CREATIVE PROBLEM SOLVING STYLES AND LEARNING STRATEGIES OF MANAGEMENT STUDENTS: IMPLICATIONS FOR TEACHING, LEARNING, AND WORK

BY

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CHAPTER 1

INTRODUCTION

Changing Times

The last several decades have been marked by societal turbulence and rapid social change (Naisbitt, 1982; Smith, 1990; Toffler, 1970, 1980). This societal turbulence has been reflected in several organizational trends. Changing demographics, social changes, and technological changes are major factors affecting organizations (Cross, 1981). Demographic changes include the increasing proportions of minority groups in the country, the aging Baby Boomers with the resulting graying of the workplace, and the entry of women into the workplace. Examples of social changes include rising rates of educational attainment and equal opportunity that allows women and minorities to participate in the workplace. An additional social change is the new trend toward cyclic life plans where education, work, and leisure become concurrent activities, as opposed to a traditional linear life plan that separates education, work, and leisure. Technological changes to consider include the increased speed of change, the explosion of information available, and the shift in our society from producing things to producing information.

As a result of these changes, organizations are being forced to respond to the turbulent business environment at a very fast pace. Those same organizations are often

downsizing, forcing remaining employees to do more work. Companies that previously had multi-level hierarchies are being flattened by removing mid-level management. The dot.com explosion with its rapid proliferation of web-based businesses came and went with hundreds of companies failing and the technology industry suffering great financial blows. The economic downturn that began in 2000 has resulted in layoffs, which has left fewer workers but no reduction in the amount of work to be done. Most organizations face challenges and opportunities too complex to be resolved by one person working alone; more and more organizations use teams to address those pressing challenges and opportunities.

Peter Vaill (1989) coined the term "permanent white water" (p. 4) to describe the chaos, rapid change, and uncertainty faced by members of society. Vaill reported a comment made by one manager attending a seminar that he was conducting.

> "Most managers are taught to think of themselves as paddling their canoes on calm, still lakes," he said. "They're led to believe that they should be pretty much able to go where they want, when they want, using means that are under their control. Sure there will be temporary disruptions during changes of various sorts — periods when they'll have to shoot the rapids in their canoes — but the disruptions will be temporary, and when things settle back down, they'll be back in the calm, still lake mode. But it has been my experience," he concluded, "that you never get out of the rapids! No sooner do you begin to digest one change than another one comes along to keep things unstuck. In fact, there are usually lots of

> changes going on at once. The feeling is one of continuous upset and chaos." (Vaill, 1989, p. 2)

Many government agencies, educational institutions, and other organizations are studying what changes must be made in schools in order to produce workers who can cope with the new workplace. Several of these studies have resulted in reports specifying what competencies and skills are needed for these turbulent times. There are three common themes that emerge in these reports as critical competencies. The first two are creative problem solving and the ability to work as a member of a team. The third critical competency relates to learning. Some reports call it lifelong learning while others call it learning how to learn. Managers in all types of organizations must themselves have these competencies and must be able to develop and nurture them in those who work with them and for them (Knowles, 1990). Thus, creative problem solving, working as a team, and learning in permanent white water are three competencies that managers need in order to ensure lifelong employability.

Creative Problem Solving

In order to cope with societal and organizational trends, it is important to have effective and efficient ways to solve problems. "A problem can be defined as any situation in which a gap is perceived to exist between what is and what should be" (VanGundy, 1988, p. 3). An alternative view is that a problem occurs when "there are

obstacles to a smooth transition from one state to the other" (Mayer, 1994, p. 4722).

It is also important to differentiate between routine and nonroutine problems. Routine problems are ones that can be resolved by replicating thinking that has occurred before. Thus, routine problems are not truly problems since there is not an obstacle blocking the transition between what is and what should be. Nonroutine problems, on the other hand, are different from those solved previously, so creative thinking is required. Creative problem solving goes beyond "simply retrieving something previously done in this situation" (Weisberg, 1988, p. 152). When students work on routine problems in school, the problems are called exercises; "however, most important problems in everyday life are nonroutine" (Mayer, 1994, p. 4723).

There are many techniques that can be used to approach problem solving. Many books have been written on the topic, and one published volume contains explanations, demonstrations, and evaluations of 105 problem-solving techniques (VanGundy, 1988). Many researchers known for their models of creative problem solving agree that it is a multi-step process (Dacey, 1989; VanGundy, 1988).

Min Basadur, Professor of Innovation in the Michael G. DeGroote School of Business at McMaster University in Toronto and founder of Basadur Applied Creativity, views the creative process in an organization as having three phases:

problem finding, problem solving, and solution implementation (Basadur, 1998a, 2000). This is a circular, iterative process in which solution implementation then leads to the discovery of new problems or opportunities. Basadur has developed an eight-step model of a complete process of creative problem solving. The eight steps include: (1) problem finding, (2) fact finding, (3) problem definition, (4) idea finding, (5) evaluation and selection, (6) planning, (7) gaining acceptance, and (8) action (Basadur, Graen, & Wakabayashi, 1990). Basadur has worked with a series of research partners to develop the Creative Problem Solving Profile Inventory, a self-report instrument which creates a profile of an individual's problem solving preferences.

Working as Teams

In order to deal with current trends which require keeping up with the fast pace and processing more information, people in the workforce will have to learn to work more effectively and efficiently. This is resulting in the development of many teams because individual workers must often pool their talents and operate in teams (Drucker, 1999; Fisher & Thomas, 1996; Senge, 1990; Tjosvold, 1986)

> A team has two or more people; it has a specific performance objective or recognizable goal to be attained; and coordination of activity among the members of the team is required for the attainment of the team goal or objective. This definition eliminates from theoretical interest many groups that are commonly called "teams." (Larson & LaFasto, 1989, p. 19)

An alternative definition of a team is "a small number of people with complementary skills, who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable" (Katzenbach & Smith, 1993, p. 45).

Teamwork is becoming an important aspect of today's workplace. "More and more people are doing more and more of their work as part of a team" (Avery, 2001, p. vii). Data from a survey conducted in 1998 at 3M indicates that the 2,800 people surveyed reported that almost 50% of their work in 1998 was done in teams. Just a decade earlier, 21% of work was done as part of a team and this reflects almost a 250% increase. Avery calls this "an unprecedented change in work style" (p. vii).

> These movements cause workers to wear more hats and assume more roles. The days of one person working within the comfortable bounds of an isolated, well-defined domain is almost ancient history. We are all performing multiple roles, and we must work with other people to create a whole. (Avery, 2001, p. viii)

According to Avery (2001), teamwork is the engine that is driving the work being done in today's organizations.

Learning in Permanent White Water

In the early 1960s, when the turbulence began in this country, Malcolm Knowles (1962) noted that:

> Intellectual mobility is not yet a top priority value in our society. The breakthrough to the new day of lifelong learning will not occur, therefore, unless the current generation of adults is dramatically confronted with the fact of the threat of obsolescence. This, then, is the central

> challenge of the modern adult education movement. (p. 280)

Perhaps the permanent white water may convince adults of the need for intellectual mobility. Vaill (1996) maintains that learning must become such an integral part of life that it is a way a being sustained throughout a person's lifetime.

Lifelong Learning

In order to keep up with the rapidly-changing world and guarantee lifelong employability, people must be lifelong learners. "In an era of breathtaking change, it is truly impossible to acquire early in life the knowledge that adulthood will require" (Smith, 1982, p. 15).

> Individuals living in today's world must be prepared to make learning a continuing lifelong activity. Lifelong learning is not a privilege or a right; it is simply a necessity for anyone, young or old, who must live with the escalating pace of change — in the family, on the job, in the community, and in the worldwide society. (Cross, 1981, p. ix)

Vaill (1996) insisted that "learning in permanent white water is learning as a way of being" (p. 43). In order to understand how employees entering the workforce can improve their problem solving techniques to deal with complex problems, it is both appropriate and necessary to use the lens of adult learning as a filter.

Andragogy

As students graduate from college and enter the workplace, they assume the roles of adults in society. They leave behind the safety of the classroom, where they have

spent approximately 16 years in a typically teacher-centered environment built around pedagogical principles. The Greek roots of the word pedagogy translate "leader" and "of children" and have come to mean "the art and science of teaching children" (Knowles, 1990, p. 28). Vaill (1996) calls this formal school system "institutional learning" (p. xv). After spending most of their lives in this environment, students must overcome their tendencies to be passive recipients in a teacher-centered classroom and become proactive, self-directed learners who bring their experience to bear on their learning situations. "Most important, college students need to stop thinking like students and start thinking like learners" (Evers, Rush, & Berdrow, 1998, p. 175). This transition can be difficult (Candy & Crebert, 1991). Vaill (1996) argues that institutional learning "has ill-prepared us for the messy learning world we inhabit as practicing managerial leaders and other kinds of professionals" (p. xv). He claims that the implicit model of learning that children first experience in kindergarten as they enter the arena of institutional learning carries over into their adult lives with traditional training and development.

Some college graduates may believe that as they enter the workplace they will receive training within their organizations. They perceive that the burden of teaching them will transfer from their college professors to trainers

in their organizations. That is true to some extent, but practitioner journals contain many examples of efforts to shorten the duration of training due to the expense and impact on production (Aldrich, 2002; Carson, 1995; Hubbard, 1997; Kaydo & Brewer, 1998).

> Over the years, training departments have been pressured to reduce the length of their programs. Classes that once took two weeks were cut to one. One-week classes were reduced to two days. Most programs are down to two hours. (Aldrich, 2002, p. 86)

During this compressed time period, several issues may be addressed, but it will be at a superficial level. There will likely be no time for in-depth coverage, for reflection, or for practice. Thus the burden will be on individuals to diagnose their own learning needs, plan their learning activities, and gather the necessary resources.

Adult learners can thrive with an andragogical approach. Malcolm Knowles, known as the father of adult education, brought the concept of andragogy to the attention of educators. Andragogy, which means "the art and science of helping adults learn" (Knowles, 1980c, p. 43) is more learner-centered than a typical pedagogical approach. Knowles developed a set of assumptions regarding the characteristics of adult learners that identifies how adult learners differ from children. These assumptions relate to the learner's need to know, self-concept, experiences, readiness to learn, orientation to learning, and motivation (Knowles, 1990). Traditional university students are on the

cusp of adulthood, old enough to be away from home yet not yet filling all the roles of adulthood. This process of maturation can be accelerated by being in environments that emphasizes increasing responsibility (Knowles, 1990). College professors can facilitate this transition by incorporating adult learning principles; helping students learn to solve the messy, complex problems they will face in the real world; and helping students become self-directed learners.

Self-Directed Learning

Self-directed learning is one of the hallmarks of learning as a way of being. Rather than having learning structured and delivered by an authority in an institution, adults must be self-directing by assessing their own learning needs and finding appropriate resources (Vaill, 1996). In an academic setting, teachers usually perform the initial steps of problem solving which includes defining the learning objectives, identifying and defining a problem for students to solve, and providing relevant data needed to solve the problem (Wagner & Sternberg, 1986). Since teachers structure the problem and direct the experience, students even adult students may revert to a passive role rather than becoming self-directed (Knowles, 1980b). The scope of the problem is usually clearly defined, a due date is assigned, and there is typically only one correct answer. Knowles (1980b) suggests that perhaps it will require a

nudge to move learners away from the passive student role for which they have been conditioned in order for them to become self-directed.

Real-Life Learning

Once graduates leave the college classroom, they will be learning in a variety of real-world settings. Previously they practiced problem solving with structured problems clearly defined by their teachers. Now they will be attempting to solve messy, complex problems that are not pre-defined for them. It would be useful if they were exposed to this type of problem solving while they still have the safety net provided by their college classroom. Sometimes this is called real-life problem solving (Sternberg, 1990), real-life learning (Conti & Fellenz, 1991), situated cognition (Black & Schell, 1995; Brown, Collins, & Duguid, 1989; Wilson, 1993), situated learning (McLellan, 1993, 1994; Stein, 1998), or problem-based learning (Coombs & Elden, 2004; Peterson, 2004).

Learning How to Learn

"The art of learning must itself be learned" (Houle, 1964, p. 1). Although it might seem as though a person who has completed 12 or 16 years of formal education would know a lot about learning, that may not be true. Schooling exposes students more to subject content or technical skills rather than to learning how to learn. Institutional learning is more about control and rules and has trained us

to be obsessed with getting the "right answers" (Vaill, 1996, p. 36) and does not necessarily provide awareness of learning how to learn. It appears that at the university level, professors are probably not equipped to facilitate learning about learning. There has been an assumption that earning a Doctor of Philosophy (Ph.D.) degree is an appropriate training path for college professors although there has been argument that a Ph.D. is a research rather than a teaching degree (Brown & Thornton, 1963). Jacques Barzun, author of Teacher in America, is quoted as saying "The doctorate of course shows nothing about teaching ability" (Brown & Thornton, 1963, p. 35). It is possible – and perhaps common – to begin teaching at the college level without a single class in education or any training about the teaching-learning transaction but merely with a knowledge of the topic being taught. As a result, it is likely that students are not learning how to learn as part of their formal education.

Since learning must continue beyond graduation, it is necessary to understand what must occur as graduates assume their adult roles when they enter the workplace. It is a very different environment with no teacher establishing the learning objectives, setting a schedule, assigning readings, giving exams, or awarding grades. Learning how to learn "involves people having or acquiring whatever understandings or skills they require to learn effectively in the

situations and settings they encounter" (Smith, 1983, p. 97). This involves their learning styles and learning strategies.

Learning Styles and Learning Strategies

> It has long been apparent to teachers, educators, and observers that people differ in how they go about certain activities associated with learning. They differ as to how they think. They differ as to how they approach problem solving. (Smith, 1982, p. 23)

Even a cursory examination of the literature regarding learning styles and learning strategies uncovers significant variation in how those terms are used. Smith discusses learning styles in his earlier works (1976, 1982, 1983), but uses the term learning strategies in his later work (Smith, 1990). He defines learning styles: "For those whose style encompasses a preference for definition, learning style can be defined as 'the individuals' characteristic ways of processing information, feeling, and behaving in learning situations'" (Smith, 1982, p. 24). Yet he also addresses learning strategies by including "broadening the individual's repertoire of learning strategies" in his list of learning-to-learn activities (Smith, 1990, p. 4).

One way that people can learn how to learn is by being aware of their own learning styles and preferred learning strategies. Learning styles are considered to be individual traits that tend to remain stable over time (Conti & Fellenz, 1991; Fellenz & Conti, 1989). One of the problems with learning styles is the perception that they are fixed

and unchanging, which can actually interfere with students' learning if the learning situation does not match the learners' styles (McKeachie, 1995). It is perhaps more useful to consider learning strategies. Learning strategies, on the other hand, are techniques or skills that can be selected for a specific task or situation (Conti & Kolody, 1999; Conti, Kolody, & Schneider, 1997).

> Regardless of the type of setting, learners use various strategies to accomplish their learning needs. Learning strategies are those techniques or specialized skills that the learner has developed to use in both formal and informal learning situations. While learning styles refer to the inherent ways that people process information, learning strategies deal with the way people approach specific learning situations. They are external behaviors developed by an individual through experiences with learning which the learner elects to use in order to accomplish a learning task. (Fellenz & Conti, 1989, p. 7)

Although individuals have preferences for certain learning strategies, they can consciously choose to use various strategies to achieve certain learning tasks (McKeachie, 1995). Conti and Kolody (1998) have developed a self-assessment instrument called Assessing The Learning Strategies of AdultS (ATLAS) that identifies an individual's preferred learning strategies.

Instrumented Learning

One way that learners can recognize their own strengths and ascertain what areas need further development is by the use of learning instruments. Learning instruments are self-report assessments that individuals or teams can use to

learn something about themselves (Pike, 2003; Zemke, 1982). A learning instrument allows an individual or team to describe some aspect of behaviors, attitudes, or preferences and to interpret these based on a theoretical foundation (Blake & Mouton, 1972; Pike, 2003; Zemke, 1982). Although instrumented learning can be used in a classroom experience, it can also be an important aspect of self-directed learning.

Problem Statement

Demographic, technological, social, and economic revolutions are underway. Businesses and organizations are struggling to survive in an increasingly complex environment and must compete in a global economy. Individuals are also buffeted by these changes; they must face the possibility of losing their jobs, medical insurance, and pension and retirement funds. Individuals who manage to remain employed face the challenges of an increased workload due to downsizing as well as the need to avoid technological obsolescence. Lifelong learning is an absolute necessity in order to remain employable in the workforce.

Individuals no longer have the luxury of working in isolation on a small problem with clearly-defined boundaries. They must learn to work in teams to solve messy, complex problems. Workers often do not work on a single, long-established team but on multiple teams; some of

them are ad hoc, and some of them span the boundaries of multiple organizations (Avery, 2001).

In addition, organizations and individuals are struggling to deal with many aspects of diversity. Workplace diversity training is usually focused on racial, ethnic, and cultural differences. Now age-related diversity is an issue; older managers are struggling to supervise much younger workers with greater technology savvy while younger workers are struggling to supervise employees considerably older than themselves. The added stresses in the workplace merely compound one that has always existed: how to work with people who approach problems and situations with very diverse styles. People differ as to how they approach problem solving (Smith, 1982), yet these differences are rarely addressed in diversity training. There are often problems when an individual who likes to keep generating new ideas works in tandem with a team that wants to take action without even pausing to define the problem. Also, a team faces challenges getting a new product out the door if no one on the team has skills in implementation.

As a response to these challenges, Basadur created an easily administered learning instrument that identifies the preferred problem solving styles of individuals. The Creative Problem Solving Profile (CPSP) Inventory allows people to become aware of their own habitual behaviors so that they may choose to make behavioral changes that make

them more effective in the workplace and in their personal lives. This is critical since a major obstacle to effective problem-solving is rigidity in thinking (Hiemstra, 1994, p. 4724). In addition, this instrument provides insights into team dynamics among individuals with diverse problem solving styles.

Conti and Kolody (1998) developed the Assessing The Learning Stategies of AdultS (ATLAS) instrument to allow learners to quickly and easily identify their preferred learning strategies. This awareness can assist learners in selecting which strategies to use for specific learning tasks. The CPSP and ATLAS are both instruments that can be useful for students who are about to graduate from college and become managers so that they can develop the necessary skills in themselves and their employees. If they do not develop the three critical competencies of creative problem solving, the ability to function as a member of a team, and lifelong learning, they will not be successful in the workplace.

Purpose Statement

The purpose of this study was to describe the problem-solving preferences and learning strategy preferences of management students at Oklahoma State University. This was accomplished by (a) identifying the problem-solving preferences of management students, (b) identifying the preferred learning strategies of management

students, (c) examining the relationship between problem solving preferences and learning style preferences, and (d) identifying any naturally occurring groups based on their problem solving preferences.

Research Questions

1. What are the preferred problem-solving styles of management students at Oklahoma State University?
2. What are the preferred learning strategies of management students at Oklahoma State University?
3. What is the relationship between the preferred problem-solving styles and learning strategy preferences of management students at Oklahoma State University?
4. Do naturally occurring groups exist among these students based on their preferred problem-solving styles?

This study used descriptive statistics (Shavelson, 1996), including frequency distributions and central tendencies to provide a profile of the participants with regard to their demographic data, preferred problem solving styles, and preferred learning strategies. A one-way chi-square test was used for two comparisons: to compare the problem solving preferences of the participants to the norms for the CPSP Inventory and to compare the preferred learning strategies of the participants to the norms for ATLAS. A two-way chi-square analysis was also performed to examine the relationship between problem solving preferences and preferred learning strategies of the students. Cluster analysis and discriminant analysis techniques were used to determine the characteristics of any naturally-occurring groups of learners.

The following techniques were used to address each of the research questions:

Question	Statistical Procedures
1	Frequency distributions, chi square
2	Frequency distributions, chi square,
3	Crosstabs, chi square, lambda, Cramer's V
4	Cluster analysis, discriminant analysis

CHAPTER 2

LITERATURE REVIEW

Critical Competencies

Educational institutions, government agencies, and business organizations have conducted studies to determine what critical competencies are required for workers who can survive and thrive in today's workplace. Some of these reports are linked to a specific level of formal education. People take many different paths on their way to the workplace. Some leave school, becoming dropouts or high school noncompleters (James, 2000). They typically obtain low-paying jobs with little hope for advancement. "This population of noncompleters is among the least and lowest employed in the U.S. and contributes less economically than they require from society" (p. 1). Some eventually obtain a General Education Development (GED) diploma or participate in some other type of adult basic education. Others obtain a high school diploma but then enter the workforce without attempting higher education. Yet others go on to college and possibly graduate school.

> Conventional wisdom says that credentials are the keys to success in the workplace and in life. In particular, the 4-year bachelor's degree is widely considered the universal ticket to a desirable, high-paying, career and a comfortable, middle-class life. (Wonacott, 2000, p. 1)

The Secretary of Labor under President George H. W. Bush established a commission to define workplace competencies and skills necessary to work in this

challenging environment. The Secretary's Commission of Achieving Necessary Skills (SCANS) published a report that describes the new workplace and specifies what schools serving grades K-12 need to do in order to produce graduates with the necessary skills and competencies. One of the conclusions reported in the SCANS report is that "all American high school students must develop a new set of competencies and foundation skills if they are to enjoy a productive, full, and satisfying life" (SCANS, 1991, p. i).

The SCANS report (1991) also identified five competencies and a three-part foundation necessary for high performance. The five competencies that are used by high-performing workers involve resources, interpersonal skills, information, systems, and technology. Resource competencies involve the ability to allocate time, money, materials, space, and staff. Interpersonal skills include working on teams, teaching others, serving customers, leading, negotiating, and working well with people from culturally diverse backgrounds. Information competencies include acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information. Systems competencies include understanding social, organizational, and technological systems; monitoring and correcting performance; and designing or improving systems. Technology competencies include selecting equipment and tools, applying technology

to specific tasks, and maintaining and troubleshooting technologies.

According to the SCANS Commission, competence requires a three-part foundation that includes basic skills, thinking skills, and personal qualities (SCANS, 1991). Basic skills include reading, writing, performing arithmetical operations, listening, and speaking. Thinking skills include thinking creatively, making decisions, solving problems, visualizing, knowing how to learn, and reasoning. Personal qualities that make up the third part of the foundation include displaying responsibility, self-esteem, self-management, integrity, and honesty.

A final report issued by SCANS in 1992 had two parts, Learning a Living and A Blueprint for High Performance, which defined workplace issues, made recommendations and provided "a more detailed roadmap" for educators and employers. The report states that the combination of foundation skills and workplace competencies — which SCANS calls "workplace know-how" (SCANS, 1992, p. xiii) — is often not taught in schools.

The report created for state agencies that provide employment, education, and training services as part of Adult Basic and Literacy Education (ABLE) delineates what competencies are needed to connect individuals who are typically underserved by academic programs with the workforce and economic development. It attempts to provide

"a seamless system and unified approach for connecting workforce and economic development and education attainment" (Van Horn, Carman, Watson, Beach, & Weirauch, 2000, Section 2: Page 1).

This report identifies 21 essential foundation skills and knowledge areas needed by all workers. These were divided into the four categories of basic workplace skills, basic workplace knowledge, basic employability skills, and lifelong learning skills. Basic workplace skills include traditional academic skills such as reading, writing, speaking, and math as well as new skills such as using resources and technology. Basic workplace knowledge includes having a basic understanding about the nature of work and workplace culture. Basic employability skills include both cognitive and social skills required to interact effectively in the workplace such as working in teams, solving problems, making decision, having self-management strategies, and demonstrating effective interpersonal relationships (Van Horn et al., 2000). The fourth category, lifelong learning skills, "includes the learning skills and strategies that enable one to continually pursue employment and learning opportunities (Section 2: Page 1).

The authors of this report worked with focus groups of stakeholders which included employers, educators, trainers, and workers to develop two models of foundation skills.

Model One is a pyramid with a bottom tier consisting of the Lifelong Learning Skills described earlier. The next tier consists of three parts: Basic Workplace Skills, Basic Workplace Knowledge, and Basic Employability Skills. Model Two is a circular model that looks like a pie chart. The pie is divided into thirds with further subdivisions into slices for each individual skill. The slices of the pie are shown as dotted lines meant to show "the integration and interaction among skills when they are used in real-life contexts (i.e., individual skills are rarely used in isolation, but are instead integrated with other skills, knowledge and abilities and applied in context)" (Van Horn et al., 2000, Section 2: Page 4) The three major sections of the pie are Basic Workplace Skills, Basic Workplace Knowledge, and Basic Employability Skills. Lifelong Learning Skills are shown as a circle in the very center of the pie chart.

Another framework was provided by the American Society for Training and Development (ASTD), a nonprofit association representing approximately 50,000 human resource development professionals which partnered with the U. S. Department of Labor (DOL) to explore what skills are critical to workplace success. This study was not linked to a specific level of formal education but rather explores workplace skills in general.

The resulting skills framework of this 3-year nationwide study has multiple components: (1) learning to learn, (2) basic competency skills, (3) communication skills, (4) adaptability skills, (5) developmental skills, (6) group effectiveness skills, and (7) influencing skills (Carnevale, Gainer, & Meltzer, 1990). Learning to learn is defined as the foundation skill. The report then lists basic competency skills of reading, writing, and computation. Communication skills consist of speaking and listening effectively. Adaptability skills are the ability to solve problems and think creatively. The ASTD/DOL report states the need for developmental skills to manage personal and professional growth and for influencing skills such as understanding organizational culture and sharing leadership. The report then identifies the need for group effectiveness skills such as interpersonal skills, teamwork, and negotiation that allow employees to work effectively with others.

Common threads are woven through these reports, making clear that there is a need to create future employees who can work effectively as a member of a team, participate in creative problem solving, and learning how to learn in order to ensure lifelong employability. Although these reports seem comprehensive, none of them specifically addressed higher education.

Historically, institutions of higher education have been called "ivory towers" (Doerfel & Ruben, 2002, p. 5) that have remained independent and above the fray. Now, the same white water that has buffeted business and industry is also lapping at the base of the ivory tower. Just as corporations constantly face new challenges, universities are also facing new challenges (Ausburn, 2002; Ausburn & Finney, 2002), including "the high-stakes search for new funding sources, the pressure and opportunity to serve new enrollments and markets" (Pittinsky, 2003, p. 6). "Today's higher education institutions are large complex businesses which are no longer outside the financial world of revenues, expenses, and budgets" (Ausburn, 2003, p. 83).

The students who are the product of universities are also affected by these changes. Students who attend university to receive a liberal arts education may feel that they are above the fray, but business students are being prepared to cope with the changing world. Often business students take a marketplace view of higher education (Franz, 1998). Students shop around for majors, for classes, and for professors who will provide a good return on their investment. There are some drawbacks to this perspective of students as customers who are purchasing an education so that they, in turn, are marketable. One drawback is that educators may focus only on marketing in order to attract and retain students, then work at keeping the "customer"

happy (Franz, 1998). A second drawback is that students may define their return on investment as relating to a high grade point average rather than how much they learn in a class. Although educators are sometimes urged not to view students as customers, there can be hazards to viewing them as mere products. A third drawback is that:

> Viewing students as products casts them in a fundamentally passive and submissive role. They are the by-products of knowledge. As teachers, we are often annoyed and disappointed by the frequent "will-this-be-on-the-midterm" and "just-tell-me-what-I-need-to-know" so I can "do-as-little-as-possible-to-pass" refrains. These sentiments, however, are simply symptoms of our educational models. Both the customer and product metaphors cast students into passive do-unto-me roles and put instructors into an adversarial relationship with their students. Teachers become subservient to their "customers" and/or dominating over their "products." Alienated from the learning process, students view education as something to be endured, not embraced. (Franz, 1998, pp. 64-65)

A fourth study titled "Making the Match Between University Graduates and Corporate Employers" was undertaken by researchers in the United States and Canada (Evers, Rush, & Berdrow, 1998). This study identifies the essential skills and competencies as managing self, communicating, managing people and tasks, and mobilizing innovation and change. Managing self includes working well on a team, lifelong learning, knowing personal strengths and developing personal traits, and identifying, prioritizing, and solving problems, thus addressing the critical competencies already identified. This study also specifically addresses the challenges faced by graduates making the transition from

college to the workplace with chapters titled "The Humbling Effect: Moving from College to the Workplace," "Closing the Gap Between Campuses and Workplaces," "Fostering Workplace Skills in the College Curriculum," and "Building on Collegiate Learning in the Workplace."

Colleges of business have several methods of determining what competencies are important for business students. Two sources of input into that decision are advisory boards and standards set by the accrediting organization. The William S. Spears College of Business at Oklahoma State University uses both methods.

Many colleges of business have advisory boards that bring members of the business community into discussion with faculty and administrators to discuss what skills are needed in the workplace. A survey of 119 business schools conducted by the Association to Advance Collegiate Schools of Business (AACSB, 2005a) showed that almost one-third of business schools have advisory boards containing less than 20 members. The most common size of advisory boards (40.3%) is 21-40 members. Almost one-fifth of business schools have 41-60 members on their advisory board, and the remaining 9.2% have more than 60 members on their advisory boards. Within the William S. Spears School of Business at Oklahoma State University the School of Accounting has a 30-member advisory board while the MBA Advisory Board has 16 members.

Finally, the Association to Advance Collegiate Schools of Business (AACSB) publishes regular reports outlining what competencies are necessary for students of business schools at both the undergraduate and graduate levels (AACSB, 2005b). AACSB accreditation is the gold standard for colleges of business. The Association to Advance Collegiate Schools of Business was founded in 1916 as the American Assembly of Collegiate Schools of Business and adopted accreditation standards in 1919. The William S. Spears School of Business at Oklahoma State University is accredited in both Business and Accounting. The AACSB (2005b) standard for accreditation identifies several trends evident in the current business environment that reflect those identified by Cross (1981), including globalization, changing demographics and diversity in employees and customers as well as in organizational and cultural values, and changing technology that impacts both products and processes.

AACSB recognizes that these challenges place demands on organizations and managers that in turn require business schools to develop those competencies in their students. "In this environment, management education must prepare students to contribute to their organizations and the larger society and to grow personally and professionally throughout their careers" (AACSB, 2005b, p. 1). The competencies identified by AACSB are intended to prepare students to manage in an

unpredictable environment, cope with new and unforeseen circumstances, and maintain engagement with difficult learning activities. Specific competencies addressed by AACSB include problem solving, decision making, group and individual dynamics, and reflective thinking skills (AACSB, 2005).

Common themes emerge from all these reports as being necessary for workers in these turbulent times. Students who graduate from college and become managers must have these skills themselves and must be able to help develop them in their employees. This study will explore three of the common themes that make students employable: creative problem solving, working as teams, and learning in permanent white water.

Creative Problem Solving

"Problem solving generally is considered to be a multistage process" (VanGundy, 1988, p. 5). There are many models of problem solving and these models usually have similarities although they do not agree on the number of stages. Several of the models include four stages (VanGundy, 1988). Many problem solving techniques are based on the work of Simon (1960), who identified the four stages of problem solving as intelligence, design, choice, and implementation. The intelligence stage consists of collecting relevant data. During the design stage, alternatives are generated, and during the choice stage, the

best alternative is selected. During the implementation stage, the selected alternative is put into practice. The model of creative problem solving developed by Wallas identifies the four stages as preparation, incubation, illumination, and verification. Bransford and Stein also limit their model to four stages: identifying problems, defining the problem, exploring approaches, and looking at effects. Polya words his four stages slightly differently: understanding the problem, deciding what to do, carrying out the plan, and looking back.

Dewey identifies five stages: sensing difficulty, defining difficulty, suggesting possible solutions, considering consequences, and accepting a solution. Vaigiu also adds a fifth component and labels the stages as: preparation, definition, frustration, incubation, and illumination. Alex Osborn, known primarily for his work on brainstorming, developed a creative problem solving model with a total of six stages. Osborn's model has three main components: fact finding, idea finding, and solution finding. Each of these components has two sub-stages. The first phase of Osborn's model, fact finding, consists of problem definition and preparation. The second phase, idea finding, consists of idea production and then idea development. The third and final phase, solution finding, consists of evaluation and adoption. Rossman defines seven stages in which a problem is observed, a problem is

formulated, available information is surveyed, solutions are formulated, solutions are critically examined, new ideas are formulated, and new ideas are accepted and tested.

Sidney J. Parnes, lifetime trustee of the Creative Education Foundation, Founding director of the International Center for Studies in Creativity, and Professor Emeritus at Buffalo State College, has built on the work of Osborn by developing a training program of creative problem solving (CPS) techniques. The five stages of the CPS process developed by Parnes are fact finding, problem finding, idea finding, solution finding, and acceptance finding (Parnes, 1977). Later, Isaksen and Trefflinger added an additional step, objective finding, to the beginning of the CPS process (VanGundy, 1988). Objective finding limits the scope of the problem while fact finding is the stage in which all information is gathered. Problem finding is the stage at which the problem statement is developed. Next, idea finding is the process of generating ideas then selecting the most promising alternatives. Solution finding involves generating the criteria for evaluating solutions and then selecting the best solution. Acceptance finding is the final CPS process, which involves planning ways to implement the final solution, including insuring that it will be accepted by other persons involved (VanGundy, 1988). Each of these stages contains first divergent and then convergent thinking. Parnes, Noller, and Biondi (1977) created an

equation as a model to demonstrate that creativity is a function of knowledge, imagination, and evaluation: C = K x I x E.

