AN INVESTIGATION INTO SUCCESSFUL LEARNING MEASURING THE IMPACT OF LEARNING ORIENTATION, A PRIMARY LEARNER-DIFFERENCE VARIABLE, ON LEARNING

by

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ABSTRACT

As year 2000 nears, one powerful and consistent finding to emerge from educational psychology research over several decades is the realization that how individuals learn is a powerful force in how they manage information, set goals, and accomplish tasks. Truly, one's successful learning ability is a framework that supports future successful learning and performance.

The increasingly rapid technology changes are creating skill shortages and revealing that our learners are not prepared to learn smart, fast, and well enough to manage change successfully or initiate change productively. Preparing successful, lifelong learners for the 21st century has escalated to a national priority.

What are the solutions for successful learning? This study introduces learning orientation as an important learner-difference variable that helps us examine the conative, affective, cognitive, and social influences, a whole-person perspective, on successful learning. The study's primary purpose investigates learning and individual learning differences by measuring the complex interplay between learner orientation, lower-order learning processes, and the learning experience.

As a secondary purpose, the researcher tested the web learning environment, called the System for Intentional Learning and Performance Assessment (SILPA), which delivers a "Discovering the Web" course. The SILPA is an instructional research model that adapts to learning orientation, provides successful learning support, and helps learners

improve learning ability. This approach replaces the traditional one-size-fits-all mass solution. As a third purpose, this study collected information to guide future research efforts.

During the course, the experimental group received guidance for using intentional learning resources. The first control group did *not* receive the guidance. Both of these groups had access to intentional learning resources. A second control group did *not* receive the guidance or access. Using a 3 X 3 factorial experimental research design and multiple univariate analyses of variance, the researcher measured and examined the effects and interactions on four variables (intentional learning performance, achievement, frustration, and learning efficacy) over three time periods. The researcher produced evidence on using intentional learning orientation to enhance learning performance. The findings revealed statistically significant main effects and interactions among the research groups. Explanations about learning orientation, help educators understand, predict, and support learning in different environments, match instruction and presentation, and adapt solutions and learning environments with greater success.

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CHAPTER ONE

Introduction

As year 2000 nears, our national priority is preparing successful, lifelong learners who competently respond to rapid changes and opportunities in the 21st century. To meet this challenge successfully, we need more reliable learning constructs that improve the way we learn faster, better, smarter, cheaper, continually, and intentionally.

If we fail to develop new learning theories and constructs that (a) clearly address the nature of learning and individual learning differences, (b) apply reliable measures to differentiate learning audiences before designing and providing the solutions, and (c) adapt realistic learning solutions to fundamental differences, then our new millennium solutions will likely continue to be disappointing and the results non-significant.

Our successful year 2000 solutions need

1. New traditions that highlight the significant impact of a comprehensive set of affective, conative, cognitive, and social learner-difference variables on successful learning. Definitions of these terms appear in the Appendix G: Glossary.
2. Reliable, well-researched explanations, using whole-person perspectives, interpretations, and measurable learning-difference constructs, about the human nature and variability of successful lifelong learning.
3. Clearer descriptions and explanations of how some learners benefit from one

type of solution or learning environment and others do not.

4. Strong theoretical foundations that describe the conceptual structure, primary sources and interrelationships for successful learning in contrast to less successful learning.
5. Practical strategies that differentiate, design, match, measure, and evaluate solutions and learning environments that support different orientations, successful learning outcomes, and progressively improved learning performance.

All learners approach learning with individual learning differences, some more successfully than others. Clearly, some learners have strong beliefs about learning and like to work hard, set high standards, achieve lofty goals, take risks, and use their initiative to discover and apply new information. In contrast, many learners remain satisfied with less effort, comfortable standards, highly structured environments, and easily attained goals. Other learners fall somewhere on the continuum between these two contrasting descriptions, and certainly some learners generally or situationally resist learning.

After forty or more years of strong cognitive traditions, we still do not include a complete set of psychological factors in our successful learning constructs, nor can we comprehensively identify and explain the key psychological sources that greatly influence differences in learning. Contemporary cognitive-rich research adds to the dilemma with the use of incomplete learning constructs that overlook the significant impact of affective and conative factors on learning.

The traditional learning difference research and successful learning constructs and theories highlight (a) cognitive processes as learning-difference variables, (b) cognitive interpretations about successful and less successful learning responses, treatments, outcomes, situations, and settings, and (c) cognitive consideration for designing, implementing, presenting, and evaluating instructional and assessment solutions. As a result, our strong cognitive traditions may be preventing us from recognizing, determining, and including other important sources for individual learning differences or using a whole-person view to explain, measure, manage, and support the variability in individual learning.

Even as we acknowledge that individuals do not learn alike, we continue to treat learners as a homogenous audience with a "one-size-fits-all" or aggregate mentality, and then we wonder why some learners learn really well, some better then others, and some eventually fail to achieve. Our learning research results are often equally ambiguous. In his discussions concerning instructional technology, Russell describes this dilemma as the no-significant-difference phenomenon, that is, those who benefit are balanced by a "like number who suffer; when combined with the no-significant-difference majority, the conglomerate yields the widely reported “no significant difference” results (Russell, 1997, p. 44).

In an effort to differentiate learning audiences, educators may recognize and respond to learning differences in styles, preferences, strategies, or skills, but these are often secondary variables and solutions derived from primarily cognitive constructs. Secondary

learner-difference variables do not address the higher-order sources of learning differences, such as intentionality, emotion, or desire for autonomy. A stronger impact is expected if we consider a construct representing the comprehensive set of higher-order psychological factors that, when combined, have the greatest influence on our approach to learning. The construct is called *learning orientation*. It is the understanding of these complex, psychological learning relationships and influences that invites further investigation.

New theoretical foundations will help us unveil the fundamental sources and interrelationships that contribute to successful learning. Reeves (1993) echoed sentiments advocating stronger, more reliable theoretical foundations when he suggested that "much of the research in the field of computer-based instruction is pseudoscience because it fails to live up to the theoretical, definitional, methodological, and/or analytic demands of the paradigm upon which it is based," and it thus leads to ambiguous results. The flood of ambiguous or inconsistent results coming from the research literature clearly indicates something critical is missing from our cognitive-rich learning constructs and theories.

Snow and Farr (1987, p. 1) suggested that sound learning theories are missing and realistically require a whole person view that integrates cognitive, conative, and affective aspects for improved instructional solutions. The two researchers wrote that in the analysis of learning, educators cannot ignore or overlook the key psychological aspects that interact in complex ways to support learning and performance outcomes. Otherwise, they both argued, explanations about learning differences will be ambiguous and “isolated”

from reality (Snow & Farr, 1987).

The intentional learning theory has its foundation in the intentional learning construct and uses this information to explain learning orientation and other important significant sources for learning differences. The learning orientation construct describes, from a whole-person perspective, the dynamic flow between: (a) deep-seated psychological factors (conative, affective, social, and cognitive factors), (b) learning orientation, (c) subsequent choices about learning, including cognitive learning preferences, styles, strategies, and skills, (d) responses to different treatments and solutions, (e) intended learning outcomes, and (f) progressive or regenerative efforts toward improved learning performance.

If learning orientation is indeed important to describing learning and identifying determinants for learner differentiation, we need to explain how its effects are more powerful than the effects of other variables and determine how its effects amplify or dampen the subsequent effects of other variables. At the same time, we should integrate these explanations with older, more established constructs about the influences and effects of other learner, learning, instructional, and teaching variables.

The successful integration of learning orientation concepts with existing research paradigms to develop new successful learning constructs is accomplished by (a) linking of traditional constructs to higher-order learning and instructional theory, (b) improving and expanding understanding about learning and individual differences, and (c) meeting the standards for sound constructs and theoretical assumptions that underlie the intended

research paradigm.

The literature review in Appendix A provides more information on these topics.

Purpose

This study broadens the investigation of successful learning by examining the relationship between key conative, affective, cognitive, and social factors and individual learning differences. The research investigates the use of learning orientation, an important construct in intentional learning theory, to differentiate characteristic of the learning audience and match instructional solutions. The intentional learning construct is used to measure, determine, and examine the complex interplay between the learning orientation, individual differences, settings, solutions, performance, attitudes, and outcomes. This study has three objectives.

1. The first objective is to collect and examine the significant learning orientation, time, and learning environment effects and interactions on dependent variables and determine if learning orientation accounts for significant variance, effects, and interactions with the dependent variables. To do this, this exploratory study provided instruction (an introduction to the Web course) that offered different treatments for subjects randomly assigned by learning orientation to three research groups. Using multiple repeated measures univariate analyses of variances (ANOVA), the researcher examined the effects of learning orientation (independent variable) on multiple dependent variables: *satisfaction*, *learning efficacy*, *intentional learning performance*, and *achievement*. The repeated measure design means that the subjects (Ss) are tested several times for a

measure of an independent variable. If learning orientation accounts for significant variance, effects, and interactions with the dependent variables, then the results will suggest some new possible explanations about the nature of learning and sources for differences in learning. In contrast, the research emphasis on the achievement dependent variable is highly exploratory because so little is known about how learning orientation influences achievement in different situations. As a result, the assessment in this study will rely on cognitive constructs until this study can gather more information about affective and conative influences on assessment.

2. The second objective is to investigate a promising new web learning environment called the System for Intentional Learning and Performance Assessment (SILPA). The SILPA, developed during a previous study, is a learning environment that measures, systemizes, and supports more successful learning performance in a specific domain. SILPA screen shots appear in Appendix C.

The evolving theory behind the model postulates that a learner experiences positive effects to the extent that the instruction and environment can appropriately match, adapt, and support the individual's learning orientation and characteristic individual differences in learning. This unique model uses the Learning Orientation Questionnaire (LOQ), as a diagnostic tool, to identify learner orientation, adapt instruction and settings to the different orientations, monitor learning activity, and encourage more intentional learning performance as the individual accomplishes course objectives. A fuller description of the LOQ appears in the Method section (see Pretest and Learning Orientation Questionnaire)

and an example appears in Appendix E.

The SILPA is an instructional research model that will help determine whether there is a significant impact on attitude, intent, and performance between learners who had access to instructional situations that specifically supported their individual learning orientation and other learners who did not receive the matched SILPA learning support and management. The quantitative and qualitative study results will also contribute to subsequent revisions for the Web learning environment, solutions for instructional and assessment, and a clearer understanding about learning orientation.

3. The final study objective is to contribute to long-term research efforts for refining the intentional learning theory, constructs, the SILPA, identifying learner-difference variables, and guiding future successful learning research. Quantitative and qualitative study results that help us understand the effects of learning orientation and the primary sources of individual differences will enhance successful lifelong learning constructs, contribute to the research already accomplished in earlier cycles, and guide succeeding improvement research.

Research Questions

This study focused on the following research questions:

1. Do learning orientations influence satisfaction, learning efficacy, achievement, or intentional learning performance (i.e., using the *iCenter*, a Learning Control Center for the SILPA, progress monitoring, task sequencing, and goal setting)?

2. Does intentional learning guidance or instruction influence satisfaction, learning

efficacy, achievement, or intentional learning performance?

3. Do learners using intentional learning environments (Experimental Group EX1) benefit with higher satisfaction, learning efficacy, and achievement, and more intentional learning performance than learners not using intentional learning environments (Control Groups CO1 and CO2)?

4. Do learning orientations influence group interactions (Control Groups EX1, CO1, and CO2)?

5. Do learning orientations influence significant time effects and interactions?

To address the five research questions, this study used an experimental 3 x 3 factorial (Table 2) research design for multiple repeated measures univariate analysis of variance (ANOVA).

Table 1

Repeated Measure ANOVA Research Design for the Five Research Questions

**Step 1 Pretest				
**Step 2 Intervention				
		A_1	A_2	A_3
---------Group EX1				
Intentional Learning	Cat_1	Y	Y	Y
Training (ILT Intervention) &	Cat_2	Y	Y	Y
Intentional Learning Environment	Cat_3	Y	Y	Y
---------Group CO1				
No Intentional Learning	Cat_1	Y	Y	Y
Training (ILT Intervention) &	Cat_2	Y	Y	Y
Intentional Learning Environment	Cat_3	Y	Y	Y
---------Group CO2				
No Intentional Learning	Cat_1	Y	Y	Y
Training (ILT Intervention) & No	Cat_2	Y	Y	Y
Intentional Learning Environment	Cat_3	Y	Y	Y
**Step 3 Analysis				

The Pretest (shown as Step 1 in Table 1) supports all the research questions by establishing a learning orientation score (a continuous independent variable) for all the Ss.

This information helps to randomly stratify each research group (EX1, CO1, CO2) by learner orientation (Cat 1, Cat 2, Cat 3). To address research question 2, only the Ss in the experimental EX1 Group received the intervention (intentional learning guidance and instruction). This repeated measure ANOVA design supports each of the research questions by collecting the Y repeated measures to test the hypotheses about the four dependent variable means measured on three different occasions or times (A_1, A_2, A_3). The separate observations by group support research question 4 and the observations by time are repeated measures that support research question 5. More information on the research design and intervention (Step 2 in Table 1) appears in the Method Section; more information on the analysis (Step 3 in Table 1) appears in the Results section.

Intentional Learning Theory Offers Successful Learning Solutions

What is the complex mix of different learner, learning, teacher, and instructional variables that fosters successful learning? How does successful learning cut across the constructs and sources of individual learning differences? How do individuals identify, manage, and support the key psychological factors that lead to successful learning in any kind of environment? Why do some learners learn less successfully? How do very successful learners very capably self-manage the social, conative, affective, and cognitive strategies that help them (a) set and attain knowledge- and performance-related goals, (b) plan, initiate, and manage personal and environmental change, (c) solve complex problems, (d) sequence tasks, (e) rely heavily on intrinsic resources, (f) adapt learning in different environments, and (g) monitor progress and learning performance? These

challenging questions stimulate a great deal of educational research, yet much is still unresolved or unknown about helping students learn more successfully.

The intentional learning theory defines successful learning as a continuous, regenerative human process that supports intentional, discriminating management and use (to differing or increasing degrees) of intrinsic and extrinsic resources for meeting challenging goals, building new knowledge, acquiring new skills, and improving strategies, abilities, and performance. Successful learning is a satisfying, self-fulfilling, transformative experience. Less successful learners constrain the learning process by allowing psychological and extrinsic influences to limit beneficial outcomes. Caplan, Choy, & Whitmore (1992) characterized successful learners as being goal-directed, self-managed, and supported by a strong sense of self-efficacy about their abilities and intentions to reach learning goals. Successful learners ensure that they have the knowledge, resources, and ability to act on their environment and bring about desired changes in the world that surrounds them.

The intentional learning theory describes a diverse set of key psychological factors (conative, affective, social and cognitive factors) that have a meaningful impact on our orientation to learn. In addition to the more commonly researched cognitive and social factors, key *conative* and *affective* factors, such as passion, intentions, emotions, aspirations, and desire for autonomy or learner control, play a significant role in explanations on how we learn. There are five critical distinguishing characteristics in intentional learning theory. The theory (a) considers conative, affective, physical, and

behavioral factors, along with cognitive and social factors, for a more comprehensive, whole-person learning perspective than is currently found in purely cognitive models, (b) describes a learning construct that isolates and measures key factors to explain or predict learning, (c) considers the complex interplay of learning factors that influence learning and individual differences in learning, (d) specifies measures for determining learning orientation, individual learning differences, and successful learning attributes, and (e) provides guidance for designing and matching solutions to learning orientations.

Amid the wealth of research about educational psychology, learning theories, and improved learning environments, Bereiter and Scardamalia (1993) discussed intentionality and primarily cognitive aspects of intentional learning when they presented a theory of building expertise. According to Bereiter and Scardamalia (1993, p. 3), reasoning and capacity to acquire expertise is uniquely human determined by intentionality. It is intentional learning, they ascertain, that turns learning into a goal rather than an incidental outcome. In fact, child psychologist Woodward (1998) offers evidence showing that by six months, babies are already beginning to recognize that when humans act or move, they do so with intent. So from this area of research, developmental child psychologists are suggesting that humans are already learning to be intentional or goal-oriented, from a very early age, as a fundamental part of their human nature.

Other researchers propose that if human beings are intentional, then learning requires a greater understanding of intentions, or the "meaning of the behavior to the individual who performs it; that is, the understanding of what he or she is doing" or intends to do

(Brown, 1987, p. 82; Dennett, 1978). Corno (1986, p.335) and Dweck (1985) support intentionality by implying that "the goal is learning rather than the performance per se."

In the publication, *Surpassing Ourselves*, the Bereiter and Scardamalia discussed the strategic, conative role played by intentionality in the achievement of expertise. In an earlier publication, these authors (1989, p. 363) originally defined intentional learning as the "pursuit of cognitive goals, over and above the requirements of the tasks." They described experts as learners, equipped with intentionality, who are actively and willfully trying to achieve learning. They are motivated, goal-directed learners who actively and intentionally achieve in environments that support learning.

Despite this ongoing research related to intentionality, transforming learners, and intentional learning environments, a theoretical representation for identifying and measuring the transforming learner or the variability in intentional learning has yet to be specified or established. A foundation that helps us understand intentional learning does not exist.

New constructs need to describe the extent and depth of an individual's fundamental desires to learn and belief about why, when, and how to choose, use, and manage learning over time and how it can accomplish personal goals or change events. These concepts are fundamental to understanding how successfully or intentionally the individual learns.

If there are significant differences in individual learning intentionality, passions, striving, beliefs, being, and how one approaches or experiences learning, how do we identify, measure, and understand these differences? In addition, how do we adequately

identify and measure these changes, attitudes, or performance over time? In contrast, how well instructors and course designers understand and match these learner differences determines how well they can deliver instruction that fosters successful learning. Finally, how do we determine the presentation, measure success, and evaluate how much of a solution one learner needs in contrast to others?

An important objective of the intentional learning theory is to provide the reliable constructs to measure individual learning differences and match solutions and learning environments to support those differences. The theoretical basis to accomplish this objective is a learning construct that provides measures for three primary learning factors. The initial theoretical components of intentional learning were derived from careful review of contributions of key researchers working in the area of psychological and developmental educational research (e.g., Pintrich, 1995; Schraw, 1994; Cheng, 1993; Corno, 1993; Flavell, 1992; McCombs, 1991a, 1991b; Bandura & Wood, 1989; Bereiter & Scardamalia, 1989; Snow, 1989; Pask, 1988; Schmeck, 1988; Weinstein, 1988; Brown, 1987; Davidson, 1986; Biggs, 1985; Deci & Ryan, 1985; Weiner, 1972).

The Intentional Learning Construct (ILC)

The intentional learning construct is a multidimensional representation (hypothesized network of explanatory concepts and relationships among concepts), derived from a blueprint specification, which provides an elaborated view of important learning variables and learning differences. The construct identifies several underlying factors that significantly impact learning and serve as learning-difference variables. The ILC describes

the influence and relationship between three primary learning factors:

1. Conation/Affective (degree of intention to learn, emotions, and learning enjoyment),

2. Learning Independence (degree of autonomy and control over learning)

3. Learning Effort (degree of planning, strategy, performance of cognitive efforts to learn, and reliance on intrinsic and extrinsic resources).

Specific information on the construct factors appears in Appendix F.

The Intentional Learning Construct (ILC) has specific relevance for all learners, regardless of age, intentions, preferences, or other learning or life-style variables. This particular study focuses on adult learners (high school or above). The construct is useful for explaining learning differences, developing learning questionnaires, designing instructional environments, matching and evaluating learning solutions, and measuring learning performance and improvements over time.

