anytime. If you choose not to participate in the study, or to withdraw in the future, it will in no way affect your standing or records at the university. If you wish to withdraw from the study, simply contact me at the address listed above.

5. How the Data will be Maintained: The information you provide will be kept in strictest confidence. Your student Datatel number will be part of the final research data base. However, your Datatel number and personal demographic information (e.g. name, age, gender, etc.) will be known only to the researcher, Becky Olive-Taylor, and will not be mentioned in any reports or publications concerning the study. The information will be locked in Becky Olive-Taylor's office, Duke 108G, as hard copies of the surveys, consent forms, and computer generated statistical analyses. By signing below, you also agree that the data may be utilized in follow-up studies while you are a student at this university. At the conclusion of any follow-up studies and your departure from the university, the printed surveys with identifiers will be shredded and stored computer analyses with personal identifiers will be erased.

6. Please indicate your understanding by signing below.

PRINT FULL NAME	EMAIL
SIGNATURE	DATE