> This equation suggests that, to perform creatively (C), one must begin with appropriate knowledge (K). As in a kaleidoscope, one's imagination (I) must transform what is known into new, different combinations, called new pattern ideas, options, or points of view. Finally, evaluation (E) is needed: one must exercise good judgment to select the most appropriate patterns, ideas, options, or points of view for further development or implementation. (Basadur, 1998a, p. 12)

Min Basadur, founder of Basadur Applied Creativity, has built on the Parnes Creative Problem Solving technique with a line of inquiry that resulted in the development of an instrument to determine an individual's unique style of creative problem solving. He has continued this line of inquiry for 25 years with a series of research partners. Basadur concurs with VanGundy, Simon, and other researchers studying problem solving that problem solving is a multistage process. In several of his writings, he lists the three phases as Problem Finding, Problem Solving, and Solution Implementation (Basadur, 2000, 2003, 2004; Basadur, Runco, & Vega, 2000). In other articles, he expands on the Problem Finding phase and divides this phase into Problem Generation and Problem Formulation (Basadur, 1998a; Basadur & Gelade, 2003). He justifies this emphasis on problem generation by quoting John Dewey and Albert Einstein. Basadur quotes Dewey as saying, "A problem well-stated is

half-solved" (Basadur, 1998a, p. 16, 19). To further support his case for the importance of Problem Generation:

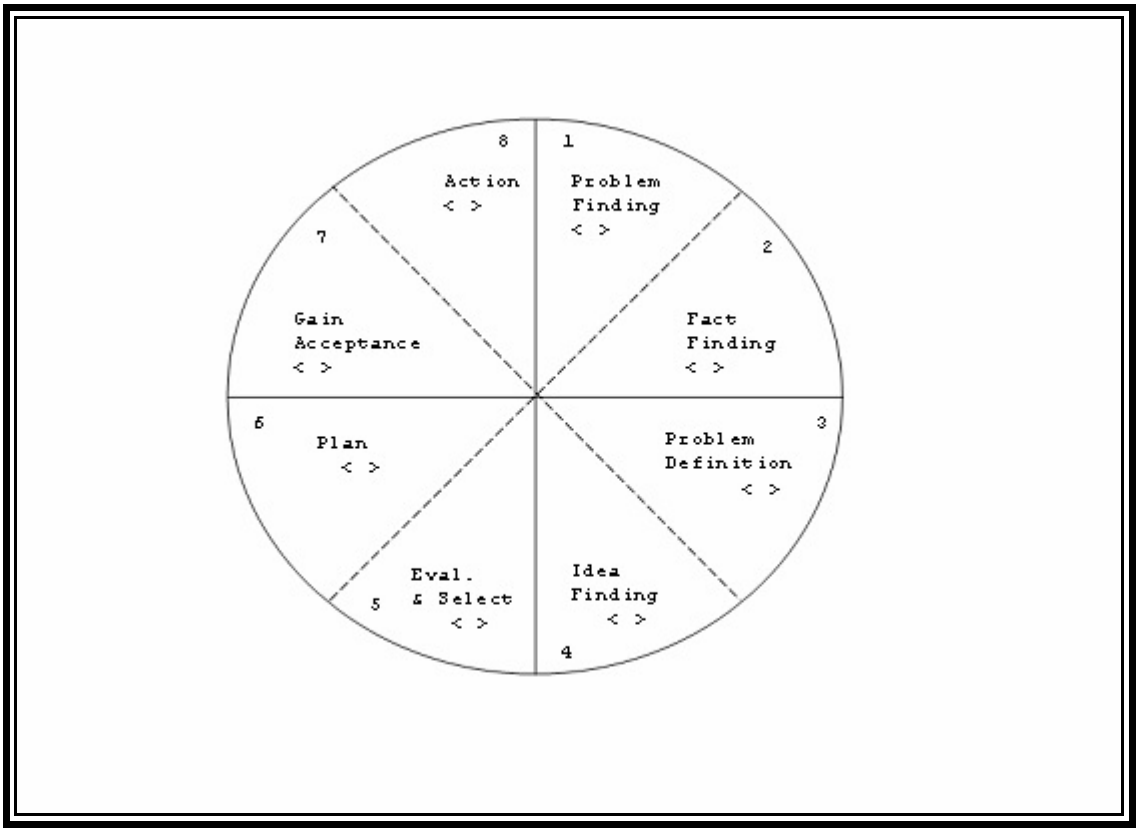
> Albert Einstein reputedly said that merely formulating a problem is often far more essential than its solution. He said that, given one hour to save the world, he would spent 55 minutes defining the problem and only 5 minutes solving it. (Basadur, 1998a, pp. 16)

Thus, depending on which of Basadur's writings are under consideration, the Creative Problem Solving model has either three or four phases.

Like Osborn's model, Basadur's phases of the creative problem solving process have sub-stages. Basadur identifies the eight steps as problem finding, fact finding, problem definition, idea finding, evaluating and selecting potential solutions, planning for action, gaining acceptance, and taking action. He has developed a circular model called the Simplex Problem Solving Process (see Figure 1) to depict these eight steps as a continuous process (Basadur, 1995b; Basadur, 2000; Basadur, 2003; Basadur & Gelade, 2002a; Basadur, Graen, & Wakabayashi, 1990; Basadur, Runco & Vega, 2000). Problem solving is viewed as a cycle "because typically, the solution to one problem leads to a new problem....In other words, the solution to one problem typically initiates recognition and definition of the next problem" (Sternberg, 1998, p. 10). Each of these steps requires first divergent and then convergent thinking. Divergent thinking requires deferring judgment while generating options or discovering information. Convergent

thinking involves analyzing, judging, and evaluating to limit the choices or information developed during divergent thinking (Basadur, 1995b).

Figure 1. Eight Step Circular Model of a Complete Process of Creative Problem Solving with Ideation-Evaluation Sequenced in Each Step.



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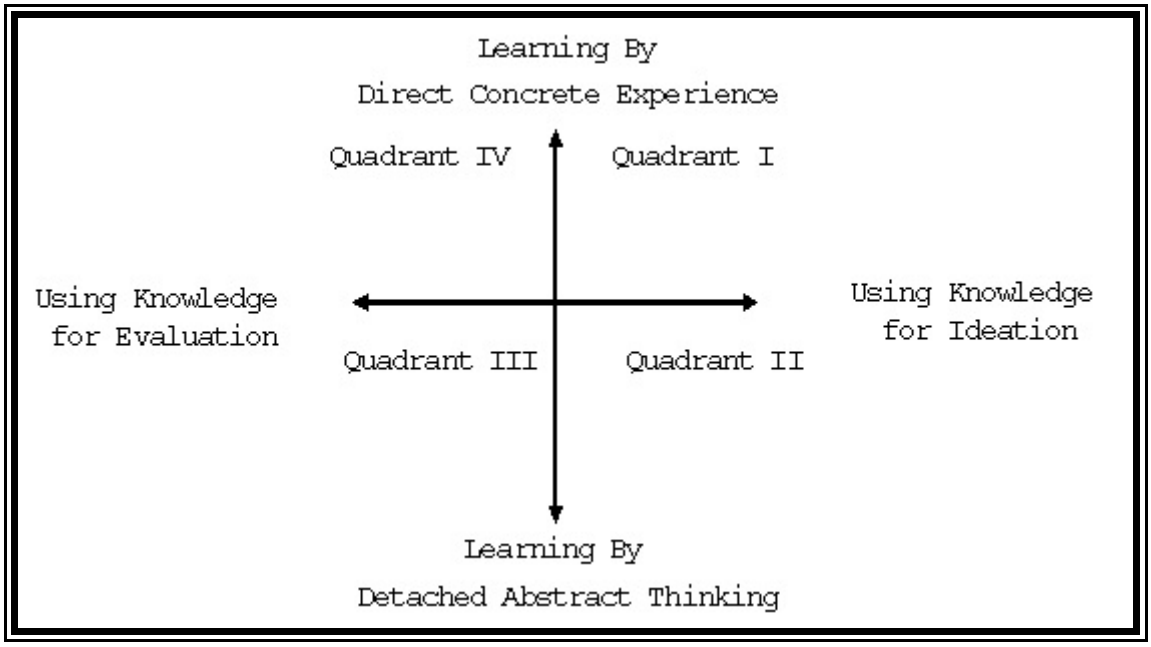
Each individual has a problem solving preference that comes most easily and naturally (Basadur, Graen, & Wakabayashi, 1990). Basadur developed an instrument called the Creative Problem Solving Profile (CPSP) Inventory to

measure this problem solving preference and continues to work with a series of research partners to refine the instrument and report its use in various organizational settings.

The Creative Problem Solving Profile Inventory is based on two dimensions (see Figure 2), which are called Apprehension and Utilization (Basadur & Gelade, 2002a, 2002b). Creative problem solving is considered as a "dynamic tension" (Basadur, Graen, & Wakabayashi, 1990, p. 112) between the opposite extremes of these dimensions (Basadur, 1998b; Basadur, 2000; Basadur, 2003; Basadur & Gelade, 2002a). The first dimension, Apprehension, describes two ways of gaining knowledge: either by concrete experience or by abstract conceptualization (Basadur, Graen, & Wakabayashi, 1990; Kolb, Osland, & Rubin, 1995). The second dimension, Utilization, involves how knowledge is used: for ideation or for evaluation (Basadur, Graen, & Wakabayashi, 1990). Ideation involves making new possibilities, breaking connections, and divergent thinking. Evaluation involves testing and verifying new possibilities, making connections, and convergent thinking (Basadur, 1998a, 1998b).

Figure 2. Two Dimensions Comprising Creative Problem Solving Activity.



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These two dimensions construct a model consisting of four quadrants with different combinations of gaining and using knowledge (see Figure 3)(Basadur, 1998b, 2000, 2003, 2004). Basadur, Graen, and Wakabayashi (1990) identify those individuals whose problem solving preference falls in Quadrant I as Generators, who learn by concrete experience such as sensing the environment and who use knowledge for ideation, or "dreaming about what might be" (p. 113). Those individuals whose problem solving preference falls in Quadrant II are identified as Conceptualizers, who learn by abstract thinking and use knowledge for ideation. Those who fall in Quadrant III are identified as Optimizers, who

prefer to learn by abstract thinking and to use knowledge for evaluation. Finally, those whose preference falls in Quadrant IV are known as Implementors and prefer to learn by concrete experience and to use their knowledge for evaluation. Basadur also depicts on a circle these quadrants created by the different ways to learn and to use knowledge. Overlaying this circular model over the model of the Simplex model shown in Figure 1 makes clear an individual's preferred steps of the problem solving process (see Figure 4).

Figure 3. Creative Problem Solving Profile.

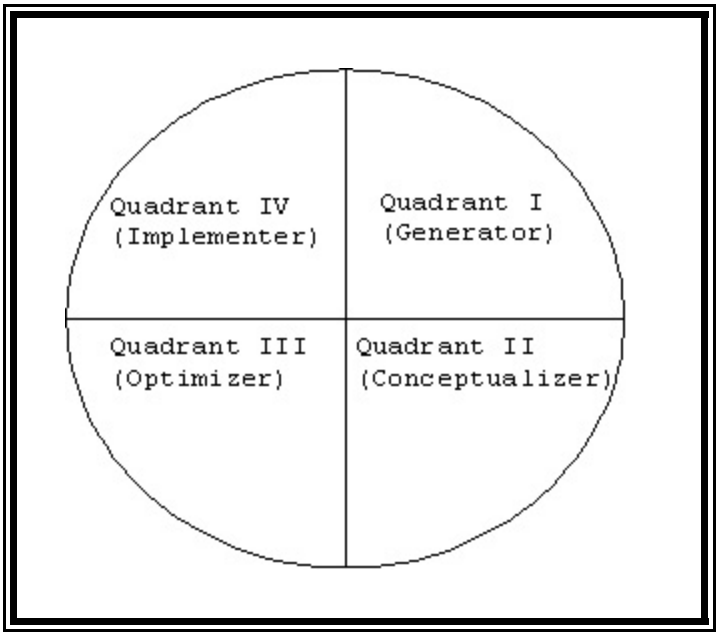

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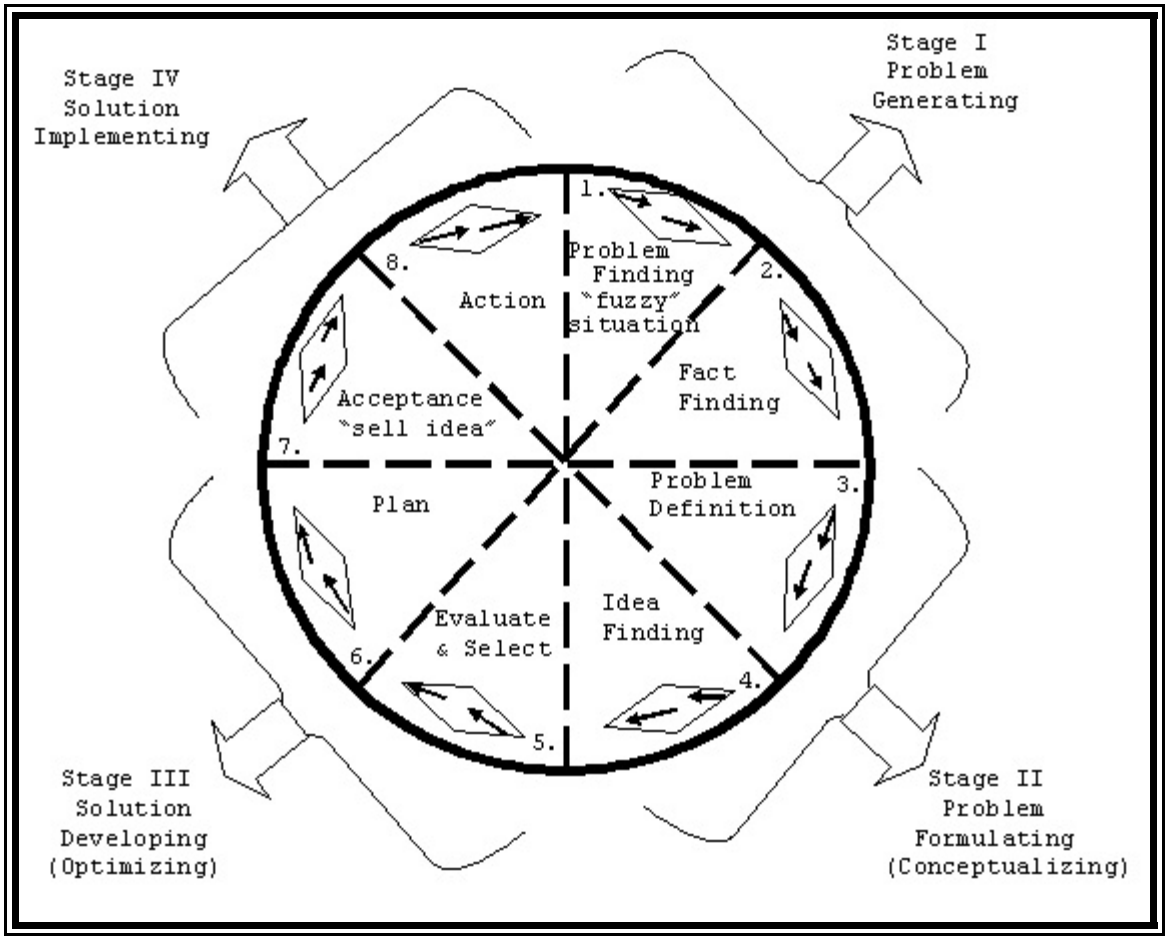
Figure 4. Organizational Creativity as a Continuous, Circular Process of Eight Steps Across Three Phases.



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Each individual has a unique profile based on that person's preferences for each aspect of the two dimensions. This profile can be graphed using the results of the CPSP Inventory. Although an individual usually has a preferred problem solving style or dominant quadrant, that person's problem solving style will typically include some of each

quadrant (Basadur & Gelade, 2003). People "cannot be 'pigeon-holed' in any single stage or quadrant" (Bell, 2004, para. 2). The overall profile will graphically demonstrate the unique blend of preferences (Basadur, 1998a). A more detailed description is available for each of the quadrants in several articles and working papers (Basadur, 2003; Basadur, 2004; Basadur & Gelade, 2003; Basadur, Graen, & Wakabayashi, 1990), the Instructor's Guide for the Basadur Creative Problem Solving Profile (Basadur, 2002), and the actual profile that each individual receives after completing the instrument (Bell, 2004).

Generators (Quadrant I), who learn by direct experience and use what they have learned for ideation, tend to "get things started" (Basadur, 2002, p. 7). They use their senses of sight, touch, hearing, smell, and taste to experience the world around them. They gather information and use it to imagine possibilities. They are able to sense problems and opportunities in their environment by performing what Simon (1960) called opportunistic surveillance. Generators see relevance in almost everything. "They are 'string savers' in a sense, in that anything they come across is seen as a potential solution to a future problem yet undiscovered" (Bell, 2004, Quadrant I - Generator). They have a high tolerance for ambiguity.

Conceptualizers (Quadrant II), who learn by detached abstract thinking and use what they have learned for

ideation, prefer "putting ideas together" (Basadur, 2002, p. 7). They can take seemingly unrelated observations and use inductive reasoning to distill and integrate them quickly into relationships and insights. They excel at defining problems, developing theoretical models, and creating multiple alternatives. Conceptualizers are idea developers, who find it important to have a full understanding of a situation and do not have a sense of urgency about taking action.

Optimizers (Quadrant III), who learn by detached abstract thinking and use what they have learned for evaluation, favor "turning abstract ideas into practical solutions and plans" (Basadur, 2002, p. 7). They are solution developers who are able to sort through large amounts of data and evaluate a large number of alternatives to determine the optimum solution. They dislike ambiguity and are not interested in additional points of view or ideas.

Finally, Implementers (Quadrant IV), who learn by direct experience and use what they have learned for evaluation, favor "getting things done" (Basadur, 2002, p. 7). They are not too interested in understanding the theory behind a new product or idea; they are interested in making it happen. They do not waste time by mentally testing a new approach, but rather they try things out and find a way to make them work. Implementers may be more willing to take

risks than those individuals whose preferred problem solving styles are in another quadrant (Bell, 2004, Quadrant IV - Implementer).

Although the complete process of creative problem solving is vital in fields as varied as science, business, government, and the arts, different types of work call for specific kinds of creativity and different steps of the process (Basadur, 2003). In addition, Holland's (1985) theory of vocational personalities and work environments states that people gravitate toward work environments that will allow them to assume roles with which they are comfortable and to use their skills and abilities. Basadur (1995a, 2003) has found relationships between certain jobs and preferred problem solving styles. Several of these apply to individuals who are business majors in college. People who work in marketing tend to be Generators with a dominant Quadrant I. Individuals involved in organizational development, strategic planning, or market research typically are Conceptualizers with a preference for Quadrant II. Those working in finance, accounting, or in information technology as systems developers or programmer/analysts tend to be Optimizers found in Quadrant III. Finally, individuals who work in project management, sales, purchasing, logistics, or information technology operations are most often Implementers found in Quadrant IV.

In addition, CPSP styles can be linked to different organizational levels. Non-managers, supervisors, team leaders, and even middle managers are disproportionately evident in Quadrant 4, Implementation. However, in upper management, more than one-third of individuals prefer Quadrant 2, Conceptualization. "This indicates that as a person rises through the ranks, he or she develops an increasingly higher level of preference for conceptualization at the expense of preference for implementation" (Basadur, 2003).

The Creative Problem Solving Profile created for an individual can give that person insight into several aspects of problem solving. That individual may choose to use the knowledge gained to identify personal preferences and areas of weakness and to improve problem solving skills. In addition, since many problems facing organizations nowadays are too complex to be solved by an individual, the knowledge gained can also be used to work more effectively as part of a team. "Solving these complex problems demands the integration of many different points of view and the effective collaboration of many individuals" (Larson & LaFasto, 1989, p. 17).

Working as Teams

Individuals working alone "are limited by the narrow scope of their knowledge, their skills, and their experiences" (Scarnati, 2001, p. 6). In an attempt to

overcome those limitations, organizations create teams to increase their competitive advantage by improving productivity, creativity, response times, and decision making (Hartenian, 2003). Teams increasingly are being used to provide multiple perspectives in problem solving situations and to improve productivity.

Teams have existed longer than formal organizations; bands of ancient hunters chasing mammoths were able to function as teams (Benders & Van Hootegem, 1999). There are even examples of effective teamwork in the animal world as evidenced by the complex societies of ants and bees. However, human teams do not always function well, and productive team behavior does not come instinctively to people as it does for bees and ants. "Our entire society is built around competitive individual performance, from grading in school to the superstar status of sports figures" (Scarnati, 2001, p. 9). Yet the complexity of the workplace requires collaborative efforts. "Rugged individualism was excellent on the US frontier, but not in the complex workings of today's modern corporations" (Scarnati, 2001, p. 10). This can be a challenging transition for college students as they learn to discern the difference between cheating by working with another student on what is meant to be an individual classroom assignment and working collaboratively as a member of a team.

There has been much debate regarding whether teams should be made up of people who are similar or who are different. Teams can be diverse with regard to many factors; age, gender, race, culture, socioeconomic status, previous experience, level of education, personality style, problem solving preference, and preferred learning strategies are just some aspects of diversity. Two factors that are mentioned repeatedly that have a negative impact on team efforts are ineffective communication and lack of trust (Fisher & Thomas, 1996; Katzenbach & Smith, 1993; Larson & LaFasto, 1989; Scarnati, 2001), and both can exist when team members do not see any commonalities. Individuals experience a wide range of new ideas and skills when interacting with team members (Scarnati, 2001, p. 7). When teams function well, team members' strengths can complement each other and fill the performance gaps that may exist (Margerison, 2001). Individuals experience a wide range of new ideas and skills when interacting with team members (Scarnati, 2001, p. 7).

Basadur believes that diversity in problem solving styles is important. "In order to succeed in creative problem solving, a team requires strengths in all four quadrants. Team members must learn to use their differing styles in complementary ways" (Basadur, 1995b, p. 28). Teams that are homogeneous, which are made up of people with the same problem solving styles, rate their team higher in

terms of team satisfaction. People tend to feel more comfortable with people who are similar to themselves. However, homogeneous teams do not perform as well as do heterogeneous teams because they do not complete every stage of the creative problem solving process (Basadur & Head, 2001). For example, a team made up of Conceptualizers will probably enjoy the brainstorming process and come up with many alternative ideas, but will likely have difficulty selecting from the alternatives and taking action to implement one idea.

The Basadur Creative Problem Solving Profile Instructor's Manual points out some possible points of conflict between people whose problem solving preferences lie in different quadrants:

> Quadrant 4s, Implementers, think that Conceptualizers, Quadrant 2s, should not get paid because they never actually see them do anything; they are always seen thinking and talking but "never" implementing anything.
>
> Conversely, Conceptualizers think that Implementers are dangerous because they'll do anything without ever appearing to actually think about the real problem. Implementers will try one thing and if it doesn't work they try something else.
>
> Quadrant 1s, Generators, view Quadrant 3s, Optimizers, as being too narrow-minded - the "green eyeshade" people – who cannot, do not see the big picture. Optimizers are very confident that they know the right answer to the problem, but Generators see them working on the wrong problem.
>
> Optimizers view Generators as being "airy fairy" people who are unable to make up their minds and focus on the "real" work. To an Optimizer, Generators come up with five new problems before

> the first problem they came up with has even been solved. (Basadur, 2002, Section 3:1)

In order to have a diverse team that is made up of members with skills in all four quadrants than can function productively, the members must learn to value their differences and to work together with good communication and trust.

Basadur (2002) has developed a training program that explains the Simplex Problem Solving Process and divergent and convergent thinking. It addition, the training uses the Creative Problem Solving Profile to help participants become aware of their preference for particular stages of the problem solving process. However, the Instructor's Guide for the training program is based on a discussion format and does not appear to provide opportunity or guidance for participants to actually practice various stages of the problem solving process (Basadur, 2002).

Edward de Bono's Six Thinking Hats technique (de Bono, 1985) is used for classroom or workplace training in order for learners to actually practice types of thinking and stages of creative problem solving that are not their natural preferences or tendencies. It is difficult to understand how people can think about their own thinking. Everyone has probably experienced the sensation of racing thoughts that seem impossible to control or redirect.

> The main difficulty of thinking is confusion. We try to do too much at once. Emotions, information, logic, hope and creativity all crowd in on us. It

> is like juggling with too many balls. (de Bono, 1985, p. 2)

In addition, if people are limited by their own preferences for learning and problem solving, they are probably unaware that other ways of learning exist or they fail to see any value in the other methods. Edward de Bono, famous for his work on lateral thinking, devised a method that allows people to think about their thinking processes, manage those processes, and explore new possibilities. De Bono uses the metaphor of six colored hats to "allow us to conduct our thinking as a conductor might lead an orchestra" (de Bono, 1985, p. 2).

The Six Thinking Hats technique (de Bono, 1985) is based on the idea that wearing a certain hat is linked to performing a particular role. The color of each hat is related to a particular type of thinking and these ways of thinking can be related to the cycle of problem solving steps identified by Basadur. The yellow hat is related to opportunity, so perhaps this hat should be worn during the Quadrant I activities of scanning the environment for problems or opportunities. It would be appropriate to wear the green hat when brainstorming or generating alternatives during Quadrant 2 activities. It would be appropriate to wear the white hat, which is to be worn while dealing with neutral facts, figures, and information, during the fact finding and problem definition stages of the eight-step process. The black hat is associated with negativity. If

someone were to don the black hat prematurely (for example during the idea finding step of Quadrant 2), that creative, brainstorming process would likely come to an abrupt halt. But there is an appropriate time for judgment and negativity, such as during the evaluation and selection step of Quadrant 3. However, black hat thinking must be logical and fact-based, rather than emotional.

The color red represents emotions and feelings. Although the phrase "seeing red" refers to a person being overcome with anger, it is important to remember that emotion can be positive and upbeat rather than only negative. We all feel emotion and if members of a team are not given the opportunity to express that emotion it has a negative effect on the problem solving process. But it is useful to allow people to vent their emotions at a certain point in the process when wearing the red hat rather than throughout the entire process.

This method of keeping an entire team engaged in the same type of thinking at the same time allows the team to move through the complete problem solving process in a synchronized manner (Basadur, 1994). Uncontrolled red hat (emotional) or black hat (negative) thinking can easily derail a team meeting. Use of this technique also allows individuals to practice types of thinking that may not come easily to them. Since team members may experience conflict with people whose preferences are opposite their own in the

circular model of creative problem solving, use of the Six Thinking Hat technique can provide an opportunity to practice the skills needed in other quadrants. By observing those whose preferences lie in those quadrants, they may identify someone who could mentor them as they practice new techniques. Once they become aware of the need for complementary skills to complete the entire process, they may gain appreciation and tolerance for team members with diverse preferences. Finally, although conflicts will still occur, team members will have a common language with which to discuss the challenges and difficulties (de Bono, 1985).

"Specific attitudes, thinking skills, and behaviors within and among individuals and groups are needed for effective teamwork and subsequent organizational creativity/adaptability and performance" (Basadur & Lapierre, 1998, p. 2). In order to meet the demand for high-performing teams, companies must either find and hire people with good team skills or must develop them in the workplace. Some managers believe that they should hire employees who have participated in team sports although the empirical research does not support that team experience transferring to the workplace (Hartenian, 2003). Other managers use tests that measure team skills or personality styles in the selection process (Hartenian, 2003, p. 27).

Yet even if managers do not hire employees with effective team skills, training in team skills has been

shown to be effective for new or current employees (Flin, O'Connor, & Mearns, 2002). Individuals experience a wide range of new ideas and skills when interacting with team members (Scarnati, 2001, p. 7). An empirical study (Hartenian, 2003) involving knowledge, skills, and abilities in problem solving, communication, conflict resolution, goal setting, and planning tasks found that training, previous experience with teams, and mentoring resulted in improved team skills.

Belonging to a team is a learning experience, and this learning can occur before or after the individuals enter the workplace. Although this training can take place on the job where it is firm-specific, organizations would be well-served if they could hire graduates who have gained some knowledge of and experience with team processes in school. Since businesses want to recruit and employ individuals who can work effectively as members of teams (Alie, Beam, & Carey, 1998; Kolb, 1999; Salner, 1999; Siciliano, 2001), it is interesting to examine how colleges of business are preparing students for this requirement. It has become common for business classes to include team projects (Bacon, Stewart, & Silver, 1999; Bolton, 1999; Feichtner & Davis, 1985; Shaw, 2004; Siciliano, 2001; Verderber & Serey, 1996). Just as business teams can solve more complex problems, student teams also have the potential to handle more complex, challenging assignments (Bolton, 1999). However,

including a team project does not mean that it will result in an effective learning experience for the students.

One survey within the College of Business at San Jose State University found that 72% of instructors assigned students to project teams in at least one of their classes (Bolton, 1999). However, the survey also uncovered that 81% of faculty provided little or no support to these students assigned to teams. Several reasons were given for this lack of support. Some faculty claimed that there was not enough time in class or that there was not enough time for preparation. Some believed that students should learn on their own or that the students could cope without support. Others admitted that they were either uncertain how to help or had just not given it much thought. The researcher compared perceptions of the faculty to those of the students, and the results indicated quite a discrepancy. While 91% of the faculty indicated that they were at least somewhat satisfied with the team experiences, only 64% of the students reported any satisfaction. Students who received help with teambuilding from a teacher who acted as a coach reported much higher satisfaction with the team experience.

A survey of graduate students in a Masters of Business Administration (MBA) program showed that students report they learn more both about course content and about teamwork from a good team experience than from a bad experience

(Bacon, Stewart, & Silver, 1999). Another survey of upper-division business students at two major southwestern universities showed an interesting result (Feichtner & Davis, 1985). Although the researcher uses the language of groups rather than teams, the results are still relevant. In this study, students were asked to identify which classes provided their least positive and most positive group experiences. Classes in marketing, accounting, and finance resulted in more reports of "least positive groups" and less reports of "most positive groups." Students reported that marketing classes accounted for 15.5% of their least positive group experiences and only 5.2% of their most positive group experiences. In accounting classes, students reported 18.7% of their least positive group experiences and no (0.0%) most positive group experiences. Finally, in finance classes, students reported 13.6% of their least positive group experiences and again no (0.0%) most positive group experiences. Classes in marketing, accounting, and finance typically focus on technical content.

The same survey reports very different results for classes in Organizational Behavior and Business Communication. Organizational Behavior classes accounted for almost a third (30.3%) of students' most positive group experiences, and none (0.0%) of their least positive group experiences. Business Communication accounted for 15.5% of students' most positive group experiences, and none (0.0%)

of their least positive group experiences. Although it is not always taught within the college of business, Speech Communication accounted for a high percentage of most positive group experiences (14.2%) and no least positive group experiences (0.0%). Unlike Marketing, Accounting, and Finance, classes in Organizational Behavior, Business Communication, and Speech Communication typically address soft skills such as interpersonal and communication skills, which can improve the team experience.

Although it appears that college teachers often adopt a laissez-faire attitude toward teams in their classes, faculty who do incorporate team projects into their courses "need to assume additional responsibilities if effective student learning is to occur" (Verderber & Serey, 1996, p. 23). Specific recommendations relate to how teams are formed, how they are developed, and how they are rewarded.

There are three common ways to form classroom teams. One is for the students to select their teammates, a second is random assignment, and the third way is for teachers to select members for each team. Several studies suggest that teachers should select the team so that it is heterogeneous. Some aspects of diversity to consider include gender, age, major, race, grades, and work experience (Clinebell & Stecher, 2003; Feichtner & Davis, 1985; Verderber & Serey, 1996; Dugal & Eriksen, 2004).

It takes time and effort to develop team skills, and a team must pass through stages in the social as well as the task realm in order to perform well (Tuckman, 1965). The developmental sequence includes four stages: forming, stoming, norming, and performing. The initial stage of forming involves orientation and testing to identify the boundaries of interpersonal and task behaviors as well as establishing relationships with others. The second stage of storming is characterized by conflict and polarization around interpersonal issues which also affects the task realm. New roles and a sense of cohesiveness occur during the third stage of norming. During the fourth stage of performing the group becomes more flexible and functional with the energy of the group directed toward the task. The artificially short duration of an academic quarter, semester, summer class, or intersession course may not allow teams to go through the developmental stages (Clinebell & Stecher, 2003; Feichtner & Davis, 1985). A teacher should not frequently form new teams for each assignment but should allow the teams time to mature (Feichtner & Davis, 1985). Teachers are urged to facilitate their students' learning regarding team process so that they gain experience with conflict resolution, teambuilding, and build team cohesiveness and trust (Feichtner & Davis, 1985; Scarnati, 2001). If this does not occur, students teams may get stuck in the storming phase until the demands of the academic

deadlines require that they move directly to performing without ever accomplishing the norming stage. Teachers are encouraged to coach and mentor students as they would be coached and mentored as employees.

> In the business world, bosses have a vested interest in the success of a project and the team. They are affected by the quality of the end product of a project team and will be held accountable for it. They understand and are affected by the long-term impact that bad project team group process can have on the morale of a work group. Thus effective managers monitor and make strategic interventions as needed. (Verderber & Serey, 1996, pp. 24-25)

It is fruitless to expect students to put much effort into the team process if the reward structure for that class is not related to that effort. So teachers should build the team process into the grading reward structure (Feichtner & Davis, 1985). Just as an organizational team succeeds or fails as a team, an academic team should share grade risks and rewards. Peer evaluation is also an important part of the team process (Cooke, Drennan, & Drennan, 1997; Feichtner & Davis, 1985; Scarnati, 2001).

Faculty may resist time spent on the team process because it takes away from the transmittal of content or because it seems unmanageable in large classes, but team learning has been shown to be effective even in large classes (Michaelson, Watson, Cragin, & Fink, 1982). This investment of time and effort is worthwhile because the skills can carry over to other classes or to the workplace (Verderber & Serey, 1996) where "teamwork and team behaviors

are necessary for individual and team success" (Hartenian, 2003, p. 23). Since the building blocks of organizations are teams and the building blocks of teams are individuals, learning is necessary for individual, team, and organizational success (Senge, 1990).

Learning in Permanent White Water

Vaill, who insists that learning is so pervasive that it must become a way of being, identifies seven modes of learning as a way of being. However, he does not claim that this is an exhaustive list, and the numbering is for readability and does not imply any sequence or prioritizing. Self-directed learning is the first of the hallmarks of learning as a way of being. Rather than having learning structured and delivered by an authority in an institution, adults must be self-directing by assessing their own learning needs and finding appropriate resources.