The intentional learning theory suggests that researchers, educators, and instructional designers, organizations, and managers need to consider, identify, and understand the nature of learning and intentional learning orientation construct more fully before they can successfully understand and differentiate their audiences, provide and evaluate relevant solutions and learning environments, and assess progress.

The successful learner is a confident, capable learner and will typically have highly developed learning strategies and skills, while a less successful learner is less confident and capable and will have fewer successful learning strategies and skills. A successful

educator recognizes these *orientations to learn* and matches instructional solutions according to individual learning orientations and recognized needs.

In contrast, instructors may unnecessarily cause frustration, aggravate performance, and inappropriately use resources if they mismatch solutions and learning environments with learning orientations. This problem may occur if educators try to (a) teach sophisticated learning strategies to less successful learners who are conceptually *not* ready to learn them, (b) set high learning standards for less successful learners who are *not* ready to attain them, (c) require successful learners to use unsophisticated learning strategies and skills (e.g., memorization), or (d) inexpertly push less successful learners to higher standards than they wish, desire, or intend to achieve.

Learning Orientations Model (LOM)

The Learning Orientations Model includes the researcher's descriptions for the four orientations that distinguish primary learner differences:

1. Transforming Learner
2. Performing Learner
3. Conforming Learner
4. Resistant Learner

Learning orientation is the degree that individuals, following a desire and intention to learn, generally extend effort to set goals, enjoy and manage the learning process, reflect upon the progress, and use reflections to improve future learning. These learning orientations represent a measure of our belief, need, and intent to grow, transform, and

improve our lives. Using the intentional learning construct as the foundation, the learning orientations describe an individual's complex, intrinsic manipulation of psychological variables (conative, affective, and cognitive influences) to approach and experience learning. Learning orientation indicates the individual's proclivity to take control, expend effort, set goals and standards, manage resources, and take risks to learn successfully. Learners situationally fall somewhere along the broad continuum of learning orientations to the degree that they successfully set and attain personal learning goals. Depending on the specific learning circumstances, a learner may easily move downwards in and out of any of the following learning orientations in response to negative or positive responses, conditions, resources, results, and experiences. Upward movement into new learning orientations requires greater effort, learner control, and increasingly stronger intentions and beliefs about learning.

Transforming learners. At one end of the continuum is the range for transforming learners. Deeply influenced by an awareness of the social, cognitive, conative, and affective aspects that influence them, transforming learners place great importance on personal strengths, intrinsic resources, ability, persistent and assertive effort, sophisticated strategies, high-standards, and positive expectations to self-manage intentional learning successfully. Intentional learning is a sophisticated, flexible approach that has great value and usefulness to the learner. Transforming learners enjoy acquiring expertise and will risk making mistakes to attain greater expertise. As they acquire expertise, they like to share knowledge and often serve as a guide, coach, or mentor to others.

Transforming learners take responsibility and control of their learning and become actively involved in managing the process. They use stimulating intrinsic influences, such as intentions, motivation, passion, personal principles and desires for high standards, to direct intentional achievement of challenging personal goals. Using an autonomous, reflective, goal-oriented, and self-assessment framework, transforming learners methodically adapt suitable strategies to manage the challenges in any learning situation.

Transforming learners learn best in learning environments that encourage, rely, and support expertise building, risk-taking experiences, mentoring relationships, self-directed learning, complex, problem-solving situations, high learner-controlled opportunities, transformative processes, high learning standards, and achievement of challenging personal goals for long-term accomplishments and change. Transforming learners seldom rely heavily on short-term goals, schedules, deadlines, grades, normative performance standards, expected social or instructional compliance, or others for learning motivation.

Performing learners. In comparison, a performing learner, in the middle range on the continuum, is a non-risk, competitive, skilled learner that consciously, systematically, and capably uses conative and cognitive processes, strategies, preferences, and self-regulated learning skills to achieve average-standard learning objectives and tasks. In contrast to transforming learners, performing learners are short-term and task-oriented, take fewer risks with mistakes and challenging or difficult goals, focus on grades and normative achievement standards, and most often rely on coaching relationships, available external resources, and social influences to accomplish a task. Performing learners often will

clearly acknowledge that they want to limit or constrain learning effort (they have other interests or do not have enough time) by only meeting stated objectives, getting the grade, or avoiding exploratory steps beyond the requirements of learning task. Performing learners need an important reason, which they value, to push themselves toward improving learning performance.

Conforming learners. Compared to transforming or performing learners, in the lower range on the continuum, conforming learners are complying and more passively accept knowledge and store and reproduce it to conform, complete assigned tasks if they can, and please others. The conforming learner does not typically think critically, like to make mistakes, synthesize feedback, or give knowledge new meaning to initiate change in themselves or the environment.

These learners are typically less skilled learners, have little desire to control or manage their learning, or aggressively work to change or improve their environment. They prefer to have simple standards set for them, rely on others for guidance. In supportive, uncomplicated, highly structured learning environments, conforming learners will usually work hard to achieve simple, clearly explained goals that have been set by others.

Resistant learners. In contrast to the other three learning orientations, resistant learners lack a fundamental belief that (a) learning is of value or worth the effort, (b) they can learn and achieve high standards, (c) academic learning and achievement can help them achieve personal goals or initiate desired changes. Too often resistant learners have

suffered repeated, long-term frustration from painful mistakes, academic failure, and disappointing situations. These learners do not believe in formal education or academic institutions as positive, necessary, or enjoyable influences in their life.

Resistant learners may find the challenge of not learning far more interesting than learning and apply great effort to their resistance. These learners are often described as at-risk or drop-out students. Further information on resistant learners does not appear in this study as it is a topic of a future study. In addition, this study does not include resistant learners because the SILPA does not yet provide options for this orientation.

The LOM guides the application of the intentional learning construct into realistic learning situations. This model is part of a greater conceptual network of framework structure that includes the (a) diverse psychological variables which impact learning and (b) intricate interactions and relationships that influence individual differences in learning. These classifications of learning orientations convey the typical or general approach to learning as an individual's characteristic trait to a new learning situation. In addition, this general learning orientation trait may be individually modified due to specific situational constraints and characteristics of the learning environment. The focus of this study is addressing learning orientation as a general trait rather than the moment-to-moment learning orientation state characteristics.

CHAPTER TWO

Method

Introduction

This study used a World Wide Web Basics course, designed and developed by the researcher, to investigate successful learning by measuring the impact of learning orientation. The System for Intentional Learning and Performance, an instructional research model, provided experimental conditions for learning and collected and stored data while the subjects (Ss) took the Web-delivered course.

The methods described in this section contributed to the threefold study purpose:

1. Research - Provide a research design and analytical model to collect and analyze information about learning orientation, time, and learning environment effects and interactions on dependent variables.

2. Development - Provide and test an instructional research model for continuing research efforts.

3. Theory Development - Explore research questions and collect information to guide future investigative efforts in the study of successful learning and individual learning differences. This information will also initiate an improvement-oriented research process, founded on (1) theory and construct, (2) formative research design and analytical methodology, (3) instructional/research environment, and (4) ongoing improvement cycles.

The employed methods to accomplish the study purpose included (a) creating an online learning environment and treatments that matched differentiated audience orientations and provided alternative instructional elements, presentations, environment, and support in three research groups, (b) determining the individual's orientation to learn, (c) using learning orientation as a random selection method to channel Ss into different research groups, (d) introducing the course and delivering instruction while helping selected learners in the experimental EX1 group understand and manage their individual learning differences, (e) analyzing data and examining effects and interactions on the dependent variables in matched and mismatched learning environments with differing ILO, and (f) making inferences for the second and third study purposes, that is, determine future refinements for the SILPA and guidance for future research.

Learning Environment and Research Groups

The System for Intentional Learning and Performance Assessment (SILPA) provided the instructional and research model for the *Discovering the World Wide Web* course. The SILPA was developed to systemize, match, manage, and measure instructional support and activities for three different learning orientations: (a) transforming, (b) performing, and (c) conforming.

The key to designing the SILPA architecture was understanding the complex interaction between (a) learning orientation, (b) instructional and assessment objectives, requirements, resources, and situational constraints, (c) intentional learning performance, and (d) preferences for instructional presentation each element has an strategic role in

supporting intentional learning processes. The SILPA design (a) uses a problem-solving, expertise-based, and process-oriented instructional core, (b) adapts to individual learning orientation, performance, and progress, (c) supports, to differing degrees, self-monitored, exploratory, self-assessed, and self-managed learning, and (d) helps learners internalize higher levels of sophisticated intentional learning performance as they progress.

The heart of the SILPA model is a learning management and assessment framework called the *iCenter*. It offers resources to examine the content of the course, set goals, reflect on presentation preferences, and review cumulative and comparative information about scores. This learning resource helps the learner manage individual learning performance for the domain of expertise (conceptual, declarative, procedural, conditional, and associated knowledge, skills, and performance) in an organized problem-solving structure integrated with dynamic feedback and assessment opportunities.

A learning progress map, called the *iMap* is also part of the iCenter. It provides information about scores and learning progress and answers questions, including (a) how well am I doing on this lesson or course, (b) what have I completed, (c) how much is left to complete, and (d) how well have I done in comparison to others on this lesson or course?

Before starting the course, the Ss took the SILPA's diagnostic instrument and were randomly assigned to one of three research groups, including the experimental EX1 group and Control CO1 and CO2 groups. Each group consisted of pretested Ss separated into three categories on the basis of the pretest measure (a) Transforming learners (Cat_1), (b)

Performing Learners (Cat_2), and (c) Conforming Learners, (Cat_3). Descriptions of the groups follow.

1. Experimental Group EX1 - This instructional setting is the optimal instructional setting that adapts the treatment to different orientations and provides intentional learning resources, such as the iCenter and iMap. The Ss received Intentional Learning Training (ILT). The ILT took approximately five minutes to read and encouraged Ss to decide how they wanted to learn (e.g., including how fast, how much, which way, and how often).

The guidance explained how Ss could use the different tools to improve self-managed learning at their own pace. In this group, all the learning orientations were expected to do well because the environment adapted to each orientation. Nonetheless, the performing learners were expected to react negatively (to some degree) to encouragement that suggested harder work or more effort.

2. Control Group CO1 - This instructional setting is the same as the Experimental Group EX1 setting with one exception. The Ss in this first Control Group CO1 did not receive ILT, but like the Experimental Group EX1 (and unlike Control Group CO2), Control Group CO1 had access to the iCenter. The Ss in this group had basic instruction on using the SILPA components; although, they did not get the encouragement.

In this group, transforming learners were expected to do well but not as well as in the EX1 group. Performing learners were expected to do best in this group because they had instruction on and access to the intentional learning components without the

encouragement for more effort or harder work. Conforming learners were expected to do well, but not as well as in the CO2 or EX1 groups. The CO2 and EX1 groups provided more explicit guidance about using a structured learning environment.

3. Control Group CO2 - This instructional setting was not the same as the Experimental Group EX1 or Control Group CO1. The Ss in this second control Group CO2 did not receive ILT or the intentional learning resources like the other two groups. This environment and treatment matches the conforming orientation, not the other orientations, and offered a scaled-down, linear-sequenced, menu-driven version compared to the setting used by the EX1 and CO1 groups.

In this control group, (a) transforming learners were expected to either get frustrated by the setting or learn despite the linear, highly structured environment, (b) performing learners were expected to downplay their learn to the less-demanding conforming environment, and (c) conforming learners were expected to do well in the comfortable, uncomplicated environment.

Experimental Research Design Measuring Orientation, Group, and Time Effects

To accomplish the study's three objectives and address the five research questions, this study uses a 3 x 3 factorial experimental research design (Table 2) with multiple repeated measures univariate analysis of variance (ANOVA). The repeated measure ANOVA tests hypotheses about the four dependent variable means measured on different occasions. This multi-variable approach and intervention research design strategy was selected to (a) demonstrate a causal link or interaction between the independent variables

(Cat1, Cat2, Cat3 variable in Table 2) and dependent variables (Y Measures in Table 2), (b) study the differential effects and interactions of an instructional intervention treatment upon the various dependent variables over time, and (c) maximize the chances of obtaining statistically significant differences among the three research groups.

Table 2

Repeated Measure Research Design for Three Research Groups

Step 1 Pretest				
Step 2 Intervention		A_1	A_2	A_3
EX1 with ILT with iCenter	Cat. 1 Cat. 2 Cat. 3	Y Measures	Y Measures	Y Measures
CO1 with iCenter without ILT	Cat. 1 Cat. 2 Cat. 3	Y Measures	Y Measures	Y Measures
CO2 without iCenter without ILT	Cat. 1 Cat. 2 Cat. 3	Y Measures	Y Measures	Y Measures
Step 3 Analysis				

Note. The table shows Ss in three research groups: Group EX1 is the experimental group, and Groups CO1 and CO2 are the control groups. Resistant learners are not part of this study. A = treatments divided into three instructional units (comprised of eight lessons joined with assessments) delivered similarly to all research groups. Y = outcome measures of the four dependent variable, including (a) satisfaction, (b) learning efficacy, (c) intentional learning performance, and (d) achievement.

This research design is unique because it uses learning orientation, a separate dimension, to guide development of the research environment and instructional treatment and to differentiate the learning audience before introducing the adapted solutions and examining the results. This step is important because it adds a key human dimension to the examination of learning. The design step distinguishes learners as individuals with strong psychological characteristics in comparison to traditional methods that treat learners as a uniform group with homogeneous learning orientation. In this study, learners are not expected to learn and benefit alike from the same instruction; the Y measures will show the variances, effects, and interactions. As previously mentioned, regarding the achievement dependent variable, the assessment model was not adapted to adjust to learning orientation. Subsequent studies will adapt the assessment model to include conative and affective factors.

Mixed Model Analysis of Data from Basic Repeated Measures Design.

The study's primary purpose and the objective of the first research question was to examine the effects and interactions of each instructional treatment group on each of the dependent variables. The researcher used a mixed model analysis procedure (PROC MIXED) in the SAS system to conduct the series of univariate repeated measures analyses of variances on the experimental and control groups. Multiple, sequential observations (Y measures in Table 2) were necessary in discriminating the effects on the dependent variables between the three research groups over three time periods.

Hence, a repeated measures design was the natural selection to analyze the data in

the different subintervals of the instructional cycle. "Repeated measures data need mixed models because of correlations between measurements on the same subject" (Littel, Milliken, Stroup, & Wolfinger, 1996, p. 97). Using this suggestion, the researcher modified a mixed model repeated measures example from Littell, Freund, and Spector (1991) and added parameters for learning orientation (treated as a continuous subject variable). The PROC MIXED auto regressive model and repeated measures methodology (shown next) accounts for variation within treatment groups, within instructional units, over three time periods, and within subjects.

```
proc mixed data = s1;
        class group subj time;
        model fru = ilo group time ilo*group ilo*time ilo*group*time time*time*group
           ilo*time*time time*group*time ilo*group*time*time / s htype = 1;
        repeated time / type = ar(1) sub = subj(group);
run;
```

Because the continuous variable TIME is quantitative, the dependent variable can be modeled as a polynomial function of time. To model time as a regression variable, the researcher chose the autoregressive covariance of order 1 (AR(1)), which "specifies that the covariance between two measurements *w* time intervals apart is $\delta^2\rho^w$. The parameter δ stands for the variance of an observation. The parameter ρ stands for the correlation between adjacent observations on the same subject. Thus the correlation between measurements at times one and two is ρ, between measurements at times one and four is

ρ^3, and so on" (Littel, Milliken, Stroup, & Wolfinger, 1996). This method examines trends over TIME and yields equations useful for examining groups at specific times or predicting dependent variables for a group at a specific TIME.

To enhance this model, Wolfinger (1992) suggested using model-fitting criteria. This criterion helps the researcher determine the appropriate covariance structure, using a step-by-step restrictive inference process of the model that best fits the data and allows valid inferences about fixed effects. This model selection criteria compare reductions in the sum of squares of the residuals for a more parsimonious model. SAS's PROC MIXED procedure offers several model-fitting criteria: Restricted Log Likelihood, Akaike's Information Criterion (AIC), Schwarz's Bayesian Criterion (SBC), and -2 Log Likelihood. AIC and SBC, the commonly used criteria, are useful for determining the best-fit model in comparison to other alternatives. Model A fits better than model B if the AIC or SBC for A is smaller (closest to zero) than that for the alternative model B.

Data Collection

This empirical research study examined Ss completing instruction observed over three time periods as a source of data. This particular data collection method increases data points by providing multiple observations of individuals in repeated models that are more realistic than measurements made at only a single point in time. This important aspect allows the researcher to reflect more realistically the dynamics of change in the analysis of complicated learning behavior.

Special programming enabled the SILPA to collect and store the data in underlying

databases throughout the instructional course. The data included information about each user and subsequent learning performance, including

1. Personal information
2. Learning orientation scores
3. Learning profile
4. Research group assignments
5. Scores for practice and assessment exercises
6. Scores for the dependent variables (satisfaction, learning efficacy, intentional learning performance, and achievement)

The data collection resulted in four sets of data. The first data set came from the pre-course diagnostic survey; the other three sets were collected while the learner worked on the course's three instructional units. Lessons (a) one through four comprised the first unit, providing easy learning content, (b) five and six the second unit, providing more difficult learning content, and (c) seven and eight the third unit, providing very difficult learning content.

The SILPA also created an activity log for each learner. The activity log is a complete record of all the activity tracked while the learner completed the course. This information demonstrated the differences in how learners managed the course by showing times (learning time per task), sequencing of tasks (learning paths), and frequency of use for different SILPA components. This log also provided information for guiding future course revisions, especially in the improvement of feedback and learning resources.

Examination of these performance logs provided information for rating intentional learning performance, which was a dependent research variable for each instructional unit. The Ss received points for their use of specific SILPA components: (a) one point if they used the iCenter more than twice within the unit, (b) one point if they used the iMap more than one time across the units, (c) one point if they sequenced tasks out of the prescribed order within the unit, and (d) one point if they sequenced tasks out of the prescribed order within the unit and scored over eighty percent.

At the end of lessons three through eight, the Ss rated themselves on two questions which provided information about two dependent variables.

1. Satisfaction Variable: How would you rate this lesson? (5 = Enjoyable for Me, 1 = Frustrating for Me).
2. Learning Efficacy Variable: How do you feel about your learning progress? (5 = Very Satisfied, 1 = Very Dissatisfied).

Pre-Test and Learning Orientation Questionnaire

Before the course, subjects (Ss) took the 25-item *Learning Orientation Questionnaire (LOQ)* as part of the registration process. The registration form also had items that collected initial information to establish a baseline concerning knowledge of the content area, learning efficacy, and online learning background. The LOQ is a diagnostic instrument, developed during a previous study, for determining an individual's learning orientation by specifically measuring the intentional learning construct factors. It is a self-report survey that aligns the intentional learning theory and construct with practical

measures to assess intentional learning orientation, match instructional solutions, and predict learning performance. An example of the LOQ appears in Appendix E.

The LOQ provides scores that indicate where the learner may fall across the dimensions of the construct and along the learning orientation continuum. In this study, the learning orientation scores were continuous variables. The computer automatically stored the data collected from the registration form in the SILPA database.

Material

The introductory material included a course introduction with information on taking the *Discovering the World Wide Web* course in a Web-based intentional learning environment. For the Experimental Group EX1, extra guidance appeared in the course introduction. This guidance introduced the intervention and offered encouragement to foster intentional learning performance (e.g., using the iCenter, iMap, progress monitoring, or task sequencing). The assumption that setting goals, sequencing task, and monitoring progress contributes toward successful learning is part of the course design. Performing learners were not expected to react too positively to guidance about setting higher performance standards and using more effort, but it was important compare the effect on all the orientations.

The *Discovering the World Wide Web Basics* course is easy-to-use, self-paced computer training delivered on the World Wide Web. The course consists of eight lessons, called *iEvents*, that present instruction integrated with practice, feedback, and assessment activities. During each iEvent or lesson, Ss had opportunities to accomplish

up to seven tasks that helped them learn, review, practice, and test new competencies.

In this course, Ss were expected to accomplish the course objectives by learning how to

1. Describe the Web
2. View a Web Page
3. Print a Web Page
4. Save a Web Page
5. Find a Web Page
6. Use a Hypertext Link
7. Navigate the Web
8. Search the Web Using a Search Browser

Assessment Instruments

After finishing each *iEvent* or lesson, learners had the opportunity to practice and take tests with feedback, called *iChallenges*, to evaluate their progress. The testing purpose was to evaluate the Ss general understanding of the concepts and ability to understand or perform specific competencies. Each of the eight iChallenges contained a set of multiple choice questions or simulated exercises. Learners clicked the Submit button to have the computer score the practice and iChallenge exercises and provide immediate feedback. The computer stored the data collected from the practices and iChallenge assessments in the SILPA database.

The assessment models are very simplistic, modeled on cognitive constructs, and use

percentage correct for a very few questions for each instructional unit. The models primarily support the second purpose to explore conditions relevant for progress assessment for the SILPA by collecting information about achieving and progress for future models development. There are many factors, especially conative-affective factors and content difficulty, which are uncontrolled and need to be understood and integrated into more comprehensive assessment constructs.

More sophisticated assessment models are necessary before we can adequately use the SILPA to test, control, and measure practice, progress, and achievement. Observation of the Ss taking the assessment, data collected, and exit interviews provided important qualitative information about the Ss commitment, interests, striving, and similar factors that need future consideration.

Participants

Seventy-two individuals, including 49 women and 22 men (age: $\underline{M} = 21.61$) volunteered to take the World Wide Web Basic course. All subjects (Ss)adults from local businesses, universities, and households had limited Web experience and showed a desire to learn how to learn use the Internet. The majority of Ss came from volunteer psychology and sociology students attending a local western university during the fall 1998 semester. They took the course in a computer lab on computers equipped with Netscape Communicator (Navigator Web Browser) and Microsoft Windows NT. The participants were motivated primarily by the desire to learn about using the Web.

Most of the Ss appeared motivated to learn the course and showed a willingness to

sit in front of the computer for a long period. Although, this is not an ideal situation for computer learning, the Ss typically chose the finish-in-one-sitting solution unless they had a time conflict and needed to reschedule. At the end of the course, most Ss took the time volunteer information on course satisfaction (offering statements like "This is cool. I am learning things I need to know" and "I wish I could always learn this way") with the course objectives, presentations, and new knowledge. In comparison, some learners in the conforming environment (Control Group CO2) mentioned that the course was too slow.

Treatment

The treatment was accomplished in three phases: Phase 1, Ss signed in as first-time users by logging in on the *i*Learn Express Web page and began the registration process, which included the pre-course diagnostic questionnaire to determine learning orientation. In Phase II, after the Ss submitted the registration form, the computer used the stratified or matched random sampling method to assign the Ss, by learning orientation, to three independent groups (equally divided for treatment and control conditions).

This random assignment method is useful when the matching variable is strongly related to the dependent variables and the researcher wants to ensure equivalent groups on specific subject characteristics, e.g., the orientation categories: Intentional, Performing, and Conforming Learners. Finally, the computer displayed a course introduction specifically designed for each group.

In Phase III, Ss worked on the instruction at their own pace. They could stop and log off when they chose. Afterwards, they could use the same Web address to access the

Web site and use their logon name and password to move to the unfinished portions of the course. They had two weeks to complete all the assessments and the course. Most of the Ss completed the course in one sitting (i.e., typical sessions lasted one and one half to two hours). Learners successfully finished the course by completing the assessments for eight lessons.

CHAPTER THREE

Results

Introduction

The examination of how learners, identified by learning orientation, individually approach and experience learning is an initial step in understanding the dynamics of successful learning, significant learning characteristics, and primary and secondary sources for individual differences in learning.

Major study findings showed how the dependent variables, including satisfaction, intentional learning performance, achievement, and learning efficacy, varied by learning orientation, time, and instructional setting in support of the research hypotheses. The quantitative evidence addresses the study's central research questions concerning learning and learning orientation as it examines the dependent variable variance, effects, and interactions. Specifically, the results provide compelling evidence that describes the interplay and relationships between the learner's orientation, a primary learner variable, and learning, teaching, and instructional variables.

In this chapter, Figures 1 through 11 depict (a) group means by time results, and (b) bivariate plots of learning orientation by time and by group interactions. Tables 3 through 14 present (a) group means by time and (b) results of the ANOVA analyses, including orientation, time, and group effects and interactions for the four dependent variables. The ANOVA asks the question: does the independent variable have a significant effect? The data are analyzed separately as learning orientations and combined as groups in a series of multiple repeated

measure univariate analysis of variance.

The three research groups are presented in these results as follows:

1. Experimental Group EX1, group offering a learning environment and treatment that adapts to three learning orientation, supports intentional learning performance, and offers Intentional Learning Training as the intervention treatment.

2. Control Group CO1, group with the same instructional setting as the Experimental Group EX1 without the ILT intervention treatment.

3. Control Group CO2, a second control group without the intentional learning resources or the ILT intervention treatment. This environment specifically matches the conforming orientation, not the other orientations, and offers a restricted, more linear-sequenced, menu-driven version of the setting used by the EX1 and CO1 groups.

Set of Results for the Satisfaction Dependent Variable

The first data set describes the variance, and ILO (orientation), GROUP and TIME main effects and interactions for satisfaction, the first dependent variable. A short summary appears at the end of each dependent variable section.

Means for the satisfaction (SAT) dependent variable. The satisfaction dependent variable means in Table 3 were consistently higher for the Experimental Group EX1 at every time point. It is interesting to note that all group means decreased during the second time period. Later, each of the group means increased during the final time period. In comparison to CO1 and CO2, (a) EX1 and CO1's decrease in means during Time 2 was less than CO2's and (b) EX1's and CO2's increase in means for Time 3 was greater than CO1's. The web learning environment and content

seemed to influence satisfaction more than content difficulty. Despite the easy to hard content difficulty of the course, the Ss often verbally indicated that they enjoyed learning this content on the Web.

Table 3

Means for Satisfaction (SAT) Dependent Variable by GROUP and TIME.

		Group Means			
GROUP	N	TIME 1	TIME 2	TIME 3	OVERALL
EX1 Group	26				
M		4.23	4.19	4.62	4.35
SD		.82	.88	.70	
Control CO1	23				
M		4.04	3.59	4.21	3.95
SD		.69	1.06	.67	
Control CO2	22				
M		4.06	3.40	3.82	3.76
SD		.98	1.20	1.14	GRAND
OVERALL		4.11	3.73	4.22	4.02

Note. This table shows how Ss rated themselves across the duration of the course using a 5point Likert scale (5 = This lesson is very enjoyable for me, 1 = This lesson is very frustrating for me). The higher the rating, the greater the satisfaction with the course. Time 1, Time 2, and Time 3 were the first, second, and third part of the course and represented three instructional units.

Overall, comparing the observations for the first and final time period of the course, the increase was higher for the Experimental Group EX1, equal for the Control Group CO1, and lower for the Control Group CO2. The Experimental Group EX1 had the highest overall increase in course satisfaction.

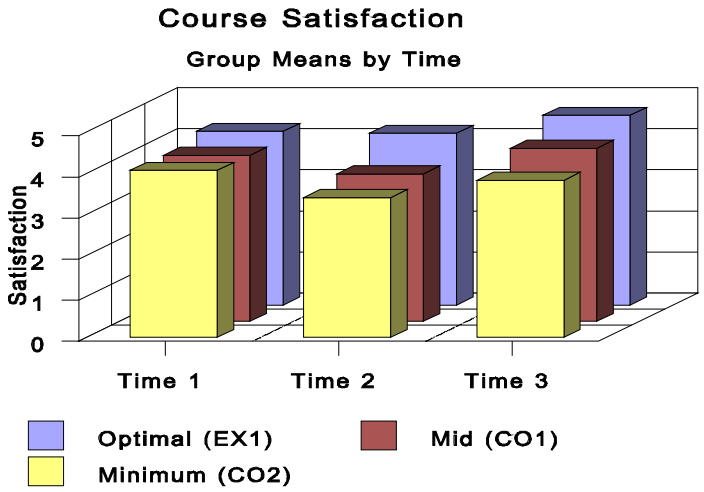

Figure 1. Group means by time for the satisfaction dependent variable.

Figure 1 shows the satisfaction group means (Y-axis) for each research group (EX1, CO1, CO2) over time, including Time 1, Time 2, and Time 3.

ANOVA results for the satisfaction dependent variable. This study used the ANOVA to examine how ILO (learning orientation), GROUP, and TIME main effects or interactions may influence satisfaction dependent variable. The results shown in Table 4 reveal a statistically significant GROUP ($F = 5.30$, $p < 0.01$) effect and ILO * GROUP ($F = 6.48$, $p < 0.01$) and ILO * TIME ($F = 9.80$, $p < 0.0001$) interactions. These results mean that GROUP and the combination of ILO and TIME elicited a particularly strong effect on learning. The other effects and

interactions were nonsignificant.

Table 4

Analysis of Variance for Satisfaction (SAT) by ILO, GROUP and TIME in Univariate Form.

Tests of Fixed Effects

Source	NDF	DDF	Type I F	Pr > F
ILO	1	65	0.22	0.6428
GROUP	2	65	5.30	0.0074
TIME	2	130	1.34	0.2661
ILO * GROUP	2	65	6.48	0.0027
ILO * TIME	2	130	9.80	0.0001
GROUP * TIME	4	130	0.40	0.8112
ILO * TIME*GROUP	4	130	1.53	0.1975

Note. NDF = Numerator Degrees of Freedom, DDF = Denominator Degrees of Freedom

In Table 4, significant ILO * GROUP and ILO * TIME interactions appeared with the continuous independent variable (ILO) yet did not appear with ILO main effect ($F = .22$, $p > .64$). Further specific information about learning orientation effects within the groups was needed to explore these interactions.

Because these interactions (ILO * TIME and ILO * GROUP) were present, the main effects for GROUP and TIME may be interpreted as differences between the intercepts where ILO takes the value of zero. However, because zero was outside the possible range of scores, and because all observed scores were greater than 3.5, these intercept differences as they appear in Table 4 are

of limited meaningfulness in understanding the data, especially the influence of orientation.

To examine the interactions more closely, the researcher estimated a modified, hypothetical ANOVA model to test GROUP and TIME main effects at three typical learning orientation points along an ILO scale (X-axis). To create the hypothetical learning orientation points, the model used three new independent variables to isolate, examine, and compare effects at points corresponding to the learning orientations: intentional (M = 6.0), performing (M = 5.0), and conforming (M = 4.0). The corresponding learning orientation variables were created by subtracting 4, 5, and 6 respectively from the ILO variable in the original data set. This calculation creates three standardized values for ILO4, ILO5, ILO6. These change have little impact on the ILO effects and interactions; they remain the same (as reported in Table 4 for the main model) for the three sets of data (ILO4, ILO5, and ILO6). However, these modifications will examine the impact of orientation on effects and interactions.

Instead of using the original ILO variable, the ANOVA (see Appendix D) was run again three times, substituting each of the new ILO variables in the revised model statement. Table 5 shows the results of the new analysis model using the three hypothetical learning orientation variables (ILO4, ILO5, and ILO6). The results from this modification allow the researcher to examine, understand, and predict differences in the data from each unique learning orientation perspective.

Table 5

Analysis of Variance for Satisfaction (SAT) by Hypothetical Learning Orientation Variables (ILO4, ILO5, and ILO6), GROUP and TIME in Univariate Form.

Tests of Fixed Effects

Source	NDF	DDF	Type I F	Pr > F
Set 1 - Using ILO4 = ILO - 4 (Conforming)				
GROUP	2	65	2.02	0.1409
TIME	2	130	5.26	0.0063
GROUP * TIME	4	130	0.53	0.7110
Set 2 - Using ILO5 = ILO - 5 (Performing)				
GROUP	2	65	4.53	0.0144
TIME	2	130	10.94	0.0001
GROUP * TIME	4	130	1.56	0.1900
Set 3 - Using ILO6 = ILO - 6 (Intentional)				
GROUP	2	65	10.52	0.0001
TIME	2	130	1.73	0.1820
GROUP * TIME	4	130	0.86	0.4895

Set 1 in Table 5 presents what we expect will happen with a standardized ILO centered at a hypothetical mean of 4. The results show a statistically significant TIME ($\underline{F} = 5.26$, $\underline{p} < 0.01$) effect. Other effects and interactions were nonsignificant. This perspective predicts what might occur for conforming learners.

What we expect with ILO centered at a hypothetical mean of 5 appears in Set 2. These results show statistically significant GROUP ($\underline{F} = 4.53$, $\underline{p} < 0.01$) and TIME ($\underline{F} = 10.94$ $\underline{p} <$

0.001) effects, thus revealing how the learning orientations are beginning to interact with GROUP and TIME main effects. Other effects and interactions were nonsignificant. This perspective predicts what might occur for performing learners.

Set 3 describes what we expect with ILO centered at a hypothetical mean of 6. The results show a statistically significant GROUP ($\underline{F} = 10.52$, $\underline{p} < 0.0001$) effect. There are no longer significant main effects of time for transforming learners. Other effects and interactions were nonsignificant. This perspective predicts what might occur for transforming learners.

Bivariate plot of orientation and the satisfaction dependent variable. The PROC REG command in the SAS system, using unstandardized regression weights for the predicted intercept and slope by GROUP, provided additional information about learning orientations within groups. To examine the effects for satisfaction by ILO and GROUP, the weights were used to plot the regression lines between *X* and *Y* using the linear equations formula, y = a + bx.

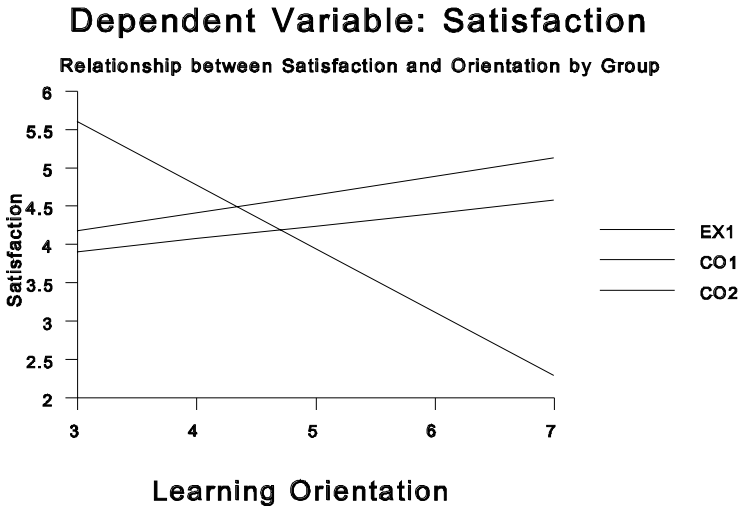

Figure 2. Linear equations for satisfaction by GROUP showing the regression of *Y* on *X* .

Figure 2 depicts the ILO * GROUP interaction, that is, the learning orientation influence on satisfaction, as the individual's learning intentionality increases or decreases in each GROUP. The higher the dependent variable satisfaction (Y axis) rating (1-5), the greater the satisfaction with the lessons in the instructional unit. Conversely, the lower the satisfaction score, the greater the frustration with the lessons in the instructional unit. The higher the learning orientation score (X axis), the higher the learning intentionality.

Figure 2 also helps explain the results shown in Table 5. When interactions are significant, the lines are unparallel and demonstrate that a great effect on the dependent variable occurs with some degree of influence from the indicated variable. These results show nonsignificant GROUP effects a learning orientation level or score centered at 4.0. This was confirmed in Set 1 of Table 5. Noticeably, as intentionality increases, we see significant GROUP effects beginning at a learning orientation score of 5.0 and clearly occurring at a learning orientation score of 6.0 and above. Sets 2 and 3 of Table 5 confirm this by showing increasingly significant GROUP effects.

These results indicate that the restrictive instructional setting offered by the Control Group CO2 influences a significant amount of learning frustration as the learning orientation increases. In contrast, the other two research groups offer learning support that positively influences course satisfaction for the three learning orientations.

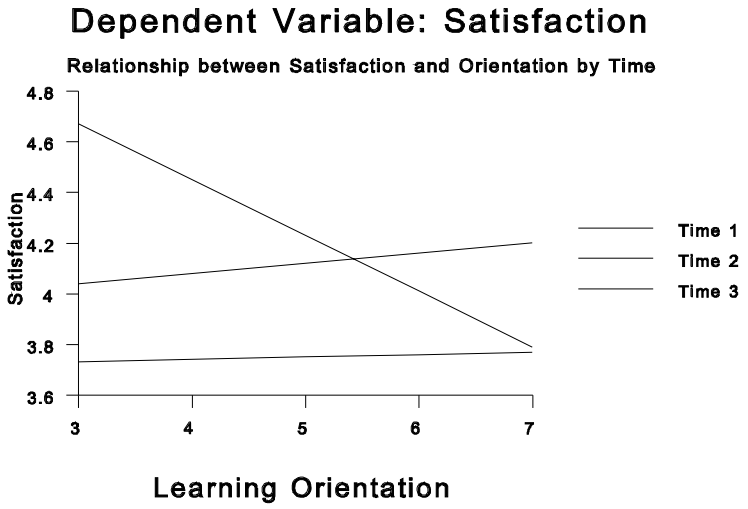

Figure 3. Linear equations for satisfaction by TIME showing the regression of *Y* on *X*.

To provide additional information about the ILO * TIME interaction, the weights were used to plot TIME as a regression between *X* and *Y*. The results shown in Figure 3 depict the effects of learning orientation on satisfaction by TIME. At a learning orientation level or score of 4.0, we see significant TIME main effects on the groups, which continue to be significant as intentionality increases to 5.0 (see Sets 1 and 2 in Table 5). However, when intentionality increases over 5.0, the means approximated by the lines in Figure 3 are closing as TIME begins losing its significance (see Set 3 in Table 5).

These results also show that the Time 3 effects influence a significant amount of learning frustration as the learning orientation increases, perhaps in response to the continuing limitations presented to the higher learning orientations in the Control Group CO2. In contrast, the other two slopes have positive slopes as intentionality increases, perhaps in response to adjusting to the continuing CO2 limitations.

Summary discussion of the results for the satisfaction dependent variable. Overall, the results related to the dependent variable satisfaction exhibited the following:

1. The interaction of the learning orientation with both GROUP and TIME appears to have influenced the Ss level of satisfaction. The learning environment for Control Group CO2 significantly exhibited lower satisfaction rates (greater frustration) for transforming learners over time compared to the other learning orientations. In contrast, Control Group CO2 exhibited increasingly higher satisfaction rates for conforming learners compared to the other learning orientations.

2. The findings consistently showed decreased mean satisfaction for the three research groups during the second instructional unit (Time 2) as course content became more difficult and the student novelty effect wore off. The first unit was relatively easy compared to the more difficult second unit. The final unit was the hardest of all. Compared to the other groups, the decrease in means (as shown in Table 3) was much smaller for the Experimental Group EX1 after the second time period and the increase greater after the third time period, indicating less frustration. Although the assessment for the last unit was difficult, the Ss appeared satisfied learning the lessons.