Creative learning is the second hallmark of learning in permanent white water. Permanent white water causes learners to constantly face new problems — problems that do not have predefined answers. This forces learning to be exploratory and creative.

The next two modes of learning identified by Vaill are expressive learning and feeling learning. Expressive learning involves learning while doing as opposed to the institutional learning experience of practicing first in an artificial setting and performing at a later time. Feeling

learning is the fourth hallmark of learning as a way of being.

> Trying to learn in an environment of constant unpredictable change can lead learners to feel that they are not getting anywhere — or indeed are going backward, becoming progressively move incompetent. Learning in white water, therefore, occurs as much at the level of one's feelings as it does at the level of ideas and skills. (Vaill, 1996, pp. 45-46)

The fifth hallmark of learning as a way of being is on-line learning. This refers to recognizing that learning does not need to take place in a typical institutional setting. The term on-line is language borrowed from the technology revolution that refers to a process that takes place at the same time as other processes that make up a system. In this case, it refers to learning that occurs in the midst of work and life rather than off-line in an institutional setting which is artificial and sheltered. "All environments are learning environments for the human being, especially the person who is spending large amounts of times in work environments of constant change (Vaill, 1996, p. 46).

The final two modes of learning identified by Vaill are continual learning and reflexive learning. Continual learning is the sixth hallmark of learning as a way of being. Although Vaill (1996) claims that the term lifelong learning has become a cliché, we need to be aware that permanent white water presents us with a continuing barrage of novel, complex, and ill-structured problems. Structured

institutional learning with its focus on reaching a single correct answer can result in a feeling of mastery that is unlikely to occur in permanent white water. "Personal mastery in permanent white water is almost a contradiction in terms (although it is the institutional learning model's ideal)" (Vaill, 1996, p. 46). The final hallmark of learning as way of being is reflexive learning, which Vaill (1996) claims is actually discouraged by institutional learning in order to maintain its position of power and influence.

Vaill (1996) created his own labels for several of the modes of learning he described. However, these can be matched to the traditional language of adult learning. Several concepts are important to the understanding of adult learning; among them are lifelong learning andragogy, self-directed learning, real-life learning, learning how to learn, learning styles and strategies, and instrumented learning.

Lifelong Learning

In the past, what one learned in school as children lasted a lifetime. "When life was simpler, one generation could pass along to the next generation what it needed to know to get along in the world; tomorrow was simply a repeat of yesterday" (Cross, 1981, p. 1). By the early part of the 20th century, this was no longer the case. Philosopher Alfred North Whitehead realized this and observed that this

basic transmittal of known facts "was appropriate only when the time-span of cultural change was greater then the life-span of individuals" (Knowles, 1980c, p. 40). The human lifespan has lengthened in the 20th century, and rapid cultural change is underway due to technology and knowledge explosions, population mobility, workplace and workforce changes, as well as political and economic changes (Knowles, 1980c). Once the human lifespan exceeded the knowledge that was valid and useful during an era of social change, education had to change in order to "prepare individuals to face a novelty of conditions" (Whitehead, 1931, p. xix).

Now the half-life of knowledge is even shorter.

> Knowledge is changing at an ever-increasing rate; some estimate that the current half-life of knowledge is four years, which means that half the content of first-year courses is potentially irrelevant by the time college students graduate. Students must learn how to learn in college. (Evers, Rush, & Berdrow, 1998, p. xviii)

Smith (1990) concurs that "the acceleration of social change has revealed the importance of lifelong learning" (p. 3). If individuals are to continue learning throughout their adulthood, it is important to understand what differences may exist between child and adult learners.

Andragogy

Malcolm Knowles, who is considered to be "one of the most influential adult educators in the United States" (Elias & Merriam, 1995, p. 131), introduced the term andragogy in his 1970 book The Modern Practice of Adult

Education: Andragogy versus Pedagogy (Van Gent, 1994). Knowles (1990) understood andragogy to mean "the art and science of helping adults learn" (p. 54) in contrast to pedagogy which means "the art and science of teaching children" (Knowles, 1980c, p. 43). Andragogy is now considered to be one of the "pillars of adult learning theory" (Merriam, 2001a, p. 3). Roots of the term andragogy, which is often simply defined as "how adults learn," can be traced back to 1833. This path flows through Germany, Russia, the Netherlands, Switzerland, Yugoslavia, and many other European countries (Van Gent, 1994). The term andragogy was not commonly used in the United States until 1970 when Malcolm Knowles wrote The Modern Practice of Adult Education: Andragogy versus Pedagogy (Van Gent, 1994). Much debate has ensued for the past 30 years over whether andragogy is a theory of adult learning, a model, a science, a discipline, or a technique (Davenport & Davenport, 1985; Merriam, 2001a, 2001b).

Knowles (1989) attempted to end these debates by concluding that rather than a theory of adult learning, andragogy is "a model of assumptions about learning or a conceptual framework that serves as a basis for an emergent theory" (p. 112). Over time Knowles came to realize that andragogy could be applied with some younger learners and that at times even adult learners require a more pedagogical approach. In later years, he viewed andragogy and pedagogy

"not as dichotomous but rather as two ends of a spectrum, with a realistic assumption in a given situation falling in between the two ends" (Knowles, 1980c, p. 43). Knowles' assumptions can be used to create a model that can be used for effective adult learning, such as creating a learning experience that is comfortable — both emotionally and physically — for the learner.

Universities tend to use a very definitive clear-cut definition of what makes a student an adult. Attaining the age of 24 makes a student an adult in the eyes of the university "because this is the age that students are recognized as financially independent of their parents for financial aid purposes" (Berker, Horn, & Carroll, 2003, p. iii). Yet an arbitrary age has nothing to do with maturity (Franz, 1998).

Knowles (1990) distinguishes between four definitions of adulthood. His first definition is biological. People reach biological adulthood when they can reproduce, and this milestone is occurring at ever-younger ages. The second definition is a legal definition and refers to the laws regarding age requirements to vote, marry, drink alcohol, obtain a driver's license, and enter into contractual relationships. The third definition is social, related to when individuals begin filling adult social roles such as worker, spouse, parent, or voter. The fourth definition is psychological and occurs when individuals feels self-

directing and responsible for their own lives. Knowles (1990) identifies this fourth definition as the most important and states that this maturation can be accelerated by being in environments that emphasizes increasing responsibility.

Knowles developed several assumptions about pedagogy and andragogy. His assumptions address issues such as the concept of the learner, the role of the learner's experience, readiness to learn, and orientation to learning (Knowles, 1980c).

1. Adults need to know why they need to learn something before undertaking to learn it. (p. 57)
2. Adults have a self-concept of being responsible for their own decision, for their own lives. (p.58)
3. Adults come into an educational activity with both a greater volume and a different quality of experience from youths. (p. 59)
4. Adults become ready to learn those things they need to know and be able to do in order to cope effectively with their real-life situations. (p. 60)
5. In contrast to children's and youths' subject-centered orientation to learning (at least in school), adults are life-centered (or task-centered or problem-centered) in their orientation to learning. (p. 61)
6. While adults are responsive to some external motivators (better jobs, promotions, higher salaries, and the like), the most potent motivators and internal pressures (the desire for increased job satisfaction, self-esteem, quality of life, and the like). (p. 63)

One of these assumptions is that children may enter the classroom on the first day of school as blank slates, ready to learn whatever curriculum the teacher or the school district has designed for them, but adults bring a vast pool

of experiences to the learning situation. The employees who study definitely will have life and business experiences that can be a "rich resource for learning – for themselves and for others" (Knowles, 1980c, p. 44). Even the students who work will have experiences that can add to the richness of the learning experience. The rest of Knowles' assumptions require consideration of two additional aspects of adult learning: self-directed learning and real-life learning.

Self-Directed Learning

Self-directed learning is the second pillar of adult learning theory (Merriam, 2001a). Self-directed learning has a long history and was practiced by the Greek philosophers Socrates, Plato, and Aristotle and by other historical figures including Alexander the Great, Caesar, and Descartes. Although self-directed learning has been practiced for many centuries, it was first studied as an educational technique during the mid 19th century in Great Britain and the United States (Hiemstra, 1994).

It was not until the 1960s that self-directed learning became a major research topic. Cyril Houle (1961) interviewed adult learners and developed a classification scheme that identified their reasons for participating in continuing education activities as either goal-oriented, activity-oriented, or learning-oriented. Goal-oriented learners participate in learning activities because they

have a specific goal or outcome in mind. Activity-related learners participate because they desire the social aspects. Learners who are learning-oriented think of "learning as an end in itself" (Hiemstra, 1994, p. 5395). Houle (1961) points out that these three categories are not completely distinct; "the best way to represent them pictorially would be by three circles which overlap at their edges. But the central emphasis of each subgroup is clearly discernable" (p. 16).

Malcolm Knowles and Allen Tough are two of Houle's students who continued the line of inquiry on self-directed learning. Knowles (1975) wrote a book titled Self-directed Learning, which:

> Provided foundational definitions and assumptions that guided much subsequent research: (a) self-directed learning assumes that humans grow in capacity and need to be self-directing; (b) learner's experiences are rich resources for learning; (c) individuals learn what is required to perform their evolving life tasks; (d) an adult's natural orientation is task- or problem-centered learning; and (e) self-directed learners are motivated by various internal incentives, such as need for self-esteem, curiosity, desire to achieve and satisfaction of accomplishment. (Hiemstra, 1994, p. 5395)

In this book, Knowles voiced his opinion that self-directed learning is the best way to learn.

Tough (1979, 1982) stated that many learning projects are related to a person's job or occupation. Tough (1982) interviewed 150 individuals and found that nearly all of them reported significant changes. Almost a third of the

participants (31%) claimed a huge or enormous change within the previous 2 years. The most common area of change, accounting for 33% of reported changes, related to individual's jobs. Hiemstra (1994) reports findings of a research study by Confessore and Confessore that identifies several emerging trends and issues. One of the trends "is research on the feasibility of self-directed learning meeting some job-related training needs in industry (Ravid 1987)" (p. 5398).

According to Vaill (1996), "effective learning in permanent white water has to be marked by a high degree of self-direction" (p. 4). Smith (1976) states Knowles' belief that self-directed learning is "a lifelong prerequisite for living in a world of ever-accelerating change" (p. 37). A journey through uncharted waters brings special challenges.

> Permanent white water frequently poses learning challenges for which no textbooks or other learning methods have been specifically designed. Indeed, a learner in white water may be the only person, so far as he or she knows, who has a particular learning need. (Vaill, 1996, p. 44)

However, learning that is self-directed does not have to occur in solitary isolation (Hiemstra, 1994). Participation with classmates, study groups, or facilitators does not negate self-direction in learning. "Self-directed learning does not preclude the receiving of help from others and usually involves it more often than not" (Smith, 1976, p. 35). College students can receive that help from their college professors and even fellow classmates. This can

take the form of scaffolding to help the students become independent learners (Black & Schell, 1995).

> Scaffolding has been defined as an activity in which one or more experienced learners provide support and guidance, in a similar vein to the work of Vygotsky (1987), in which the more experienced person helps the less experienced to move from assisted learning to independent and non-assisted learning. (Jelfs, Nathan, & Barrett, 2004, p. 87)

In order to develop lifelong learners, a priority of formal education "should be to develop skills in students that enable them to learn how to learn and become self-directed learners" (Bartlett & Kotrlik, 1999, p. 185).

Real-Life Learning

Knowles' remaining assumptions address the fact that adults are not inclined to learn things for which they see no application. Rather, they want to solve real-life problems they are facing. During much of the 20th century, there existed a decremental view of adult intelligence. Because adults could not memorize random lists of words or perform timed testing activities as quickly as could children, it was believed that adults lose cognitive function as they age. Schooler and Schaie (1987) suggested that this perception was perhaps caused because adults focus more on real-life learning tasks rather than artificial meaningless tasks. "Learning from and through everyday experience may constitute another aspect of self-directed learning -- at least it seems to have its greatest potential in that kind of learning" (Smith, 1976, p. 41).

Often learning is perceived to be an exercise in abstract ideas that takes place in a classroom and has no relation to real life. Students finish school and believe that they have finished learning. Hiring and promotions in their new jobs are often based on the grades they earned in the classroom rather than real-life accomplishments "in spite of the fact that psychological research has had little success in establishing correlations between performance in the classroom (grades) and success in later life" (Kolb, Osland, & Rubin, 1995, p. 48). However, interest in real-life learning is evident from the 1960s and 1970s works of Houle and Tough (Fellenz & Conti, 1989). Real-life learning is "learning that is relevant to the living tasks of the individual in contrast to those tasks considered more appropriate to formal education" (p. 3). Although problem solving has been a topic of scientific study since the beginning of the 20th century, it was usually studied in the context of artificial problems in well-controlled laboratory situations. "However, cognitive-based research towards the end of the twentieth century has begun to shift its focus to problem-solving within more realistic situations" (Mayer, 1994, p. 4726). Research has shown that people often abandon problem-solving procedures taught in school when they are facing real-world problems (Lave, 1988).

> Rather, they invented other procedures more suited to the situation. An educational implication is that problem-solving should be taught within more real-world settings. (Mayer, 1994, p. 4727)

Wagner and Sternberg (1986) compiled a list of seven differences between real world learning and learning that occurs in the academic classroom. Fellenz and Conti (1989) compressed these into a concise list:

> Academic problems are (1) formulated by others, (2) often have little interest to learners, (3) have all relevant information provided, (4) are disembodied from ordinary experience, (5) are clearly defined, (6) have one right answer, and (7) often have one acceptable way to arrive at a solution. (pp. 3-4)

Sternberg (1990) later created a list of nine ways in which academic and real-life problem solving differ.

> 1. Although classroom learners wait for a teacher to hand them a problem, real life requires that adults continue to scan the environment for potential problems.
> 2. It is very challenging to correctly define a problem because that definition determines how the problem will be solved; in an academic setting students typically receive problems that are pre-defined.
> 3. Problems in the real world are not well-structured as are those printed in a classroom textbook. A classroom problem is usually highly structured while a real-world problem is very chaotic.
> 4. In the real world it is necessary to take the context of the problem into account; in the classroom, there is usually no context provided.
> 5. Most school problems have one right answer although this is rarely true for real-world problems. In the real world "there are options that work better or worse, but there is certainly no right answer" (p. 39).
> 6. With a classroom problem, concepts are taught in a logical order and necessary information is provided to calculate the answer; in the real world, the learner often does not know what information is needed or where to find it.
> 7. Solving real problems requires that learners be able to view the problem from different perspectives, even the opposing view to what they may believe.
> 8. While school feedback may come in the form of a red mark on a practice quiz so that corrective action may be taken, in real life feedback often does not occur until it is too late and disaster has struck.

9. Finally, in the classroom learners are usually required to work alone; complex real life problems usually require group collaboration.

These nine points of comparison make it clear that real-life learning is well-suited for the condition of permanent white water found in the world today.

Although some teachers and college professors attempt to create real-world learning experiences by requiring service-learning projects in the local community (Eyler & Giles, 1999) or on-campus (Washburn & Petroshius, 2004) or by using problem-based learning (Peterson, 2004), the phrase real-world learning is often used to refer to a learning experience that occurs completely outside an educational institution. Shirk (1990) found learning for real-life situations can be "grouped in nine categories: vocational, domestic, interpersonal, religious, medical, recreational, cultural, political and other" (p. 44). Improving problem solving capability can improve all these real-life activities. Yet this study examines the learning and problem solving preferences of learners who do not fit neatly into these categories. Rather, these students are preparing for the transition from the university setting to the workplace. An additional term that is relevant for this context is situated cognition.

Although academic problems are typically "disembodied from ordinary experience" (Wagner & Sternberg, 1986, p. 52), situated cognition attempts to provide a context for a

learning experience (Black & Schell, 1995; Brown, Collins, & Duguid, 1989; McLellan, 1993, 1994; Wilson, 1993). McLellan (1994) identifies three types of acceptable contexts. These are "(1) the actual work setting; (2) a highly realistic or 'virtual' surrogate of the actual work environment; or (3) an anchoring context such as a video or multimedia program" (p. 8). Increasing the options of acceptable contexts for learning makes application of the theory of situated cognition more feasible for a university class so that learners in transition from the classroom to the workplace have an increased chance of transfer of learning.

Problem-based learning (PBL) originated in medical education but has since spread to other disciplines in higher education. Problem-based learning developed as a response to medical students who were quite good academically during their first 2 years in the classroom, but whose performance declined significantly when they began their clinical rotations and were faced with real patients with real illnesses. Problem-based learning has several defining characteristics (Coombs & Elden, 2004). PBL focuses on learning rather than teaching and is based on active learning. PBL links theory to the problem while providing learners with a challenging, real-life task. Finally, problem-based learning recognizes that learning is a social process and encourages teamwork. PBL can be adopted at the course level, the curriculum level, or the

institutional level. All of these factors make PBL a promising approach for management education, which has been criticized for not teaching what is needed to succeed in business (Sherwood, 2004). Problem-based learning has been used effectively in both undergraduate (Bigelow, 2004; Miller, 2004) and graduate management courses (Brownell & Jameson, 2004; Peterson, 2004).

Peterson (2004) identified three critical success factors for successfully implementing problem-based learning: orienting the students, picking the problem, and forming the team. Initial experiences with PBL in which teams engaged in self-selection resulted in problems and since then he has asked students to complete Basadur's Creative Problem Solving Profile Inventory. Although it is not always possible to form teams that are equally balanced among the quadrants of problem solving preferences, at least teams can be made aware of skills that are lacking or weaker among team members. Adoption of problem-based learning using teams is a useful way to simulate the real-world problem solving that management students will face when they enter the workplace.

Learning How to Learn

It is not sufficient for formal classroom training merely to teach course content. As it is, new graduates often struggle when they leave the structured learning environment where they have spent most of their young lives

(Candy & Crebert, 1991). Part of the reason is that teachers and professors control the learning and students focus just on learning subject matter. Students must be able to learn effectively in whatever situations they may encounter once they leave educational institutions behind (Smith, 1982).

> Learning as a way of being has to include learning about learning itself. The practice of learning as a way of being is a process of becoming a more conscious and reflective learner, more aware of one's own learning process and how it compares to the learning processes of others. (Vaill, 1996, p. 47)

There are three components to learning how to learn (Smith, 1982). The first is learners' needs, or what learners need to know and be able to do. The second component is learning style, which refers to "a person's highly individualized preferences and tendencies that influence his or her learning" (p. 17). The third component is training, which includes organized instruction to increase a learner's competence for learning. "It has long been apparent to teachers, educators, and observers that people differ in how they go about certain activities associated with learning. They differ as to how they think. They differ as to how they approach problem solving" (p. 23). A common model for learning modalities distinguishes between aural, haptic, interactive, kinesthetic, olfactory, print, or visual learners (James & Galbraith, 1985). Smith (1982) comments on the value of developing an understanding

of oneself as a learner, and one approach to this awareness is by helping students become aware of their preferences in learning and problem solving.

Learning Styles and Learning Strategies

If individuals are to become effective self-directed learners, it is useful for them to learn how to learn. One way learners can do this is by developing self-awareness of their learning styles and strategies. According to Keefe (1982), learning styles "serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (p. 44). When considering the concepts of learning styles and learning strategies it becomes quickly apparent that there is some confusion about how these two things differ. In an article in Training sub-titled "An Expert Debate on Learning Styles," one of the purported experts on learning styles addresses this issue. Lynn Curry, who has earned a doctorate in educational psychology and who has written extensively on learning styles, opines that "one of the most pervasive difficulties in this field of research is the sloppiness of the definitions" (Delahoussaye, 2002, p. 32). Dave Kolb, who created the Kolb Learning Style Inventory and who introduced the term learning styles during the 1960s, defines learning style to describe each individual's preference for receiving and processing information.

Among the field of seven experts who participated in this published debate, Curry and Kolb agree that an individual's learning style is stable over time. Other participants in the debate state that learning styles are not stable across task, problem, or situation. Another of the experts says the answer is indeterminate. One other expert in the debate uses the terms strategy and style interchangeably, while yet another hedges by combining the terms into "strategic style" (Delahoussaye, 2002, p. 34).

The massive volumes of The International Encyclopedia of Education which contain 6,821 pages of information about education do not even include learning styles as a topic but they devote several pages to learning strategies. One of the entries defines learning strategies as including "any thoughts, emotions, or behaviors that facilitate studying, understanding, knowledge, or skill acquisition, or the reorganization of one's knowledge base" (Weinstein & Van Mater Stone, 1994, p. 3325). A second entry offers an alternative definition: "Learning strategies are methods or techniques that individuals use to improve their comprehension, learning, retention, and retrieval of information" (Weinstein & Meyer, 1994, p. 3335). Yet Smith (1982), known for decades of work in education, claims that "people do have identifiable learning styles, and learning styles have important implications for program planning, teaching, and learning" (p. 24).

Although there has been much debate about the validity of various learning style instruments, one instrument that has been used and debated over the years is Kolb's Learning Style Instrument (LSI). This instrument describes two dimensions of learning: concrete-abstract and active-reflective. Like the Creative Problem Solving Profile, this instrument results in a profile that tends to have a dominant quadrant. The four quadrants of the LSI describe as individual's preferred learning style (Smith & Kolb, 1986). Divergers, as the name implies, tend toward divergent thought and are imaginative individuals who excel at generation of ideas and brainstorming. Convergers, on the other hand, are deductive thinkers who work best in a situation where there is one best answer to a problem. Assimilators focus on abstract theories rather than practicalities while Accommodators take action and carry out plans. Because of the controversy over the validity of learning style instruments, attention in recent years has been directed toward learning strategies.

Although there is much research on learning strategies appropriate for the classroom, one stream of research focused on what strategies were adopted by individuals in real-life learning situations (Fellenz & Conti, 1989). This resulted in the development of the Self-Knowledge Inventory of Lifelong Learning (SKILLS) instrument, which takes approximately 20 minutes to complete. SKILLS is a self-

report instrument that identifies the learning strategies selected by individuals considering 12 real-life scenarios. These learning strategies are defined using the concepts of metacognition, memory, critical thinking, metamotivation, and resource management. These concepts are consistently listed in this order in the writings of Conti, Fellenz, and Kolody but will be addressed in a different order here. Within the SKILLS model each of the constructs has three components.

Memory. At a basic level, memory refers to the ability to recall what has been learned. More profoundly, memory is "the binding and unifying force that holds our consciousness together" (Lemme, 2002, p. 179). Memory has three components: Organization, External Aids, and Memory Application (Conti & Kolody, 1999). Organization refers to the way in which information is processed and structured into patterns or relationships in order to aid in storage, retention, and retrieval . Examples include mnemonics, visualization, and chunking information into sets. It is relevant for a discussion of learning strategies to consider the distinctions between memory in artificial classroom situations and that used in real-life learning. For example, in the classroom teachers have been known to "teach to the test", and when students realize this they may use mnemonics to remember certain factoids until the test (Altalib, 2002). Schoolchildren may use mnemonics, imagery

and grouping to boost memory in laboratory or classroom situations, but memory in real-life situations is more likely to anchor information linked to an individual's previous experiences. External Aids include using external devices such as appointment books, electronic calendars with reminders, to do lists, or a post-it note stuck on a bathroom mirror. The SKILLS models refers to Memory Application as using the strategies of Memory Organization in order to plan, perform, and evaluate learning (Conti & Kolody, 1999). "In adult real-life learning, memory application is used for self-improvement, problem solving, and critical thinking" (p. 7).

Resource Management. Some learning strategies used in the SKILLS model focus on the effective use of resources in order to enhance learning (Conti & Kolody, 1999). Resource Management has three components: Identification of Resources, Critical Use of Resources, and Use of Human Resources (Conti & Kolody, 1999). *I*dentification of Resources relates to "the identification and location of the best possible source of information which may include modern information sources, print sources, people, models, professionals or agencies" (Conti & Kolody, 1999, pp. 8-9). It is important to consider whether the learner is willing to use a particular resource, as well as whether the learner considers that resource to be worth the time, effort, and expense of obtaining it (Conti & Kolody, 1999; Tough, 1979).

The Critical Use of Resources refers to the ability of the learner to evaluate the resources in order to select the most appropriate. Some factors to consider include whether the material is current, whether the source is biased, and whether it is accurate. College-age students, labeled the Net Generation, are more likely to use Google as a means of searching for information than they are to wade through more staid academic journals for information that has undergone peer review (Lippincott, 2005; Oblinger & Oblinger, 2005b). The third aspect of Resource Management is the Use of Human Resources. Examples of using human resources include entering into dialogue or discussions, checking opinions of others, listening to others, and getting support from or networking with others (Conti & Kolody, 1999).

Critical Thinking. Critical thinking is part of the SKILLS model that focuses on the "reflective thinking process in order to improve learning" (Conti & Kolody, 1999, p. 7). Skill at problem solving and decision making is part of critical thinking. Critical Thinking in the SKILLS model is based on Brookfield's approach to critical thinking in real-life situations and consists of (1) identifying and challenging assumptions, (2) challenging the importance of concepts, (3) imagining and exploring alternatives, and (4) reflective skepticism. In the SKILLS model, Critical Thinking has three components: Testing Assumptions, Generating Alternatives, and Conditional Acceptance of

General Knowledge (Conti & Kolody, 1999). Although Critical Thinking is not one of the strategies promoted by a study of learning strategies (Fellenz & Conti, 1989), it is addressed in creative problem solving.

Metamotivation. Some learning strategies used in the SKILLS model focus on metamotivation, which is "awareness and control over factors that energize and direct our learning" (Conti & Kolody, 1999). Metamotivation involves the affective domain and has three components: Attention, Reward/Enjoyment, and Confidence (Conti & Kolody, 1999). Attention refers to a learner's ability and willingness to set aside time for learning, to avoid distractions, and to focus on the material to be learned. Reward/Enjoyment refers to "recognizing the value to one's self of learning specific material, having fun, or experiencing satisfaction with the learning activity" (Conti & Kolody, 1999, p. 5). Finally, confidence relates to the learner's belief in his or her ability to successfully complete the learning task (self-efficacy) and belief that the task is worth doing.

Metacognition. Metacognition is usually defined as knowing about one's own process of thinking or learning (Fellenz & Conti, 1989) and is thus related to the cognitive domain. Metacognition has three components: Planning, Monitoring, and Adjusting (Conti & Kolody, 1999). Planning implies that the learner is self-directed enough to assume responsibility for the learning and can organize the steps

needed to accomplish the learning. Monitoring involves the learner checking the progress of the learning activity to see if the learning is on track. Finally, Adjusting refers to modifying the original plan based on the results of Monitoring and adopting new strategies as needed.

Angelo (1991) originally described four dimensions of higher learning. These four dimensions were declarative learning, procedural learning, conditional learning, and reflective learning. He later added a fifth dimension, metacognitive learning (Angelo, 2004). Declarative learning is defined as Learning What, or learning basic principle and facts. Procedural learning is defined as Learning How, or learning skills and procedures. Conditional learning is Learning When and Where to apply the skills that an individual has mastered. Reflective learning is Learning Why and is based on learning to understand one's self and others. The latest addition to this taxonomy, metacognitive learning, describes Learning How to Learn, or directing and managing one's own learning. Angelo (2004) has developed a handout with the basic definitions of these five dimensions and asks faculty to identify the approximate percent of instruction related to each of these types of learning that the faculty received in their own undergraduate years. He then asks them to indicate what percentages the faculty believe that their students today need in each of the dimensions. This researcher has seen the handout used in a

multidisciplinary faculty development meeting with interesting results. The results showed that although the faculty members felt their own undergraduate learning experiences were focused on declarative and procedural learning with limited time spent on conditional learning, they believed that the most important learning dimensions for their students were reflective and metacognitive. This caused considerable dissonance when the participating faculty members realized how much of their class time and assignments were devoted to declarative and procedural learning.

It has been found that natural groupings exist of individuals who share a preference for specific learning strategies although these groupings are not related by any common demographic variables (Conti, Kolody, & Schneider, 1997). The three groups are identified as Navigators, Problem Solvers, and Engagers.

Navigators are "focused learners who chart a course for learning and follow it" (Conti & Kolody, 1999, p. 9). They enjoy planning and organizing their learning and are conscientious learners (Conti & Kolody, 2004). They tend to schedule learning activities and assignments, and they become frustrated if the schedule is disrupted. They also tend to use tools such as various colors of highlighters, sticky page markers, and other office supplies to add structure and organization to their learning experience.

One aspect that can be confusing about Navigators is that about half of them express "a high preference for using human resources" (Conti & Kolody, 1999, p. 10) while at the same time they find group work difficult. This apparent contradiction can be explained. While half of Navigators enjoy using human resources who are experts and professionals and thus can bring value to the learning experience (Ware, 2005), Navigators tend to get very frustrated with team members who are not as structured or who are perceived to be too social or wasting time (Conti & Kolody, 2004).

Problem Solvers are critical thinkers who engage in reflective thinking. They tend to be intuitive and inventive and excel at generating alternatives (Conti & Kolody, 1999). They can keep a lot of options open and do not rush to commit to a decision. As students they tend to struggle with multiple-choice exams because they must choose the single best answer rather than continuing the divergent thinking process that they enjoy (Conti & Kolody, 2004). Problem Solvers rely a great deal on human resources and would rather learn from a teacher who tells stories that from reading a technical manual.

"Engagers are passionate learners who love to learn, learn with feeling, and learn best when they are actively engaged in a meaningful manner with the learning task" (Conti & Kolody, 1999, p. 13). Unlike Navigators and

Problem Solvers who operate out of the cognitive domain, Engagers operate out of the affective domain and must perceive the learning activity to be worthwhile and enjoyable before they will engage (Conti & Kolody, 2004). They use visualization and mental images in order to solve problems, and thus they tend to be visual or kinesthetic learners (Conti & Kolody, 1999).

Researchers pursuing the SKILLS learning strategy line of inquiry developed a new instrument based on SKILLS that could be administered and used quickly and easily, without requiring a complex scoring proces. This instrument is called ATLAS (Assessing The Learning Strategies of AdultS). ATLAS uses a decision-tree format that allows an individual to answer just two or three questions in order to identify their preferred learning strategies. Although ATLAS was developed to assess learning strategies in real-life learning situations, ensuing research has show this instrument to be useful in formal learning situations also such as vocational training (Ausburn & Brown, 2004) and university business classes (D. R. Munday, 2002; W. S. Munday, 2002).

One way that adults can became aware of their learning strategies and be self-directed in their learning is by using learning instruments such as ATLAS and the CPSP Inventory. Smith (1976) indicates support for the use of learning instruments when he suggests that training

facilitators should determine the learner's preferred style by "using such resources as 'cognitive style mapping instruments' and 'strategic disposition tests'" (p. 51).

Instrumented Learning

Learning instruments, or self-assessments, are among the fastest growing tools used by trainers in businesses and organizations for human resource development (Pike, 2003). Blake and Mouton (1972) claim that instrumented learning "may be the most important discovery in education since programmed learning or even the podium" (p. 12). Prior to the development of learning instruments in the 1960s and 1970s, training was usually theory-based (Dunn & Peters, 1982). In contrast, learning instruments allowed diagnosis and understanding of specific behavioral changes. However, good learning instruments are based in theory, which provides individuals with a framework to examine their own assumptions, attitudes, and behaviors (Blake & Mouton, 1972). Those individuals may become aware of behavior options beyond those in which they habitually, and unthinkingly, engage. People can understand their present ways of doing things and assess what is functional and what is dysfunctional. Then they can consider alternate strategies and plan a course of action (Smith, 1983). As a result, they may be able to identify weaknesses and decide to develop strengths.

There are many advantages to using learning instruments. "A learning instrument can do much that a teacher can do, and in some ways a lot more by way of providing an educational experience" (Blake & Mouton, 1972, p. 12). Mouton and Blake (1984) claim that instrumented learning offers both assessment tools and interpretation instructions and information that allow an individual to learn without a teacher. However, they note that seminar-based instrumented learning, especially where other seminar participants are in the same profession, can be very powerful. "This is a far stronger, broader, and deeper source of learning than is self-examination by itself" (Blake & Mouton, 1972, p. 18). Smith (1976) agrees that "...self-directed learning does not preclude the receiving of help from others and usually involves it more often that not" (p. 35).

Learners are motivated to use learning instruments because it tells them something about themselves. Using learning instruments can capture the people's interest and personalizes the learning experience by linking the content to them individually (Pike, 2003). Pike lists five additional benefits of the use of learning instruments:

1. Because it personalizes complex concepts, it accelerates the learning process for participants.
2. Because participants are involved in a variety of ways, it lengthens retention of the content.

3. Because it is personalized, it increases the personal motivation to put the learning to use.
4. It can provide organizations with measurable learning outcomes.
5. It is a well accepted instructional method. (p. 214)

Learning instruments are ubiquitous; "name a topic and you can probably find an instrument to go along with it" (Pike, 2003, p. 209). Another advantage of learning instruments is the variety available; some are designed for self-learning while others can be used to develop effective teamwork and group problem solving (Blake & Mouton, 1972).

Although there are many advantages, there are also potential problems when using learning instruments. There are known challenges with self-reporting, which could be either subconscious or intentional. Historically, researchers focused on objective observation and measurement and "self-report data, which are people's accounts of their own behavior and thinking" (Säljö, 1997, p. 101) were suspect (Critchfield, Tucker, & Vuchinich, 1998; Manfredo & Shelby, 1988; Säljö, 1997).

> There is an inherent mistrust of self-report data because such data could be erroneous, not just because of measurement error with which we must always contend but because of the possibility of conscious bias in the person providing the data. Presumably a desire to look good could distort data either intentionally or unintentionally. (Baldwin, 2000, p. 3)

In spite of those concerns, the use of self-report data has become widespread and is necessary for behavioral research

because "there is no other source for the information" (Baldwin, 2000, p. 3).

Blake and Mouton (1972) suggest reducing self-deception by using instrumented learning in a context where external feedback is provided. One way to do this is for an individual to provide a copy of the instrument to a spouse, a boss, or a customer and to ask them to fill it out based on how they view the individual's behaviors (Blake & Mouton, 1972). This triangulates the data and allows the individual to compare self-description with the view of others. In addition,

> A powerful use of instruments is in a seminar setting where other students are people in the same profession as yourself. There you can compare what you <u>think</u> you are doing with what they see and feel you are doing. This is a far stronger, broader, and deeper source of learning than is self-examination by itself....All make use of this instrumented learning methodology in a context where feedback from others that can diminish one's self-deception is provided. (Blake & Mouton, 1972, p. 150)

One potential challenge is how data is used once it is obtained from the instrument. "One flaw that I've seen in using learning instruments in training is that participants use the data as an excuse for behavior, not as a tool to manage their behavior" (Pike, 2003, p. 212).

Another potential problem is misuse of learning instruments. There are three basic ways this can occur (Pike, 2003). First, people may believe it is a test, which means there are right or wrong answers. Second, if a

participant's results are shared with others without them giving permission, it is a violation of their privacy. Third, personality instruments are not often valid as predictors of job success, but they are sometimes used for this.

One advantage of learning instruments is the variety available; some are designed for self-learning while others can be used to develop effective teamwork and group problem solving (Blake & Mouton, 1972). Rideout and Richardson (1989) report a teambuilding model based on individual differences uncovered by use of a self-assessment tool, the Myers-Briggs Type Indicator (MBTI). As they note:

> In teambuilding it is important to use the strengths of the various individuals on staff. Limiting functions in problem solving can result in incomplete and sometimes damaging conclusions. Valuing the strengths of each function is critical to innovative solutions. (p. 529)

Much of the research stream using the Creative Problem Solving Profile addresses how the awareness of self and others brought about by the use of this instrument can improve team performance (Basadur, 1995b, 2002; Basadur & Lapierre, 1998).

Just as personality type is considered to be relatively constant (Scarr & VanderZanden, 1984), learning styles remain relatively stable over time (Conti & Kolody, 1999). However, preferences in learning or problem solving are strategies, and these techniques can be selected for use for various tasks (Conti & Kolody, 1999).

CHAPTER 3

METHODOLOGY

Design

This study used a descriptive design, which tells "how things are" (Rosenthal & Rosnow, 1984, p. 49). "Quantitative descriptive studies are carried out to obtain information about the preferences, attitudes, practices, concerns, or interests of some group of people" (Gay & Airasian, 2000, p. 11). In this type of study, it is common to collect data from "questionnaires that are self-administered by those chosen to provide data" (p. 11). This study used historical data from participants who completed a self-report assessment of their problem solving preferences and preferred learning strategies.

Quantitative data was obtained from the Basadur Creative Problem Solving Profile (CPSP) Inventory and the Assessing The Learning Strategies of AdultS (ATLAS) instrument. These data, along with demographic data collected, were used to describe the problem solving preferences and learning strategy preferences of the participants.

Sample

"A population is the complete set of individuals, objects, or scores that the investigator is interested in studying" (Pagano, 1990, p. 5). The population for this study consists of management students at Oklahoma State

University in either graduate or undergraduate programs. Some of the management students at Oklahoma State University take classes at the Stillwater campus, others take classes at the Tulsa campus, and some take classes at both campuses.

A sample is a subset of the population under investigation (Pagano, 1990). A sample is judged to be good if it is representative of the population from which it is selected (Gay & Airasian, 2000, p. 123). In experimental research, which takes a scientific approach, a random or probability sampling technique is used to obtain a sample that is representative of the population. The intention is that each member of the population have an equal chance of being included in the sample. However, sometimes it is necessary to "compromise the ideal for the real and do what it feasible. This is true for educational as well as other areas of research." (p. 123). That was the case in this study. This researcher did not select students to participate in this study. During the Fall 2004 semester, several management professors at Oklahoma State University requested that their students complete the web-based version of the Creative Problem Solving Profile Inventory. The classes included sections of Human Resource Management, Change Management, Managing Diversity in the Workplace, Project Management, Strategy, Management and Organizational Theory, and Leadership.

Students who participated in this study were enrolled in classes of several instructors who requested this data from the Creative Problem Solving Profile (CPSP). Students participating in these classes were required as part of class assignments to complete the CPSP Inventory. In one of the classes, Managing Diversity in the Workplace, the results of the instrument were used to discuss working in teams with others who have different problem solving preferences. In all the other classes, the results of the instrument were used to actually form student teams to work on major team projects and to facilitate discussion of the team process.

These classes were taught by four faculty members, all of whom have used the CPSP Inventory for several years in their classes for team projects. In previous years, the instructors had students fill out a paper-based version of the survey, which the students then scored in class to ascertain their problem solving preferences. All of the instructors had previously experienced problems with students completing the instrument correctly and then scoring the instruments. Scoring the instrument is a moderately complex process, requiring removing several distractor rows of data, summing four columns of numbers, subtracting column totals from each other in a precise pattern, and then graphing the results on a two-axis grid. It was not unusual for students to make mistakes scoring the

instrument or graphing the result, thus creating an invalid profile for themselves.

Earlier in 2004, this researcher created a web-based version of the instrument to use in some continuing professional development for staff at Oklahoma State University (see Appendix). The web site provided participants with information allowing them to give informed consent and also provided the opportunity to indicate by clicking on a check box if they were willing to allow their data to be used for future research. This web-based version performed data validation as individuals completed the instrument that prevented them from making errors in data entry. The scoring was done within Excel, and a graphical profile was created, which eliminated mathematical and graphing errors. Although the web-based version was originally intended for the staff development, this researcher decided to use it for her students in Fall 2004. When the other instructors heard that it was available, they asked if their students could also complete the web-based version. This researcher provided the scored profiles to the other instructors for them to use for team formation in their classes.

Although students were required to complete the instrument for class, they were not required to make their data available for research. When the students accessed the instrument on the web, they were presented with an informed

consent screen (see Appendix). This screen explained the instrument and offered them the opportunity to allow or deny their data to be used for research. Agreement required an overt action of clicking the computer mouse on a box to allow their data to be used. Only if they agreed and complied with this electronic consent procedure were these students included in the study and asked for demographic data. Because these learning instruments were used as part of previous classroom instruction, the Institutional Review Board (IRB) at Oklahoma State University determined that no IRB application or permission was required to use these historical data for this study.

Some students were taking more than one management class during Fall 2004. The sample for this study uses unduplicated student participants. Duplicate names were removed by a manual matching process before the data were included in the data file.

The resulting sample consists of 478 unduplicated students who volunteered to have their data used for research. "For descriptive research, it is common to sample 10 to 20% of the population" (Gay & Airasian, 2000, p. 134). There were 332 undergraduate management majors in the Spears School of Business at Oklahoma State University during the Fall 2004 semester, with 285 master's level and Master of Business Administration students during that semester. The sample consists of 77% of the population.

Profile of Students

Table 1 reports all of the demographic data collected for this study. The demographic data in the table show comparisons between the student population of the William S. Spears School of Business as a whole and the participants in this study.

Gender

The sample for this study was representative of the population. Enrollment in the William S. Spears School of Business (SSB), which was the population for this study, has a larger percentage of male students (59.94%) than female students (40.06%) resulting in a 3:2 ratio of males to females (see Table 1). The 478 students in management classes that provided data for this study very closely matched this 3:2 ratio, with 59.6% males and 40.4% females.

Race and Ethnicity

The racial designations of the 478 management students whose data were used in this study were similar to those of SSB (see Table 2). However, when comparing the racial and ethnic distribution of students in this study to SSB enrollment, it is important to realize that there are some differences in the way data were collected and reported between the SSB statistics and the statistics for this study. The OSU Fall 2004 Student Profile distinguished between international students from domestic students, and this is reflected in the frequencies and percentages for SSB

students. In the study data, no such category for international students exists. Thus, international students were forced to pick between White, Black, American Indian, Hispanic, Asian, or Other. This distinction is most apparent for Asian students, which appear as a percentage slightly more than four times higher in this study than in the SSB. Many of the international students are from Asian countries, and this could account for the apparent discrepancy.

There are two other distinctions between the student racial demographic data collected and reported for this study and that collected and reported by OSU for the SSB. The web-based data collection did allow for a designation of Other while the Student Profile does not. In addition, since the web-based system was not originally designed and created for use with students, it did not allow a designation for international participants. Black was chosen for the web-based system rather than African American and was meant to include people of African origin or descent who are not American. Yet despite these minor issues, the two groups are similar enough to consider the sample as representative of the population.

Table 1. Frequency of Demographic Variables

Variable	Sample		Population	
	Number	Percent	Number	Percent
Gender				
Male	285	59.6	2,773	60.07
Female	193	40.4	1,853	40.13
Race				
White	383	80.1	3,422	73.97
Black	17	3.6	202	4.37
American Indian	24	5.0	365	7.89
Hispanic	12	2.5	98	2.12
Asian	39	8.2	87	1.88
Other	3	0.6	-	-
International	-	-	452	9.77
Campus				
OSU-Tulsa	158	33.1	783	16.93
Stillwater	320	66.9	3,843	83.07
Classification				
Grad. Student	184	38.5	610	13.19
Undergraduate	294	61.5	4,016	86.81
Age				
20-25	309	64.6	-	-
26-30	76	15.9	-	-
31-35	45	9.5	-	-
36-40	14	2.9	-	-
41-45	13	2.7	-	-
46-50	16	3.4	-	-
51-55	5	1.0	-	-

It may seem inappropriate or at least insensitive to list the dominant White race in the first position of the list of racial or ethnic identifiers. Some researchers suggest an alphabetical listing in order to ensure no bias. The Publication Manual of the American Psychological Association (American Psychological Association, 2001) and the comprehensive works by Dillman (2000, 2002) on mail and Internet surveys do not address this issue. The sequence used in this study and for the web-based instrument follows the accepted guidelines for computer screen design. These guidelines suggest a frequency of use design technique based on placing the items used most frequently at the beginning in order to save keystrokes for the individual doing data entry or completing an on-line survey (Galitz, 1989).

Campus Location

The 478 students in management classes that provided data for the study were at two campuses of Oklahoma State University: Stillwater and OSU-Tulsa. Stillwater is the main campus of the OSU system, with a total of 20,997 students enrolled during Fall 2004 (Student Profile, 2004). OSU-Tulsa is an urban campus approximately 70 miles from Stillwater with a Fall 2004 enrollment of 2,050 (Student Profile, 2004). An additional 579 students were enrolled in classes at both campuses in Stillwater and Tulsa (Student Profile, 2004).

The William S. Spears School of Business (SSB) is one of seven colleges at OSU with a total of 4,626 students in Fall 2004 (Student Profile, 2004). Among those SSB students, there was roughly a 5:1 ratio between Stillwater students and OSU-Tulsa students (see Table 1).

The Management Department is part of the William S. Spears School of Business at Oklahoma State University. It is one of the departments that has a faculty presence on both the Stillwater and OSU-Tulsa campuses. Although the office of the department chair is in Stillwater and most of the management faculty are based there, some management faculty are based at the OSU-Tulsa campus. In addition, management faculty members based at each campus often commute to offer classes on the other campus in order to maximize course offerings. The management program is one of the few programs to offer classes at both campuses at the undergraduate, masters, and doctoral level.

Since the 478 students in this study were not randomly selected to participate, the campus identified by the students as their site does not closely match the SSB statistics reported in the Fall 2004 Student Profile. The participants in this study indicate a 2:1 ratio between Stillwater and OSU-Tulsa students while the overall ratio is 5:1 (see Table 1). This apparent anomaly between the campus affiliation of students may have been caused because the majority of the teachers that requested student completion

of the Creative Problem Solving Inventory taught at both campuses or exclusively at the Tulsa campus rather than exclusively at the Stillwater campus.

There are two additional factors which may influence this variation from SSB enrollments. One factor may be that the web-based system did not allow them the option of selecting both campuses. In addition, it is impossible to determine whether these students were indicating their primary enrollment location or the campus location of the particular class for which they completed the instruments.

Classification

Although graduate students make up just over one-fifth of enrollment of OSU and just over one-eighth of students within the SSB (Student Profile, 2004), they represent more than one-third of the students in this study (see Table 2). This anomaly becomes even more apparent upon examination of a cross-tabulation between classification and location of students in this study (see Table 3). Among students who identified their location as OSU-Tulsa, graduate students outnumber undergraduates by an astounding 2:1 ratio. This apparent anomaly can be explained by the fact that different types of students tend to be drawn to each of these two campuses. The rural campus in Stillwater attracts younger traditional students who may be hoping for the typical university experience of dormitories, fraternities and sororities and an abundance of student activities. These

students are known as students who work (Berker, Horn, & Carroll, 2003). The urban campus at OSU-Tulsa, on the other hand, is convenient for adult non-traditional students, also know as employees who study (Berker, Horn, & Carroll, 2003). These tend to be urban professionals who are already employed and have homes and families of their own.

Table 2. Frequencies of Students by Classification and Campus

Campus	Grad Students	Undergraduates	Total
OSU-Tulsa	108	50	158
Stillwater	76	244	320
Total	184	294	478

Age

The ages of the 478 management students included in this study ranged from 20 to 55 years old (see Table 1). The mean age was 26.3 with a standard deviation of 7.0. This measure of central tendency is reported for comparison of these participants with the entire OSU student population because only the mean ages for the entire OSU student population and each campus were reported in the 2004 Student Profile. However, the distribution of participants by age in this study is positively skewed (kurtosis = 3.13).

The undergraduate students were younger than the graduate students. The mean age of all OSU undergraduate students was 21.9 years, and the mean age of all OSU

graduate students was 33.0 years (Student Profile, 2004). Within this sample the mean age of undergraduates was 23.5 years and the mean age of graduate students was 30.8.

Since the mean "is very sensitive to extreme scores at one or the other end of the range" (Shavelson, 1996, p. 93), it is probably more useful to discuss the median ages of the students who participated in this study although this information is not available for the population. The median age of all participants in the study was 23 years with a mode of 22. The median age of undergraduates in the study was 22 also with a mode of 22. The median age of graduate students was 28, and the mode is 25.

Some age differences were magnified when comparing students at Stillwater and OSU-Tulsa with students at the OSU-Tulsa campus being older (see Table 3). The mean age of undergraduates at Stillwater was 21.5 years while the mean age of undergraduates at OSU-Tulsa was 28.3 years. This reflects the difference between the rural campus which attracts more traditional students and the urban campus which attracts individuals who are already filling the social roles of adults. Many more traditional age students were at the rural Stillwater campus. Approximately seven times as many students between the ages of 20 to 25 (87.38%) were at Stillwater, compared to 12.62% at OSU-Tulsa. In contrast, more than two-thirds (70.41%) of students over the age of 25 identified OSU-Tulsa as their location, compared

to less than one-third (29.59%) who identified Stillwater. Although this difference is less pronounced for graduate students than it is for undergraduates, the mean age of OSU graduate students at Stillwater was 32.4 years while at Tulsa the mean age was 36.3 years.

Table 3. Cross Tabulation by Student Ages by Campus and Classification

Age in Years	Classification		Total
	Graduate	Under-graduate	
OSU-Tulsa			
20-25	17	22	39
Over 25	91	29	119
Total	108	51	158
Stillwater			
20-25	41	229	270
Over 25	35	15	50
Total	76	244	320

Classification as a graduate or undergraduate student explains some of the apparent age differences. There are many more graduate students taking management classes at OSU-Tulsa. Most of them are working professionals who desire to move into management positions. Stillwater is a rural town with fewer employment opportunities, so that campus does not attract as many working professionals.

Summary

Demographic variables for the sample were very similar to those of the population with regard to gender and race. The mean age of undergraduate students in the sample was not substantially larger than the mean age of the population. The same was true to the mean age of graduate students. However, when comparing sample demographics to population demographics, there were differences with regard to age, classification, and campus location. The sample contains a disproportionately large number of older students, graduate students, and students attending classes on the OSU-Tulsa campus. This difference is a function of which professors requested to have their students complete the learning instruments for classroom use which in turn resulted in this historical data. The results of this study should be interpreted with the caveat that these ratios were somewhat different.

Creative Problem Solving Profile Inventory

The Basadur Creative Problem Solving Profile (CPSP) Inventory is the primary instrument of this study. The CPSP Inventory uses referent items which include single words and short phrases (Kerlinger, 1986) rather than statement items. The inventory (see Appendix) asks participants to rank order a series of four words, indicating which word is most like them and least like them when they are solving problems. The CPSP Inventory uses an ipsative scale, which is a

forced-choice scale with 4 indicating the most-preferred item and 1 indicating the least-preferred item. The inventory consists of 18 sets of 4 words. Six of the 18 sets of words are distractors that are not scored. Distractors are used to prevent the tendency to follow a pattern when completing a self-assessment (Basadur, 1998a). Once the distractors are eliminated, the columns are scored by adding the rankings. Column 1 (Experiencing) consists of referents that are considered to be the opposite of the corresponding referents in Column 3 (Thinking). Column 2 (Ideation) consists of referents that are considered to be the opposite of the corresponding referents in Column 4 (Evaluation). Then each column score is plotted on the corresponding axes of the Complete Problem Solving Profile (CPSP) which is a separate form that provides a graphical representation of each individual's personalized profile. These four points are then connected with curved lines to created a profile which shows preferences in each of the quadrants. Each individual profile will contain some portion of each of the four quadrants, which indicate secondary preferences.

When choosing an instrument or assessment to use for instrumented learning or for collecting research data, it is important to consider both validity and reliability (Gay & Airasian, 2000; Huck, 2000; Ray, 1993). The concept of validity can be roughly expressed by the word "accuracy" or

whether it measures what it claims to measure (Huck, 2000). "Validity is the most important characteristic a test or measuring instrument can possess" (Gay & Airasian, 2000, p. 161).

Preliminary screening of the CPSP Inventory was done by testing the inventory for face validity (Basadur, 1998a; Basadur, Graen, & Wakabayashi, 1990), which can give some indication whether or not the instrument seems to measure what it claims to measure. "While determining face validity is not a psychometrically sound way of estimating validity, the process is sometimes used as an initial screening procedure" (Gay & Airasian, 2000, p. 164). Basadur reports two studies involving groups of undergraduate business students (N = 181) and managers in a consumer goods company (N = 14) who completed the CPSP Inventory and were trained on the inventory and its purpose (Basadur, Graen, & Wakabayashi, 1990). They were then asked to rate how well the profile identified their personal styles of creative problem solving. The participants in these studies used a 10-point Likert scale to rate the degree of fit of the profile with 1 indicating No Fit At All and 10 indicating a Perfect Fit. The mean ratings of the degree of fit between the Creative Problem Solving Profile and the participants' perceptions of their own problem solving preferences were 7.1 for students and 8.3 for managers. Among the undergraduates, 72.4% of the participants reported that the

CPSP was a good (7) or higher reflection of their preferred problem solving tendencies, 44.8% reported that the CPSP was a very good (8) or higher indication, and 3.3% reported that it was a perfect fit (10). Among the managers, 92.9% of the participants reported that the CPSP was a good (7) or higher reflection of their preferred problem solving tendencies, 78.6% reported that the CPSP was a very good (8) or higher indication, and 21.4% reported that it was a perfect fit (10).

There are three more important types of validity to consider: construct validity, content validity, and criterion-related validity (Gay & Airasian, 2000; Huck, 2000; Kerlinger, 1986). This classification of types of validity was created by a joint committee of three influential organizations: the American Psychological Association, the American Educational Research Association, and the National Council of Measurements Used in Education (Kerlinger, 1986). Kerlinger claims that construct validity is "probably the most important form of validity" (p. 417). Gay and Airasian (2000) concur and add that:

> Construct validity is the most important form of validity because it asks the fundamental validity question: What is this test really measuring? We have seen that all variables derive from constructs and that constructs are nonobservable traits, such as intelligence, anxiety, and honesty, "invented" to explain behavior. Constructs underlie the variables that researchers measure. You cannot see a construct, you can only observe its effect. (pp. 167-168)

Construct Validity

Since there are no rulers or scales to measure the invented constructs, construct validation is a process that involves collecting evidence to demonstrate validity (Gay & Airasian, 2000,). Kerlinger claims that what sets construct validity apart from the other forms of validity "is its preoccupation with theory, theoretical constructs, and scientific empirical inquiry involving the testing of hypothesized relations" (1986, p. 420). Cronbach (1970) lays out a three-step process which includes identifying the constructs, specifying hypotheses predicting the relation between the constructs based on the theories being used, and then testing the hypotheses. Basadur accomplished each of these steps.

Basadur identified the constructs based on the learning style work of Kolb and the problem solving theories of Parnes (Basadur & Gelade, 2002a). Basadur identified the two dimensions of creative problem solving as being how a person gains knowledge and how a person uses knowledge. He sees each of these dimensions as a continuum and says there is a "dynamic tension" (Basadur, 1998a, p. 32) between the opposing ends of these continuums. Basadur shows the continuum of gaining knowledge as the vertical axis with direct experience at one end and abstract analytical, logical thinking at the other. The continuum of using knowledge uses ideation to anchor one end of the continuum

and evaluation to anchor the other. The constructs measured by the CPSP Inventory are an individual's preference for obtaining knowledge (experiencing or thinking) and preference for using knowledge (ideation and evaluation).

Gay and Airasian (2000) discuss several ways to collect evidence of construct validity. One method is to have scholars familiar with the topic judge whether the items represent the topics under investigation. This method was actually part of the development of Basadur's Creative Problem Solving Profile Inventory when a panel of 20 individuals with graduate-level training in organizational change and development first worked independently using divergent thinking to develop lists of words that described each of the 4 concepts that related to the opposing ways of gaining (experiencing vs. thinking) and using (ideation vs. evaluation) knowledge. This panel then reached consensus among themselves on the 12 words on each of the 4 lists that best described the concepts. Since these are opposing concepts, "one important criterion for selecting a word was its ability to be coupled with a word from the opposing list" (Basadur, 1998a, p. 20).

Basadur (1998a) reports several additional pieces of evidence to support the construct validity of the CPSP Inventory. The Creative Problem Solving Profile created as the output of the CPSP Inventory can be viewed from several perspectives. One may view an individual's scores on each

of the four scales: Experiencing (X), Ideation (I), Thinking (T), and Evaluation (E). In addition, one may view the individual's scores from a bi-polar perspective, which indicates a preference for one end of the bi-polar scale over the other. This view is created by subtracting T scores from X scores to obtain the score for the X-T bi-polar scale and by subtracting E scores from I scores to obtain the score for the I-E bi-polar scale (Basadur, 1998a, p. 40). One may focus on an individual's dominant quadrant. Finally, one may view the overall unique profile of creative problem solving by plotting the participant's relative preference on each of the 4 scales of Experiencing, Ideation, Thinking, and Evaluation and by connecting the four points with curved lines (see Appendix). Basadur's use of a forced-choice (ipsative scale):

> Requires users to state some preference level for each of the four quadrants of the complete process of creative problem solving. This is consistent with the theory that, although each person has some unique combination (profile) or relative preferences among the different phases, all phases of the process are valuable and should be appreciated. (Basadur, 1998a, p. 21)

These various sets of scores that provide multiple perspectives on creative problem solving preferences also provide several means for determining construct validity. Pearson correlation coefficients were calculated for the four basic scales (columns), the two bi-polar scales, and the four quadrants. These correlations were calculated using data from five samples. Four of the samples were a

similar size (N=101, N=138, N=107, N=167). The fifth sample (N=1,639) consisted of the first three samples in addition to several additional samples. Basadur developed hypotheses as suggested by Cronbach and proceeded with empirical testing.

Based on the constructs proposed by Basadur, which in turn are based on the theoretical underpinnings of Kolb and Parnes, the expectation would be that scores on opposing scales would be strongly negatively correlated. The results supported this expectation. The Pearson correlation coefficients for the X:T basic scales showed strong negative correlations (-.69, -.67, -.69, -.65, and -.66 respectively across the five samples). The Pearson correlation coefficients for the I:E basic scales showed strong negative correlations (-.78, -.69, -.70, -.64, and -.68 respectively). "This supports the notion that opposing concepts are being measured at the poles of each of the two major dimensions of the CPSP" (Basadur, 1998a, p. 36).

Based on the constructs proposed by Basadur, the expectation would be that correlations between the two bi-polar scales would be very low. The results supported this expectation. The Pearson correlation coefficients between the two bi-polar scales X-T and I-E showed very weak correlations (.09, .05, .11, -.07, and .11 respectively across the five samples). "This indicates that the two scales are independent and that the two dimensions of the

CPSP — gaining and using knowledge — are separate constructs as intended" (Basadur, 1998a, p. 36).

As expected from theory, scores between opposing quadrants showed a strong negative correlation. Correlations between Quadrant I (Generating) and Quadrant III (Optimizing) were -.98, -.92, -.90, -.96, and -.98 respectively across the five samples. Correlations between Quadrant II (Conceptualizing) and Quadrant IV (Implementing) were -.97, -.92, -.87, -.97, and -.97 respectively across the five samples. This indicates that the CPSP discriminates between the opposite concepts represented by these quadrants.

Since each quadrant shares one scale with each adjacent quadrant, it was also useful to examine the correlation coefficients between each pair of adjacent quadrants. The adjacent Quadrants I and II had Pearson correlation coefficients of .22, .16, .05, -.02, and .05 respectively. The adjacent Quadrants II and III had Pearson correlation coefficients of -.23, -.23, .02, .03, and -.11 respectively. The adjacent Quadrants III and IV had Pearson correlation coefficients of -.23, .00, .04, -.02, and -.03 respectively. The adjacent Quadrants IV and I had Pearson correlation coefficients of .20, .13, .03, -.03, and .05 respectively. The low correlations between adjacent quadrants "indicate satisfactory independence of adjacent quadrants despite the sharing of one column (scale) between each adjacent quadrant

pair" (Basadur, 1998a, p. 36). Thus, by identifying the theoretical basis for his constructs, identifying hypotheses and testing them empirically, Basadur met the requirements for establishing construct validity.

Content Validity

Content validity determines whether an instrument adequately samples the content of the topic being measured. "There is no formula by which it can be computed and there is no way to express it quantitatively" (Gay & Airasian, 2000, p. 164). This is often determined by the researcher who chooses to use a particular instrument (Gay & Airasian, 2000), who makes a judgment "based on whether all subareas have been included in the correct proportions" (p. 164). For example, if all the items on the CPSP Inventory related to a preference for Thinking or Experiencing, the instrument would not be valid because Ideation and Evaluation were not addressed. By its very structure, the CPSP Inventory addresses all subareas in equal proportions. Each set of four referents contains one word or short phrase that represents each of the four scales. In addition, Basadur determined that each referent should be judged to have an opposite meaning in the appropriate column. Thus, a word or phrase in Column 1 (Experiencing) would have a referent with opposite meaning in the corresponding position in Column 3 (Thinking), while a word or phrase in Column 2 (Ideation) would have a referent with opposite meaning in the

corresponding position in Column 4 (Evaluation). This instrument, like many others, continues to evolve. Basadur (1998b) continues to test versions of the CPSP Inventory with new referents in order to determine more appropriate choices to express the different constructs. However, the version used in this study does meet the standard for content validity (1998b).

Criterion-related Validity

Criterion-related validity correlates a test or instrument against another test or instrument. One view of criterion-related validity states that there are two forms of criterion-related validity: concurrent and predictive (Gay & Airasian, 2000). If two instruments or tests are administered at approximately the same time, the researcher is investigating concurrent validity. On the other hand, if the researcher correlates a score on one test to the score on a second test taken at a different time, this refers to predictive validity. A second view expressed by Kerlinger (1986) suggests that the use of criterion-related validity as a predictive tool puts an unfortunate and unnecessary focus on the idea of a forecast of future performance. Kerlinger (1986) points out that:

> One "predicts" from an independent variable to a dependent variable. One "predicts" the existence or nonexistence of a relation; one even "predicts" something that happened in the past! The broad meaning of prediction is the one intended here. In any case, criterion-related validity is characterized by prediction to an outside criterion and by checking a measuring instrument, either now

> or in the future, against some outcome or measure. (1986, p. 419)

Criterion-related validity was established for the CPSP Inventory by correlating the CPSP Inventory to two other inventories, the Kirton Adaptation-Innovation Scale (KAI) and the Myers Briggs Type Indicator (MBTI)(Basadur, 1998a, 1998b).

Two groups (N = 101 and N = 185) completed both the CPSP Inventory and the Kirton Adaptation-Innovation Scale (KAI), which is an established instrument measuring creativity style. The KAI measures creativity scales on a single dimension ranging from highly adaptive to highly innovative. Adaptors are at one end of the continuum, and they "characteristically use accepted definitions of the problem and likely solutions in generating ideas" (Basadur, 1998a, p. 39). Basadur finds this definition to be "consistent with the description of the Optimizer stage of the CPSP" (p. 39). Pearson Product Moment correlations were calculated for the KAI score and CPSP Quadrants in both samples. The correlation coefficient for KAI score and Optimizer Quadrant was -.35 and -.42 respectively, both of which were statistically significant at the $p<.001$ level.

Innovators are at the other end of the KAI continuum, and are inclined to view a problem without concern for accepted paradigms or viewpoints and typically end up redefining the problem and thinking of an approach that is different rather than necessarily better. "This description

is very consistent with the description of Generators (opposite to Optimizers), who continually find new problems to solve and initiate new projects" (Basadur, 1998a, p. 39). The correlation coefficients for KAI score and Generator Quadrant were .33 and .43 respectively, both of which were statistically significant at the $p<.001$ level.

Basadur (1998a) posits that the opposing ways of using knowledge (Ideation or Evaluation) appear consistent with the KAI styles of Innovator or Adaptor, so the Ideation and Evaluation scales would correlate to the KAI scores. However, the opposing ways of gaining knowledge (Experiencing or Thinking) are not measured by the KAI. Accordingly, the Conceptualizer Quadrant should correlate positively with the KAI score as does the Generator Quadrant. Conceptualizers are also Innovators as identified by the KAI "because of their interest in new ideas and their desire to correctly define the problem and see the big picture" (Basadur, 1998a, p. 39). The two studies show a positive, albeit weaker, correlation of .12 (not significant) and .25 (significant at $p<.001$) respectively. In the same manner, "Implementers, who confine their activity to converting already developed plans and ideas into action, are consistent with the KAI Adaptor style" (p. 39). The two studies show a negative correlation of -.08 (not significant) and -.28 (significant at $p<.001$) respectively.

One group of 134 MBA students completed the CPSP and the MBTI Form G. The MBTI produces four bipolar scales which measure Extroversion-Introversion (EI), Sensing-Intuition (SN), Thinking-Feeling (TF), and Judgment-Perception (JP). "Many of the characteristics assessed by these scales appear highly relevant to the CPSP quadrant styles" (Basadur, 1998a, p. 43).

The Generator Quadrant had a significant positive correlation with all four MBTI scales (Extroversion = .35, Perception = .30, Intuition = .25 all at the $p<.01$ level and Feeling = .22 at the $p<.05$ level). This is consistent with the tendency of Generators to "excel in the first phase of the Simplex creative problem solving process, which involves scanning the external environment to identify new facts and new problems to work on" (Basadur, 1998a, p. 45).

As expected, people whose preferences lie in the Optimizer Quadrant scored opposite to the scores of Generators (Introversion = .37, Judgment = .31, Sensing = .24, all at the $p<.01$ level; and Thinking = -.17, $p<.05$).

> The introverted focus is consistent with the Optimizer style preferences for mental testing of ideas, working on one project at a time, and for dealing with things rather than people. Their preference for Judging is consistent with the evaluating, selecting, planning and organizing stage of the Simplex creative problem-solving process. The Thinking preference is consistent with the Optimizer's reliance on logic, analysis and reasoning in problem solving, and the Sensing preference is consistent with the orientation toward practical solutions. (Basadur, 1998a, pp. 50-51)

People whose preferences lie in the Conceptualizer Quadrant prefer the problem-definition and idea-finding steps of the Simplex creative problem-solving process. These individuals have a preference for Intuition as measured by the MBTI (.38, $p<.01$) and Perception (.20, $p<.05$). "Intuitive individuals seek to grasp patterns, and try to understand relationships and make connections between facts; they are also said to do well at seeing new possibilities and different ways of doing things" (Basadur, 1998a, p. 51).

People whose preferences lie in the Implementer Quadrant, which is opposite the Conceptualizer Quadrant, have MBTI scores that also indicate those opposing positions. Where Conceptualizers scored high on Intuition, Implementers score high on the opposite end of that bipolar scale (Sensing = .36, $p<.01$). Where Conceptualizers scored relatively high on Perception, Implementers score relatively high on the opposite end of that bipolar scale (Judging = .21, $p<.05$). These people are concrete and practical, with a desire to move on and get things finished, which is consistent with a preference for real-world implementation.

Therefore, Basadur reports that the CPSP Inventory has adequate construct, content, and criterion-related validity. The criterion-related validity uses a variety of correlations with other instruments with coefficients that are statistically significant but account for only a minimum

amount of variance in the relationship. There is "an interesting relationship between validity and reliability: a valid test is always reliable but a reliable test is not always valid" (Gay & Airasian, 2000, p. 170). In spite of this assurance that a valid test is always reliable, discussion of the reliability of the CPSP is warranted.

Reliability

Reliability is defined most basically as consistency (Huck, 2000; Pagano, 1990; Ray, 1993). "Reliability is the degree to which a test consistently measures whatever it is measuring" (Gay & Airasian, 2000, p. 169). There are various types of reliability: stability, equivalence, equivalence and stability, internal consistency, and rater agreement. Another term for stability is test-retest reliability because it refers to the administration of a test or instrument more than one time. If these scores are the same or similar, the test shows stability of scores over time (Gay & Airasian, 2000).