3. The results offer predictive information on the expected level of satisfaction for the learning orientations by GROUP (solutions and learning environment for EX1, CO1, and CO2) and TIME.

Set of Results for the Learning Efficacy (LEF) Dependent Variable

This data set describes the variance, and ILO (orientation), GROUP and TIME main effects

and interactions for learning efficacy, the second dependent variable.

Means for the learning efficacy dependent variable. The learning efficacy means in Table 6 were consistently higher for the Experimental Group EX1 at every time point and overall. It is interesting to note that all group means decreased during the second time period, then increased during the final time period.

Table 6

Means for Learning Efficacy (LEF) Dependent Variable by GROUP and TIME.

		Group Means			
GROUP	N	TIME 1	TIME 2	TIME 3	OVERALL
Group EX1	26				
M		4.42	4.17	4.62	4.40
SD		0.69	0.84	0.57	
Control Group CO1					
M	23	4.17	3.65	4.22	4.01
SD		0.61	0.65	0.60	
Control Group CO2					
M	23	3.80	3.45	4.19	3.81
SD		0.10	0.97	0.59	GRAND
OVERALL		4.13	3.76	4.34	4.08

Note. This table shows how Ss rated themselves on the question "How do you feel about your learning progress?" using a 5-point Likert scale (5 = Very Satisfied, 1 = Very Dissatisfied). This

question was repeated throughout the course. Time 1, Time 2, and Time 3 the first, second, and third part of the course represented three instructional units. The higher the rating, the greater the learning efficacy with the instructional unit.

Comparing the second time period decrease, Experimental Group EX1 had the smallest decrease and CO1 the largest. Comparing the first and final time period, Control Group CO2 had the largest increase and CO1 the smallest. The Control Group CO2 had the highest overall increase in learning efficacy for the course. Overall, comparing the first and final time period, the increase was higher for the Experimental Group EX1 and Control Group CO2, and about equal for the Control Group CO1.

Figure 4 shows the learning efficacy group means (Y-axis) for each research group (EX1, CO1, CO2) over time (X axis), including Time 1, Time 2, and Time 3. The higher the means (1-5), the greater the learning efficacy for the course.

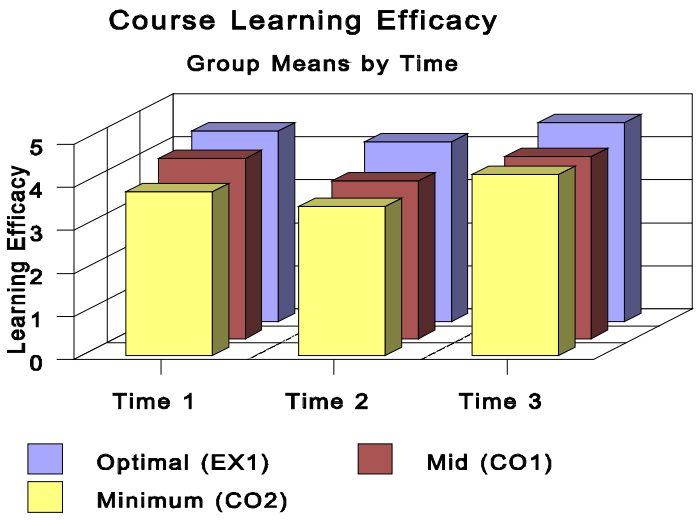

Figure 4. Group means by time for the learning efficacy dependent variable.

ANOVA results for the learning efficacy dependent variable. This study used ANOVA to

examine how ILO (learning orientation), GROUP, and TIME effects or interactions may influence learning efficacy. The results in Table 7 show statistically significant GROUP ($F = 6.64$, $p < 0.01$) and TIME ($F = 31.82$, $p < 0.0001$) effects and an ILO * GROUP ($F = 3.93$, $p < 0.05$) interaction. The other effects and interactions were nonsignificant.

Table 7

Analysis of Variance for Learning Efficacy (LEF) by ILO, GROUP and TIME in Univariate Form.

Tests of Fixed Effects

Source	NDF	DDF	Type I F	Pr > F
ILO	1	65	0.13	0.7227
GROUP	2	65	6.64	0.0024
TIME	2	130	31.82	0.0001
ILO * GROUP	2	65	3.93	0.0245
ILO * TIME	2	130	0.14	0.8670
GROUP * TIME	4	130	1.23	0.3016
ILO * TIME*GROUP	4	130	0.84	0.5023

Note. NDF = Numerator Degrees of Freedom, DDF = Denominator Degrees of Freedom

A significant ILO * GROUP interaction with the continuous independent variable (ILO) appears in Table 7. Similar to the modifications introduced for the satisfaction dependent variable (shown in Table 5), the researcher estimated a modified, hypothetical ANOVA model using the learning orientation variables (ILO4, ILO5, ILO6) to test GROUP and TIME main effects and

interactions at three corresponding points along the ILO scale. The previously measured ILO main effects and interactions remain the same in the revised model (i.e., as reported in Table 7 for the main model) for the three sets of data (ILO4, ILO5, and ILO6). Again, instead of using the original ILO variable, the ANOVA (see Appendix D) was run again three times substituting each of the new ILO variables in the model statement.

Table 8 shows the results of the modified ANOVA model using the three hypothetical learning orientation variables (ILO4, ILO5, and ILO6). The results from this modification allow the researcher to examine, understand, and predict differences in the data from each unique learning orientation perspective.

Table 8

Analysis of Variance for Learning Efficacy (LEF) by Hypothetical Learning Orientation Variables (ILO4, ILO5, and ILO6), GROUP and TIME in Univariate Form.

Tests of Fixed Effects					
Source	NDF	DDF	Type I F	Pr > F	
Set 1 - Using ILO4 = ILO - 4 (Conforming)					
GROUP	2	65	1.43	0.2458	
TIME	2	130	10.47	0.0001	
GROUP * TIME	4	130	0.16	0.9575	
Set 2 - Using ILO5 = ILO - 5 (Performing)					
GROUP	2	65	5.76	0.0050	
TIME	2	130	30.90	0.0001	

GROUP * TIME	4	130	1.41	0.2349
Set 3 - Using ILO6 = ILO - 6 (Intentional)				
GROUP	2	65	8.30	0.0006
TIME	2	130	6.99	0.0013
GROUP * TIME	4	130	1.71	0.1515

Set 1 in Table 8 presents what we expect will occur with ILO centered at a hypothetical mean of 4. The results show a statistically significant TIME ($F = 10.47$, $p < 0.0001$) effect. Other effects and interactions were nonsignificant. This perspective predicts what might occur for conforming learners.

What we expect with ILO centered at a hypothetical mean of 5 appears next in Set 2. These results show statistically significant GROUP ($F = 5.76$, $p < 0.005$) and TIME ($F = 30.90$, $p < 0.0001$) effects. Other effects and interactions were nonsignificant. This is a perspective which predicts what might occur for performing learners.

Set 3 describes what we expect with ILO centered at a hypothetical mean of 6. The results show statistically significant GROUP ($F = 8.30$, $p < 0.006$) and TIME ($F = 6.99$, $p < 0.0013$) effects. Other effects and interactions were nonsignificant. This perspective predicts what might occur for transforming learners.

Bivariate plot of orientation and the learning efficacy dependent variable. The PROC REG command, using unstandardized regression weights for the predicted intercept and slope by GROUP, provided additional information about learning orientations within groups. To examine the effects for learning efficacy by ILO and GROUP, the weights were used to plot the regression lines between *X* and *Y* using the linear equations formula, y = a + bx.

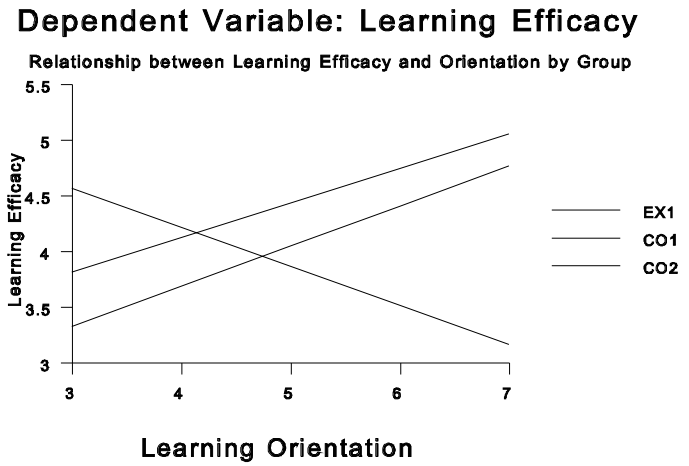

Figure 5. Linear equations for learning efficacy by GROUP showing the regression of *Y* on *X*.

The results shown in Figure 5 depict the effects of learning orientation on learning efficacy as the individual's learning intentionality increases or decreases in each GROUP. The higher the dependent variable rating (1-5), the greater the learning efficacy with the course. The higher the learning orientation score (1-7), the higher the learning intentionality.

Figure 5 also helps explain the results shown in Table 8. These results show nonsignificant GROUP effects at a learning orientation level or score centered at 4.0. This was confirmed in Set 1 in Table 8. Noticeably, as intentionality increases, we see significant GROUP effects beginning

at a learning orientation score above 5.0 and clearly occurring at a learning orientation score above 6.0. Sets 2 and 3 of Table 8 confirm this by showing increasingly significant GROUP effects.

These results show that the restrictive instructional setting offered by the Control Group CO2 significantly limits learning efficacy as learning orientation increases. In contrast, EX1 and CO1 groups offer support that positively influences learning efficacy for the three learning orientations.

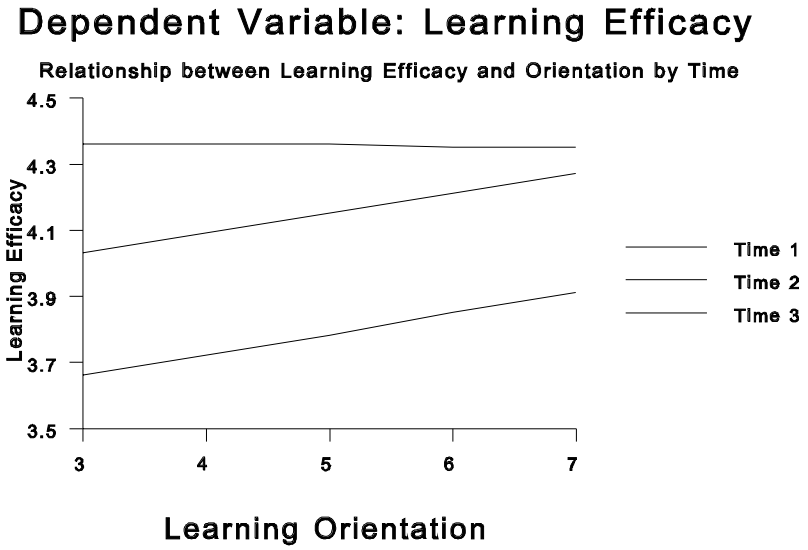

Figure 6. Linear equations for learning efficacy by TIME showing the regression of *Y* on *X*.

To provide additional information about the effects of ILO by TIME, the weights were used to plot the regression lines between *X* and *Y*. The results shown in Figure 6 depict the effects of learning orientation on learning efficacy by TIME. At a learning orientation level or score of 4.0, we see significant TIME main effects on the groups which continue to be significant as intentionality increases to 5.0 (see Sets 1 and 2 in Table 8). As intentionality increases to 6.0, the

means approximated by the lines, while closer, indicate that the TIME effect is still significant (see Set 3 in Table 8). These results show that the Time 3 effects are similar at all levels of learning orientation. By this time, all learners, regardless of their learning orientation, have achieved a high level of learning efficacy. In contrast, the other two TIME slopes are positive slopes toward the highest means as intentionality increases.

Summary discussion of the results for the learning efficacy dependent variable. Overall, the results related to dependent variable learning efficacy exhibited the following:

1. GROUP (solutions and learning environments EX1, CO1, and CO2) and TIME main effects and ILO * GROUP interaction appear to have influenced the Ss level of learning efficacy.

2. The assessment difficulty for the three instructional units appears to have influenced the TIME main effects, especially in the most difficult TIME 3 instructional unit.

3. The results indicate that the solutions and learning environment for Control Group CO2 significantly influenced lower learning efficacy for transforming learners compared to the other learning orientations. In contrast, Control Group CO2 influenced higher learning efficacy rates for lower learning orientations compared to the highest learning orientations.

4. The findings consistently showed decreased mean learning efficacy for the three research groups during the second instructional unit (Time 2) as the student novelty effect wore off and the students dealt with more difficult instructional content. Compared to the other groups, the decrease in means (as shown in Table 6) was much smaller for the Experimental Group EX1 after the second time period and the increase greater after the third time period, probably an indication of more learning efficacy.

5. The results offer predictive information about the expected level of learning efficacy for the learning orientations by GROUP (solutions and learning environments for EX1, CO1, and CO2) and TIME main effects and ILO * GROUP interaction.

Set of Results for the Intentional Learning Performance (ILP) Dependent Variable

This data set describes the variance, and ILO (intentional learning orientation), GROUP and TIME effects and interactions for intentional learning performance, a dependent variable.

Means for the intentional learning performance dependent variable. The intentional learning performance dependent variable means in Table 9 were similar for the two groups. The Control Group CO2 does not appear in this table because the solutions and learning environment deliberately limited intentional learning performance in the CO2 solutions and learning environment. In contrast, the setting for the EX1 and CO1 groups provided the same opportunities for intentional learning opportunities. To contrast the groups, the Ss in the Experimental Group EX1 received the guidance for using intentional learning performance. All the results were similar, and both group means increased with each Time period.

Table 9

Means for Intentional Learning Performance (ILP) Dependent Variable by GROUP and TIME.

		Group Means			
GROUP	N	TIME 1	TIME 2	TIME 3	OVERALL
Group EX1	26				
M		1.50	2.12	2.19	1.94
SD		0.99	1.11	0.94	

Control Group CO1	23			
M	1.52	2.00	2.22	1.91
SD	0.73	1.00	0.95	GRAND
OVERALL	1.51	2.06	2.20	1.93

Note. The ILP criterion (4 = High, 1 = Low) was used to rate the Ss' use of the different intentional learning performance elements, including the iCenter, iMap, and task sequencing. Time 1, Time 2, and Time 3 were the first, second, and third part of the course. The higher the rating, the greater the intentional learning performance with the course. This rating is indicative of how much the learner is willing to contribute toward learning. Overall, the ratings were very similar for both groups, and observations continually increased over time.

Figure 7. Group means by time for the intentional learning performance dependent variable.

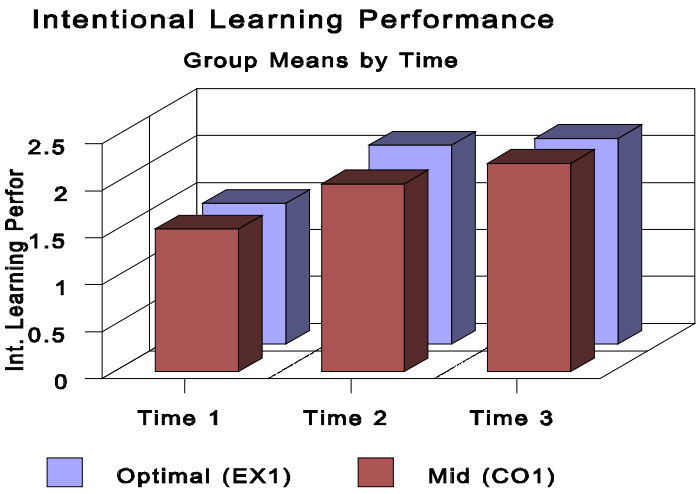

Figure 7 shows the intentional learning performance group means (Y-axis) for each research

group (EX1, CO1, CO2) over time, including Time 1, Time 2, and Time 3. A second examination of group means by orientation presented specific information about learning orientations within the groups. To group the Ss by orientation, the following estimated cut-off scores, determined in a previous measurement study, were used:

1. 7.00 - 5.60 Transforming learners
2. 5.59 - 4.50 Performing Learners
3. 4.49 - 3.00 Conforming Learners

A closer examination of the means by orientation shows that transforming learners in EX1 had a higher means (M = 2.67) than that of the performing learners (M= 1.96) in the same group. These orientation results are hidden when scores are averaged. A similar situation occurred in CO1. This analysis suggests that group means may average to the majority orientation in each group and will conceal important information about performance by learning orientation.

ANOVA results for the intentional learning performance dependent variable. This study used the ANOVA to examine how ILO (learning orientation), GROUP, and TIME main effects or interactions may influence intentional learning performance. The results in Table 10 show a statistically significant TIME ($F = 31.82$, $p < 0.0001$) effect. The other effects and interactions were non-significant.

Table 10

Analysis of Variance for Intentional Learning Performance (ILP) by ILO, GROUP and TIME in Univariate Form.

Tests of Fixed Effects				
Source	NDF	DDF	Type I F	Pr > F
ILO	1	45	1.80	0.1861
GROUP	1	45	0.01	0.9112
TIME	2	90	14.77	0.0001
ILO * GROUP	1	90	0.18	0.6700
ILO * TIME	2	90	0.61	0.5480
GROUP * TIME	2	90	0.35	0.7074
ILO * TIME*GROUP	2	90	0.08	0.9239

Note. NDF = Numerator Degrees of Freedom, DDF = Denominator Degrees of Freedom

A closer examination of learning orientation effects on intentional learning performance was needed. Similar to the previous two dependent variables, the researcher estimated a modified analysis model to test GROUP and TIME main effects and interactions at the three corresponding orientations points along the ILO scale. The ANOVA (see Appendix D) was run again three times substituting each of the new ILO variables in the analysis model statement.

Table 11 shows the results of the analysis model using the hypothetical learning orientation variables (ILO4, ILO5, and ILO6). The results allows the researcher to examine, understand, and predict differences in the data from each unique learning orientation perspective.

Table 11

Analysis of Variance for Intentional Learning Performance (ILP) by Hypothetical Learning Orientation Variables (ILO4, ILO5, and ILO6), GROUP and TIME in Univariate Form.

Tests of Fixed Effects				
Source	NDF	DDF	Type I F	Pr > F
Set 1 - Using ILO4 = ILO - 4 (Conforming)				
GROUP	1	45	0.09	0.7683
TIME	2	90	2.98	0.0559
GROUP * TIME	2	90	0.01	0.9917
Set 2 - Using ILO5 = ILO - 5 (Performing)				
GROUP	1	45	0.04	0.8511
TIME	2	90	14.85	0.0001
GROUP * TIME	2	90	0.40	0.6728
Set 3 - Using ILO6 = ILO - 6 (Transforming)				
GROUP	1	45	0.19	0.6681
TIME	2	90	5.22	0.0072
GROUP * TIME	2	90	0.27	0.7604

Set 1 in Table 11 presents what we expect will happen with ILO centered at a hypothetical mean of 4. The results show a barely non-significant TIME ($F = 2.98$, $p > 0.05$) effect. This perspective predicts what might occur for conforming learners.

What we expect with ILO centered at a hypothetical mean of 5 appears next in Set 2. These results show a statistically significant TIME ($F = 14.85$, $p < 0.0001$) effect. This perspective predicts what might occur for performing learners.

Set 3 describes what we expect with ILO centered at a hypothetical mean of 6. The results show a statistically significant TIME ($F = 5.22$, $p < 0.0072$) effect. This perspective predicts what might occur for transforming learners.