Hundreds of people have completed the Creative Problem Solving Profile Inventory during training sessions, and the instrument has "excellent reliability" (Basadur, Graen, and Wakabayashi, 1990, p. 120). Two preliminary investigations of reliability used the test-retest stability approach with samples of 129 and 40 business employees taking the CPSP Inventory on 2 occasions 1 week apart. Test-retest correlations were calculated for the four columns on the

inventory and the two bipolar scales, and "no significant variations are found among the four columns and two bipolar scales" (Basadur, Graen, & Wakabayashi, 1990, p. 124). The test-retest reliability coefficients "ranged from .66 to .75 for the bi-polar scales and from .58 to .69 for the columns, respectively" (Basadur, 1998a, p. 34), and all the correlation coefficients were statistically significant at the $p<.001$ level.

Another measure of reliability used the random, parallel, split-half method to compare each participant's four quadrant scores. This split-half method was used for five samples and found Spearman-Brown Corrected Correlation Coefficients ranging from .62 to .73 both across the quadrants within each of the five samples and within the four quadrants across the samples. "This indicates satisfactory levels of consistency reliability within each sample and across samples" (Basadur, 1998a, p. 35).

Basadur (1998a) confirmed the appropriateness of the items in each column by calculating Cronbach alphas and inter-item correlations to test the internal consistency of the four columns (Experiencing, Ideation, Thinking, and Evaluation) and the two bi-polar scales (X-T and I-E). He argued that Cronbach Alpha was an inappropriate measure for the ipsative version of the instrument since the ipsative version yields non-independent ratings. He created a non-ipsative Likert scale format to allow calculation of a

standard Cronbach alpha on all 72 items in the inventory. The 72 items were not grouped in sets of 4 words as they are in the ipsative version, and the distractor items were included. This version was administered to two groups (N=149 and N=107), and these participants were asked to assign a value from 1 (Very Little Characteristic of my Probem Solving Style) to 4 (Very Much Characteristic of my Problem Solving Style) to each of the items. The internal consistency of the four scales (columns) using the non-ipsative format ranged from .76 to .83 across the two samples, showing adequate inter-item correlations.

ATLAS

The second instrument used in this study was Assessing The Learning Strategies of AdultS (ATLAS). ATLAS is an instrument that was developed in order to help learners easily and quickly determine their preferred learning strategies (Conti & Kolody, 1998; Conti & Kolody, 1999). By answering two or three questions, a learner can identify preferred learning strategy. Each question begins with a sentence stem which leads to two options, one of which can be used to complete the stem and lead the learner to the next question. Several paper-based forms of ATLAS have evolved; these vary from spiral-bound sets of multi-colored cardstock to versions that are contained on one regular sheet of paper. At least two electronic versions have been developed by one of the developers to be used in web-based

research studies. Regardless of the version, the instrument follows a basic flowchart format and can be completed in one or two minutes, depending on the reading skills of the learner.

By completing ATLAS, a learner can determine which of three groups best describes that individual's preferred learning strategies: Navigators, Problem Solvers, or Engagers (Conti & Kolody, 2004). Navigators prefer a learning environment that is structured with schedules, deadlines, clear objectives, feedback, and appropriate resources. Problem Solvers are creative and tend to generate many alternatives in a learning situation. They are flexible and can tolerate ambiguity as they go about creating other options and evaluating the alternatives. They prefer human resources over technical manuals and enjoy storytelling. Although Engagers love to learn, they tend not to even enter into a learning situation unless they feel meaningfully engaged. Once they find meaning in a learning activity and feel they will enjoy the experience, they proceed joyfully and with great enthusiasm.

When considering use of any instrument, validity and reliability are major concerns. While Kerlinger (1986) reported the classification of types of validity designated by the American Psychological Association, the American Educational Research Association, and the National Council of Measurements Used in Education, Gay and Airasian point

out that there is now "a unitary concept of validity. That is, it is now recognized that content, criterion-referenced, and construct validity cut across and are pertinent to each others' focus" (2000, p. 162). This is especially true when considering the validation process for ATLAS.

ATLAS is based on earlier studies of learning strategies. The Self-Knowledge Inventory of Lifelong Learning Strategies (SKILLS) was developed by Fellenz and Conti to measure learning strategies in five areas: metacognition, metamotivation, memory, critical thinking, and resource management (Conti & Fellenz, 1991; Conti & Kolody, 1998, 1999). SKILLS has been used in several studies with a variety of populations; these studies have shown that although people can be divided into distinct groups based on the learning strategies that they use, this division is not based on demographic variables (Conti & Kolody, 1998). Although SKILLS is a valid and reliable instrument (Conti & Fellenz, 1991; Conti & Kolody, 1998, 1999), it requires a considerable amount of time to complete and score. The motivation for developing ATLAS was "to produce an instrument which was easy to administer, which could be completed rapidly, and which could be used immediately by both facilitators and learners" (Conti & Kolody, 1998, p. 109). While a deductive approach was used to develop SKILLS, an inductive approach was used with ATLAS to identify naturally-occurring groups of learners by using

cluster analysis and then using discriminant analysis to identify what differentiates those groups of learners.

Construct Validity

ATLAS was based on the same theoretical foundations as SKILLS and used the same five constructs: metacognition, metamotivation, memory, critical thinking, and resource management. Construct validity for ATLAS was established by compiling and consolidating results of the previous research studies using SKILLS (Conti & Kolody, 1998, 1999). At the time, these studies had produced a data set containing 3,070 cases. Cluster analysis was performed on this aggregate data in order to discover the naturally-occurring groups of learners. SPSS was used to create three-cluster, four-cluster, and five-cluster solutions. Analysis of these solutions showed that the five-cluster solution placed 62.5% of the cases in the correct group as identified by SKILLS, the four-cluster solution placed 73.9% of the cases in the correct group, and the three-cluster solution placed 96.1% of the cases in the correct group. Thus, the three-cluster solution was selected to serve as the basis for this instrument. These clusters are naturally-occurring groups of people with similar patterns of use of learning strategies. The groups have been named Navigators, Problem Solvers, and Engagers. Among these 3,070 cases, 36.5% were Navigators, 31.8% were Engagers, and 31.7% were Problem Solvers (Conti & Kolody, 1998, 1999).

Content Validity

Content validity for ATLAS investigated how well the items on the instrument represented the characteristics of the three groups identified using SKILLS. This was done by performing the multivariate procedure of discriminant analysis (Conti & Kolody, 1998, 1999). This approach was repeated for each item in the instrument to ensure that the most precise wording was used on the instrument to assist learners in determining whether their preferred learning strategies are those of Navigators, Problem Solvers, or Engagers.

The first discriminant analysis was performed to determine what separated the 3,070 cases at the two-cluster level. At this two-cluster level, the cases were correctly classified with 96.09% accuracy. The structure matrix was examined to see what separated these two clusters. Using a minimum structure coefficient criteria of .3, learning strategy items of Confidence, Reward, Identification of Resources, and Critical Use of Resources discriminated between the two clusters. Confidence and Reward are related to internal self-examination which typifies the Engagers. Identification of Resources and Critical Use of Resources relate to external processes of utilization of resources, which typifies the non-Engagers. The interaction of these four items is what separated the two clusters of cases. The average scores for the items Confidence and Reward were

higher for the cluster of Engagers than for the cluster of non-Engagers. The average scores for the items related to Using Resources was higher for the non-Engagers than for the Engagers. Thus, at the two-cluster level, the cluster of Engagers tended toward internal factors such as Confidence whereas the cluster of non-Engagers tended toward external factors.

After this, the discriminant analysis process was used to further differentiate within the larger cluster of non-Engagers, which became two clusters called Navigators and Problem Solvers. At this level, the cases were correctly classified with 98.3% accuracy. The structure matrix was examined to see what separated the final two clusters. Using a minimum structure coefficient criteria of .3, learning strategy items of Attention, Planning, and Generating Alternatives discriminated between the two clusters. Attention and Planning typify the Navigators while Generating Alternatives typifies the Problem Solvers. The interaction of these three items is what separated these two clusters of cases. The average scores for the items Attention and Planning were higher for the cluster of Navigators than for the cluster of Problem Solvers. The average scores for the items related to Generating Alternatives was higher for the Problem Solvers than for the Navigators. Thus, at this level, the cluster of Navigators

tended toward Attention and Planning whereas the cluster of Problem Solvers tended toward Generating Alternatives.

Criterion-Related Validity

Criterion-related validity for ATLAS was determined by having adult learners in Oklahoma, Montana, and Alberta, Candada complete both SKILLS and ATLAS. In 1999 the developers claimed that "the current version of ATLAS correctly places approximately 70% of the respondents in their corresponding SKILLS group" (Conti & Kolody, 1999, p. 19). Then focus groups met to discuss how those individuals go about learning, what barriers they encounter, and things that facilitators do that either assist them or hinder them as they attempt to learn. This qualitative data has been used to fine-tune the wording of the instrument. Since that time, nearly 1,000 additional participants have used ATLAS and approximately 90% of them agree that the learning strategy preference identified by ATLAS match their actual behavior (Willyard, 2000).

Reliability

Test-retest procedures were used to establish reliability for ATLAS. One study reported a reliability coefficient of .84 when ATLAS was re-administered one to three weeks after initial administration (Ghost Bear, 2001). In addition, another study reported that "test-retest results are approximately 90% accurate for placing people in

the same learning strategy preference category" (Willyard, 2000, pp. 88-89).

Electronic Data Collection

The two instruments used in this study, the CPSP Inventory and ATLAS, were converted from their original paper-based version to an electronic version (see Appendix). The creation of an interactive web site such as that used in this study requires both an application program and a database to store the data that is collected. The programming language used to create the web-based system was PHP, which is appropriate to handle the complexities of an interactive web site. PHP is an open-source language available as a free download. The database component selected was MySQL, which is a relational database management system similar to Microsoft Access but is fast, free, and can run on many operating systems, including Windows, Linus, Mac OS, Unix, and others (Valade, 2004). PHP and MySQL are described as "a dynamic partnership" (p. 9) that can be used together to create a dynamic, interactive web-based application.

Electronic versions of both the CPSP Inventory and ATLAS have been developed previously by the respective authors of these instruments, but this study involved development of a new electronic version that combined both instruments. This conversion was done for several reasons. Participants were able to access the instruments through a link to a web page

rather than the researcher having to manually distribute, collect, and score paper copies of the instrument. In addition, programmatic data validation reduced possible errors made by participants as they completed the instruments. With regard to the CPSP Inventory, previous experience has shown a tendency for participants to ignore the instructions to use ipsative scoring for each set of words. Participants tend to ignore that instruction on the inventory to avoid ties. For example, if individuals completing the paper version of the inventory feel as though two referents are equally descriptive of themselves they will assign the same ranking to both referents. Data validation techniques on an electronic version of an instrument can flag the inputted data as an error and require correction before proceeding. With regard to ATLAS, the spiral bound version does not prevent individuals who complete the instrument from reading question stems and answers that do not apply to that individual although directions tell them not to do so. There have been single-page versions of ATLAS, but it is somewhat confusing to use regarding the branching logic.

Electronically scoring the instruments is a very quick and accurate process. Although ATLAS can be completed quickly, manually scoring the CPSP Inventory is time consuming. It has been the experience of this researcher and the other faculty members that individuals who have

completed the CPSP Inventory previously have had problems with self-scoring the instrument. They have been confused about the instruction to disregard the distractor rows and have had difficulty doing the arithmetic necessary to add the columns then subtracting column totals to obtain a predominant quadrant. Finally, they have sometimes been confused about plotting the points on the axes to create a visual depiction of their personal profiles. It has proven convenient from classroom use to have participants focus on completing the instrument rather than the complexities of scoring. A final advantage was having the data available in electronic format for the researcher, requiring no time for manual data entry and no risk of transposition of data items.

Testing the Program: CPSP

Since this instrument was converted from a paper-based version to an electronic version so that data collection could be accomplished electronically, it was necessary to test the electronic version of the instrument to ensure that the same results were attained with each version. This was done by entering six test records online. As the data was entered each time, the screen was printed to record the data that was entered. The printed screen version of each set of test data was then visually compared to the data in the MySQL file. After all six sets of test data had been entered and verified, the records were downloaded into a comma-

delimited file and then transferred into Excel (see Appendix). The printed screen version of each record of test data was scored manually, then the result was compared to the result calculated by the Excel spreadsheet. Each of the six data records resulted in identical results when scored both electronically and manually.

Testing the Program: ATLAS

Since ATLAS was also converted from a paper-based version to an electronic version, it was necessary to test the electronic version of the ATLAS instrument to ensure that the results matched those of the manual version of the instrument. This was done by entering six test records online. As the data were entered each time, the screen was printed to record the data that was entered.

The electronic version of the instrument was simple to test against the paper version because the instrument asks a maximum of three questions to direct the respondent along one of the paths to the final outcome. A script was created that recorded the possible answers that would lead along all paths. The electronic version was then tested by following the script using both the paper and electronic versions, verifying that the same branches of logic were followed in both versions of the instrument. These responses were stored in a MySQL database then downloaded to Excel. After the outcomes were verified for all six records in the

script, the screen prints and printout of the Excel spreadsheet were saved to document successful testing.

Procedures

Data collection in this study took place early in the Fall 2004 semester at Oklahoma State University. Participants filled out the CPSP Inventory and ATLAS online. Any participants who agreed to participate in the research study also provided demographic data online (see Appendix). Due to the branching logic of the program, those who did not volunteer to make their data available for research never saw the questions asking for demographic data. After the students completed the online instruments, the data were downloaded in a comma-delimited format and stored in an Excel spreadsheet (see Appendix). Student names were removed from the data records, and the data were analyzed using the statistical package SPSS Version 12 for Windows.

Descriptive statistics were used to provide a profile of participants with regard to their demographic data, preferred problem solving styles, and preferred learning strategies. A one-way chi-square test was used for two comparisons: to compare the problem solving preferences of the participants to the norms for the CPSP Inventory and to compare the preferred learning strategies of the participants to the norms for ATLAS. A two-way chi-square analysis was also performed to examine the relationship between problem solving preferences and preferred learning

strategies of the students. Cluster analysis and discriminant analysis techniques were used to determine the characteristics of any naturally-occurring groups of learners.

CHAPTER 4

FINDINGS

This study is based on information collected from 478 students in management classes at Oklahoma State University (OSU) during the Fall 2004 semester. These students completed a web-based version of the Creative Problem Solving Profile (CPSP) Inventory, the Assessing The Learning Strategies of AdultS (ATLAS) instrument, and a short demographic survey. The data were used to create a profile of the students and to facilitate statistical analyses using chi square analysis, cluster analysis, and discriminant analysis.

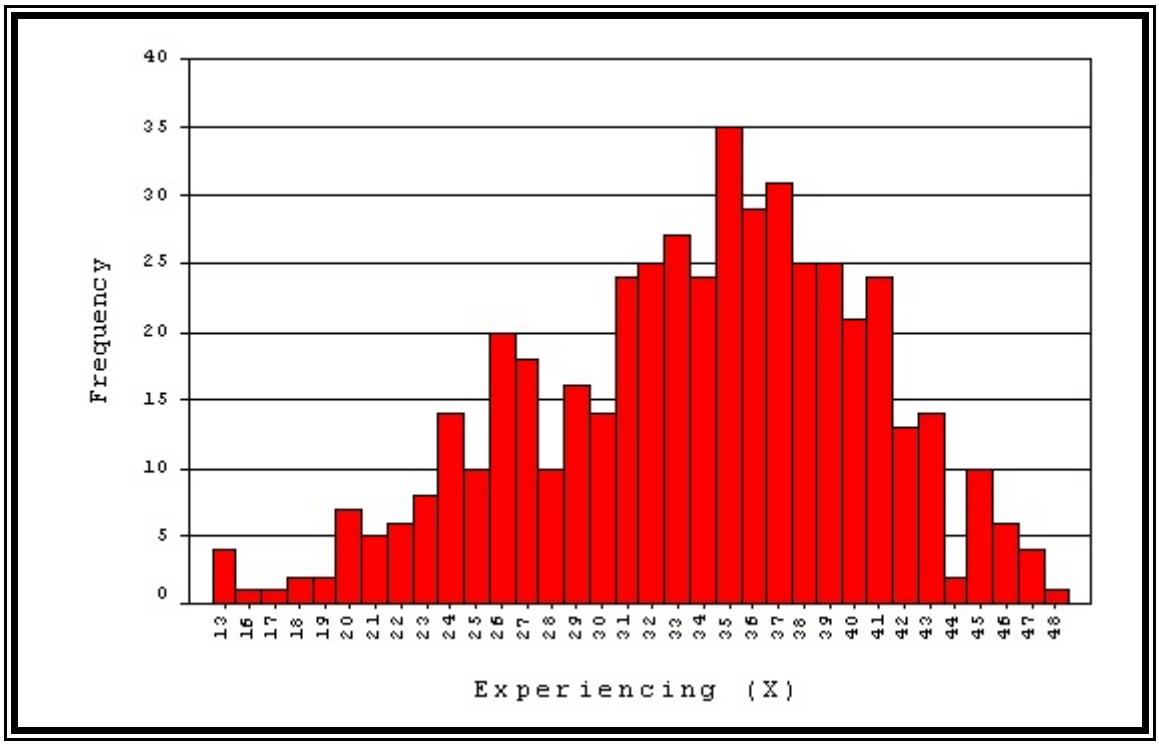
Creative Problem Solving Profiles

The first research question addressed the problem solving preferences of students in management classes. All students in several management classes completed the Creative Problem Solving (CPSP) Inventory as a class assignment. Responses on the 18 sets of words of the CPSP determined the problem solving preferences of the students. Each of the four scales (i.e., Experiencing, Ideation, Thinking, and Evaluation) is computed by first removing the distractor rows then summing the columns. Respondents indicated how each of the four words in each row described their problem solving styles. Responses are marked by assigning a 4 to the word which best characterizes that individual's problem solving style, a 3 to the word which

next best characterizes the problem solving style, a 2 to the next most characteristic word, and a 1 to the word which is least characteristic of the individual as a problem solver. Scores for each scale range from 12 to 48. A total score of 12 on a scale indicates that a respondent does not have a tendency for that problem solving behavior while a total score of 48 on a scale indicates that a respondent has a strong tendency for that behavior related to problem solving. The data for the students in this study indicated a stronger tendency for Experiencing than Thinking and for Evaluation than Ideation.

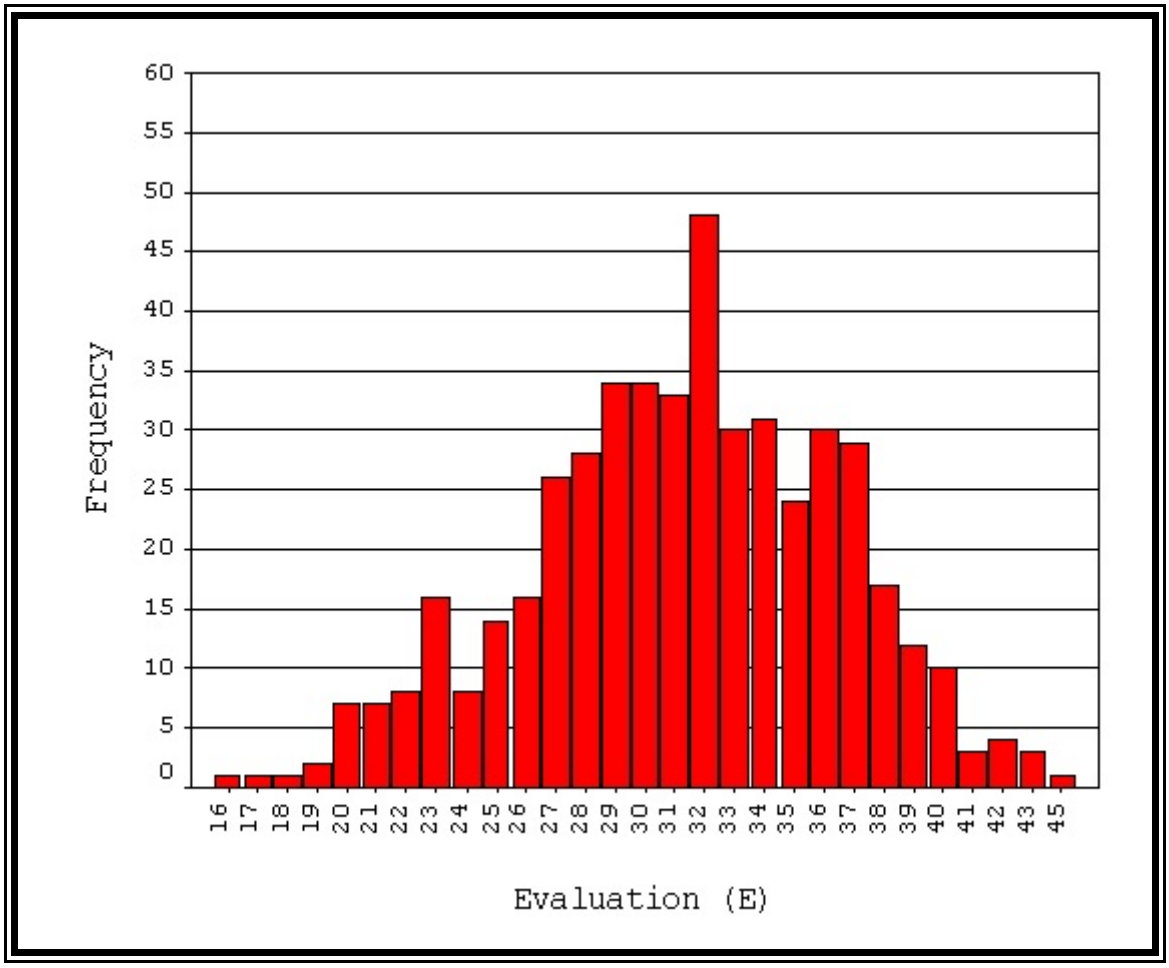
Experiencing refers to an individual's preference for gaining knowledge by direct concrete experience (Basadur, 1998a). The frequency distribution for Experiencing was bell-shaped with the distribution skewed toward the higher end of the scale (see Figure 5). The scores of the 478 students ranged from 13 to 48 with a mean of 33.66 and a standard deviation of 6.719. The median and mode were both 35. Thus the scores covered nearly the full range of possible scores (12 to 48) with the mean slightly above the midpoint of 30 for the scale.

Figure 5. Frequency of Experiencing Problem Solving Style Scores.



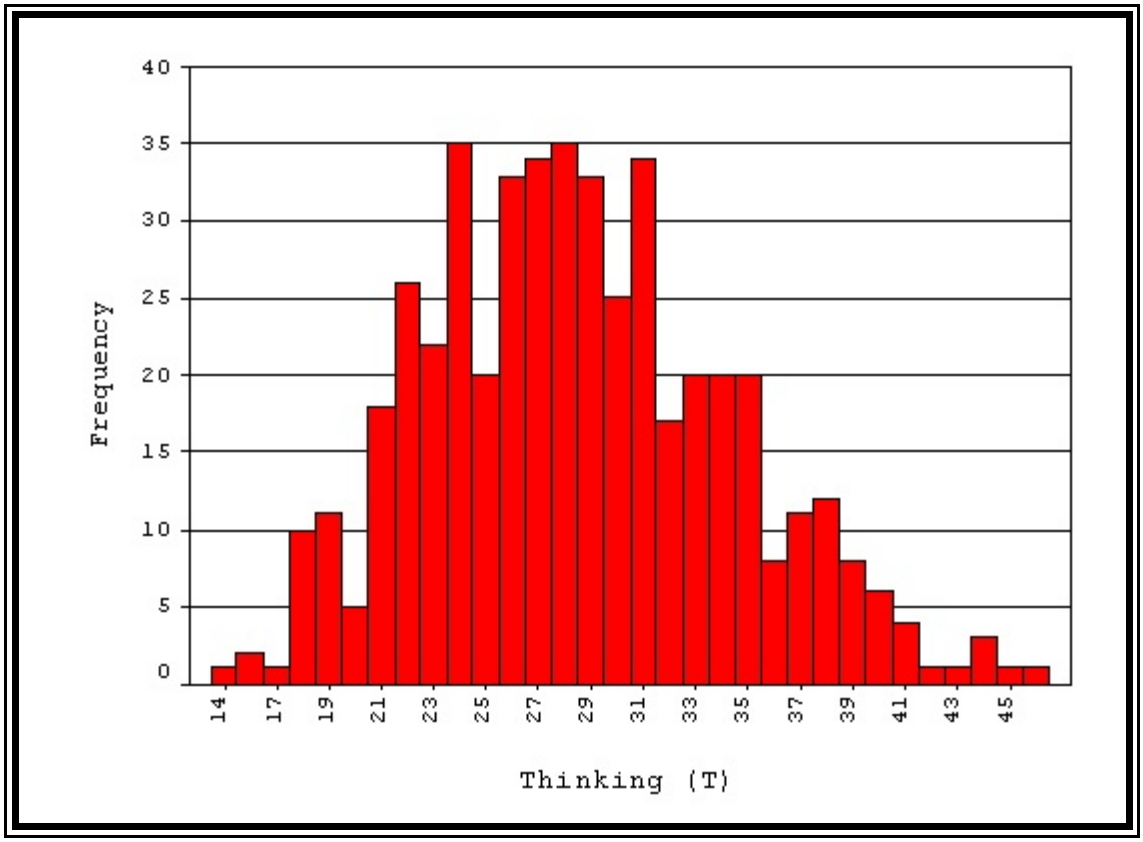
Evaluation refers to an individual's preference for using knowledge for "using judgment to select from [various] options, ideas and diverse points of view" (Basadur, 1998a, p. 14). The frequency distribution for Experiencing was bell-shaped (see Figure 6). The scores of the 478 students ranged from 16 to 45 with a mean of 31.27 and a standard deviation of 5.149. The median and mode were both 32.

Figure 6. Frequency of Evaluation Problem Solving Style Scores.



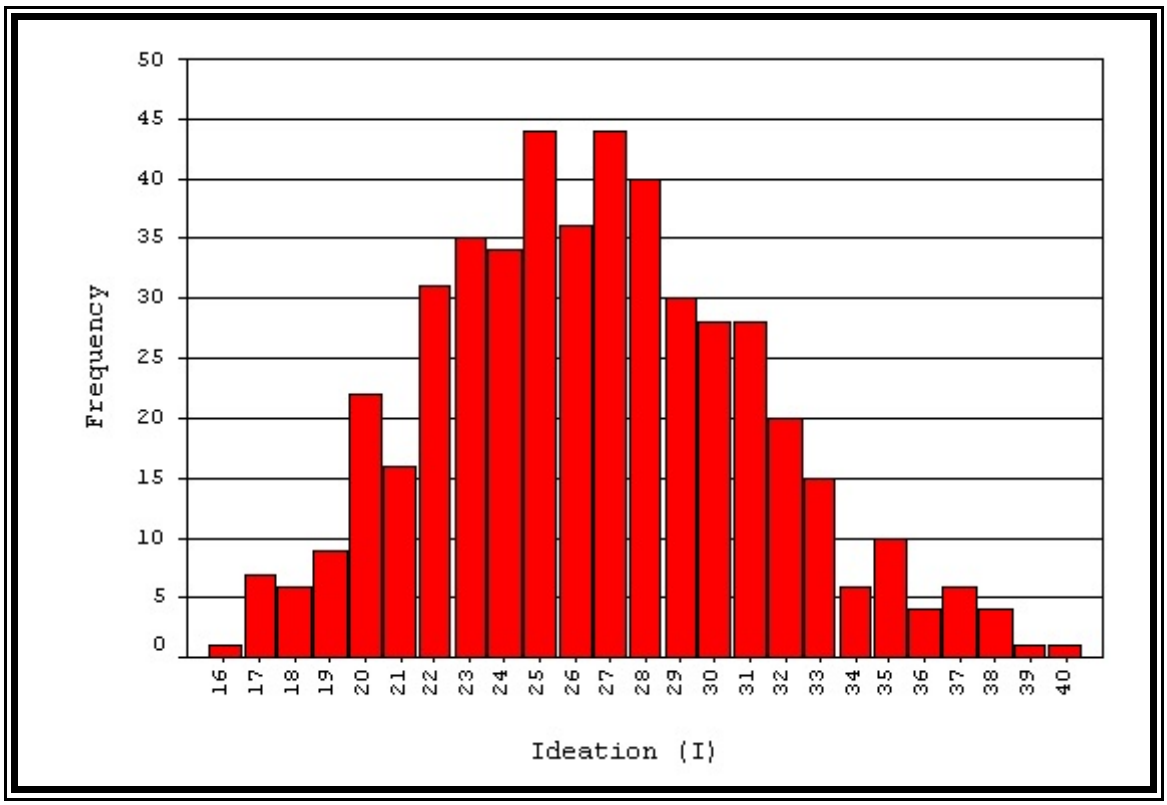
Thinking refers to an individual's preference for gaining knowledge by detached abstract thinking (Basadur, 1998a). The frequency distribution for Thinking was fairly bell-shaped with a slight skew toward the lower scores (see Figure 7). The scores of the 478 students ranged from 14 to 46 with a mean of 28.50 and a standard deviation of 5.754. The median was 28 and the modes were 24 and 28.

Figure 7. Frequency of Thinking Problem Solving Style Scores.



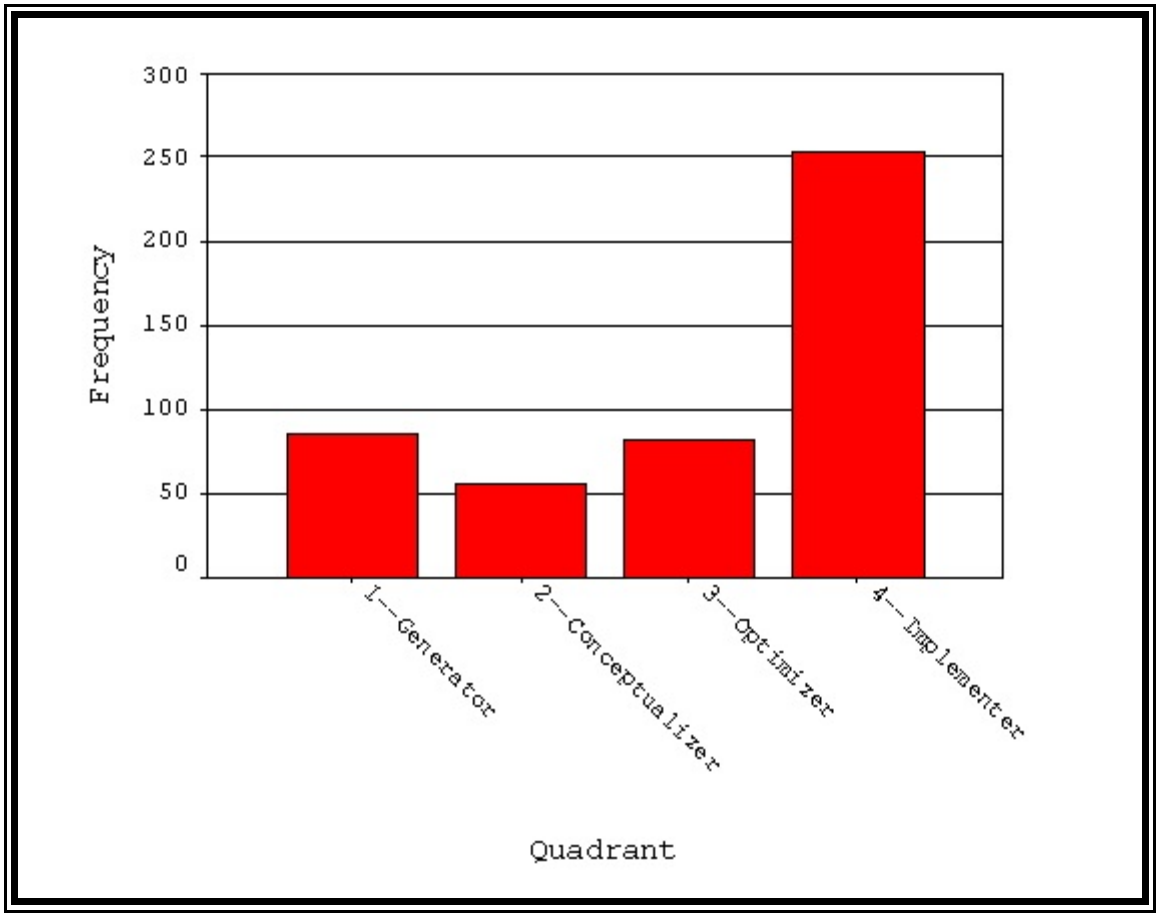
Ideation refers to an individual's preference for generating "more options, ideas and diverse points of view while deferring judgment" (Basadur, 1998a, p. 14). The frequency distribution for Ideation was also fairly bell-shaped with a slight skew toward the lower scores (see Figure 8). The scores of the 478 students ranged from 16 to 40 with a mean of 26.57 and a standard deviation of 4.55. The median was 26 and the modes were 25 and 27.

Figure 8. Frequency of Ideation Problem Solving Style Scores.



Although scores on these four scales provide an individual's overall creative problem solving profile, the scores were subtracted in order to plot a single point which identifies an individual's predominant problem solving tendency. Each individual's score on the Thinking scale was subtracted from the score on the Experiencing scale, thus yielding that individuals's score on the y-axis. Then each individual's score on the Evaluation scale was subtracted from the score on the Ideation scale, thus yielding that individuals's score on the x-axis. Once this scoring was completed and one point was identified for each of the 478 participants in this study, it was apparent that one quadrant dominates all others; therefore, a bar chart was used to demonstrate that a majority of the students have a propensity to prefer taking action rather than completing the initial 6 steps of Basadur's 8-step problem solving process (see Figure 9). More than half (53.1%) of the 478 students in this study have dominant tendencies in Quadrant IV (Implementing). Only 18.0% have a dominant Quadrant I (Generator), 17.2% have a dominant Quadrant III (Optimizer), and a mere 11.7% have a dominant Quadrant II (Conceptualizer). Thus, students may neglect to identify and define problems, generate multiple alternatives, or select the best of the alternatives.

Figure 9. Frequency of Predominant Quadrant of Problem Solving Style.



A chi-square test examines whether people are distributed across the categories as would be expected by chance. The chi-square test is "one of the widely used tests of significance" (Babbie, Halley, & Zaino, 2003, p. 305) that is commonly used for nominal data. A chi-square test examines whether people are distributed across the categories as would be expected by chance. A series of chi-square tests were used to examine the students' dominant

problem solving tendencies and the demographic variables because all of these variables are nominal data. A criterion level was set at .05.

> The .05 and .001 levels of significance are often used by social scientists as a convention for concluding that an observed relationship reflects a similar relationship in the population rather than arising from sampling error. Most social scientists agree that relationships with significance values of .05 or less are so unlikely to have occurred by chance that they can be called significant. The lower the probability, the more statistically significant the relationship. (Babbie, Halley, & Zaino, 2003, p. 307)

A one-way chi-square goodness of fit test classifies participants on only one variable (Shavelson, 1996). In this case, the single variable was dominant problem solving tendency. A one-way chi-square test may also be referred to a single-sample or one-sample chi-square test (Huck, Cormier, & Bounds, 1974). The one-way chi-square test is sometimes called a goodness of fit test because it tests how observed frequencies within a sample fit the expected frequencies (Huck, Cormier, & Bounds, 1974; Shavelson, 1996). The expected frequencies can be based on chance and probability or on frequencies found in earlier research.

Initially, the one-way chi square test was performed to determine if this was an expected distribution of dominant problem solving tendencies. In an earlier study, Basadur, Graen, and Wakabayashi (1990) reported the dominant styles of creative problem solving for a sample of 181 university business students undergraduates. In that study, 13.0% were

Generators, 17.3% were Conceptualizers, 37.0% were Optimizers, and 32.7% were Implementors. Using that distribution as the expected value, the chi-square results showed a significantly different distribution with the participants of this study (χ^2 = 129.718, df = 3, p = .000). This means that the larger sample of management students in this study had more Implementors than Optimizers, unlike the results reported for business school undergraduates in the earlier study.

A two-way chi square test is a test of independence between an independent and dependent variable (Shavelson, 1996). This type of test is sometimes called a two-sample chi-square test (Huck, Cormier, & Bounds, 1974). In this case, a series of chi-square analyses were conducted with the demographic variables as independent variables and the dominant problem solving tendency as the dependent variable. The dominant problem solving tendencies of the 478 management students that participated were compared to the demographic variables of gender, race, campus location, classification, and age (see Table 4).

Table 4. Chi-square Results of Predominant Problem Solving Preference and Demographic Variables

	Generate		Conceptual		Optimize		Implement	
Variable	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.
Gender								
Male	50	51	34	33	52	49	149	151
Female	36	35	22	23	30	33	105	103
Race								
White	71	69	47	45	64	66	201	204
Non-white	15	17	9	11	18	16	53	50
Campus Location								
OSU-Tulsa	24	28	18	18	22	27	94	84
Stillwater	62	58	38	38	60	55	160	170
Classification								
Graduate	29	33	18	22	28	32	109	98
Undergraduate	57	53	38	34	54	50	145	156
Age								
20-25	62	56	37	36	56	53	154	164
Over 25	24	30	19	20	26	29	100	90

A chi-square analysis was performed to determine if there was a significant relationship between the predominant problem solving preference and the gender of the students. The participants were grouped by the four quadrants of Generating, Conceptualizing, Optimizing, or Implementing and by male or female gender. No significant relationship was found between the predominant problem solving preference and the gender of the students ($\chi^2 = .694$, $\underline{df} = 3$, $\underline{p} = .875$).

A chi-square analysis was performed to determine if there was a significant relationship between the predominant problem solving preference and the race of the students. The participants were initially grouped by the four quadrants of Generating, Conceptualizing, Optimizing, or Implementing and by the six race categories of White, Black, Hispanic, American Indian, Asian, and Other. The result of the chi-square calculation show that 14 (58.3%) of the resulting cells have an expected count less than 5.

> Because the calculation of chi-square involves divisions by expected cell frequencies, it can be greatly inflated if any of them are very small. By convention, adjustments to chi-square should be made if more than 20% of the expected cell frequencies are below 5. (Babbie, Halley, & Zaino, 2003, p. 308)

Since in this study 80.1% of the participants were White, resulting in small expected counts in the other racial categories, participants were then grouped as White or Non-White. Still no significant relationship was found between the predominant problem solving preference and the race of the students ($\chi^2 = 1.207$, $\underline{df} = 3$, $\underline{p} = .751$).

A chi-square analysis was performed to determine if there was a significant relationship between the predominant problem solving preference and the campus location of the students. The participants were grouped by the four quadrants of Generating, Conceptualizing, Optimizing, or Implementing and by the two campus locations of Stillwater or OSU-Tulsa. No significant relationship was found between

the predominant problem solving preference and the campus location of the students (χ^2 = 4.281, df = 3, p = .233).

A chi-square analysis was performed to determine if there was a significant relationship between the predominant problem solving preference and the classification of the students. The participants were grouped by the four quadrants of Generating, Conceptualizing, Optimizing, or Implementing and by the two classifications of graduate or undergraduate. No significant relationship was found between the predominant problem solving preference and the classification of the students (χ^2 = 4.532, df = 3, p = .209).

A chi-square analysis was performed to determine if there was a significant relationship between the predominant problem solving preference and the age of the students. The participants were grouped by the four quadrants of Generating, Conceptualizing, Optimizing, or Implementing and by their age. This data was originally reported in 7 age ranges as shown in Table 1. However, 64.6% of the participants fell in the youngest category (20-25), and each of the older categories contained only 1% or 2% of the participants. The result of the chi-square calculation show that 13 of the resulting cells have an expected count less than 5. So the age ranges were recoded into just two ranges of 20 - 25 years and greater than 25 years. Still no significant relationship was found between the predominant

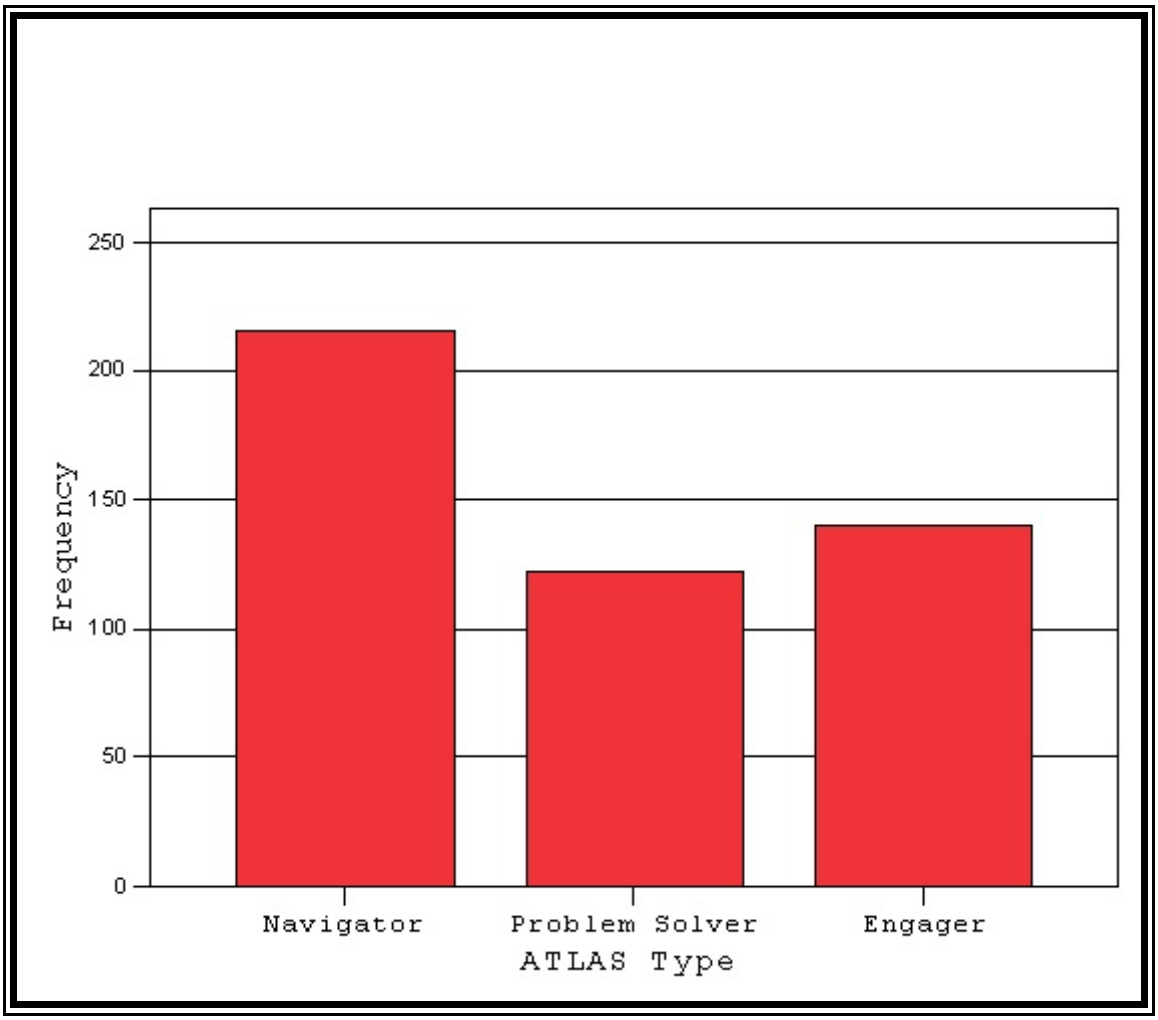
problem solving preference and the age of the students (χ^2 = 4.406, df = 3, p = .221).

There was no significant relationship between quadrant placement on the CPSP and the demographic variables of gender, race, campus location, classification, and age. Although more than half (53.1%) of the students had a tendency for Quadrant 4 Implementing, there was no relationship between this tendency and any of the demographic variables.

Learning Strategy Preferences Profile

The second research question addressed the learning strategy preferences of management students. The Assessing The Learning Strategies of AdultS (ATLAS) instrument was also included in the web-based data collection completed by the 478 participants. Their responses to the questions determined their placement in one of three groups of learners, according to whether they were Navigators, Problem Solvers, or Engagers (see Figure 10).

Figure 10. Frequency of Learning Strategy Preference.



The majority (45.2%) of the 478 management students identified themselves as Navigators (see Table 5). More than one-fourth of the students (29.3%) identified their preferred learning strategy as Engager, while barely one-fourth (25.5%) identified their preferred learning strategy as Problem Solver. In earlier studies involving more than 3,000 participants, the distribution norms for ATLAS were relatively equal: Navigators made up 36.5% of the respondents, Engagers made up 31.8%, and Problem Solvers made up 31.7% (Conti & Kolody, 1998).

Table 5. Frequencies of Learning Strategy Groups

ATLAS Type	Observed		Expected		Difference	
	No.	%	No.	%	No.	%
Navigator	216	45.2	174	36.5	42	8.7
Engager	140	29.3	152	31.8	-12	-2.5
Problem Solver	122	25.5	152	31.7	-30	-6.2

A one-way chi-square goodness of fit test was done to determine if this distribution of management students would be expected by chance. The frequencies of learning strategy preferences found in this study were significantly different from the expected frequencies based on the ATLAS norms (χ^2 = 17.006, $\underline{df}$ = 2, $\underline{p}$ = .000) (see Table 5). Navigators were over-represented by 8.7% more than the expected 36.5%.

Engagers were under-represented by 2.5%. Problem Solvers were under-represented by 6.2%.

Additional chi-square tests were performed to investigate any relationship between preferred learning strategies of the 478 management students that participated and the other demographic variables of gender, race, campus location, classification, and age. A series of two-way chi-square tests treated each demographic variable as the independent variable and the learning strategy preference as indicate by ATLAS type as the dependent variable for each individual (see Table 6). Again the chi-square analysis was appropriate because these variables contain categorical data. A criterion level was set at .05.

A chi-square analysis was performed to determine if there was a significant relationship between the preferred learning strategy and the gender of the students. The participants were grouped by the three categories of Navigator, Problem Solver, or Engager and by the binary gender categories of male or female. No significant relationship was found between the preferred learning strategy and the gender of the students ($\chi^2 = 2.537$, $\underline{df} = 2$, $\underline{p} = .281$).

A chi-square analysis was performed to determine if there was a significant relationship between the preferred learning strategy and the race of the students. The participants were grouped by the three learning strategy

categories of Navigator, Problem Solver, or Engager and by the two race categories of White or Non-White. No significant relationship was found between the preferred learning strategy and the race of the students ($\chi^2 = 1.562$, $\underline{df} = 2$, $\underline{p} = .458$).

Table 6. Chi-square Results of Learning Strategy Preference and Demographic Variables

	Navigator		Problem Solver		Engager	
Variable	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.
Gender						
Male	126	129	80	73	79	84
Female	90	87	42	49	61	56
Race						
White	176	173	93	98	114	112
Non-white	40	43	29	24	26	28
Campus Location						
OSU-Tulsa	85	71	46	40	27	46
Stillwater	131	145	76	82	113	94
Classification						
Graduate	97	83	48	47	39	54
Undergraduate	119	133	74	75	101	86
Age						
20-25	130	140	69	79	110	90
Over 25	86	76	53	43	30	50

A chi-square analysis was performed to determine if there was a significant relationship between the preferred learning strategy and the campus location of the students.

The participants were grouped by the three learning strategy categories of Navigator, Problem Solver, or Engager and by the two campus locations of Stillwater or OSU-Tulsa. A significant relationship was found between the preferred learning strategy and the campus location of the students (χ^2 = 17.057, df = 2, p = .000). At the OSU-Tulsa there were more Navigators and Problem Solvers than expected and fewer Engagers than expected. At the Stillwater campus there were more Engagers than expected and fewer Navigators and Problem Solvers than expected.

A chi-square analysis was performed to determine if there was a significant relationship between the preferred learning strategy and the classification of the students. The participants were grouped by the three learning strategy categories of Navigator, Problem Solver, or Engager and by the two classifications of graduate or undergraduate. A significant relationship was found between the predominant problem solving preference and the classification of the students (χ^2 = 10.480, df = 2, p = .005). Among the graduate students, there were more Navigators than expected and fewer Engagers than expected. There was no significant difference between the expected and observed number of Problem Solvers among the graduate students. Among the undergraduate students, there were more Engagers than expected and fewer Navigators than expected. There was no

significant difference between the expected and observed number of Problem Solvers among the undergraduate students.

A chi-square analysis was performed to determine if there was a significant relationship between the preferred learning strategy and the age of the students. The participants were grouped by the three categories of Navigator, Problem Solver, or Engager, and by the two recoded age ranges of 20 - 25 years, and more than 25 years. A significant relationship was found between the preferred learning strategy and the age of the students ($\chi^2 = 17.251$, $df = 2$, $p = .000$). There were 20 more Engagers than expected and 10 fewer Navigators and 10 fewer Problem Solvers than expected among the students who are 20 to 25 years of age. Among the students who are more than 25 years of age there were 10 more Navigators than expected, 10 more Problem Solvers than expected, and 20 fewer Engagers than expected.

Earlier studies have shown no relationship between preferred learning strategies and the demographic variables such as gender and race (Conti & Kolody, 2004; Conti, Kolody, & Schneider, 1997; Ghost Bear, 2001; Hinds, 2001; Lively, 2001; Willyard, 2000). The findings in this study were consistent with those earlier findings.

Summary

Over half (53.1%) of the students had a preference for the Navigator learning strategy. Although there was no

relationship between this preference and the demographic variables of gender or race, there was a relationship between learning strategy preference and the demographic variables of age, campus location, and student classification.

Problem Solving and Learning Strategies

The third research question addressed whether there is a relationship between preferred problem-solving styles and preferred learning strategies. Investigation of this question began with a crosstabulation, "a matrix that shows the distribution of one variable for each category of a second variable" (Babbie, Halley, & Zaino, 2003, p. 137). Examination of the results of the crosstabulation shows that people in Quadrant I (Generators), Quadrant II (Conceptualizers), and Quadrant III (Optimizers) are fairly evenly distributed among Navigators, Problem Solvers, and Engagers. However, when it comes to Quadrant IV (Implementors), there are more than twice (2.43 times) the number of Navigators than there are Problem Solvers and there are nearly twice (1.79 times) as many Navigators as Engagers.

Table 7. Crosstabulation of CPSP Quadrant and ATLAS

Quadrant	Navigator		Problem Solver		Engager	
	No.	%	No.	%	No.	%
Generator	29	6.1	29	6.1	28	5.9
Conceptualizer	22	4.6	19	4	15	3.1
Optimizer	36	7.5	21	4.4	25	5.2
Implementer	129	27	53	11.1	72	15.1

A chi-square analysis was performed to determine if there was a significant relationship between the preferred learning strategy and the problem solving tendency of the students. The participants were grouped by the three learning strategy categories of Navigator, Problem Solver, or Engager and by the four problem solving categories of Generating, Conceptualizing, Optimizing, or Implementing . No significant relationship at the .05 level was found between the preferred learning strategy and the problem solving tendency of the students (χ^2 = 11.057, df = 6, p = .081).

Although .05 is used for most studies, exploratory research might allow a probability level as high as .10 (Gay & Airasian, 2000). Since this study was exploratory research and there were no treatment consequences to the students since the study used historical data, using a higher probability level would not be inappropriate. With a probability level of .10, the chi-square result of p = .081 could indicate a significant difference between expected and observed frequencies. Gay and Airasian (2000) note that selecting the higher probability level of .10 could prevent a technique being "prematurely abandoned" (p. 479), so this line of investigation was continued using an additional non-parametric test.

Another measure that can be used to measure the association between nominal variables in lambda. Lambda is

based on the logic of preportionate reduction of error (PRE)(Babbie, Halley, & Zaino, 2003). The value of lambda can range from 0.00 and 1.00 and indicates the strength of the relationship between the two variables. The relationship between the variables becomes stronger as the value approaches 1.00. Conversely, as the lambda value approaches 0.00, the weaker is the relationship between the variables. In order to pursue this investigation further, lambda was calculated to examine the strength of the relationship between preferred learning strategy (ATLAS type) and problem solving preference as indicated by CPSP quadrant. When examining the overall relationship between ATLAS type and CPSP quadrant, the lambda value of 0.000 indicates no relation between the two variables. In other words, knowing a student's preferred learning strategy does not help predict more accurately that student's dominant problem solving tendency, or vice versa. However, there is a caveat when using lambda:

> Lambdas of 0.0 must be treated with great caution. When one of the totals for the dependent variable is much larger then [sic] the rest, lambda can take on the value zero even when an inspection of the percents indicate a strong relationship. To be safe, lambda should only be used when the marginal totals are relatively equal in magnitude. If they are not, a chi square based measure of association, such as Cramer's V, should be used. (Babbie, Halley, & Zaino, 2003, p. 258)

The Cramer's V test is a measure of association based on the chi square value that avoids some of the weaknesses of chi square (Kerlinger & Lee, 2000). This test can be used

with any size crosstab table. A chi square test indicates statistical significance but not the magnitude of the relationship.

> Generally speaking, the best advice for handling categorical data is to calculate χ^2 (to determine statistical significance), calculate V...then interpret the data using all the information. (Kerlinger & Lee, 2000, p. 236)

A Cramer's V test was performed to further investigate the lambda value of 0.0 obtained previously. The result was a Cramer's V value of .108 with $\underline{p}$ = .081. Although this level of significance indicates a 92% chance that the relationship is not a random fluke, this value for Cramer's V falls in the category of "Moderate/Worth Noticing", but it is not evidence of a particularly strong association (Babbie, Halley, & Zaino, 2003).

One crude method of the strength of association between variables examines the size of the difference in percentages across variables. The general rule of thumb is that a larger percentage difference across variables indicates a stronger association while a smaller percentage difference indicates a weaker association (Babbie, Halley, and Zaino, 2003).

> Some researchers use a rough "10 percentage point rule." That is, if the percentage point difference is 10 percent or more, the relationship between the variables is probably worth examining further. Of course, the larger the percentage point difference, the stronger the association. Keep in mind, this "rule of thumb" is just a rough indicator. (p. 193)

Epsilon, or the percentage difference between the smallest and largest percentages in each row (Babbie, Halley & Zaino, 2003), is negligible for students whose predominant problem solving tendency places them in the first three quadrants, but Implementers (Quadrant 4) have an epsilon value of 15.9% (see Table 7). This relationship between preferred learning strategy and predominant problem solving tendency is thus worthy of further investigation because there is an affinity between the Navigator learning strategy and Implementation as a problem solving tendency.

Thus, knowing a student's preferred learning strategy does not help predict more accurately that student's dominant problem solving tendency, or vice versa; however, there does appear to be an affinity between the Navigator learning strategy and Implementation as a problem solving tendency among these management students. That affinity may be worthy of further exploration.

Natural Clusters of Students

The Creative Problem Solving Inventory was developed from a theoretical model and creates profiles for individuals by placing them in quadrants that identify their preferred problem solving styles. By scoring them to identify one predominant quadrant, it is possible to pinpoint the dominant problem solving tendency (Generator, Conceptualizer, Optimizer, or Implementor). That used a deductive method based on Basadur's theoretical model. In

this study the majority of management students had dominant tendencies for Quadrant IV as Implementors.

The study next addressed whether any natural groupings of management students existed based on their responses to the Creative Problem Solving Inventory. For the last few decades, the focus of adult education has become the learner, and a new approach is often used to study learners which is more naturalistic and sociological. A monograph written by Guba (1978) addresses naturalistic inquiry as an alternative to rigidly controlled conventional experimental inquiry.

> When the naturalistic evaluator has identified even a preliminary set of categories he will wish to begin "fleshing" them out, i.e., by collecting information which will describe the issues or concerns in some detail, by providing perspectives for viewing them, and by developing sufficient evidence to permit judgements to be made about them. (Guba, 1978, p. 57)

Cluster Analysis

Next the data were examined using an inductive approach in order to "tease sense out of the data. Rather than imposing sense upon the data, the goal is to have meaning and understanding emanate from the data itself" (Conti, 1996, p. 67). Aldenderfer and Blashfield (1984) suggest cluster analysis as an appropriate method of classification which is increasingly used in the social sciences. Cluster analysis is a multivariate statistical procedure that is "designed to create homogeneous groups of cases or entities called clusters" (p. 9). Early applications of cluster analysis

included studies of alcoholics, anthropological role terms, and religiousity (Aldenderfer & Blashfield, 1984), all of which involve complex human behaviors. Cluster analysis is a powerful multivariate statistical tool that can be used to analyze a complex set of variables. This can describe complex human behavior more holistically rather than by isolating and scrutinizing individual variables. "Learning and education are complicated human activities" (Conti, 1996, p. 67). More recently, the use of cluster analysis has spread to include education. Kidd (1973) first focused attention on the learner in his work How Adults Learn. This was followed in the 1980s by influential works by Smith (1982), Brookfield (1986) and Jarvis (1983) which have replaced the earlier behavioral and psychological focus on learning with a more sociological perspective.

This change in the focus of education and learning research was one of the factors that make the identification of groups by use of cluster analysis part of new trend in education research. Since 1989, several education studies have used cluster analysis (e.g., Beder, 1990; Bighorn, 1997; Courtnage, 1998; Davis, 2000; Fellenz & Conti, 1989; Gallagher, 1998; Gehring, 1997; Goodwin, 2001; Hays, 1995; Hulderman, 2003; Kolody, 1997; Lockwood, 1997; Massey, 2001; O'Brien, 2001; Sachatello-Sawyer, 1996).

The second factor was the development of computer hardware and software that made running cluster analyses more

practical. Even after statistical users had access to more computing power, software that could perform cluster analysis was not readily available. Early software required knowledge of FORTRAN (Aldenderfer & Blashfield, 1984) and job control language for mainframe computers (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975). Cluster analysis capability was not common in early mainframe statistical packages; the mainframe version of SPSS contained no clustering method (Nie et al., 1975) , and SAS contained just one (Aldenderfer & Blashfield, 1984). Now cluster analysis options exist in all major statistical packages.

Several decisions must be made by the researcher before turning over the calculation of the cluster analysis to the power of the computer. The researcher must decide which variables to include in the analysis, how the similarity of or distance between cases will be determined, and what criteria will be used to combine cases into clusters (Aldenderfer & Blashfield, 1984; Norusis, 1990b). In this cluster analysis, the variables used were students' responses to the items on the Creative Problem Solving Profile Inventory.

The concepts of similarity and distance are "complements of one another" (Kachigan, 1991, p. 264). There are several categories of methods to determine similarity and distance, including correlation coefficients, distance measures, association coefficients, and probabilistic similarity

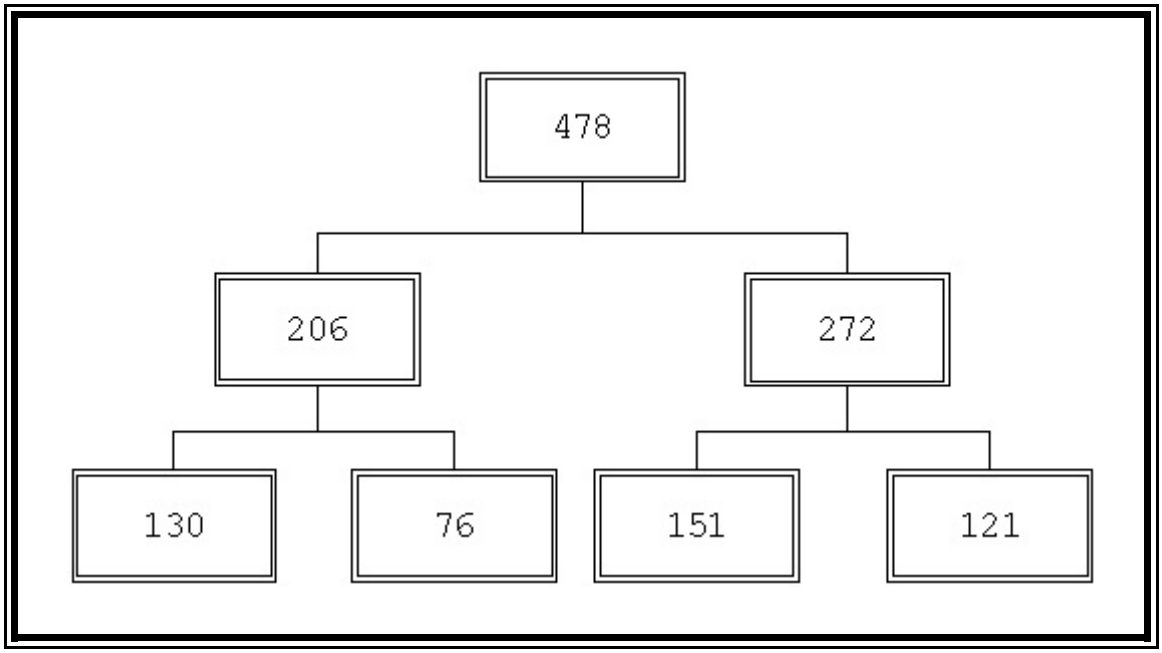
measures (Aldenderfer & Blashfield, 1984). One common method is the squared Euclidean distance, "which is the sum of the squared differences over all of the variables" (Norusis, 1990b, p. 350), and that method was used in this study.

There are also several ways to combine objects or cases into clusters. Agglomerative hierarchical methods are frequently used (Aldenderfer & Blashfield, 1984). Agglomerative hierarchical methods form clusters by starting with as many clusters as there are cases. Then two cases are combined into a single cluster, based on certain linkage rules or criteria. After this, another case is considered and is either joined to the previous cluster or paired with another case to start a new cluster. This process continues until all cases are part of a single cluster. Once a case has been attached to a cluster, it can never be detached and join a new cluster. Within this agglomerative hierarchical family of clustering methods, there are several sets of linkage rules. Social science research has often used Ward's method as a linkage rule (Aldenderfer & Blashfield, 1984, p. 43), and that method has been used in this study.

The responses of the 478 management students to the Creative Problem Solving Inventory were used to perform an agglomerative hierarchical cluster analysis. The 6 distractor rows had already been eliminated from the data before any data analysis took place, so the agglomerative hierarchical cluster analysis used 4 items from each of the

12 remaining rows. This analysis used the squared Euclidean distance measure of similarity and the Ward's method to combine the problem solving response items into similar clusters. The most appropriate solution for clustering the data in this study was a 4-cluster solution. The solution grouped the 478 management students into four problem-solving groups containing 151, 130, 121, and 76 students. The development of this four-group solution is depicted as a hierarchical chart in Figure 11.

Figure 11. Diagram of Four-Group Solution.



Differences Between Groups

Once the naturally-occurring groups of students were identified using the inductive technique of cluster analysis, the deductive technique of discriminant analysis was used to hone in on what variables differentiated between those groups (Conti, 1993; Klecka, 1975; Norusis, 1990a). Kachigan (1991) described this "as a procedure for identifying boundaries between groups" (p. 216). Discriminate analysis requires that the cases already be assigned to different groups (Norusis, 1990b). For this procedure cases should be independent and membership in clusters of groups should be mutually exclusive with no case belonging to more than a single group (Norusis, 1990b).

Three discriminant analysis procedures were performed to determine what separated the four groups from each other. The groups were the four clusters "teased out" by the cluster analysis, and the discriminating variables were the items from the Creative Problem Solving Inventory.

The first discriminant analysis was performed to determine what separated the 478 students at the 2-cluster level. One cluster contained 206 students and the other contained 272 students. At this 2-cluster level, the students were correctly classified with 90.0% accuracy. In the cluster of 206 management students, 184 were correctly classified. In the second cluster of 272 students, 246 were correctly classified. The structure matrix was examined to

see what separated the two clusters. Using a minimum structure coefficient criteria of .3, problem solving tendency items of Handling, Practicing, Hands On, Implementing, Action, Theoretical, Doing, and Future-orientated discriminated between the two clusters.

The referents Handling, Practicing, Hands On, Implementing, Action, and Doing are from the Experiencing scale on Basadur's Creative Problem Solving Profile (CPSP) Inventory. These referents match Vaill's (1996) description of on-line learning. On the other hand, Theoretical is from the Thinking scale and Future-oriented is from the Ideation scale on the CPSP, which match Vaill's description of off-line learning, and is typical of institutional learning (1996). The interaction of these eight items is what separated the two clusters of management students. The average scores for the items for the cluster of 272 students were higher than the average scores for the cluster of 206 students on the referents Handling, Practicing, Hands On, Implementing, Action, and Doing. The average scores for the items for the cluster of 206 students were higher than the average scores for the cluster of 272 students on the referents Theoretical and Future-Oriented. Thus, at the 2-cluster level, the cluster of 272 management students tended toward on-line learning whereas the cluster of 206 management students tended toward off-line learning.

In describing the on-line learning preferred by the cluster of 272 students, Vaill (1996) borrows a computer term to:

> Describe a process that occurs simultaneously with all the other processes of the system in which it is imbedded. Thus, on-line learning is a learning process that occurs in the midst of work and of life rather than in an artificial, sheltered environment. (p. 76)

Common definitions of the word "on-line" refer to being under the control of a central computer, being connected to a computer or computer network, or accessible by computer (American Heritage Dictionary, 2000). Secondary definitions do refer to an activity being in progress or ongoing (American Heritage Dictionary, 2000; WordNet 2.0), which is a better match for Vaill's context. However, this usage could be confusing because the term on-line learning is often used to refer to computer-based or distance-education classes, and this could lead to confusion. A better term to adopt might be "real-time." This term also relates to computer systems, specifically ones that update information as soon as they receive it (American Heritage Dictionary, 2000; Scott, 2003) rather than setting it aside for processing at a later time which is called batch processing. One dictionary defines real-time as "of or relating to the actual time during which something occurs; that is, current as opposed to delayed" (American Heritage Dictionary, 2000) while another says that one use of the term "refers to doing something while people are watching or waiting" (Howe, 2005). One clear advantage

to the choice of real-time to describe this type of learning is that the term is not already being used to describe some other type of learning.

In contrast to those students who seem to prefer real-time learning, the cluster of 206 students who prefer off-line learning as described by Vaill (1996) are likely to enjoy the institutional learning setting. This term does not lead to confusion as might the term on-line learning. Off-line learning is also a term in common use for this context. The Free On-Line Dictionary of Computing and Jargon File 4.2.0 both use the word off-line to mean "not now or not here" and give a usage example: "Let's take this discussion off-line" to refer to not having the discussion right now in a public forum but rather deferring it to a later or more private setting. Learners who are comfortable in this setting are content to learn in an artificial environment such as a classroom and defer actual performance.

Thus, what differentiates between the two clusters is the temporal issue related to when the learners plan to put what they have learned to use: either while they are learning it, or at some future time.