Bivariate plot of orientation and the intentional learning performance dependent variable. The PROC REG command, using unstandardized regression weights for the predicted intercept and slope by GROUP, provided good information about learning orientations within groups. To examine the effects for intentional learning performance by ILO and GROUP, the weights were used to plot the regression lines between *X* and *Y* using the linear equations formula, y = a + bx.

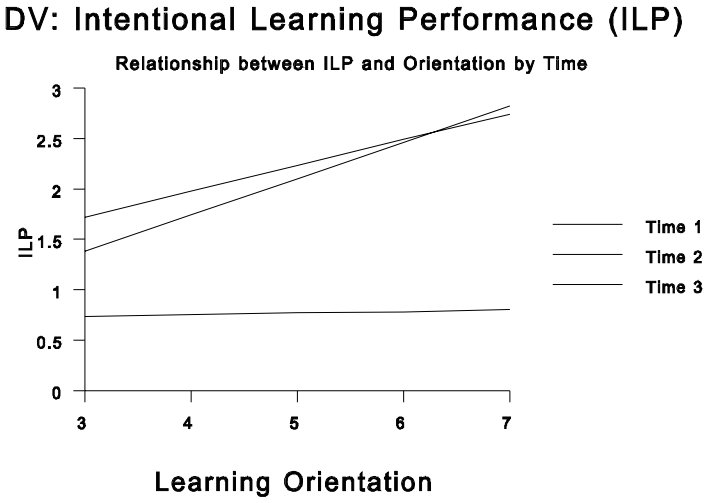

Figure 8. Linear equations for intentional learning performance by GROUP showing the regression of *Y* on *X*.

The results shown in Figure 8 depict the effects of learning orientation on the intentional learning performance as the individual's learning intentionality increases or decreases in each GROUP. The higher the dependent variable rating (1-4), the greater the intentional learning performance with the course. The higher the learning orientation score (1-7), the higher the learning intentionality.

Figure 8 also helps explain the results shown in Table 11. These results show nonsignificant GROUP effects at an learning orientation level or score centered at 4.0. This was confirmed in Set 1 in Table 11. Noticeably, as intentionality increases above 5.60, we see higher means for EX1 and still nonsignificant effects. Sets 2 and 3 in Table 11 confirm this.

To provide additional information about the ILO * TIME interaction, the weights were used to plot TIME as a regression between *X* and *Y*.

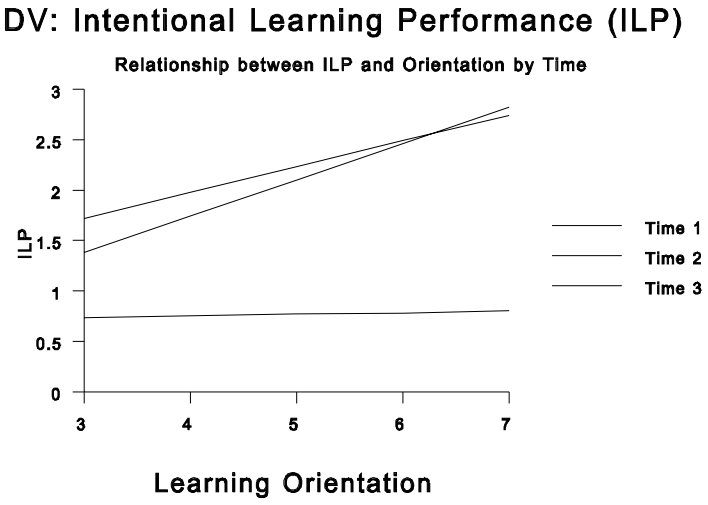

Figure 9. Linear equations for intentional learning performance by TIME showing the regression of *Y* on *X*.

The results shown in Figure 9 depict the effects of learning orientation on intentional learning performance by TIME. At a learning orientation level or score centered at 4.0, we barely see non-significant TIME main effects. This was confirmed in Set 1 in Table 11. The results show, as intentionality increases, significant TIME main effects are occurring at learning orientation scores above 5.0. Sets 2 and 3 in Table 11 confirm this by showing increasingly significant TIME main effects. These results show that the intentional learning performance increases over time and particularly for Time 2 and Time 3, perhaps due to the learner's comfort level with the content, instructional solutions, learning environment, and use of the intentional learning elements.

Summary discussion of the results for the Intentional Learning Performance dependent variable. Overall, the results related to dependent variable intentional learning performance exhibited the following:

1. The group means results indicate that the learning orientation majority within the group, in this case performing learners (50% to 65%), exhibited the intentional learning performance means for the research groups by averaging out the other learning orientation□s means, thus, obscuring the results by learning orientation.

2. The group means were about equal (M = 1.91 and M 1.94), showing that performing learners, the majority orientation, had marginal preference for the CO1, the performing learning environment. Since performing learners were the majority in each group, the two groups achieved similarly, that is, according to the majority performing orientation. By definition, performing learners are not expected to respond assertively to guidance that encourages them to

extend greater effort or achieve more challenging goals unless they have strong reason to.

3. The ANOVA results in Table 14 show that ILO and GROUP effects and interactions were non-significant. The evidence suggests that we need more sophisticated methods, integrated with conative and affective factors, then simple guidance and extrinsic resources to foster more intentional performance, especially for the lower learning orientations.

4. For a perspective on how learners with different learning orientations respond in the two groups, Figure 8 offers additional GROUP information specific to orientations. In this figure, higher means occur as intentionality increases. The evidence for intentional learning performance in EX1 suggests that transforming learners had higher means than the performing learners.

5. TIME main effects appear to have influenced the Ss level of intentional learning performance, particularly during Time 2 and Time 3. Adjusting over time to the content and using the course seems to be a factor in improving learning performance. The first time period appears to have been a period of adjustment and exploring how to manage the course. The third time period reflects the difficulty of the unit.

6. The results offer predictive information about the expected level of intentional learning performance for the learning orientations by GROUP (solutions and learning environments for EX1, CO1, and CO2) and TIME.

Set of Results for the Achievement Dependent Variable

This data set describes the variance, and ILO (orientation), GROUP and TIME main effects and interactions for achievement, the third dependent variable. Since little is known about the effects of orientation on achievement, it was difficult to create conditions in the learning

environment for reliable assessment models. The researcher began with a simplistic, cognitive achievement model (percentage correct for a few uncalibrated questions) and used the results, including mistakes and confounding evidence (e.g., content or assessment difficulty), for future research efforts and refinements.

Means for the achievement dependent variable. The mean percentage correct for achievement in Table 12 shows that the group means decreased during the final time period. The final instructional unit, particularly the assessment, in Time 3 was harder than the previous two units. Time 1 was the easiest. Overall, comparing the means by GROUP, the means were about equal, between 83% and 85% (M = 84%). Further analysis indicates that the overall learning orientation of the group, in this case performing learners, greatly influenced the overall achievement mean for each of the research groups. In fact, the performing orientation, as the majority, average out the means for the other two orientations. Since performing learners were the majority (50% to 65%) in each group, the three groups had similar achievement means, that is, according to the performing orientation.

Table 12

Mean Percentage Correct for Achievement (ACH) Dependent Variable by GROUP and TIME.

		Group Means			
GROUP	N	TIME 1	TIME 2	TIME 3	OVERALL
Group EX1	26				
M		0.88	0.88	0.76	0.84
SD		0.14	0.12	0.16	

Control CO1	23				
M		0.89	0.92	0.75	0.85
SD		0.10	0.10	0.18	
Control Group CO2	23				
M		0.94	0.80	0.76	0.83
SD		0.09	0.20	0.22	GRAND
OVERALL		0.90	0.87	0.76	0.84

Note. This table shows the mean achievement scores (1.00 = High, 0 = Low) by GROUP. Time 1, Time 2, and Time 3 were the first, second, and third part of the course and represented the three instructional units.

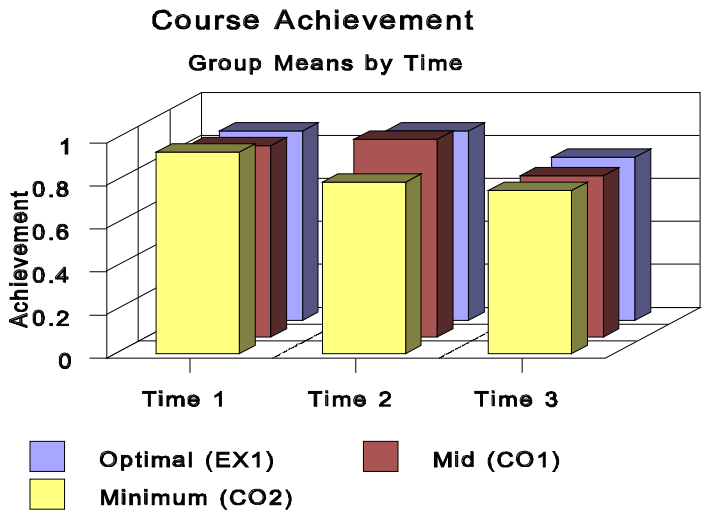

Figure 10. Group means by time for the achievement (ACH) dependent variable.

Figure 10 shows the achievement group mean percentage correct (Y-axis) for each research group (EX1, CO1, CO2) over time (X axis), including Time 1, Time 2, and Time 3. The higher

the means (1-5), the greater the achievement for the course.

A second examination of group means by orientation presented specific information about learning orientations within the groups. The same orientation cut scores, previously mentioned for intentional learning performance, were used.

Table 13

Mean Percentage for Achievement (ACH) Dependent Variable by GROUP and Learning Orientation.

GROUP	EX1 CO1	CO2	OVERALL	
Transforming Learner				
M	0.94	0.79	0.80	0.84
SD	0.08	0.04	0.20	
Performing Learner				
M	0.83	0.86	0.83	0.84
SD	0.09	0.09	0.14	
Conforming Leaner				
M	0.84	0.84	0.87	0.85
SD	0.08	0.08	0.10	GRAND
OVERALL	0.87	0.83	0.83	0.84

Note. This table shows mean percentage-correct achievement scores (1.00 = High, 0 = Low).

Table 13 indicates some interesting results for learning orientations within the three groups. Of the three groups, transforming Learners achieved the highest scores in the Experimental Group

EX1 (M = .94), performing learners achieved highest scores in the CO1 group (M = .86), and conforming learners achieved highest scores in the Control Group CO2 (M = .87), the restricted, linear learning environment. The transforming Learners did not appear to adjust as well as the conforming and performing learners to the other two groups.

Comparing Table 12 and 13 demonstrates how the evidence about the learning orientations is concealed by the group means for the majority. This is similar to treating the group as a aggregate with a single learning orientation to learn. It is only through closer examination, by learning orientation within the groups, that individual learning differences and preferences in achievement appear.

ANOVA results for the achievement dependent variable. This study used an ANOVA to examine how ILO (learning orientation), and GROUP effects or interactions may influence achievement. The results in Table 14 show that overall ILO and GROUP effects and interactions were nonsignificant.

Table 14

Analysis of Variance for Achievement (ACH) by ILO, GROUP and TIME in Univariate Form.

Tests of Fixed Effects				
Source	NDF	DDF	Type I F	Pr > F
ILO	1	65	0.46	0.5011
GROUP	2	65	0.22	0.8030
ILO * GROUP	2	65	0.22	0.8033

Note. NDF = Numerator Degrees of Freedom, DDF = Denominator Degrees of Freedom

These findings seem to suggest how the inadequate conditions created in the learning environment, in the treatment, or the assessment model resulted in nonsignificant results. This situation reflects a typical situation occurring in a university setting and may also explain the "no significant difference" phenomenon, as described by Russell (1997). Nevertheless, qualitative and quantitative evidence will contribute to future research refinements.

Since this was an exploratory study, a repeated measure ANOVA (showing significant effects or interactions over time) was not done because of a lack of control over confounding variables, such as learner commitment, assessment difficulty, and the simplistic assessment model that did not highlight conative and affective factors.

Bivariate plot of orientation and the achievement dependent variable. The PROC REG command, using unstandardized regression weights for the predicted intercept and slope by GROUP, provided additional information about learning orientations within groups. To examine the effects for achievement by ILO and GROUP, the weights were used to plot the regression lines between *X* and *Y* using the linear equations formula, $y = a + bx$.

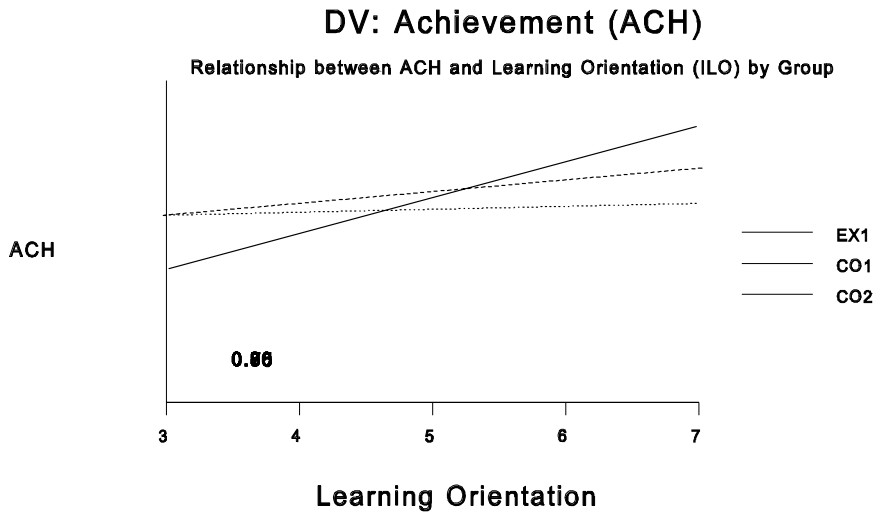

Figure 11. Linear equations for achievement showing the regression of *Y* on *X* by GROUP.

The results shown in Figure 11 depict the effects of learning orientation on achievement as the individual's learning intentionality increases or decreases in each GROUP. The higher the achievement dependent variable score (0-1.0), the greater the achievement in the course.

Figure 11 shows that although the Experimental Group EX1 achieves the greatest achievement as orientation increases, these results considered as a whole present nonsignificant results. These results also show that the restrictive solutions and learning environment offered by the Control Group CO2 begins to limit achievement significantly as learning orientation increases above 5.0. In contrast, the EX1 and CO1 groups offer solutions and learning environments that more positively influence course achievement for the higher learning orientations. Nonetheless, the slope of EX1 is steep enough to suggest that refinement of the assessment models may contribute to significant effects.

Summary discussion of the results for the achievement dependent variable. Overall, the results related dependent variable achievement exhibit the following:

1. As expected, limitations of the simplistic assessment model and confounding variables lead to nonsignificant ILO and GROUP effects (Table 14). These results lend credence to the argument that incomplete solutions and treatments lead to ambiguous, nonsignificant results. In support of the study's secondary purpose, these findings and the combined set of quantitative and qualitative evidence foster new hypotheses about integrating conative and affective factors into more refined progress assessment models and determining, presenting, and controlling the conditions that significantly influence successful achievement in an intentional learning environment.

2. Table 13 suggests that the predominance of one learning orientation may influence the overall achievement means for the groups and conceal important evidence for other learning orientations. In this study, each group had a much larger percentage of performing learners (50% to 65%) compared to the other learning orientations. This dominant learning orientation had an overall impact on the means for each group; that is, the groups achieved what performing learners were expected to achieve. The group means for achievement in Table 12 are almost equal (83% to 85%), indicating that the performance orientation equalized achievement for each of the groups.

3. Figure 11 suggests how level of achievement may vary by learning orientation within the learning environments (Groups EX1, CO1, and CO2). As intentionality increased over 5.60, Ss performed better in the Experimental Group EX1.

4. The findings present a broad picture of achievement and learning in a university setting and may have implications for researchers investigating similar undergraduate populations with predominant performing learning orientation ratios.

5. The solutions and learning environment for Control Group CO2 significantly influenced lower achievement compared to the other learning orientations. In contrast, Groups CO1 and CO2 supported achievement for lower learning orientations compared to the higher learning orientations.

6. The findings show that learners performed best in the learning environment that best matched their learning orientation, that is, EX1 = Intentional, CO1 = Performing, and CO2 = Conforming. The EX1 was the one learning environment (GROUP) that adapted best to all the differing learning orientations.

7. The results offer predictive information about the level of achievement for the learners by GROUP and learning orientation.

Final Discussion of Study Results

This study's findings indicate that learning orientation, instructional solutions, learning environments (GROUP), and TIME have significant effects upon the selected dependent variables. It appears that specific interventions, like the ones introduced in the different research groups, are useful in exploring, understanding, and fostering more successful learning for all learning orientations, in different manageable and predictable ways, and examining performance, achievement, and attitudinal results in an audience differentiated by learning orientation.

Especially useful is the examination of the successful combination of strategies that identify

orientation and match solutions and learning environments. Testing of these instructional strategies is useful in determining sources for individual learning differences and identifying some of the problems which increase frustration, lessen learning efficacy, influence achievement, or result in less successful learning performance. A discussion of the results appear in the context of the study's research questions.

Research Question 1: Do learning orientations influence satisfaction, learning efficacy, intentional learning performance (i.e., use of the iCenter, a Learner Control Center, and iMap, a Learning Progress Map, progress monitoring, and task sequencing), or achievement? The results appearing in (a) Table 5 present significant learning orientation effects and interactions for satisfaction, (b) Table 8 present significant learning orientation effects and interactions for learning efficacy, (c) Table 11 present significant learning orientation effects for intentional learning performance, and (d) for achievement, Table 12 present almost equal group means ($\underline{M} = 84$), Table 14 present nonsignificant results, and Table 13 describe how the differing learning orientations achieved within the different solutions and learning environments.

The bivariate plots appearing in Figures 2, 3, 5, 6, 8, 9, and 11 demonstrate how learning orientations influence the different dependent variables as intentionality increases or decreases. These results showed that Ss with higher learning orientations had higher means (more benefits) for each of the dependent variables in the Experimental Group EX1. In comparison, the transforming Learners did not fare very well in the more conforming or less challenging environments as indicated by the (a) decreasing means as intentionality increased for satisfaction (Figure 2) and learning efficacy (Figure 5), and (b) lower means as intentionality increased for

achievement (Figure 11). Ss with lower learning orientation scores did do comparatively well in both Groups EX1 and CO2 because both environments could be utilized by the Ss to match their learning orientation. Ss could choose low-control, linear sequenced events in both environments. It is important to note that although Ss with conforming orientation scores did best in the Control Group CO2, that is, in the environments which best suited their learning orientation, they were not in an environment that would help them experiment and improve intentional learning ability. These findings suggested refinements that would make performing and conforming learners more comfortable in the Experimental Group EX1.

Research Question 2: Does intentional learning guidance or instruction influence satisfaction, learning efficacy, intentional learning performance, or achievement? Experimental Group EX1 is the only group to receive the encouragement and guidance about using intentional learning performance (i.e., managing learning with the iCenter (Learner Control Center) and iMap (Learning Progress Map) and changing tasks out of the prescribed order for individualized learning. Transforming learners had higher means in the Experimental Group EX1, than the other Ss who performed marginally better in the other two groups, without the guidance.

Compared to the other two groups, the dependent variable means for the intervention Experimental Group EX1 showed many beneficial outcomes, including greater overall satisfaction ($\underline{M} = 4.35$), higher overall learning efficacy ($\underline{M} = 4.40$), and more intentional learning performance for transforming learners ($\underline{M} = 2.67$). There is no evidence of how much this guidance influenced learning only that it was part of the more successful combination presented in Experimental Group EX1. In contrast, Ss with lower learning orientations actually performed

somewhat better with greater efficacy and satisfaction in the less challenging or limited solutions and learning environments which did not promote greater learner control and effort. In the future this guidance will need refinements that better match specific orientation attributes to conforming and performing learners. Primarily, the instruction will need to be less intimidating, more supportive, and more sensitive to the lower learning orientations.

Research Question 3: Do learners using intentional learning environments (Experimental Group EX1) benefit more than learners not using intentional learning environments (Groups CO1 and CO2)? The results for Experimental Group EX1 showed more beneficial outcomes in Tables 3, 6, and 9, including greater overall satisfaction ($\underline{M}$ = 4.35), higher overall learning efficacy ($\underline{M}$ = 4.40), and more intentional learning performance for transforming learners ($\underline{M}$ = 2.67). For achievement, despite a weak measure, Table 13 shows that each orientation achieved highest in the learning environment that mostly closely matched their learning orientation, i.e., EX1 = Intentional, CO1 = Performing, and CO2 = Conforming. Table 12 reveals evidence of how the predominance of any one learning orientation in an solutions and learning environment influences achievement outcomes averaged by group. A closer examination by orientation elicits specific information on a learning audience differentiated by orientation.

Experimental Group EX1 offered the intentional learning environment that adapted best to all the individual learning orientations and encouraged Ss to use more intentional learning performance (i.e., use of the iCenter, a Learner Control Center, and iMap, a Learning Progress Map, progress monitoring, and task sequencing). Overall, the higher learning orientation learners in Experimental Group EX1 had higher means (greater benefits) for each of the dependent

variables than the results for transforming learners in the other two control groups. In comparison, the more transforming learners did not fare as well in the conforming environment, as exhibited by the (a) decreasing means as intentionality increased for satisfaction (Figure 2) and learning efficacy (Figure 5), and (b) lower means as intentionality increased for achievement (Figure 11). Conforming learners did do comparatively well in both Groups EX1 and CO2 because these environments adapted to match the learning orientation. Additionally, the ANOVA results in Table 4 showed significant GROUP ($F = 5.30$, $p < 0.01$) effects for satisfaction and in Table 7 showed significant GROUP ($F = 6.64$, $p < 0.01$) effects for learning efficacy.

In support of the study's second purpose, the elimination of the Control Group CO2 from the results in Table 10, sensitivity to the predominance of performing learners in the different samples, influence from other group confounding variables suggest future research refinements are necessary in the examination of GROUP effects and interactions. This evidence, combined with the information on adapting treatments to learning orientation, suggests possible ways to examine and explain Russell's no-significance-difference phenomenon (1997).

Research Question 4: Do learning orientations influence group interactions (Groups EX1, CO1, and CO2)? What is the complex mix or interaction of different learner, learning, and teacher variables that fosters successful learning? The ANOVA results in Table 4 showed significant ILO * GROUP ($F = 6.48$, $p < 0.01$) interactions for satisfaction and in Table 7 showed significant ILO * GROUP ($F = 3.93$, $p < 0.05$) interactions for learning efficacy. Table 10 showed nonsignificant GROUP effects for intentional learning performance, yet a closer examination of the means by orientation showed that learners have the highest means in the settings that best suit their learning

orientations. For achievement, although the ILO * GROUP ($F = 0.22$, $p > 0.05$) effects in Table 14 were nonsignificant, evidence revealed the influence of the group majority learning orientation.

This evidence, combined with the examination of group orientation majority, suggests possible ways to avoid treating learning audiences as one homogenous group with a single learning orientation and explain what may be a major factor in the "no-significance-difference phenomena" that Russell (1997) often discusses.

It is important to note that although Ss with lower learning orientations did do comparatively well in Control Group CO2, since this environment matched their learning orientation, they were not in an environment that would motivate them to experiment, improve, or use more intentional learning performance. A group means comparison reveals that conforming learners in Experimental Group EX1 had higher means for each of the dependent variables than the conforming Ss in the Control Groups CO1 and CO2. This evidence demonstrates how well conforming learners can do in any learning environment as long as adapts to the conforming learning orientation by providing a scaffolded, structured environments. The results indicate that the Experimental Group EX1 provided flexible solutions that matched the three conforming, performing, and intentional learning orientations.

Research Question 5: Do learning orientations influence TIME interactions?

The ILO * TIME interaction appears to have influenced significantly the Ss level of satisfaction and TIME main effects for learning efficacy and intentional learning performance. With the standardized ILO centered at a hypothetical mean, the results indicate statistically significant TIME main effects on satisfaction for some learning orientations. The GROUP * TIME and ILO

* GROUP * TIME interactions were nonsignificant for all dependent variables.

The findings consistently showed decreased mean satisfaction and learning efficacy for the three research groups during the second instructional unit (Time 2) as course content became more difficult and the student novelty effect wore off. The content difficulty appears to have influenced the level of significance for the TIME main effects, especially the difficult TIME 3 instructional unit.

Adjusting over time to the course content and practice using the course seems to be a factor in improving learning performance. The first time period appears to have been a period of adjustment and exploring how to manage the course. The third time period reflects the difficulty of the unit. Since this was an exploratory study, a repeated measure ANOVA (showing significant effects or interactions over time) was not done for achievement. The lack of control over confounding variables, such as learner commitment, content and assessment difficulty, and the simplistic assessment model, caused the researcher to eliminate the TIME main effects analysis for achievement.

CHAPTER FOUR

Conclusions

Introduction

This research study introduces learning orientation, an important conative-affective-cognitive-social learning construct, and examines its influence on learning and fostering individual learning differences.

1. As a primary purpose, this research created and used the intentional learning theory, System for Intentional Learning and Performance Assessment (SILPA) model, and an experimental 3 x 3 factorial (Table 2) research design for multiple repeated measures univariate analysis of variance (ANOVA) to examine the significant learning orientation, time, and learning environment effects and interactions on dependent variables.

2. As a secondary purpose, the Web course and the SILPA learning environment were designed as resources useful in determining an empirical link between learning orientation and complex learning performance.

3. The final purpose was to collect and use the data for refining existing resources and guiding long-term successful learning research.

The Whole-Person Human Perspective Enhances Successful Learning

The researcher hopes that these study results will revitalize the often-ignored, whole-person perspective for meaningful and successful learning that considers key conative and affective factors along with the more commonly explored cognitive and social learning factors. These

findings highlight the need to identify learners and learning audiences by learning orientation to discern the true effects and interactions of interventions.

These results may prove worthwhile in areas where, despite the sophistication of differing treatments, settings, measurement instruments, and research methods, researchers often describe ambiguous or disappointing research results. In these areas, this investigation reveals evidence that considering learning orientation (a whole-person learning construct) first, before secondary primarily cognitive learning characteristics and treatments, is a useful way to differentiate the learning audience before determining, matching, and evaluating solutions and environments for more successful learning.

With practice, the matched solutions for differentiated audiences will be less expensive and produce better results because the individual learns to assume greater responsibility for learning, expend greater, faster learning effort, and improve learning performance (e.g., setting goals, selecting treatments, sequencing tasks, and monitoring goals). These solutions are even more likely to be successful when learners increasingly internalize more learning performance skills that lead to higher learning orientation and higher performance standards.

The next section presents a (a) review of the results supporting the three study purposes and five research questions, (b) list of study benefits and significance of this research, (c) list of recommendations for educators, (d) list of recommended research improvements, and (e) view of future research.

Review of the Study Results

This research offers evidence showing that learning orientation is a rational and useful way

to (a) differentiate the learning audience an important aspect of determining what works and (b) guide design, development, implementation, and evaluation of solutions or treatments based on reliable whole-person learning constructs.

1. Study purpose one. In support of the primary study purpose, this study provides evidence that learning orientations are important influences on learning and learning outcomes and strongly interact with other learner, instructional, and teaching variables. Supporting the five research questions, a series of analyses addressing learning orientation differences within groups, between groups, and over time, showed significant ILO, TIME, and GROUP effects and interactions on the dependent variables. In other analyzes, demonstrated variance between the three groups (EX1, CO1, and CO2) revealed positive learning effects and interactions in the intentional learning environments that supported different learning orientations over more conservative, traditional settings that did not adapt to individual learning orientations.

One important finding demonstrated that the intervention Group EX1 had significantly higher overall group means for three (satisfaction, learning efficacy, and intentional learning performance) of the four dependent variables. Findings for the fourth variable, achievement, revealed an interesting but expected exception. The group means for achievement in Table 12 are almost equal (83% to 85%) indicating that the majority performing orientation for each group equalized achievement means for each group. Each group had a much larger percentage of performing learners (50% to 65%) compared to other learning orientations. Actually, this dominant learning orientation had an important impact on the means for all the dependent variables. Overall, all the groups means averaged out equal to the majority orientation and hid

important information on orientations within the groups. Overall, the groups achieved and experienced as performing learners, that is, as performing learners were expected to perform. Nevertheless, this broad picture of achievement group means and learning in a university setting has implications for researchers who investigate similar undergraduate populations with predominant performing learning orientation ratios.

The mixed model analyses revealed interesting information on main effects and interactions with the dependent variables. Most important of these analyses was the significant

1. GROUP effects on satisfaction and learning efficacy.
2. TIME effects on learning efficacy and intentional learning performance.
3. ILO * GROUP interactions on satisfaction and learning efficacy.
4. ILO * TIME interactions on satisfaction.

The modified ANOVA models revealed more specific information about the orientations. These findings hypothesized how Ss, with different learning orientations, responded to the treatment and conditions within the three learning environments. The nonsignificant results were equally interesting when combined with the series of analyses examined by learning orientation. These results may also contribute useful descriptions and explanations for confounding variables, inadequate treatments, and nonsignificant results found in other research studies. The nonsignificant results for achievement suggest that incomplete, ambiguous treatments and solutions, that lack specified constructs and overlook or fail to consider a comprehensive set of key psychological factors, may lead to ambiguous, nonsignificant results. In support of this hypothesis, this study provides evidence that will specifically help the researcher refine future

assessment models.

The results showed statistically significant GROUP effects and interactions. These findings suggest that we provide (a) assertive, sophisticated, discovery learning situations for transforming learners when they want to be satisfied, assertive learners, (b) non-risk, energizing, competitive settings that encourage performing learners (while minimizing the need for extra effort and difficult standards), and (c) scaffolded, structured, non-risk environments for conforming learners that help them learn comfortably and more efficaciously, (while helping them internalize more intentional learning performance). The findings also show content and assessment difficulty is an important factor that needs greater consideration and highlights the need for more sophisticated progress assessment models that have greater emphasis on conative and affective factors. The results also suggest that TIME is an important factor in helping learners satisfactorily perform more intentionally and efficaciously.

2. Study purpose two. In support of the second study purpose, this study also accomplished the goal of testing and proving the functionality of the new (prototype) online learning environment, called the SILPA, where we can initially identify learner orientation, adapt instruction to the different learning orientations, monitor learning activity, and encourage more intentional learning performance as the individual practices, performs, and accomplishes course objectives. As expected, this study highlighted the need for more sophisticated assessment models that consider the complex relationships between achievement and key conative, affective, cognitive, and social factors. In other words, the theoretical foundations need to be enriched by considering the confounding variables identified in this study and applied in the design of more

sophisticated solutions.

Maddux (1993) discusses problems about using incomplete instructional and assessment models by suggesting that lack of sound constructs and ambiguous explanations about how learner and learning variables interact with new teaching variables (new technology, formats, mediums, objectives, and presentation and delivery methods) as they relate to specific dependent variables lead to ambiguous results. Continuing this topic of discussion, about inadequate research foundations leading to ambiguous results, Bangerter-Downs and Rudner (1991) suggest that for every study that contains a recommendation, there is another, equally well documented study, challenging the conclusions of the first. No one seems to agree with anyone else's approach. But more distressing: no one seems to know what works" (1991). In response to this educational dilemma, this study attempts to describe our critical need to determine how learning occurs, which are the influential factors, and what are the reliable foundations, before we try to design and evaluate what works.

3. Study purpose three. In support of the third study purpose, this study showed the importance of identifying the main effects and interactions for learning orientation. It suggests the importance of continuing intentional learning research using this important learner-difference variable to identify and expand our understanding about (a) successful learning and (b) the primary and secondary sources of individual learning differences. The results provide compelling evidence to guide research, contributions, and next steps in succeeding research cycles.

Study Benefits

The study results contribute to the further understanding about individual learning

differences by:

1. Enhancing contemporary theoretical foundations by including important conative and affective psychological factors, together with other cognitive and social learning constructs, into measurable whole-person learning constructs.

2. Showing that serious consideration needs to be given to learning orientation (ILO), learning environments (GROUP), and TIME effects and interactions.

3. Demonstrating how different learning orientations adapt to different interventions.

4. Providing an innovative instructional and research model for an intentional learning environment that (a) identifies and adapts to learning orientations and individual learning differences, (b) offers components that help learners support and internalize more intentional learning performance, (c) enables flexible use of learner-managed instructional treatments, (d) collects data for analysis, and (e) introduces a five-tier model for the physical data infrastructure, human performance processes, course operations, human interaction, and presentation. This model highlights the possibility of providing web or computer-based environments that recognize learning orientations and allow subsequent learner modification of learning processes and strategies, including goal setting, task sequencing, progress monitoring, adaptive assessment integrated with feedback, and problem solving tasks according to learning orientations.

5. Identifying important concerns that warrant future research and providing guidance for continuing the individual learning research process.

6. Suggesting the need to integrate learning orientation constructs with older, more established constructs representing influences, relationships, and effects of other learning and

learning-difference variables.

7. Providing an important view of undergraduate learning in the university setting. The number of performing learners in this sample actually reflects a similar ratio in a typical university community and can provide especially useful information to researchers interested in this or similar populations.

This research also has implications for reaching other diverse groups and professions that can equally benefit from identifying and understanding the primary psychological factors that can specifically influence or differentiate their audiences. There are obvious connections to other professions that need learners or performers acquiring more learning expertise in the face of rapidly changing workplace requirements. For example, business managers can apply these findings to examine sources for individual differences in job performance. Alternatively, communicators and technical writers can use this information to differentiate intended audiences, examine sources for individual communication differences, and use design, implementation, and evaluation strategies for the different learning orientations.

Recommendations for Educators

1. Educators should diagnose learning orientation and apply this information to differentiate the audience before planning, designing, developing, implementing, delivering, and evaluating instruction. The understanding and determination of learning orientations and the complex interplay of primary learning differences from the onset leads to a clearer understanding of the learning audience. This information helps educators manage learners and their proclivity and ability to learn with more sensitive, relevant, and appropriate learning solutions. If we do not

begin to apply tools that appropriately define our learning audiences and help us understand fundamental learning differences and needs, we will continue to offer mismatched solutions and treatments that frustrate learners, waste valuable resources, and aggravate successful learning outcomes.

2. Instructional designers and developers and educators should learn how to deliver learning environments that offer flexible instruction in alternative settings that adapt to learning orientation. In an intentional learning environment, learners have opportunities to match their learning with resources and alternatives that enrich the learning experience. For some students this means using open systems that offer a comprehensive set of on- and offline solutions for sophisticated high-discovery, problem-solving experiences. For others, the environment should offer less intimidating instruction for performing learners or simpler, more structured solutions for conforming learners.

3. Educators should learn how to match, implement, and evaluate instruction according to an individual's learning orientation.

Educators need to gain a deeper understanding of each of the learning orientations: intentional, performing, conforming, and resistant learning orientations, in order to understand the nature of their audiences and how they measurably differ. Ideally, in supportive environments, learners acquire increasing expertise for a unique set of resources that foster overall improved learning ability. Some of these new resources include instruction integrated with adaptable performance assessments, an automatic advisor function, elements for learner-controlled goal setting, task sequencing, and progress monitoring capabilities, and different scaffolding,

knowledge building, and problem-solving strategies for the different learning orientations.

Future research should provide principles and guidelines for implementing and using specially designed learning environments, components, resources, and alternative learning paths that support individual differences and promote successful, satisfying intentional learning experiences.

4. Educators should conduct further research to continue the investigation into learning orientations and subsequent effects and interactions on learner, learning, instructional, and teaching variables. We need theories, constructs, and studies, integrated with key conative, affective, cognitive, and social factors that help educators offer specific solutions that measurably improve learning and help learners internalize more successful lifelong learning ability. For example, we need longitudinal studies that integrate the learning orientations into traditional, common, or new practices and then examine and compare how these learning experiences contribute to lifelong learning success and improved learning ability. Such research will closely examine how educators can use learning constructs and learner-difference variables to improve lifelong learning.

5. Educators should use learning orientation as an initial step in the definition of a conceptual structure of individual differences in learning. We urgently need new research to expand theoretical foundations and define the conceptual structure of individual learning differences. We need to understand the structure, relationships, and order of influence of learning and individual learning differences from the very highest psychological level. We need to use this research as we provide and evaluate solutions that introduce new learning, instructional, and

teaching variables. The productive answers are in our new understanding of how conative, cognitive, social, and affective factors influence learning orientations and lower-order learning differences, such as learning preferences, learning styles, cognitive styles, intelligences, aptitudes, and learning and study strategies.

Recommendations for Research Improvements

Some of the limitations in this initial study were small sample size (n = 71), simplicity of the SILPA prototype, short instructional intervention period, lack of strict research control over the volunteer's commitment or motivation to achieve, elimination of the intentional learning performance for Group CO2, and unsophisticated assessment, practice, feedback, and other intentional learning components. The investigator originally considered the predominance of the sample's performing learning orientation a limitation and searched hard for more learners with intentional and conforming orientations. By the end of the analysis, particularly in the examination of achievement and the study of learning in the university population, this limitation evolved into an obvious advantage. Nevertheless, future research will also need to consider using samples with different learning orientation ratios to uncover the different influences. Another large area yet to be explored and particularly useful would be studies with learners who have resistant and conforming learning orientations.

Improvements that would increase the sophistication of this study and offer more sensitivity to the findings are listed below:

1. A greater sample size and diversity that may represent varying proportions of all the different types of learning orientation is recommended. In many ways, this study would have

benefitted from more intentional and conforming learners in the sampled population that was dominated by performing learners.

2. The SILPA is still a relatively unsophisticated online learning environment and needs funding to implement refinements that (a) greatly improve the different intentional learning performance components, particularly the iCenter, iMap, and the iAdvisor, (b) offer more refinements and sophisticated solutions that reliably match the different learning orientations, and (c) greatly improve the practice, feedback, and assessment and other intentional learning components.

3. The next big challenge is to test learning orientation and learning environment effects and interactions with the more sophisticated progress assessment models. Concerning achievement, this exploratory study has identified and described key variables that need careful attention in future research, such as (a) better practice, feedback, advisory, learning-management components, (b) carefully managed course goals, instructional objectives, and subjects' commitment to achievement, and (c) carefully developed assessment constructs (testlets) and progress assessment scaled on progress metrics that show progress measured with difficulty across time intervals.

4. The intervention of intentional learning performance guidance needs greater sophistication, relevancy, and sensitivity toward the different learning orientations to encourage rather than intimidate Ss toward greater effort, higher achievement, and improved learning ability.

5. New research methods could better define, identify, exemplify, implement, and examine intentional learning performance.

Future Research Efforts

Since this study is one step in a long-term research program, the results from this study will guide the direction of future investigations into learning, particularly in understanding learning orientation as a primary source for learning differences, determining secondary learning differences, and designing subsequent instructional and assessment solutions that match these differences.

Future replications and extensions of this study will continue the three-fold purpose introduced in this study by focusing on

1. Research: (a) identifying, examining, and measuring significant psychological influences on successful learning and learning difference, (b) determining a conceptual network or framework structure that describes learning sources, key relationships, and order of influence for learning and individual learning differences, (c) refining the intentional learning theory, constructs, questionnaires, and explanations about learning and how learners approach learning differently, (d) applying information on learning orientations as a necessary dimension of other constructs, theories, and research projects, and (e) integrating learning orientation constructs with older, more established learning constructs.