> How people make new things part of themselves... some people are watchers first, others are doers first. The watchers reflect on new things; they filter them through their own experience to create meaning in a slow, deliberate choosing of perspectives. The doers act on new information immediately. They reflect only after they have tried it out. They need to do it, to extend themselves into the world, in order to make it theirs. (McCarthy, 1990, p. 32)

After this, the discriminant analysis process was used to further differentiate within each cluster of the 2-cluster solution. The second discriminant analysis was performed to further discriminate within the cluster of 206 students who tend to prefer off-line learning. Within this cluster of 206 was one cluster of 130 management students and another cluster of 76 management students. In this second discriminant analysis process the management students were correctly classified with 95.6% accuracy. In the cluster of 130 management students, 125 were correctly classified. In the cluster of 76 management students, 72 of them were correctly classified. The structure matrix was examined to see what separated these two clusters. Using a minimum structure-coefficient criteria of .3, problem solving tendency items of Action, Waiting, Reading, and Experiencing discriminated between the two clusters. Action and Experiencing are from the Experiencing scale on Basadur's Creative Problem Solving Profile Inventory while Waiting and Reading are from the Thinking scale on the CPSI. Thus, Doing vs. Thinking is what separates these two clusters of management students who prefer off-line learning. The average scores for the cluster of 130 students were higher that those of the cluster of 76 students on Action and Experiencing. The average scores for the cluster of 130 students were lower than those of the cluster of 76 students on Waiting and Reading. Thus, the cluster of 130 students

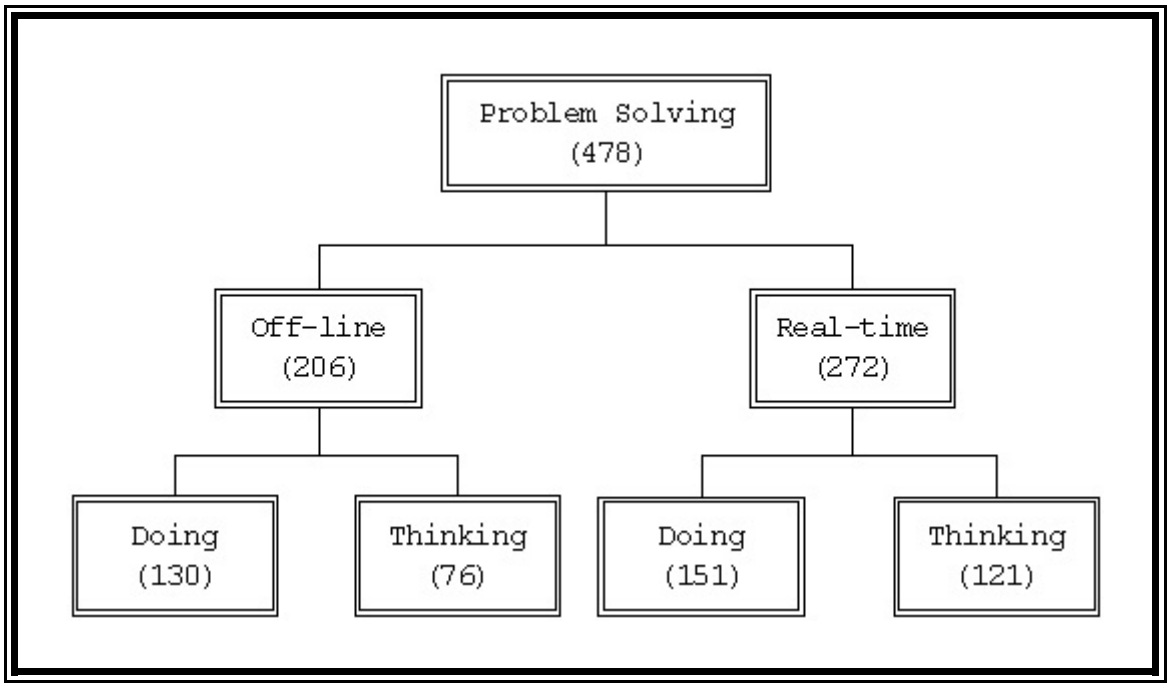
would rather take action as Doers while the cluster of 76 students would rather solve problems as Thinkers by studying and reading.

The third discriminant analysis was performed to further discriminate within the cluster of 272 students who prefer to real-time learning. Within this cluster of 272 real-time learners was one cluster of 121 management students and another cluster of 151 management students. In this third discriminant analysis process, the management students were correctly classified with 89.0% accuracy. In the cluster of 121 management students, 110 were correctly classified. In the cluster of 151 management students, 132 of them were correctly classified. The structure matrix was examined to see what separated these two clusters. Using a minimum structure-coefficient criteria of .28, problem solving tendency items of Physical, Zeroing In, Mental, Visualizing, Evaluating, Focusing, and Trial and Error discriminated between the two clusters. Thus, within this group of students who prefer real-time learning, Doing vs. Thinking is also what separates these two clusters of management students. The average scores for the cluster of 121 students were higher that those of the cluster of 151 students on Zeroing In, Mental, Evaluating, and Focusing, which represent the Thinking and Evaluation scales. This indicates a preference for Thinking. The average scores for the cluster of 151 students were higher than those of the cluster of 121

students on Physical, Visualizing, and Trial and Error, which represent the Experiencing and Ideation scales. This indicates a preference for Doing.

Thus, four naturally-occurring groups of learners were identified in the data using cluster analysis. By using discriminant analysis to determine what differentiated these groups, it was first determined that some of the participants prefer to real-time learning while others prefer off-line learning. To further differentiate between real-time and off-line learners, a preference for Action or Thinking determines the final cluster (see Figure 12).

Figure 12. Diagram of Final Four-Group Solution.



In order to examine these differences further, post hoc tests were run. Since membership in a specific cluster is nominal or categorical data, two-way chi-square tests were run to examine relationships between the naturally-occurring clusters and the variables of gender, race, campus location, classification, age, preferred CPSP quadrant, and preferred learning strategy (see Table 8).

A chi-square analysis was performed to determine if there was a significant relationship between the naturally occurring groups of problem solvers and the gender of the students (see Table 8). The participants were grouped by the four naturally occurring groups of problem solvers and by the two classifications of male or female. No significant relationship was found between the naturally occurring groups and the gender of the students ($\chi^2 = 7.141$, $\underline{df} = 3$, $\underline{p} = .068$).

A chi-square analysis was performed to determine if there was a significant relationship between the naturally occurring groups of problem solvers and the race of the students (see Table 8). The participants were grouped by the four naturally occurring groups of problem solvers and by the two categories of White and Non-White. No significant relationship was found between the naturally occurring groups and the race of the students ($\chi^2 = 3.144$, $\underline{df} = 3$, $\underline{p} = .370$).

A chi-square analysis was performed to determine if there was a significant relationship between the naturally

occurring groups of problem solvers and the campus location of the students (see Table 8). The participants were grouped by the four naturally occurring groups of problem solvers and by the two campus locations of Stillwater and OSU-Tulsa. A significant relationship was found between the naturally occurring groups and the campus location of the students (χ^2 = 26.289, df = 3, p = .000). There was not much difference between campuses for off-line learners. With regard to real-time learners, OSU-Tulsa had more Thinkers than expected and fewer Doers than expected, while Stillwater had more Doers than expected and fewer Thinkers than expected.

A chi-square analysis was performed to determine if there was a significant relationship between the naturally occurring groups of problem solvers and the classification of the students (see Table 8). The participants were grouped by the four naturally occurring groups of problem solvers and by the two classifications of graduate or undergraduate. A significant relationship was found between the naturally occurring groups and the classification of the students (χ^2 = 16.008, df = 3, p = .001). This indicates that among the undergraduate students, there is a tendency to taking action, while the graduate students tend to think and engage in mental activity.

Table 8. Crosstabulation of Naturally-Occurring Groups and Demographic Variables, Problem Solving Preference, and Learning Strategy Preference

	Real-time				Off-line			
	Doing		Thinking		Doing		Thinking	
Variable	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.	Obs.	Exp.
Gender								
Male	95	90	60	72	80	78	50	45
Female	56	61	61	49	50	52	60	71
Race								
White	117	121	103	97	101	104	62	61
Non-white	34	30	18	24	29	26	14	15
Campus Location								
OSU-Tulsa	32	50	61	40	41	43	24	25
Stillwater	119	101	60	81	89	87	52	51
Classification								
Graduate	49	58	65	47	45	50	25	29
Undergraduate	102	93	56	74	85	80	51	47
Age								
20-25	108	98	63	78	86	84	52	49
Over 25	43	53	58	43	44	46	24	27
CPSP Quadrant								
1--Generator	51	27	5	22	24	23	6	14
2--Conceptualizer	1	17	0	14	18	15	37	9
3--Optimizer	7	26	11	21	34	22	30	13
4--Implementer	92	80	105	64	54	69	3	40
ATLAS Group								
Navigator	55	68	71	55	56	59	34	34
Problem Solver	41	39	21	31	37	33	23	19
Engager	55	44	29	35	37	38	19	22

A chi-square analysis was performed to determine if there was a significant relationship between the naturally occurring clusters and the age of the students (see Table 8). The participants were grouped by the four naturally occurring clusters and by the two age groups 20-25 and over 25. A significant relationship was found between the naturally occurring clusters and the ages of the students (χ^2 = 12.106, df = 3, p = .007). Among the younger students, there is a tendency to engage in Doing while the older students tended to engage in Thinking.

A chi-square analysis was performed to determine if there was a significant relationship between the naturally occurring clusters and the predominant CPSP quadrants of the students (see Table 8). The participants were grouped by the four naturally occurring clusters and by the four quadrants labeled Generating, Conceptualizing, Optimizing, and Implementing. A significant relationship was found between the naturally occurring clusters and the predominant CPSP quadrants of the students (χ^2 = 12.106, df = 3, p = .007). Among the real-time learners, there are more with Quadrants 1 and 4 predominant. This is consistent with Basadur's model which has Generating and Implementing as the quadrants which involve gaining knowledge by direct concrete experience. Among the off-line learners there are more with Quadrants 2 and 3 predominant. This is congruent with Basadur's model

which has Conceptualizing and Optimizing as the quadrants that prefer to gain knowledge by detached abstract thinking.

A final chi-square analysis was performed to determine if there was a significant relationship between the naturally occurring groups of problem solvers and the learning strategy preferences of the students (see Table 8). This was of interest to this researcher since the Epsilon value reported earlier for the relationship between preferred learning strategy and predominant problem solving tendency was worthy of further investigation. There appeared to be an affinity between the Navigator learning strategy and Implementation as a problem solving tendency. The participants were grouped by the four naturally occurring groups of problem solvers and by the three learning strategy preferences of Navigator, Problem Solver, or Engager. A significant relationship was found between the naturally occurring groups and the learning strategy preference as indicated by ATLAS grouping (χ^2 = 16.302, df = 6, p = .012). This indicates that among Engagers and Problem Solvers, there is a tendency to taking action while Navigators tend to think and engage in mental activity.

Summary

While no significant relationships were found between the naturally occurring groups and the gender or race of the students, significant relationships were found for several variables. These variables were the campus location,

classification, age, predominant CPSP quadrant, and preferred learning strategy.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Study

For the past four decades, society has encountered a period of turbulence that has been likened to being in permanent white water. The increased rate of change is unlikely to dissipate in the foreseeable future. This has caused challenges for organizations as they attempt to respond to this environment. Demographic changes and social changes such as the graying of the American workforce and the entry into the workforce of more women and minorities as well as technological changes such as the explosion of information available through the Internet and increased computing power have had major impacts.

Several major studies by organizations such as the Department of Labor, the American Society for Training and Development, and a consortium of academic and industry leaders in the United States and Canada have reported that there are several competencies needed by today's workers in order to survive and thrive in the world of permanent white water. These competencies include the ability to perform creative problem solving, to work effectively as members of teams, and to learn how to learn in order to maintain lifelong employability. The Association to Advance Collegiate Schools of Business International, which sets the accreditation standards for business schools, concurs with

the findings of these reports. Management students must learn to develop these competencies in themselves as well in people who will be working for them and with them.

The purpose of this study was to describe the problem-solving preferences and learning strategies of management students at Oklahoma State University. The sample consisted of 478 unduplicated management students at two campuses of Oklahoma State University in the Fall 2004 semester. This study used a descriptive design which included two online instruments. The Creative Problem Solving Profile (CPSP) Inventory was used to identify the students' preferred problem solving tendencies, and Assessing the Learning Strategies of AdultS (ATLAS) was used to identify the students' preferred learning strategies. Students who chose to make their data available for research also completed a short demographic survey that included age, gender, race, campus location, and classification as a graduate or undergraduate student. The demographical data were used to create a profile of the students. The data were analyzed using SPSS.

Summary of the Findings

Descriptive statistics were used to provide a profile of the 478 students who participated in this study. Measures of frequency and measures of central tendency were used to create this profile. The characteristics of the students are summarized below:

1. The participants in this study were made up of 60% males and 40% females, which exactly matches enrollment in the William S. Spears School of Business (SSB) at OSU.

2. Four-fifths of the participants were White.

3. Two-thirds of the participants were between the ages of 20 and 25.

4. Two-fifths of the participants in the study were classified as graduate students.

5. One-third of the participants were at the OSU-Tulsa campus while the remaining two-thirds were at the main Stillwater campus.

6. The urban campus at OSU-Tulsa had older students as both undergraduates and graduate students.

7. The urban campus at OSU-Tulsa had a higher proportion of graduate students than the Stillwater campus.

Using data from the Creative Problem Solving Profile, descriptive statistics were used to describe the problem solving preferences of the students. More than half of the students had a Implementing problem solving preference. Less than 20% were Generators. Another group that made up less than 20% of the sample were Optimizers, and just over 10% of the students had a Conceptualizing problem solving preference. The results of a chi-square analysis showed a statistically significant difference between the distribution of problem solving preferences among the study participants compared to the established norms for business students completing the CPSP with an unexpectedly high proportion of Implementors. A series of two-way chi-square tests were conducted to examine the relationship between

problem solving preferences and the demographic factors. No significant relationships were found between problem solving preferences and any of the demographic variables of gender, race, age, classification, and campus location.

Using data from ATLAS, descriptive statistics were used to describe the preferred learning strategies of the students. Almost half of the participants were Navigators while over one-third were Engagers and barely one-fourth were Problem Solvers. The results of a chi-square analysis showed a statistically significant difference between the distribution of preferred learning strategies among the study participants compared to the established norms for ATLAS with an unexpectedly high proportion of Navigators. A series of two-way chi-square tests were conducted to examine the relationship between preferred learning strategies and the demographic factors. No significant relationships were found between preferred learning strategies and gender and race, but significant relationships were found between preferred learning strategies and the demographic variables of age, classification, and campus location.

A chi-square analysis was performed to determine if there was a significant relationship between preferred problem solving style and preferred learning strategies. No significant relationship was found at the .05 level. For exploratory research such as this study, a probability level of $\underline{p}$ = .10 is sometimes used. The result of $\underline{p}$ =.08 from

this two-way chi-square analysis could be worthy of further exploration.

The multivariate statistical techniques of cluster analysis and discriminant analysis were used to determine if there were any naturally-occurring groups of problem solvers within the sample. A cluster analysis performed using the referent items from the Creative Problem Solving Profile Inventory revealed four groups of problem solvers. A series of three discriminant analyses were conducted to ascertain what differentiated between these four groups. The trait that separated the groups at the two-cluster level was a tendency to Learn by Doing or real-time learning as opposed to Doing After Learning or off-line learning. Within the cluster of real-time learners, another discriminant analysis was performed to discriminate between the two groups who prefer that mode of learning. A preference for either action or mental activity is what separates these two groups. Within the cluster that prefer off-line learning, another discriminant analysis was performed to discriminate between the two groups who prefer that sequence of learning. A preference for either Doing or Thinking is what separates these two groups.

Conclusions

> Assessment by management professor of learner's readiness to have andragogical principles inform the teaching-learning transaction can facilitate the transition from classroom student to self-directed lifetime learner.

The campus location and student classification revealed two types of students in the business program. Faculty members who encouraged their students to participate in this study agreed that their Stillwater students tend to be students who work while their students at OSU-Tulsa tend to be employees who study. With younger students at the Stillwater campus and more mature students at the OSU-Tulsa campus, it might seem more appropriate to apply andragogical principles to the OSU-Tulsa classes. However, Knowles (1980c) did not suggest that children and youth should be taught using a pedagogical approach with an andragogical approach being reserved for adults. Rather, he noted that a more andragogical approach might be used with children and youth "if youth education is to produce adults who are capable of engaging in a lifelong process of continuing self-development" (p. 58). In other words, the younger students should start being exposed to an andragogical approach in order to prepare them for their transition to being self-directed adult learners. In addition, Knowles (1980a) acknowledges that it may be appropriate to use a more pedagogical approach if the learners do not have basic knowledge on a certain topic or if there is a great deal of content to be covered in a short time.

It may be tempting to assume that the older students would appreciate, or perhaps even demand, an andragogical approach. However, even some of these adult learners may

have had earlier educational experiences that have had a negative effect on their self-concept as learners. It may be necessary for professors to provide more initial direction and support so that these learners can develop a more positive self-concept and sense of self-efficacy.

Students who are comfortable with the banking concept of education (Freire, 1997) in which they are relatively passive and receive deposits of knowledge from their teachers may initially resist becoming more active participants in their own learning. They sometimes state that they are paying for the teacher's services and expect the teacher to plan the learning activities and to organize the information for them. They want PowerPoint handouts made available so that they have material to review before an exam without having to make the effort to take notes. They like having materials available on the course website so that they can access them at their own convenience rather than having to attend class. However, this apparent passivity may be a response to the hours spent in large lecture halls taught by professors who focus on transmittal of content in a lecture format and do not allow for much interaction and experiential learning. The Net Generation students who enter college in this new millenium are reported to favor constructing their own knowledge through first-person learning rather than having it interpreted for them (Oblinger & Oblinger, 2005b). It would be appropriate

to point out to them that they will need to be lifelong learners in their future and that there will not always be a teacher who lays out their learning objectives, schedules their learning activities, and evaluates their progress. Even young college students who are not yet filling adult roles in society often express a desire to be treated as adults. They often perceive that as the freedom of being away from home and not living under the supervision of parents. Part of their learning could be becoming aware of the strategies and responsibilities that go along with being treated as adult learners.

Problem Solving Styles

Business students are action oriented.

> Without additional training in problem solving, management students will lack the necessary skills to perform all the steps necessary to build a solid foundation for their actions.

The great majority of management students, whether graduate or undergraduate, are Implementers. When it comes to problem solving, students who are drawn to management classes tend to focus on getting things done. Often this is done by trial-and-error rather than by thinking things through or even having a complete understanding of the problem or possible alternatives. They may fail to complete many steps of the problem solving process, such as recognizing an opportunity or a problem, clearly defining the problem and its scope, generating an adequate number of potential solutions, selecting the best option from among

those alternatives, creating a detailed plan to implement the change, and gaining acceptance of the plan they have selected.

Since so much work in the business world depends on teamwork, management students must learn to value diversity in problem solving styles. Classroom teams should be created with this aspect of diversity in mind so that the team is well-rounded and all steps of the creative problem solving process will be addressed. Students should learn how to recognize and deal with friction among team members that may be caused by differences in problem solving style. Members of the Net Generation are social creatures who like to work collaboratively and in teams (Brown, 2005; Kvavik, 2005; Lippincott, 2005; McNeely, 2005; Oblinger & Oblinger, 2005b; Ramaley & Zia, 2005), so increased self-awareness may enhance this process. Instrumented learning can provide insights that improve self-awareness. Awareness of the problem solving preferences of themselves and others can be facilitated through the use of learning instruments such as Basadur's Creative Problem Solving Profile Inventory.

These management students tend to have a dominant Implementing problem solving style. That quadrant is bounded on one side by Evaluation and on the other by Experience. Although the students' highest scores are on the Experience scale, their second highest scores are on the Evaluation scale, which involves judgment. What makes this

ironic is the students' tendency to lean toward using judgment in spite of recent research that shows that judgment is the last stage of brain development, and many of these students have probably not completed that stage of development.

Conventional wisdom held that the brain "stopped growing at around 18 months and that neurons were pretty much set for life by age 3" (Bowman, 2004, ¶ 4). Several prestigious organizations such as the American Bar Association, National Institute for Mental Health, the National Institute on Alcohol Abuse and Alcoholism, Harvard Medical School, the University of California at Los Angeles, the Brain Behavior Laboratory at the University of Pennsylvania, and the National Institutes of Health have recently weighed in on this matter. The context in which much of the recent work was done was the debate about whether teens should be eligible for capital punishment. However, this has implications for other contexts such as education, mental health, and substance abuse (Breyer & Winters, 2004). Several studies using anatomic dissections and various types of brain scans such as functional magnetic resonance imaging (MRI) have recently shown that adolescent brain functioning is significantly different from that of adults (Beckman, 2004; Bowman, 2004; Ortiz, 2004) . The frontal lobe "doesn't begin to mature until 17 years of age" (Beckman, 2004, p. 596) according to Ruben Gur, a

neuroscientist and director of the Brain Behavior Laboratory at the University of Pennsylvania. In particular, the prefrontal cortex, which is responsible for judgment is one of the last areas to mature (Breyer & Winters, 2004). The exact age at which this happens is not known and varies from person to person. Some scientists claim that "growth maxes out at age 20" (Beckman, 2004, p. 596). Other think it occurs even later.

> The evidence now is strong that the brain does not cease to mature until the early 20s in those relevant parts that govern impulsivity, judgment, planning for the future, foresight of consequences, and other characteristics...indeed, age 21 or 22 would be closer to the "biological age of maturity. (Ortiz, 2004, p. 2)

Some scientists propose setting the age of legal majority at 22 or 23 (Bowman, 2004). "Others, such as Jay Giedd of the National Institute of Mental Health (NIMH) in Bethesda, Maryland, consider 25 the age at which brain maturation peaks" (p. 596). In any case, very recent scientific research indicates that judgment is not fully developed in traditional-age college students. Other recent research (Kruger & Dunning, 1999) indicates that they are likely to be unaware of this lack of judgment. This empirical research consisted of four studies and the title of the article published in the American Psychological Association's Journal of Personality and Social Psychology effectively summarizes the findings. The title is "Unskilled and Unaware of It: How Difficulties in

Recognizing One's Own Incompetence Lead to Inflated Self-assessments." These studies found that incompetent individuals are lacking the metacognitive, metamemory, metacomprehension, and self-monitoring skills to be able to evaluate either themselves or others with respect to "how well one is performing, when one is likely to be accurate in judgment, and when one is likely to be in error" (p. 1121). Perhaps not coincidentally, the four studies that make up this empirical research used undergraduate students at Cornell University as participants. Undergraduate students typically are below the age at which brain maturation is believed to occur.

Perhaps as these management students mature they will be more able to use different problem solving techniques. This maturation effect has been noted with Kolb's Learning Style Inventory (LSI). The User's Guide to Kolb's Learning Style Inventory contains a discussion of the three predictable stages of the maturation process (Smith & Kolb, 1986). People can be embedded or stuck in a particular pattern. During the period from birth through adolescence, children are in the Acquisition stage in which they "acquire the basic abilities to learn concretely, actively, reflectively, and abstractly" (p. 18). Throughout their formal education or career training, individuals enter the Specialization stage. This second stage continues through early adulthood, both in work and personal life.

> In this stage, development primarily follows paths that accentuate an individual's particular learning style. Competence in adaptation style is increased, allowing the person to meet the demands of his or her chosen career path. For example, a young man or woman in this stage choosing a degree in engineering will, by virtue of that career choice, become a specialist in convergent learning skills. (p. 18)

When people are at the midpoint of their careers, they finally enter the third stage of Integration. During this stage, an individual "begins to express non-dominant or non-preferred styles and skills. Until now, he or she suppressed other means of adapting to the world in favor of the more highly rewarded, dominant learning style" (Smith & Kolb, 1986, p. 18). The impetus for this evolution may be that employees reach a point in their careers, such as moving from a technical job to a managerial position which requires more diverse skills. Development is marked by increasing complexity in dealing with the world and one's experiences.

Kolb's research using the LSI shows that people whose career field of study is business (which in his view excludes accounting and information systems) are Convergers, which means they focus on arriving at a single best solution to a question or problem (Smith & Kolb, 1986). Their dependence on convergent learning means that they may be premature in defining problems and making decisions. This is also a problem for Implementers, as identified by the Creative Problem Solving Profile. As Basadur (2003) has observed, employees at lower levels of an organization tend

more toward implementing decisions and plans devised by others. As they rise to higher levels within organizations they must learn to conduct opportunistic surveillance of the environment in order to search out problems and opportunities, to generate several viable alternatives, and to choose the optimal solution from among those alternatives and plan the implementation. This has implications for these university students who are studying management. Their tendency toward taking action may serve them well as they begin their careers and are still implementing the decisions and plans of upper management. However, if they hope to rise to higher levels within their organizations they must develop their capabilities in the other areas of problem solving or surround themselves with people who have strengths in those areas.

Learning Strategies

> Management students like to plan their learning and organize their resources.
>
> Without additional training in learning strategies, management students will lack a variety of learning strategies to use as self-directed lifelong learners.

When it comes to learning, students who are drawn to management classes tend to be very results-oriented and are more comfortable with structure and organization. With almost half of the management students preferring to use Navigator strategies, it is easy to predict what makes them comfortable in the classroom and what makes them uncomfortable. These are learners who like to make a plan

and stick to it. They are likely to have programmed exam dates and the due dates for assignments into their Palm Pilots when they received the syllabus at the beginning of the semester, and they do not like changes to the schedule. Few of the management students are Problem Solvers. They are not interested in creating many alternatives or choosing an optimal solution from among the alternatives. They tend to want the teacher, who is viewed as the expert, to tell them exactly what to do. For example, they want the teacher to specify how many pages a paper should be, and how many references it should have.

Although ATLAS is a useful tool to determine learners' preferred learning strategies, what are the responsibilities of teachers with respect to accommodating those preferences? Should we try to match educational treatment and learners' characteristic styles?

> While a prolonged mismatch is clearly undesirable, some educators feel a responsibility to expose learners for short periods to instructors, approaches, environments, and methodologies that are not in line with learners' preferences and strengths. Some feel that this will help people to accommodate (i.e., to develop flexibility); there is evidence that higher levels of learning style flexibility accompany higher achievement levels (Kirby, 1979). Others feel that deliberate mismatching may help to foster creativity in learning and problem solving. (Smith, 1982, p. 71)

Although half of the management students in this study were Navigators, the remaining half consisted of Problem Solvers and Engagers. It may seem overwhelming for a professor to take into account these various preferences for

learning strategies. The developers of the ATLAS instrument have devised a lesson plan template that contains guidelines for creating lesson plan components that address the preferences of Navigators, Problem Solvers, and Engagers (Kolody, 2004; Kolody & Conti, 2004). The template uses a different variation of the acronym ATLAS to identify various parts of the lesson: Attention, Teaching content, Learner involvement, Assimilation, and Specific application. The first three steps of this five-step process (Attention, Teaching content, and Learner involvement) provide a teaching strategy for each of the three preferred learning strategies while the last two steps of the process (Assimilation and Specific application) provide useful strategies for all learners.

Attention is addressed in the introduction to the lesson. Teachers are urged to be aware of the importance of the very beginning of the lesson because this is a time to focus the attention of the students on the content and encourage them to implant this content in long-term memory. Stimulating the students' curiosity and creating activities in the affective domain creates an emotional connection with the lesson. "As 'Attention' is one of the major learning strategies preferred by Engagers, effective practitioners immediately fulfill a fundamental need of the Engagers in the classroom by launching the lesson with an engaging activity" (Kolody & Conti, 2004, p. 3).

The next step, Teaching content, addresses the delivery of the content material. Kolody and Conti (2004) urge teachers to avoid "a simple, passive lecture" (p. 3) but rather to select an interactive and effective delivery mode. One important aspect of the choice of delivery mode is how effective it is in helping the learners organize the material in their own minds and notes. It is also important that the content be presented in a way that enables learners to recognize patterns within the content and organize information into chunks in order to enhance the retrieval process from memory. These factors are especially important to enhance the learning experience of Navigators.

> As Navigators indicate a strong preference for material being delivered in a structured format, it is during this step that practitioners best meet Navigators' needs. Providing additional structure with clearly defined objectives and expectations also reduces Navigator frustration and enhances learning success. When Navigators know what is expected of them in a learning situation, they then plan their learning schedule according to the deadlines and the final expected results. (Kolody & Conti, 2004, p. 3)

The third step of the ATLAS delivery model, Learner involvement, calls for students to work as individuals or small groups in experimental and experiential learning. This step recognizes the complexity of real-world problems and allows students to practice critical thinking by "envisioning the future, identifying and challenging assumptions, brainstorming, ranking the order of alternatives, and identifying alternate solutions" (Kolody & Conti, 2004, p. 3). These activities are some of the steps

of Basadur's creative problem solving process that are not natural strengths of many management students, especially the Navigators. However, Kolody and Conti report that "Problem Solvers become especially animated during this phase" (p. 4)

The fourth step of the ATLAS delivery model is Assimilation, during which the learner reflects upon the learning experience using reflective journals or some other form of reflection. This period of reflection can cause the lesson content to be committed to long-term memory and become part of the learners' value systems. "Reflective practice is an effective means of developing resilient recall abilities for all three learning strategy preference groups" (Kolody & Conti, 2004, p. 4).

The final step of the five-step process is Specific application. This step is also important for all three learning strategy preference groups, because this is the point at which learners are encouraged to apply their newly acquired knowledge in real-life situations (Kolody & Conti, 2004). Although this is important for all learners, it may come more easily to Realtime Learners than for Off-line Learners who are comfortable in an institutional setting and prefer to defer acting on what they have learned.

Problem Solving Styles and Learning Strategies

> Management students tend to set a course of action without clearly defining the problem and generating alternatives.

Although there is not a strong significant relationship between learning strategy preference and preferred problem solving style for each student, most management students have an affinity for taking action, getting things done, and getting results. Almost four-fifths (78%) of the participants are either Implementers or Navigators, which means they tend toward action. Most management students do not enjoy contemplation or generating alternatives of possibilities. Although the findings of this study did not find a strong significant relationship between learning strategy preference and preferred problem solving style, there was evidence of an affinity between the Navigator learning strategy and the problem solving preference for Implementation. More than one quarter (27%) of the participants have a double dose of these tendencies because they are Navigators when it comes to learning strategy preferences and Implementers when it comes to problem solving. This indicates a strong propensity for taking action without much interest in identifying and clearly defining a problem or opportunity, generating several viable alternatives, selecting the optimal solution from those alternatives, and creating a plan of action. My late father described this as a tendency or perceived need "to do something, even if it's wrong."

A management teacher can use instruments such as ATLAS and the Creative Problem Solving Profile to help students identify which steps they tend to skip. Since teams are

used in so many management classes, teams could be formed intentionally to provide diversity of learning strategy preferences and problem solving preferences. Students could learn to appreciate the contribution of those who approach things differently than they do and perhaps learn from fellow students who have different preferences.

Natural Groups of Problem Solvers

> Management students have differing time orientations regarding when they plan to put to use what they have learned.
>
> There are four naturally occurring groups of management students: Real-time Doers, Real-time Thinkers, Off-line Doers, and Off-line Thinkers.

Although the Creative Problem Solving Profile Inventory identifies four problem solving preferences that differentiate among people based on how they prefer to gain knowledge and how they prefer to use knowledge, management students predominantly use the Implementor style. Basadur's instrument was developed based on theoretical constructs and attempts to fit people into these artificially created quadrants. This study went beyond this by using multivariate statistical procedures to examine the preferred styles of several hundred people and determine commonalities. Cluster analysis was used to see what natural groups occurred and then discriminant analysis was used to determine what differentiated among these groups. Examination of the structure matrix indicated that there may be temporal aspect that separates groups of problem solvers:

some prefer to use knowledge at the same time they are acquiring it while others prefer to defer performance.

It may be that real-time learners, those who prefer to learn while actually performing, may have an easier time transitioning to the type of learning that will occur once they begin their careers. They will be good candidates for on-the-job training, just-in-time learning, and an andragogical approach which recognizes their desire to learn what they need to know in order to solve problems as they arise in the workplace. However, their preference for immediate action may result in a lack of reflection and self-monitoring that comes with reflection. This, in turn, will compromise the quality of their performance.

Off-line learners, who prefer to defer performance and learn in a setting removed from the real world, may have a more difficult time adjusting once they enter the business world. Once they are engaged in their careers, most will no longer have the luxury of deferring performance – they will be expected to put to use what training the company provides for them or what they have learned on their own. Instead of having a course catalog and advisors to determine what they need to study and teachers who plan and structure the learning activities and evaluate the outcome, these learners will be forced to diagnose some of their own training needs and participate in self-directed learning.

Whether they are real-time or off-line learners, some are Doers who prefer active hands-on learning while others

are Thinkers who prefer cognitive processes. Regardless of this preference, these individuals could be helped by being aware of the value of instrumented learning to diagnose their strengths and weaknesses. In order to meet the needs of these various groups, management professors can create a mix of teaching strategies that are tailored to their strengths so that the students are in their comfort zones part of the time but when they are also forced to stretch themselves part of the time and learn to deal with that discomfort. Teachers could include experiential and interactive learning activities for hands-on learners who prefer to learn by doing. Teachers can also provide guidance for learners who prefer a more cognitive type of learner by pointing them at references and materials that they can read and study. There are many venues for this to occur in addition to the traditional textbook. A class web page can contain links to additional readings or web sites that students can explore in order to construct their own learning (Oblinger & Oblinger, 2005b). It is not necessary for a teacher to be able to code HTML in order to create such a class web page; a course management system such as WebCT or Blackboard can make this task achievable even for teachers without a high level of technical proficiency.

Business exemplars can be identified for these four naturally-occurring groups: Fred Smith, Alan Greenspan, Ted Turner, and Steve Jobs (see Figure 13). Fred Smith, founder of Federal Express, is an example of an Off-line Doer.

Smith conceived the idea of a hub-and-spoke overnight delivery system while a student at Yale (Biography: Frederick W. Smith, 2005). When he wrote a paper for a class explaining the idea, the professor said it was unworkable and gave him a grade of C. After graduation and serving two tours of duty in Vietnam, Smith eventually put his plan into effect and founded Federal Express. Thus, Smith is an example of someone who plans to put his problem solving skills to use in the future, but his approach is to think out the solution rather than using trial-and-error.