2. Development: (a) providing principles, resources, and models for designing, developing, implementing, and evaluating enriched learning environments that adapt, match, and support intentional learning performance, (b) developing instructional and assessment models that incorporate the comprehensive set of psychological factors, and (c) providing measurable intentional learning solutions that significantly help learners improve over time.

3. Future Research: (a) using the information to guide a long-term research program, (b) developing a formative research methodology, founded on a sound, scientific theory and construct, research design and analytical methodology, instructional/research environment, and improvement cycles, and (c) consider other factors, such as physical and behavioral, that may need inclusion into learning constructs.

Summary

The study results offer information on learning constructs and paradigms that contribute innovative general psychological and learning theories, improved understanding about successful lifelong learning, and guidelines for improving instructional solutions and environments. These results suggest that we consider how:

1. Learning orientation has a measurable impact on successful learning outcomes and is useful in examining the nature of learning and individual differences.

2. Learning is a function of a comprehensive human psychology, not just cognitive or social psychology.

3. New 21st century paradigms, theoretical foundations, and measurable constructs should give an account of the role of a comprehensive set of higher-order psychological (conative, cognitive, social, and affective) factors and explain their relationship to learning and individual differences.

4. Complex conceptual network or framework structures and sequential relationships exist among differing levels of psychological factors and learning.

5. Learning orientations is a means of understanding the influence of psychological

learning factors, measuring learning orientations to learn, differentiating the learning audience, and adapting and evaluating learning solutions.

6. Managing learning orientation from learner, learning, instructional, and teaching perspectives, as a primary source influencing individual differences that enhance learning success.

7. Integrating learning orientation concepts with existing research paradigms will link traditional constructs, such as those describing cognitive processes, to a complete set of higher-order psychological learning factors.

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APPENDIX A

Review of the Literature

Introduction

The purpose of this section is to provide (a) historical background information concerning the many developmental and psychological research topics related to intentional learning and (b) new information justifying the importance of developing new expert learning constructs and theories. This literature review provides the empirical and theoretical evidence for theoretical foundation and educational standards that contribute to the quality and depth of this research study. The theoretical foundation includes work accomplished in previous studies, including an intentional learning theory, intentional learning construct, intentional learning measurement instrument, and instructional research model integrated with practice, assessment, feedback, underlying research databases, and intentional learning components.

History of Cognitive Psychology

In empirical psychology of learning, early researchers like Tolman (1932, 1959) and Lewin (1936) brought interest in cognitive processes to the forefront. Over the past fifty years, contemporary educational researchers have been exploring new ways to explain the complex psychological structures and cognitive processes involved in learning and development in contrast to the previous emphasis on behavioristic learning theories. These efforts focus on the use of cognitive processes in the acquisition, management, retention, and building of new knowledge. Purdie, Hattie, and Douglas (1996) list several commonly discussed themes on student learning: learning as increasing one's knowledge, learning as duty, learning as means to an end, learning as

seeing something in a different way, learning as understanding, learning as social competence or conformance, learning as personal fulfillment, learning as constructing knowledge, or learning as memorizing, studying, and reproducing knowledge. Joyce and Weil (1986) describe a variety of learning models uniquely designed to help individuals become more competent learners, including learning as attaining concepts, thinking inductively, problem-solving, developing intellect, increasing awareness, enhancing creative thought, and role playing.

The early pioneers, believing strongly in learning and individual differences, focused on identifying the key differential sources. It was in 1965 that Gagné organized a major conference, sponsored by the Office of Naval Research, to discuss and explore individual differences in learning (Gagné, 1967, p. 239); this conference defined "the essential issue of individual differences in learning, and describe the suppositions and limitations associated with this problem (Frederico, 1980, p. 3)." During the conference, Melton (1967, p. 239) suggested that we frame our hypotheses about individual differences variables in terms of the process constructs of contemporary theories of learning and performance. The most important development in experimental, differential, and theoretical educational psychology was the consensus that conceptual formulations of processes or mechanisms, i.e., information or knowledge processing, intervened between stimuli and response, the prevalent behavioral learning perspective. Fundamental to this research was the perspective that intelligence and achievement relied heavily on specific intrinsic cognitive processing (Frederico, 1980, p. 3). "It was suggested strongly that these psychological mechanisms be examined in order to comprehend more completely the processes basic to intellectual behavior. The conference reflected a change in the

conceptualization of intelligence as measured performance to mental mechanisms" (Frederico, 1980, p. 3). The general attitude was that "descriptive knowledge of learning should be used to generate research that would likely lead to prescriptive knowledge [i.e., using knowledge to plan and specify conditions] for optimizing the outcomes of instruction" (Frederico, 1980, p. 6). "To implement these prescriptive pedagogical paradigms, an adequate conceptual formulation was necessary to manage how a student masters increasingly complex performances by arranging present responses in manipulating environmental events and situations and employing developed knowledge of how one learns" (Frederico, 1980, p.6).

Since then, much of our evolving understanding and research have become broadly focused on cognitive interests and intrinsic or extrinsic mechanisms for information processing. From the beginning, cognitive psychology examined how the degree of control and management of cognitive processes involved interaction among four classes of phenomena: (a) metacognitive knowledge, (b) goals, (c) metacognitive experience, and (d) actions (Flavell, 1979, 1971; Flavell, Friedrichs, & Hoyt, 1970; Masur, McIntyre, & Flavell, 1973). Glaser (1972) described similar reasoning about metacognition when he offered his conceptualization of the new aptitudes, the learning processes managed for intellectual competence.

By the mid-seventies, many educational texts were using words like *metacognition*, *cognitive styles*, and *learning styles* and *strategies*, and emphasizing the "mental mechanisms mediating human performance" (Federico, 1980, p. 8). Educational conferences were examining key cognitive issues such as (a) cognition and instruction, (b) competence in cognitive process as the objective of instruction, (c) initial states in which a student commences learning, (d) teaching

treatments oriented toward cognitive processes, (e) transition from the initial novice learning performance to the assessed terminal performance, (f) conditions that facilitate the acquisition of competence, and (g) measurement of consequences of instruction (Frederico, 1980).

The texts described learners as users of operations, such as encoding, decoding, organizing, and sorting to accomplish internal cognitive processes. Such learners used mechanisms that "may involve conjoining images, memorizing items, analogizing notions, rehearsing performances, and elaborating contents" (Federico, 1980, p. 8). During this time some researchers were stating that the cognitive perspective presented learners as computer-like processors of "information input, manipulators of intellectual throughput, and producers of performance output" (Frederico, 1980, p. 8). Also during this period, researchers may have considered more human-like factors like personality and cognitive styles, as compared to computer-like, but they seldom used, a holistic, synthesized learning construct that included a combination of social, conative, cognitive, and affective influences in their educational research. The research interest was primarily in estimating the variability among people in terms of cognitive process.

During the eighties, a multitude of new models, factors or traits were developed to demonstrate an interaction between treatment effects and dependent variables as measured by aptitude tests. These early models set the course for the next decade of research investigating individual learning differences in experimental studies of cognition. Following this trend, Sternberg (1982) developed a process-oriented model of intelligence that described two levels of information processing for the individual. Information processing elements at the first level were cognitive strategies. At the second level, the information processing elements performed an

executive decision-making role and were situationally responsible for determining and managing what to learn and how to learn it.

In support of more holistic learning constructs, Snow and Farr (1987, p. 1) argued that a realistic understanding of learning requires a more balanced, "whole-person view that integrates cognitive, conative, and affective aspects" of individual learning. They suggested that these three key aspects should not remain "isolated provinces" in the study of learning. These researchers argued that psychological aspects interact in complex ways to support learning, performance and expertise, and cannot be ignored or overlooked in the analysis of learning.

In the intervening years, interest in cognitive psychology increased dramatically. This socio-cognitive research concentrated on four traditions:

1. Knowledge about cognition and the processes intrinsic to learning (Gagné, 1985; Corno, 1986; Glaser, 1984).

2. Regulation of cognition (Zimmerman, 1998; Schraw, 1994, Zimmerman, 1989; Zimmerman & Martinez-Pons, 1988; Brown, 1987; Flavell, 1987; Biggs, 1985).

3. Support of cognitive processes in instructional design (c) (Bruer, 1993; Scardamalia & Bereiter, 1993, 1989; Brown, Campione, J., Ferrara, R. A., & Palincsar, 1991).

4. Importance of individual emotional states on cognitive processing (McCombs, 1994, 1991; Deci & Ryan, 1991; Snow, 1987, Kuhl & Atkinson, 1986; Dweck, 1983).

Psychological Learning Processes

Research in the eighties and nineties continues to investigate key cognitive and metacognitive influences on successful learning. This complex research examines the strategic

role played by (a) a learner's awareness of personal learning processes and strategies and (b) the learner's unique ability to manage internal and external processes in different learning situations and environments. This continuous wave of cognitive interest (Kuhl & Atkinson, 1988; Corno, 1986; Dweck 1985; Ryan, Connell, & Deci, 1985; Schunk, 1984; Weiner, 1972, et al.) typically centers on identifying learning or teaching mechanisms (what learners do to learn in structured environments) and observing how they individually operate for personal achievement.

Some socio-cognitve theorists continued the individual difference research with an ongoing investigation by examining how social learning situations and external resources and environmental manifestations influence and support learning and learning processes. Other theorists, examining the differences between poor and excellent learners, suggested that there was great diversity in the way individuals used psychological processes to learn (Coop & Sigel, 1971). For example, they explain that variability in the way learners, acquire, manage, retain, and generate new knowledge is not necessarily due to difference in intelligence or ability but also to cognitive differences in personal learning sets, knowledge, and competencies.

Today, most of this developmental research shows that successful learners have some kind of an awareness and conception of learning and show an understanding (to some degree) of how to use metacognitive and cognitive strategies and skills (Brown, 1987). Yet few researchers use conative and affective factors to balance their individual learning difference constructs to show how these factors measurably influence learning. They are not using whole-person constructs to determine how some learners are more successful because they are better at managing social, conative, affective, or cognitive processes that help them (a) initiate personal and environmental

change more aggressively, (b) attain more challenging knowledge-related goals, (c) solve more complex problems, and (d) self-monitor and assess progress and learning performance more often than others. They are overlooking how successful learners deliberately ensure that they have the knowledge, resources, and ability to set goals, act, and bring about desired changes..

Successful Learning is Intentional

Our goal as educators is to foster more successful learning. Professionals use a variety of adjectives to describe successful learners: skilled, serious, committed, self-regulated, achievement motivated, self-directed, self-managed, expert, and lifelong learners. Caplan and colleagues characterized successful learners as being goal-directed, self-managed, and supported by a strong sense of self-efficacy about their abilities and intentions to reach learning goals (Caplan, Choy, & Whitmore, 1992). Successful learners are those who are doing well in school or on a job, as contrasted with the children or adults who reject learning and see themselves as less likely to succeed or learn successfully.

Unsuccessful learners have lower academic or life goals, seek less control of their learning, and expend less effort to achieve goals (Caplan et al., 1992). Zimmerman (1989) suggested that successful learners used three classes of determinants for self-regulated learning, including personal processes, the environment, and their behavior. Whatever the label, achieving learners have similar characteristics in that they have strong causal beliefs about learning, seek knowledge, and expend effort, and have a passion for competition, above-standard accomplishment, and change. When skilled learners approach learning, they ensure their success by considering five important aspects:

1. Reasons and relevancy for learning.
2. Capabilities, capacity, and internal resources to meet challenges.
3. Nature and requirements of the performance task (task difficulty, predictions, and expectations).
4. Nature and capacity of external resources that allow, support, and improve learning.
5. Expected and perceived accomplishment and acceptance of personal and environmental changes.

Intentional Learning

In a discussion about the main focus on metacognition in educational psychology research, Brown (1987) suggested that motivation constructs, and terms like metacognition and cognition were too fuzzy, and imprecise for realistic scientific inquiry. Instead, she advised the inclusion of more precise concepts or constructs to describe learning processes, such as learner control, learning with awareness, knowledge construction, mechanisms for change and development, and transfer. Yet even these terms are ambiguous.

In response for more precise constructs, Bereiter and Scardamalia (1993) posited that the capacity to acquire expertise is uniquely human determined by intentionality. It is intentional learning, they say, that turns learning into a goal rather than an incidental outcome. Others contend that if human beings are intentional, then learning requires a greater understanding of intentions, or the "meaning of the behavior to the individual who performs it; that is, the understanding of what he or she is doing" or intends to do (Brown, 1987, p. 82; Dennett, 1978).

Corno (1986, p.335) and Dweck (1985) added to this concept by inferring that the goal is

learning rather than the performance per se." Corno and Mandinach state that "self-regulated learning refers to the deliberate planning and monitoring of the cognitive and affective processes that are involved in the successful completion of academic tasks" (Corno and Mandinach, 1983; Corno, 1986).

Amid the wealth of research about educational reform, learning theories, cognitive prescriptions, and improved learning environments, Ng and Bereiter (1991) distinguished three levels of goal orientation in a learning situation: task-completion goals, instructional goals, and personal knowledge-building goals. According to Ng and Bereiter, students who intentionally use task-completion goals typically equated learning with the simple completion of assigned tasks. In comparison, students who do use instructional goals equated learning with accomplishing the specified learning objectives. Finally, Ng and Bereiter found that students with a higher standard of learning attributes and knowledge-building goals actively related new learning to prior knowledge" and intentionally used personal goals that went beyond the given instructional objectives. This early work describes how learners use observable, measurable levels of intentionality that influence how they set and accomplish goals.

Following this earlier work, Bereiter and Scardamalia (1993) presented prescriptive constructs for intentional learning as they discussed a theory of building expertise. Like many others, they stressed that it was the cognitive processes that needed support in the design and development of adaptive instructional systems.

In the book *Surpassing Ourselves*, Bereiter and Scardamalia (1989, p. 363) defined intentional learning as the “pursuit of cognitive goals, over and above the requirements of the

tasks.' In this book, the two researchers defined experts as learners, equipped with intentionality, who are actively and willfully trying to achieve learning. The two researchers described experts as motivated, goal-directed learners who actively and intentionally achieve in environments that support learning.

Much of Scardamalia and Bereiter's continuing work focuses on elementary students (grades four through six) in instructor-led intentional learning environments, called collaborative learning communities. The fundamental components of intentional learning performance, such as (a) collaborative problem-solving and knowledge construction and (b) self-managed cognitive processes, encourage learners to take responsibility and self-control of learning, personalize objectives, and apply self-managed strategies to accomplish challenging, high-standard personal learning goals. Much of this work focuses on homogenous intentional use of cognitive processes.

Most of the applied research specific to intentional learning continues to highlight the homogenous intentional use of cognitive processes, such as learning styles, skills, processes, and strategies. This primarily cognitive approach still lacks the insight that Snow and Farr (1987, p. 1) advocated in understanding differing levels of psychological influences on learning. As Snow and Farr (1987, p. 1) suggested, the many critical conative, cognitive, and affective psychological aspects interact in complex ways and intricately influence, guide, and support individual learning.

Ironically, even as he argued against the hegemony of cognitive psychology, Snow (1987), like Scardamalia and Bereiter, strongly embraced perspectives about cognitive achievement in his learning theories and design of treatments and interactions without using conative and affective constructs to differentiate the audience. Even as he strived to consider conative and affective

factors in his solutions, he continued to rely primarily on prescriptive knowledge to optimize cognitive solutions for differing aptitudes and abilities but not allowing for the differing influence from conative and affective learning factors.

The literature shows that most educational researchers are not including the broad set of psychological factors in their instructional solutions. Diverse factors, such as passion, striving, competition, desires, learning enjoyment, frustration, and need for independence are critical conative and affective states that directly affect learning performance, and cannot be discarded or underestimated in the exploration and analysis of learning. To ignore these critical aspects may present a lopsided, superficial, incomplete, or one-dimensional view of the learning audience that leads to the "no-significant-difference" phenomenon. For example, Russell suggests that "when lumping all the students together into a fictional "mass" those who benefit from the technology are balanced by a like number who suffer; when combined with the no-significant-difference majority, the conglomerate yields the widely reported no significant difference results (Russell, 1997, p. 44).

Following the need to differentiate the audience with conative and affective elements, many researchers have isolated influential learner variables, such as motivation, for further examination. Motivation is an affective state often discussed as an isolated factor in connection with metacognitive and cognitive processes. Motivation to learn is an innate response to a learning opportunity that explores one's intrinsic deliberate awareness to consider (a) relevancy to desired goals and personal interests, (b) one's beliefs, abilities, and capacities for self-regulation and transformance, (c) learning in various situations for various reasons, and (d) intrinsic and extrinsic

factors that influence responses to learning opportunities. If you ignore or overlook the source of one's motivation to learn, a critical learning factor, you have an incomplete picture of the individual's proclivity and ability to learn.

Dweck (1983) and Deci and Ryan (1991) recognized the importance of intrinsic information and action to perform, contending that motivation is a function of natural needs for control, competence, and belonging that exist in all of us. McCombs added that learners of all ages are naturally quite adept at being self-motivated and at directing and managing their own learning on tasks that they perceive as interesting, fun, personally meaningful, or relevant in some way (McCombs, 1991, 1993, 1994).

Hence, a key to learning motivation is the learner's deliberate awareness of the degree to which learning tasks stimulate and/or are related to student interests, level of student control and choice that is encouraged, necessary skill development that is fostered, and resource and social support that is provided" (McCombs, 1997, p. 1). McCombs adds that motivation becomes a sensitive issue in situations in which learners (a) are asked to learn something that does not particularly interest them, (b) have little or no control or choice, (c) lack the personal skills or resources needed to be successful, or (d) lack adequate external resources" (McCombs, 1997, p. 1).

Again the question of key psychological influences arises when McCombs et al. suggest that the key to self-determination in learning lies in identifying why some students are motivated to self-regulate learning and others do not (McCombs & Marzano, 1990, 1998; Deci and Ryan, 1991; McCombs & Whistler, 1989; Brown, 1987, Dweck, 1983). In the following example,

McCombs discussed motivation (a conative state) and internal and external conditions that increase motivation as follows:

> Motivation is a function of (a) a personal assessment of the meaningfulness of particular learning experiences or activities and (b) the process of self-initiating, determining or choosing, and controlling learning goals, processes, and outcomes. Educational conditions that allow for the development of self-regulation strategies are the very ones that can address students' will to learn. They are those conditions that honor students' needs for choice and control.
>
> Internal conditions that can enhance motivation to learn in situations where what is to be learned is largely imposed from the outside include (a) an understanding of the self-as-agent in orchestrating thinking, feelings, motivation, and self-regulated behaviors; (b) operating from an understanding of natural capacities to control and direct one's own learning; and (c) perceptions that the learning task or experience is personally interesting, meaningful, and relevant. External conditions that support these internal conditions include provisions for relevancy, choice, control, challenge, responsibility, competence, personal connection, fun, and support from others in the form of caring, respect, and guidance in skill development. (McCombs, 1997, p. 1)

Weiner and his associates also reviewed evidence of how attributes or influences, other than cognitive processes, may affect the student's learning performance (Weiner, 1972; Weiner et al., 1971, p. 208). Their studies examined the influence of causal learning beliefs about ability and

effort on the actions of both instructors and learners. They described the important effects of causal attributions on intentional achievement and causes for success and failure. Several of their studies demonstrated how learners, high in achievement motivation and intention, attributed success to ability and intensive effort, and failure to lack of effort (all individual aspects which they can personally control). In comparison, learners who were low in achievement motivation generally attributed both success and failure to ability and luck, not effort (all individual aspects that they cannot personally control). These learners may feel that they can only try to control personal variables and not the environmental factors that surround and affect them.

Consequently, Weiner (1972, p. 208) and Kuhl and Blankenship (1979, p. 186) delved deeper into the broad set of psychological learning factors. They suggested that learners high in achievement motivation feel more pride in successful accomplishment and will strive to follow this initial success with higher expectations, greater interaction, and more effort on the completion of increasingly difficult tasks. "That is, the causal attribution of self-responsibility for success, which augments positive achievement affect (pride) for success, is postulated to mediate the observed relationship between achievement-related needs and volitional achievement striving" (Weiner, 1972, p. 208). In simpler words, the combination of self-managed learning and learning success lead to greater learning effort.

Weiner et al. (1972, p. 208; Dweck & Reppucci, 1973) were some of the first to hypothesize that achievement motivation, striving, and activity would increase with the "growth of causal attributions to effort (intention)." They suggested that significant learning and performance differences exist between individuals high or low in achievement needs. Weiner et

al. (1972, p. 208; Dweck & Reppucci, 1973) described some of these differences as achievement-related responses: free-choice behavior, persistence of behavior, intensity of performance, and risk performance. To expand his theory, Weiner further wrote that persons high in achievement needs work with greater intensity, persist longer in the face of failure, and choose more tasks of intermediate difficulty than persons low in achievement needs." Achievement motivation (i.e., intentional learning performance) increased when learners attributed success or failure to internal and external variable which they can influence and control themselves (e.g., task difficultly, effort, or resources), rather than characteristics, or external influences, which they can not volitionally affect or control (e.g., chance, conditions, or luck).

The educational research literature is rich in describing or measuring how successful learners self-regulate, self-guide, or self-direct their motivation, volition, cognition, and learning and study skills and strategies to achieve learning objectives. This primarily cognitive research emphasizes examining learning styles or preferences, devising successful learning strategies, and acquiring relevant learning skills, such as memorization, critical thinking, knowledge construction, elaboration, and rehearsal. Necessarily, some of this literature also discusses conative and affective psychological variables, such as goal orientation, attitude, motivation, control beliefs, and self-efficacy. Unfortunately, most of this research still investigates learning focusing on a single-variable instead of a complete set of influential learner, learning, teaching, and other conditions of instruction variables. Snow and Farr (1987) would suggest that this research would benefit from a broader, whole-person perspective.

Following this mandate, Martinez and Bunderson (1997b, p. 28) suggest that individuals

approach learning with a measurable set of psychological variables (i.e., with an orientation to learn) that directly influence how they approach learning and intentionally manage strategies, styles, and skill. Learning orientation considers and describes the primary sources of individual learning differences, including conative, cognitive, social, and affective factors. In a discussion of the fundamental difference between the learning orientation construct and other primarily cognitive constructs for learning strategies, skills, styles, and preferences, it is important to note that learning orientation describes the individual's psychological orientation or proclivity to learn and impacts use of cognitive processes and how the learning eventually occurs.

Successful Learning Environments

The key question is how to provide interactive learning environments that mimic real life, that is, that support a judicious mix of compatible and conflicting experience (Brown, 1987, p. 105). Creating an environment that effectively supports the intersection of constructs for conative, cognitive, and affective processes is a formidable task (Snow, 1979). Another concern is the means to support change and development (Brown, 1987). To design effective learning environments in schools, Bereiter and Scardamalia (1989) believe that educators must understand the complex interaction between students, teachers, situational constraints, and intrinsic factors each has an important role to play in the learning process.

Mechanisms of change need to support learning as an evolving process (Brown, 1987). Such tools need to support performance by engineering change and development in dynamic, interactive learning situations. Today's computer-supported learning environments permit a new capability and flexibility in the learning process and economic design and evaluation of solutions and learning environments.

The rapid advancement in technology and distance and online education as a common learning paradigm opens the door for unique opportunities to change the way we learn and implement tomorrow's successful solutions. Subsequently, today's approach to learning is rapidly adapting to the use of technology tools and the dynamics that are changing learning roles and processes from linear to multidimensional, interactive activities.

In previous years, some instructional designers thought they had the answer in intelligent tutoring systems that are capable of sensitive instruction, prescriptive treatments, and responsive computer assistance. However, these systems were largely unsuccessful because the inflexible rules and structure gave little responsibility to the individual for learning and it was economically impossible to match the diversity and complexity of human needs. Bereiter and Scardamalia (1989) argue that it is not the computer that should be doing the diagnosing, goal-setting, and planning, it is the student. The computer environment should not be providing the knowledge and intelligence to guide learning, it should be providing the facilitating procedures, structure and tools that enable students to make maximum use of intelligence and knowledge. Unfortunately, traditional education still has too little experience in giving individuals such autonomy or responsibility for learning.

In recent years, there is an increasing interest in developing supportive intentional learning environments, especially using computer-based facilitation procedures (Bereiter & Scardamalia, 1989). These researchers are exploring a learning theory that encompasses a lifelong inquiry into the nature and implications of managing expertise. In these environments, learners have diverse opportunities to acquire metacognitive and domain-specific knowledge, model strategies for self-directed or self-managed learning, and engage feelings of learning efficacy. The Computer-Supported Intentional Learning Environment (CSILE) is a well-known educational knowledge media system. The design of the CSILE features eleven principles for intentional learning (Scardamalia, Bereiter, McLean, Swallow, & Woodruff, 1989). Following are a sample of well-known intentional learning environments.

1. Fostering Communities of Learners is an approach to literacy, science, and social studies, developed at the University of California Berkeley, that emphasizes developing knowledge in a social context of a community. This approach models a three-stage process of cognitive apprenticeship that specifies roles for the mentor at each stage (Brown, 1987).

2. The *Adventures of Jasper Woodbury* is a mathematics problem-solving series developed at Vanderbilt's Learning Technology Center. This approach presents theories based on a constructivist, meaning-centered orientation.

3. The *Multimedia Forum Kiosk*, developed at the University of California Berkeley, provides an environment for scaffolding constructive conversation and sharing information in a public kiosk.

These programs share a set of assumptions about learning that are reflected in the *Schools for Thought* classrooms: the importance of deep disciplinary knowledge; of skill development; of authentic problems (from the students' perspectives); of feedback and reflection; and of high-standard social structures and cognitive skills that encourage learning (Bruer, 1993). The emphasis is on the importance of sustained thinking about authentic problems that support extended, in-depth inquiry in domains such as science, social studies, mathematics and literature.

This study and the development of instructional products clearly benefit from many others working in this and related areas of research, including Farr and Snow's (1989) championing learning difference constructs that include a well-balanced, whole-person view, Mandinach's (1987) investigation into relationships among learner characteristics and instructional variations in online learning environments, Chi's (1983) work on learning frameworks for expertise, Merrill's (1990) instructional design and transaction theories, Reigeluth's concept elaboration theory (1996), Scardamalia and Bereiter's (1989) focus on intentionality, and Brown and Campione's (1991) research into interactive progress and strategy environments that challenge learners to develop expertise and individual understanding. This study also uses the research literature indicating the importance of students' use of self-regulated learning strategies. In this area, Zimmerman and Martinez-Pons (1986) offer a self-regulated learning model, featuring goal-setting and planning (Bandura & Schunk, 1981) and environmental structuring (Thoresen & Mahoney, 1974) strategies.

Online Learning Environments

Many educators suggest that computers or the Web may directly influence and support

more successful learning, especially for self-managed, distance learning, or collaborative learning for instructor-led courses. However, it is not yet clear how educators can identify which learners can use online learning more successfully, which elements are more successful, or how to support less successful online learners adequately. For example, while some studies investigate the effects of online learner-control or task sequencing, few truly isolate this element from other variables and examine how well prepared or willing an individual is to even control learning--online or offline.

As a result, reliable theoretical foundations are missing, and research results are largely inconsistent because the constructs are incomplete, ambiguous, or unclear about the unique factors that influence the nature of learning and individual learning differences. Despite the wealth of research, instructional designers have yet to provide online solutions that (a) differentiate the audience by identifying the individual learning differences, (b) determine the key psychological learning traits that influence successful online learning, (c) integrate a comprehensive set of learning factors, including conative, affective, cognitive, social, physical, and behavioral factors into one construct, (d) match and support primary learning differences, (e) help students increasingly self-manage more successful learning, and (f) provide researchers additional information for fostering intentional learning.

Today the World Wide Web (WWW) justifiably tantalizes the imagination with its rapid advances and vast new possibilities for learning environments. Professionals are rushing to the Internet, each seeking new ways to capitalize on the technology offered by Internet and Intranet capabilities. Most organizations--large and small--are currently developing plans for learning via

the Web. It is expected that this trend will continue to grow exponentially. Nevertheless, the Web is not neutral and most experts will agree that the technology needs greater advances to meet most sophisticated requirements and differences in learning.

Because Web-delivered training is still an unexplored domain, there exists only a paucity of research that demonstrates what really works or does not work on the Internet. Eventually research will probably show that to work and respond to change successfully, online learners must learn to self-mange learning in a high-discovery, problem-solving environment. Learners that need structure, few risks, and explicit, step-by-step procedures will need additional, scaffolded support or different formats to help them learn and work productively online.

Until now, most of the research and issues concerning web-delivered instruction is technology or content related. Instructional design issues and online learning theories concerning the web-delivered course are still relatively unexplored. Research results are ambiguous about the benefits or quality of online learning because they have not differentiated the audience according to orientation or individual learning differences. This lack of sound theoretical foundations contributes to the unfortunate trend for the "no significant difference phenomena" reported by Russell (1997). The profession urgently needs theories about learning successfully on the Web and online learning models that (a) identify learning orientations to differentiate the audience, (b) adapt instructional elements to the different orientations, (c) consider the demands of complex instructional needs and educational and business objectives as they change, (d) provide instructional and assessment models that consider whole-person learning constructs, and (e) integrate the newest WWW technological advances as they evolve.

Conclusion

As we approach the twenty-first century and confront burgeoning economic demands and expanding social requirements, the world continues to search for successful learning constructs by pursuing primarily cognitive learning and developmental perspectives, cognitive processing as the primary source for individual learning difference, one-variable-at-a-time research, and one-size-fits-all solutions.

The new learning theories and constructs hold realistic promise for the future support the individual's proclivity to learn and manage learning performance. These solutions will evolve after we identify a broader set of primary sources for learning differences. These whole-person explanations will consider not only the cognitive and social variability, but, at the same time, the affective and conative variability among learners as a complete set of deeply interrelated factors.

Our need to determine a comprehensive set of psychological learning factors that impacts and differentiates the learning audience and guides instructional design, development, and evaluation will lead us to discovering conceptual structures and mutually supportive relationships among the diverse sources for individual learning differences. In turn, the new theoretical foundations will help us match the best solutions, individualized by higher-order learning variables, for successful lifelong learning requirements in the new century.

APPENDIX C

COURSE REENS

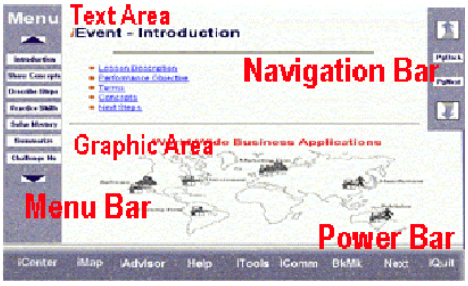

Figure 1. Screen shot of a lesson delivered by the SILPA.

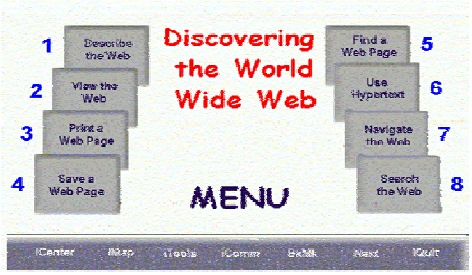

Figure 3. This menu shows the simpler learning environment for the control group CO2.

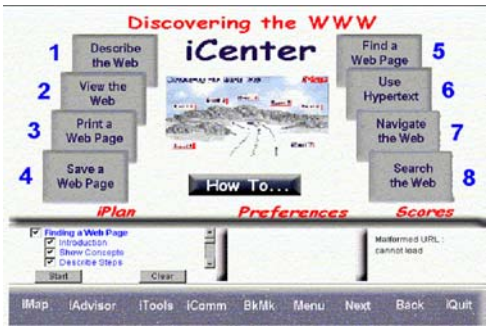

Figure 2. The iCENTER provides the course menu and intentional learning resources.

Figure 4. A screen shot of a practice exercise in Lesson 8.

APPENDIX D

SAS ANOVA PROGRAMMING CODE

This is the programming for the hypothetical ANOVA model using the learning orientation variables (ILO4, ILO5, ILO6) to test GROUP and TIME effects and interactions at three corresponding points along the ILO scale. Instead of using the original ILO variable, the ANOVA was run three times substituting each of the new ILO variables in the model statement for the satisfaction (SAT). This programming was also modified for the learning efficacy (LEF) and intentional learning performance (ILP) variables.

1. proc mixed data = s1;
   class group subj time;
   model **sat = ilo4** group time ilo4*group ilo4*time group*time ilo4*group*time / s
   htype = 1;
   repeated time / type = ar(1) sub = subj(group);
   run;
2. proc mixed data = s1;
   class group subj time;
   model **sat = ilo5** group time ilo5*group ilo5*time group*time ilo5*group*time
   group*time / s htype = 1;
   repeated time / type = ar(1) sub = subj(group);
   run;
3. proc mixed data = s1;

```
class group subj time;
model sat = ilo6 group time ilo6*group ilo6*time group*time ilo6*group*time  /
        s htype = 1;
repeated time / type = ar(1) sub = subj(group);
run;
```

Note. Although the ILO * GROUP * TIME interaction shown in Table 4 was non-significant, it was not omitted from further revised models because it contributed to the consistent presentation for between-model tabular comparisons. This convention was possible because the shifting of variance in the revised models due to dropping the three-way interactions would have been insignificant.

APPENDIX E

LEARNING ORIENTATION QUESTIONNAIRE

NOT SHOWN HERE

APPENDIX F

FACTOR DESCRIPTIONS

Intentional Learning Construct Factors

The intentional learning construct consists of three measurable factors: (1) Conative and Affective Influences, (2) Planning, Strategy, and Performance Efforts, and (3) Control of Learning,

Combined, these factors represent a composite of an individual's general orientation to learn. Learning orientation is how individuals, at any age with varying beliefs, intelligence, and ability, approach and generally intend to experience learning. The following descriptions of the construct factors provide general interpretations for the construct scores received after taking the learning orientation questionnaire.

Over the years, as individuals repeatedly experience learning, they deliberately manage learning effort and control, to some degree, in response to stimuli or some activity, acquire positive or negative reinforcement about the learning experience, and use this information to guide future learning experiences. Transforming learners have learned to manage conative and affective factors to achieve high-standard goals as they strive for satisfaction, pride, and a sense of accomplishment. Indeed, individuals who approach learning with challenging goals, autonomy, and strong learning efficacy, beliefs, intentions are likely to improve learning ability continually as they successfully repeat and learn from the learning process.

Conative and Affective Influences - Factor 1

Conation refers to the individual's will, intent, or drive for engaging and accomplishing an act, change, goals, or learning tasks. On the Learning Orientation Questionnaire (LOQ), conation refers to the individual's general intent regarding the entire process of learning, regardless of content, environments, resources, or course delivery. Naturally, learners will be more intentional, enjoy, or apply greater effort in specific courses that interest or appeal to them and vice versa.

Affective refers to the emotional or attitudinal influences on learning. As individuals make choices, control actions, set goals, and extend effort to learn, they experience some set of emotions. Positive learning experiences may result in fulfillment, pride, and joy in the attainment of goals. In contrast, less positive experiences may result in negative emotions or attitudes. The emotions experienced during one learning situation generally transfer and influence subsequent learning experiences. Repeatedly negative experiences may lead to long-term learning resistance, lack of motivation, and frustration.

Some of the items in the LOQ assess how individuals may or may not enjoy using learning as a positive way or resource to attain goals. Most current theories about learning discuss many affective concepts that influence learning, including efficacy, motivation, pride, hope, fear, frustration, satisfaction, interest, anxiety, joy, distress, dislike, or discomfort. These learning theories examine the influence of affective factors on attaining goals, achieving competence, ensuring personal development, and enjoying the learning process.

Research about intentional learning assumes that knowledge of the self as an agent plays a key role in how we learn successfully. Transforming learners have the ability to identify, manage, and strive for positive emotions that continually stimulate interests, raise high expectations for success or mastery, self-motivate, soothe anxieties, seek learning enjoyment, expand personal knowledge, and take pride in personal achievement.

Planning, Strategy, and Performance Efforts - Factor 2

Planning, Strategies, and Performance Efforts refer to the learner's comprehensive, deliberate cognitive efforts that contribute to the accomplishment of the learning goal. Transforming learners place great importance on intentions, motivation, passions, self-concept, and personal principles to direct intentional learning, with as much effort as is necessary, in the achievement of long-term, challenging goals.

Using a dynamic, holistic, thoughtful, goal-directed approach for learning management, problem-solving, and assessment, transforming learners continually plan and adapt specific strategies to satisfy needs, meet learning challenges, expand personal knowledge, and initiate improvements. They do this against a background of desires, perceived capabilities, anticipated situational requirements and results, extended effort, expected intrinsic and extrinsic resources, and the ability to accomplish the intended performance. Ultimately, a series of positive anticipations, experiences, routine, practiced use of an intentional learning approach, and learning efficacy will enhance learning opportunities, raise levels of esteem, and lead learners toward lifelong successful, above-standard learning accomplishments.

Control of Learning - Factor 3

Control of Learning refers to the individual's desire and ability to take responsibility, make choices, and control their own learning (independent of the instructor) in the attainment of learning goals (including personal learning goals). As individuals have different experiences and mature as learners, they gradually (a) gain some degree of awareness of their learning processes, (b) develop some degree of need for autonomy, (c) assimilate a unique mixture of internal and external resources and processes, strategies, and capabilities that they situationally use to learn, and (d) learn about and manage affective, conative, and cognitive factors as resources for achieving goals.

In general, individuals who take greater responsibility and control of learning will extend greater effort, show better conceptual understanding and commitment, will more easily self-motivate, set higher goals, achieve greater satisfaction, and continually make personal adjustments that more positively enhance learning.

APPENDIX G

GLOSSARY OF TERMS

These terms offer a psychological description of life. Definitions are taken from the American Heritage College Dictionary, 3rd Edition. Boston: Houghton Mifflin Company, 1993.

Conation

"The aspect of mental processes or behavior directed toward action or change."

Conation includes aspects such as intent, inclination, determination, deliberateness, voluntary choice, resolve, volition, purposefulness, drive, impulse, desire, will, or striving.

Affective

"Influenced by or resulting from the emotions."

Affective includes aspects such as passion, frustration, satisfaction, distress, joy, fulfillment, gratitude, comfort, arrogance, or disinterest.

Cognition

"The mental process or faculty of knowing" or "coming to know."

Cognition describes how people become aware of, gain, manage, and build new knowledge about the world. This term includes aspects such as awareness, creativity, perception, reasoning, comprehension, analysis, synthesis, evaluation, application, judgment, concept learning, memory, problem solving, task sequencing, goal setting, and progress monitoring.

Social

"Of, or relating to, or occupied with matters affecting human welfare."

Social includes aspects such as communication, collaboration, gathering, and interaction.