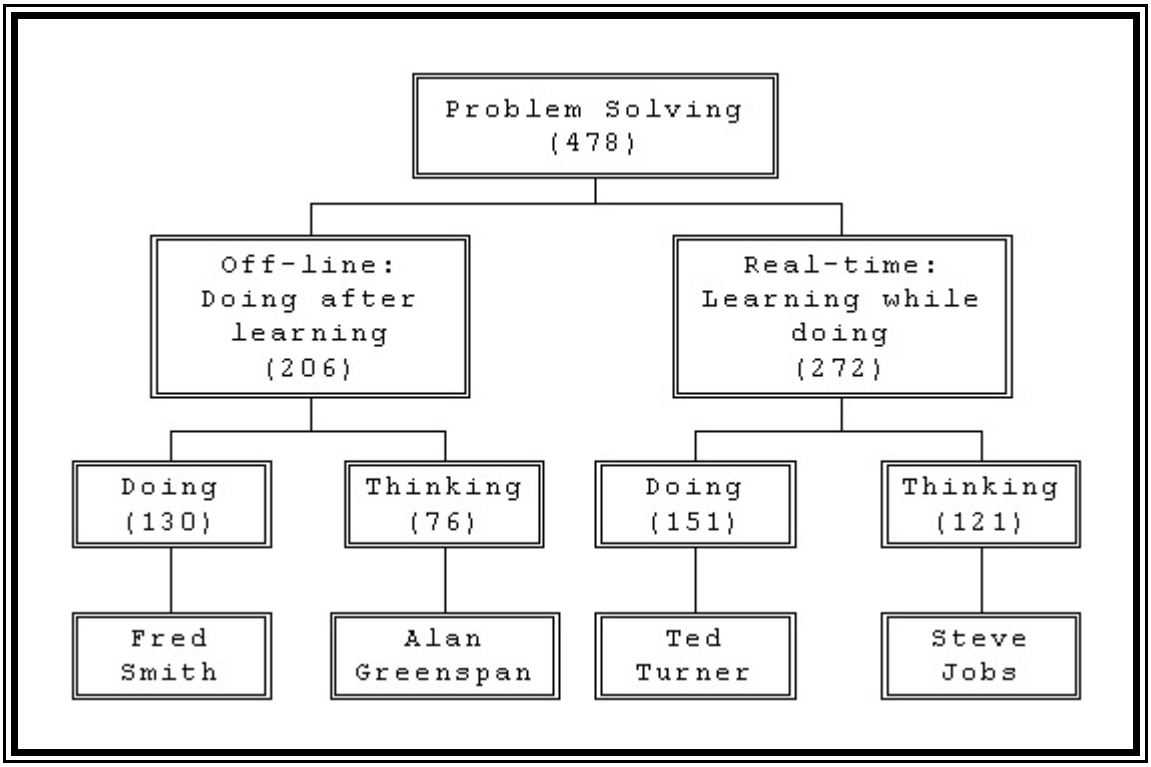
Alan Greenspan, the former Chairman of the Federal Reserve, is an example of an Off-line Thinker. He has three degrees in economics and honorary degrees from several prestigious universities. Greenspan's career has been exclusively in positions as consultant, advisor, and chairman of various councils and commissions (Alan Greenspan, 2006). According to reports, he does most of his work while soaking in the bathtub each morning. This contemplative work involves setting direction for the American economy in order to promote economic growth and control inflation. Thus, Greenspan exemplifies a person who uses Thinking and who plans to have an effect at a future time.

Ted Turner, media mogul, is an example of a Real-time Doer. Since 1970 his career has spanned business, entertainment, and sports. Turner is known for launching CNN as the first 24-hour all-news network and several other

networks as part of the Turner Broadcasting System. After the merger of AOL and Time Warner, Turner was the vice chairman of the world's largest media company. This sportsman not only owned the National Basketball Association team Atlanta Hawks and the Atlanta Braves baseball team, but he also was the skipper of the boat that won the America's Cup in 1977. "You need to be taking some risks," says Turner. "I was always buying and expanding" (Ted Turner, 2006, ¶ 4). Thus, Turner is a Real-time Doer.

Steve Jobs, co-founder and chief executive officer of Apple and Pixar (Steve Jobs, 2004), is an example of a Real-time Thinker. Jobs is a visionary thinker whose inventions are on the cutting edge of technology. However, he has the reputation of allowing his visionary thinking to compromise business operations. This was evidenced by his being removed by the board of directors from the company he started. Although he has founded several companies and invented several innovative technologies, he operates in his head rather than dealing with the practical issues of the workplace. He has openly discussed his use of the mind-altering drug LSD and wanted to hire workers with the same mindset. Thus, Jobs stays on the cutting edge of technology as a Real-time Thinker.

Figure 13. Processes That Separate Four Naturally-Occurring Groups.



Recommendations for the Classroom

Instrumented learning can be used to prepare students for their futures. Just as a syllabus for a class or an agenda for a meeting or training session can provide scaffolding to anchor the knowledge of the participants, instruments such as ATLAS or CPSP can act as scaffolding for learners' development of metacognitive skills or problem solving skills. This scaffolding can help these students in management classes to transition from being students in a teacher-centered classroom to becoming self-directed learners who will engage in lifelong learning to ensure lifelong employability.

Management students face a turbulent business environment and the rapid changes associated with permanent white water. They need to develop the competencies identified by academic, business, and governmental organizations and agencies. Those competencies include creative problem solving, being able to work as members of a team, and learning how to learn in order to be lifelong learners. If management professors and students can become aware of their own preferences regarding problem solving and learning as well as the preferences of the other participants in the teaching-learning transaction, they may have a positive impact on the learning experience. The Creative Problem Solving Profile (CPSP) Inventory and Assessing the Learning Strategies of AdultS (ATLAS) learning instruments can increase the self-awareness of individuals about their problem solving and learning strategy preferences.

Problem Solving Styles

Management students must develop some competence in all aspects of problem solving in order to succeed in the business world. The Creative Problem Solving Profile and Basadur's work shows that each individual has some preference for each of the four quadrants, but it is noteworthy that more than half (53%) of the management students in this study have a dominant tendency in Implementing (Quadrant IV). These students may need some help in developing their skills in the other aspects of problem solving, namely Generating

(Quadrant I), Conceptualizing (Quadrant II), and Optimizing (Quadrant III). These are some specific techniques and tactics that management professors could adopt in order to expand the skills of their students. Some of these are based on Edward de Bono's work on lateral thinking. Peterson and Lunsford (1998) concluded that the Six Thinking Hats technique was useful in management education. This technique can also be used to improve the creative problem solving process.

Generating consists of the first two steps of problem solving, namely Problem Finding and Fact Finding (Basadur, 1994). In order to facilitate student skills at Problem Finding, which involves "sensing, anticipating and seeking out problems, changes, trends, needs and opportunities for improvement, inside and outside the organization" (Basadur, 1995b, p. 59), management professors might have students practice opportunistic surveillance in their area of interest. Students could be encouraged to scan the environment by attending trade shows and conferences in order to network with others in the same industry; reading trade magazines, practitioner and scholarly journals, as well as the works of futurists; and talking to customers. Even while still in school students could practice asking customers or workers in their industry questions that would allow them to create a "bug list" (a list of problems or things that "bug" them about a product or service), or a "burr list" (things

that are a “burr under the saddle” of customers or workers)(Cougar, 1995).

An academic setting is a natural environment for students to learn skills related to Fact Finding, which involves gathering information without making premature judgment. Professors can encourage students to hone their academic research skills, including evaluating the factualness of various resources that students tend to depend on nowadays such as Googling on the Internet. Specific tactics that students could practice include de Bono’s use of White Hat thinking.

Although White Hat thinking precludes interpretation and opinion, it may be useful to allow some time for Red Hat Thinking, because feelings may seem like facts to these students. An exercise such as a sensory stretch may give some richness that allows them to separate feelings from facts. A sensory stretch exercise uses all five senses to create questions about the issue that is being explored. For example, a teacher could prime the students by asking questions such as “What color is Monday?” “What does the sun taste like?” or “What does success sound like?” This priming may be necessary to get business students who are not known for their creativity used to thinking this way. Once the students are used to responding to this type of question, the questions could address the topic at hand. Management students could be asked, “What does organizational change sound like?” Students in a Human Resource class might be

asked, “What does discrimination sound like?” or “What color is sexual harassment?” The responses to these questions may help students identify emotional responses toward or feelings about the topic in question. A teacher might get some useful insight into the students’ perceptions by asking, “What does this class feel like?”

Conceptualizing consists of the next two steps of Basadur’s eight-step problem solving method, namely Problem Defining and Idea Finding. In order to facilitate student skills at Problem Defining, which involves composing a clear insightful statement of the problem with an appropriate scope, management professors could provide opportunities for students to write problem statements. These statements could be evaluated by professors and other students, and then the writers could continue to refine them until they are acceptable. Idea finding could also be incorporated as a classroom or group activity using de Bono’s Green Hat thinking or some other brainstorming or free association technique.

If students find it challenging to brainstorm without prematurely criticizing their own ideas or the suggestions of others, one tactic to try is brain writing. Using this method students can work independently to write one or more ideas which are then presented to the group. This is an important skill to develop among this group of students. Study findings showed that few participants have preferences that involve generating alternatives; less than 12% of

management students in this study prefer Conceptualization, and barely 25% of the participants prefer Problem Solving as a learning strategy. Therefore, they must guard against the tendency to quit generating alternatives as soon as they come up with one feasible possibility (Basadur & Thompson, 1986). Pushing themselves to keep coming up with ideas, even to the point of seeming silly, may move them toward more creative thinking.

Optimizing consists of the next two steps of Basadur's eight-step problem solving method. The first of these steps, Evaluating and Selecting, involves "converting selected ideas into practical solutions" (Basadur, 1995b, p. 58). Several tactics can be used in the classroom in order to facilitate student learning about Evaluating and Selecting. Students could practice three of de Bono's thinking hats: Yellow Hat thinking which is optimistic and positive, Black Hat thinking which is gloomy and negative, and Red Hat thinking which provides the emotional view (de Bono, 1985).

There are some chart or graphic organizer techniques that students could be taught to enhance their Evaluation and Selection skills. The first of these is a PMI Chart (de Bono, 1992), which can be filled out to include the Plusses, Minuses, and Interesting things (or Implications) related to an idea, topic, or decision under consideration. This chart allows individuals or teams to organize their thoughts about making a decision, to list pros and cons of an alternative, and compare the advantages or disadvantages of an action.

Another tool that students could practice developing is a decision matrix or weighted criteria matrix. An individual or team first creates a list of options and then creates a weighted criteria matrix that assigns a priority or level of importance to each criteria by determining a relative weight to each of the criteria that will be used to evaluate the options (Tague, 2005). Free templates for PMI charts and decision matrices can be found on the Internet.

The second step within the Optimizing quadrant is Action Planning, which entails "creating specific action steps that will lead to successful implementation of a solution" (Basadur, 1995b, p. 59). Several tools are already taught within business courses that can strengthen students' skills in this area. They may typically be taught in an Operations Management class or Project Management class, which may be found within a management department or might be a core body of knowledge course for all business students. These tools include Gantt charts, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), as well as Work Breakdown Structures (WBS). A Gantt chart is a bar chart that shows the timing of tasks and activities within a project (Hoffer, George, & Valacich, 1999). CPM is a network model for project management that uses a fixed time estimate for each activity (Hoffer, George, & Valacich, 1999). PERT is a network model that introduces more complexity by allowing for randomness in activity completion times (Hoffer, George, & Valacich, 1999). A WBS is a hierarchical tree

structure of deliverables that must be accomplished and tasks that must occur for successful completion of a project (Haugan, 2002; Pritchard, 1998). Free templates for many of these tools can also be found on the Internet.

Implementing consists of the final two steps of Basadur's eight-step problem solving method, namely Gaining acceptance and Taking action.

> Gaining acceptance means understanding that even the best ideas and plans can be scuttled by resistance to change. Someone skilled at gaining acceptance creates ways to show people how a particular solution benefits them, and how possible problems with the solution can be minimized. (Basadur, 1995b, p. 59)

In order to facilitate student skills at Gaining acceptance, students must become politically astute, able to recognize the stakeholders and decision makers involved in or affected by a project. They could learn to develop an Entity Relationship Diagram in order to identify the stakeholders both within and outside of the organization (Hoffer, George, & Valacich, 1999). These students may also need to learn to apply marketing or psychology principles in order to understand what influences people. Learning to identify a sponsor or champion for a project would also be useful. An understanding of change management is also necessary so that they can understand why people resist change.

It may appear that the final step of the creative problem solving process, Taking Action, should come naturally to these students since so many of them prefer Quadrant IV (Implementation). However it is still useful for them to

learn tactics to accomplish this in a disciplined manner so that they are not driven "to do something, even if it's wrong." They could learn in the classroom how to write SMART goals so that they will learn to evaluate whether their problem solution has been successful. Although different writers may choose slightly different words for this acronym, in general SMART goals are those that are Specific, Measurable, Achievable, Relevant, Time-specific. Having rewards linked to the achievement or certain milestones or goals can provide structure to this Action taking step, whether those rewards are grades or some other measure of success.

Even after they complete these eight steps, these students must then be reminded that they are not finished; the problem-solving model is circular and the next step is to start again at the beginning to look either for problems created by what has been implemented or for new opportunities that have arisen. This is important since students have limited experience with projects, and even semester-long projects are finished at the end of 16 weeks. This is as unrealistic in the real world as an hour-long television show in which the drama is neatly resolved in 60 minutes minus the time for commercial breaks.

Learning Strategies

Although there is debate whether teachers should attempt to match the learning styles of their students all of the time, match them some of the time, or try to change the

learning styles of their students, there is some consensus that "competent people have a large repertoire of strategies" (Brandt, 1988/1989, p. 2). To that end, teachers may need to explicitly teach learning strategies to their students rather than assuming that they have developed them as they proceeded through their schooling. Even the teachers themselves may question the feasibility of this suggestion since members of the business faculty at the university level are hired based on their subject matter knowledge and research record and typically have not taken any education classes. The AACSB has recognized this challenge and has begun offering professional development for business professors in order to help them better facilitate the teaching-learning transaction. This professional development focuses not only on instructional strategies and techniques, but also focuses on how learners learn and the interaction between teacher and learner. The first offering of this professional development received such an overwhelming response that the AACSB has decided to hold its own Conference on Learning in June 2006.

In addition, the faculty might well be concerned about how time consuming it would be to tailor their teaching approaches to each individual's preferred learning strategy and the time this would take away from teaching course content and research requirements. This concern could be assuaged by use of a speedy self-scoring learning instrument such as ATLAS which places individuals into groups of

learners. These groups of Navigators, Problem Solvers, and Engagers share certain tendencies and preferences.

Navigators. Since almost half (45%) of the management students in this study preferred the learning strategies labeled Navigators, it would be useful to examine both how to tailor the teaching-learning transaction to those preferences, how to encourage them to develop other strategies, and how to develop those strategies for students who are not primarily Navigators. In order that Navigators will be comfortable part of the time, teachers could provide the structure that increases the comfort level of Navigators. This could include such techniques as making assignments and due dates early in the semester so that Navigators can get the important dates on their calendars. By the end of the first week of the semester, Navigators have often identified the times during the semester when they have exams and major projects or papers due so that they can plan their other activities accordingly. Having a teacher who tries to avoid making a change in these dates or the order of the assignments will help these students who like to plan their work and work the plan (Ghost Bear, 2001). Navigators appreciate having course information and documents available on a course web page (Ausburn, 2004). Teachers can also help Navigators identify human or other resources that might enhance their learning. Management teachers could also provide a resource checklist of items that students should bring with them to class although Navigators are usually the

students who bring their textbooks, multiple colors of highlighters, pens, staplers and hole punches.

In order to help Navigators learn to adapt to less structured modes of learning, teachers could explicitly state that some ambiguity may occur intentionally in assignments to realistically reflect the complexity and ambiguity of real-world problem-solving (Pina e Cunha, Vieira da Cunha, & Cabral-Cardoso, 2004). Navigators may need to be reminded to practice their Green Hat thinking and not stop seeking alternatives as soon as one has been identified. Navigators may need to be explicitly taught to try to answer complex open-ended questions rather than simple objective true-false or multiple-choice questions that typically have just one right answer.

Helping students who are Problem Solvers or Engagers to learn some Navigator strategies could involve teaching them how to create a task list, create a semester plan listing important dates on a paper calendar, a personal digital assistant such as a Palm Pilot, or an electronic calendar within Outlook or on a course management system such as Blackboard or WebCT. Management teachers could also provide a resource checklist of items that students should bring with them to class because it may not occur to Problem Solvers or Engagers to bring supplies to class. Engagers, for example, may not bother to purchase the textbook until they decide that the class is interesting enough to remain enrolled.

Engagers. Since almost one-third (29%) of the management students in this study preferred the learning strategies labeled Engagers, it would be useful to examine both how to tailor the teaching-learning transaction to those preferences, how to encourage them to develop other strategies, and how to develop those strategies for students who are not primarily Engagers. In order that Engagers will be comfortable part of the time, teachers could remember that Engagers operate out of the affective domain and use teaching strategies that increase the comfort level of Engagers. A relationship with the teacher is often important to Engagers as is having a professor who approaches the teaching-learning transaction as a partner in learning rather than a remote, authoritative figure. Relationships with their fellow students are also important to Engagers, so they often like group projects. A professor could incorportate some team-building activities to get the group started.

Teaching strategies tailored to Engagers could include such techniques as letting students pick a topic or aspect of a topic that they care about to explore within the scope of the course. If students cannot pick a topic, the teacher might invest some of the lesson planning time in developing an interesting hook to draw the students in and help them to engage. Even providing information about assignments has been found to help Engagers determine whether it is worthwhile undertaking that learning activity (Ausburn, 2004). Since Engagers like to have fun while learning,

teachers could plan small rewards or celebrations when goals are achieved or milestones are met. In order to help Engagers learn to adapt to other learning strategies, teachers could work with them on time management issues such as scheduling and creating milestones that may encourage them to start projects or assignments in a timely manner rather than just waiting until they become interested.

Helping students who are Problem Solvers or Navigator to learn some Engager strategies could involve encouraging them to experience some of the joy of learning rather than focusing exclusively on a grade or evaluation. Students who learn to have fun as they learn may be able to be less driven and prone to burnout. Benjamin Zander has learned some ways to help learners develop the joy of learning. Zander, Conductor of the Boston Philharmonic, also teaches at The New England Conservatory of Music. When he found students so consumed with anxiety about grades that they could not perform creatively as musicians, he adopted a new strategy in which he awards each and every student a grade of "A" at the beginning of the term. He then enters into a learning contract with each student by having each of them write him a letter dated at the end of the term explaining what that individual did to earn the "A" (Zander & Zander, 2000). His teaching has had such a powerful impact on the lives of many people beyond the musicians at The New England Conservatory of Music that he now travels the world speaking to business organizations and managers as well as the general public

about his methods. Zander enters into relationship with those who learn from him by making himself available to hosts of people on his website (www.benjaminzander.com). The website contains a section called The Conversation Room which has areas devoted to general discussion, student discussion, correspondence, and Ben's journal. Even people who heard him speak in a large public venue consisting of thousands of people can feel as though they develop a more personal relationship with him. Developing a relationship with the teacher may help Navigators and Problem Solvers realize the potential of the teacher as a learning resource.

Problem Solvers. Approximately one-quarter (25%) of the management students in this study preferred the learning strategies labeled Problem Solvers. Teachers should recognize that Problem Solvers like to look at things in more than one way, and they should be patient and try to keep a sense of perspective as Problem Solvers question or challenge the status quo. In order that Problem Solvers will be comfortable part of the time, teachers could adopt some teaching strategies that would increase the comfort level of Problem Solvers. Problem Solvers like stories, so teachers could share some of their stories and personal experiences. These teachers could allow experimentation and create opportunities for experiential learning so that Problem Solvers could explore various possibilities. If teachers avoid limiting the assessment of learning to just true-false or multiple-choice questions, the students who are Problem

Solvers will enjoy open-ended questions and problem solving activities (Conti & Kolody, 2004). Problem solvers have indicated that they appreciate having some structure imposed on them (Ausburn, 2004). This "may represent recognition of their own tendency to stray off-task and a need for guidance in reaching required goals in a formal learning situation" (p. 11).

In order to help Problem Solvers learn to stretch themselves, teachers could plan activities that help learners move beyond generating alternatives, or Green Hat thinking. Teachers should also realize that Problem Solvers have a strong sense of self-efficacy. This could be a challenge if it is an unwarranted self of self-efficacy, which has been shown to occur in traditional age students (Kruger & Dunning, 1999). Teachers should attempt to help these students assess when this is the case while being careful not to so damage their self-esteem that it affects their ability to learn.

Helping students who are Navigators or Engagers to learn some Problem Solver strategies could involve teaching them that good problem solving requires coming up with more than one possible alternative. Problem Solvers seem to naturally excel at creating many alternatives while the seeming inability to do this is a problem for many Navigators and Engagers. A specific technique that could be used for these students is Green Hat thinking or brainstorming. They might learn from participating in free association exercises with Problem Solvers. Offering open-ended questions and

problem solving activities would also encourage them to stretch themselves and move beyond their comfort zone.

Problem Solving Styles and Learning Strategies

Teachers should recognize the possible interplay of problem solving style and preferred learning strategy. This study has shown that there is an affinity between the Implementor problem solving style and the Navigator learning strategy. If a student is both a Navigator and an Implementer, that student may want to make a plan and take action without really defining the problem or its scope or identifying possible alternatives. If a student is both a Problem Solver and a Conceptualizer, that student may spend so much time generating ideas and alternatives that it is impossible to select one of the alternatives, implement a solution, complete a project, or turn in an assignment. If a student is both an Engager and a Generator, that student may keep scanning the horizon for opportunities without ever becoming engaged in addressing a problem or opportunity. Thus, if a student has a preferred learning strategy and problem solving style that reinforce each other in this way, it may be very challenging for that student to learn any other strategies or modes of operation.

Natural Groups of Problem Solvers

Management students who participated in this study differed in whether they preferred real-time learning (56.9%) or off-line learning (43.1%). A variety of options can allow students to participate in learning experiences with which

they are comfortable but also nudge them to participate in some that are outside their comfort zone and develop other areas.

Real-time learners who prefer action and experiencing would enjoy hands-on, experiential activities both in the classroom and outside of the class. An example of this type of activity outside of the classroom would be a high ropes course. A tendency for these learners is not to spend time on reflection after the activity however. The result is they may not remember or be able to analyze how they succeeded on one ropes activity, but they often want to quickly move on to the next activity. Causing them to slow down and process what has occurred is likely to help them on later activities. These students are often good candidates to be referred for internships or co-op positions which provide academic credit as well as practical experience in a business setting.

It is important to remember that some of the real-time learners scored higher on Waiting and Reading than on the more action-oriented referents. These students may be good candidates for computer-based instruction or simulations that have a text component. Introducing them to manuals, practitioner journals, or reference materials appropriate to their career interests could provide them with some useful resources. These students might be helped by manual or electronic job aids or online resources. Although the students in this cluster may favor reading, it is important for teachers to realize that this is the smallest of the

four clusters. Of the 478 management students who participated in this study, only 76 (16%) were in the group. "Although reading text may be the preferred mode of learning for faculty, librarians, and other academics, it is not the preferred mode for most of the population" (Oblinger & Oblinger, 2005b, p. 2.14). The students in the other three clusters will often not wade through lengthy text. Traditional age college students, labeled the Net Generation, do not favor text (Oblinger & Oblinger, 2005a, 2005b; Windham, 2005); rather they prefer more graphics and multi-media materials (Clayton-Pedersen & O'Neill, 2005; Lippincott, 2005; Oblinger & Oblinger, 2005b; Windham, 2005).

There are management students who prefer off-line learning. This group may be made up of students who are simply more theoretically inclined or future-oriented. They may feel that the classroom provides a safety net that allows them to learn and practice in a safe environment before they must perform in the work setting. As demonstrated by the cluster analysis, this group also divides into two clusters. Students in the cluster who score higher on the referents of Physical, Visualization, and Trial and Error will probably enjoy experiential activities in the classroom. Because of their preference for visualization, they will probably enjoy multi-media learning materials that include visual images. They are likely to prefer to have their learning evaluated by performance assessment rather than written exams.

The second cluster of off-line learners prefer cognitive learning. They may do well with reading assignments and traditional assignments, and they may be content with pen-and-paper assessments. These students are likely to be content with a traditional pedagogical approach. Their professors are often comfortable with these traditional students because the professors themselves probably experienced this type of learning environment as college students.

However, those who prefer off-line learning may face a challenge in conditions of permanent white water. The "slow, deliberate choosing of perspectives" described by McCarthy (1990, p. 32) may not be appropriate for this environment. Students who favor the slow, deliberate approach should perhaps be challenged to stretch themselves toward more expressive learning (Vaill, 1996) or action learning (Revans, 1986). On the other hand, students who prefer real-time learning may need to be encouraged to learn to be less immediate in their learning, allowing time for reflection. Being able to learn and react in a timely manner but also being able to reflect on their learning and performance will help students to succeed in the workplace.

Implications for the Workplace

"Both undergraduate and graduate business students regard education primarily in career-value terms" (Pierson, 1959, p. 5). Although this has been true for decades, business students may not be receiving the best preparation

for entering the workplace. These students often are required to work and be graded as individuals on assignments that are defined in detail by their professors. This is in spite of the fact that businesses have stated a need for workers who can complete all the steps of problem solving, work as members of teams, and be self-directed lifelong learners. A survey of businesses showed that the perceptions of those within a corporate environment do not match those of students or faculty in an academic environment. "A high percentage of corporate respondents thought realistic expectations were not a strength of business graduates...This contrasted sharply with the views of deans, faculty members, and, especially, the students themselves" (Porter & McKibbin, 1988, p. 120).

Business classes typically reward convergent thinking which can cause premature movement toward a single alternative. The ability to take action and implement the decisions of others is important for lower-level jobs but success in higher-level jobs requires a more strategic, divergent approach.

> Collegiate business schools...have always faced a nettlesome yet highly important issue:...To what extent should graduates be prepared for the first job after graduation versus a longer-term career in business management. If the former objective is emphasized, a student may do well when initially out of school but may falter somewhat on the way up the corporate ladder. (Porter & McKibbin, 1988, p. 104).

Learning instruments such as ATLAS or CPSP can act as scaffolding for learners' development of metacognitive skills

or problem solving skills. This scaffolding can support students in management classes as they transition from being students in a teacher-centered classroom to becoming self-directed learners who will engage in lifelong learning. Thus, instrumented learning can help these students to develop a broader set of strategies and improve chances of lifelong employability.

Suggestions for Future Research

There are several possibilities for continuing this stream of research with regard to problem solving preferences. A longitudinal study could be undertaken to determine how problem solving styles evolve throughout an individual's career. Smith and Kolb (1986) report that people focus on their preferred learning syle throughout their formal education or career training. This continues through the early stages of their careers. However, at approximately mid-career, people are able to integrate multiple learning styles and begin "to express non-dominant or non-preferred styles and skills" (p. 18). Basadur (2003) observed that different problem solving preferences are needed for higher positions within an organization.

Additional research could be done using other instruments to see if there is criterion validity for Basadur's CPSP Inventory. One such assessment is the Team Dimensions Profile, formerly called Innovate with C.A.R.E. (Fahden & Namakkal, 1995), which is a self-directed learning instrument used to enhance team processes. The Team

Dimensions Profile could also be used to investigate whether it makes a difference if instruments use statements rather than referents.

Just as the SKILLS instrument was adapted to provide a quick instrument for use in training, it would be useful to adapt the concepts of Basadur's Creative Problem Solving Profile Inventory to provide develop an instrument that can be used for quick assessment of an individual's preferred problem solving style. Conti, the co-developer of ATLAS which provided a quick, easy to score instruments to identify preferred learning strategies, has done this with several other instruments. One of these, Groups of Adult Learning Styles or GOALS™ uses a brief series of questions to identify which of Kolb's learning styles a person tends toward (Conti, 2002b). Another instrument called Philosophies Held by Instructors of Lifelong-learners (PHIL™) also uses a brief series of questions to identify whether a teacher's philosophy is Idealism, Realism or Behaviorism, Pragmatism or Progressivism, Constructionism, or Reconstructionism (Conti, 2002c). Yet another instrument called Categories of Adult Teaching Styles (CATS™) uses the same format to identify teaching styles that are consistent across teaching situations regardless of the content (Conti, 2002a). As part of a doctoral study, Tapp (2002) adopted Conti's format of a brief decision tree instrument to create an instrument titled Cultural Appreciation in Lifelong Learning (CALL) to identify various levels of cultural appreciation among educators and

social workers. CALL used a pool of items from the Multicultural Counseling Awareness Scale and the Quick Discrimination Index combined using multivariant statistics. Another doctoral student is developing an instruments tentatively titled Categories of Policing Styles (COPS) to identify the decision-making processes of police officers based on the established validity and reliability of the General Decision-Making Styles (GDMS) Instrument (Hulderman, 2003). This is the beginning of a line of research intended to create valid and reliable instruments that are easy and quick to use in learning and training situations where lengthy administration and scoring of instruments is not feasible. The ease of use puts learning squarely in the hands of the learner. This self-diagnosis technique of instrumented learner means that the learner is not dependent on a trainer or teacher.

I propose additional research using ATLAS to assess students' preferred learning strategies at different stages of a student's college experience. I have some preliminary data collected from 39 management students who took a class from me in two consecutive semesters. These semesters were the fall and spring semesters of their senior year. As I removed the spring semester data from the data set and checked for unduplicated students, it was interesting to note that while some students reported the same preferred learning strategy across those semesters, an interesting phenomenon seemed to occur. Some of those seniors who had reported

Engager learning strategy in the fall reported a Problem Solver learning strategy in the following spring semester. Some of the seniors who reported a Problem Solver learning strategy in the fall reported a Navigator learning strategy during the spring. Although this is merely anecdotal evidence, when I discussed this with the students most of them related it to their job search activities. Those who had been going through school as Engagers, looking to have fun and waiting for inspiration to strike to become engaged, realized that they needed to start examining realistic alternatives in order to obtain a job after graduation. Some of the previous Problem Solvers who reported a Navigator learning strategy in the spring mentioned that they were "getting serious" about their job search and becoming much more focused and disciplined. There was only one student who reported a Navigator learning strategy in the fall and an Engager learning strategy in the spring. This was a very serious, focused student who had started his job search early, received several good offers, and made a commitment to a firm by the end of the fall semester. By spring, he reported that he was ready to relax and enjoy his last semester of college after being so disciplined for the first few years. These may indicate that students were able to select a learning strategy that met their needs at this particular time. It would be interesting to trace the students' learning preferences throughout their college careers. An experimental study could be done to see if

explicit knowledge about various learning strategies would provide students with more flexibility and competence to select an appropriate strategy to match the phase of education and entry into the workforce.

Through the Kaleidoscope

In their early writings about instrumented learning, Blake and Mouton (1972) observed that

> A learning instrument is designed so that you can "look into it and see yourself," as though in a mirror. Yet, unlike a mirror, it gives you a penetrating look inside yourself. Using it, you can study yourself as you really are – underneath the skin, behind the eyes, so to speak. (p 12)

Sharan Merriam (2001a) recently described adult learning as "an everchanging mosaic, where old pieces are rearranged and new pieces are added" (p. 1). She noted that two important pieces of the "mosaic of theories, models, sets of principles and explanations" are andragogy and self-directed learning. As I considered these two metaphors, I was reminded of holding a kaleidoscope up to the light to view the mosaic-like colors and patterns contained within. This image was reinforced by Basadur's (1998a) observation about the creativity kaleidoscope, in which our imaginations "must transform what is known into new, different combinations, called new pattern ideas, options, or points of view" (p. 12)

Since my childhood, I have been fascinated by kaleidoscopes. As a young child in England, my first kaleidoscope was an inexpensive cardboard tube with simple

colored bits of plastic or glass in the object case. I now have a collection of kaleidoscopes and teleidoscopes.

The first kaleidoscope was invented in 1816 just to the north of the England of my childhood by a Scotsman, Sir David Brewster. Since that time kaleidoscopes have served as children's toys as well as being used for inspiration by artists, weavers, rug and wallpaper designers, and jewelers (Baker, 1987). Kaleidoscopes are tubular with two or three mirrors along its length that are angled toward each other in a way that determines the complexity of the pattern. Kaleidoscopes have an eye-piece at one end, and a disc of colored glass or an object case containing objects to be viewed at the other end.

A teleidoscope differs from a kaleidoscope in that it does not have a colored disk or an object case that contains colored fragments of glass or plastic that create symmetrical patterns. Instead the object case is merely a lens that allows the viewer to examine an object in the environment. "Whatever it is pointed towards is reflected again and again" (Baker, 1987, p. 22). For some of the management students in this study, their proclivity toward action is repeated again and again as though through a teleidoscope, especially for those who are both Implementers and Navigators. Using instrumented learning can allow them to see a different view, which was described by Blake and Mouton as holding up a mirror to themselves. Learning about different problem solving steps and learning strategies may allow them to make

the conscious choice to practice and possibly adopt some of those alternative strategies. This is analagous to choosing to rotate the tube, disk, or object case of a kaleidoscope, thus changing the pattern. Due to the angled mirrors inside the tube of the kaleidoscope, the pattern is always symmetrical. Learners who choose to change their view by rotating the kaleidoscope may develop themselves into more symmetrical problem solvers rather than having such a predominant quadrant.

Some of my kaleidoscopes are more complex with two disks rather than one. As the two disks turn, the pattern becomes more complex. One of my kaleidoscopes has two parallel disks, each consisting of fragments of colored glass. If the same color aligns on both disks, the color seems more intense as occurs when a person is both an Implementer and a Navigator. This is the double whammy of tending toward action and implementation. If contrasting colors align, the resulting pattern is more varied and subtle.

Another of my kaleidoscopes also has two parallel disks, but instead of both being made of stained glass, one disk is colored glass, and the outer disk is thinly sliced agate. This is more opaque and muted in earth tones. This kaleidoscope really reminds me of the dual action of our problem solving preferences and our learning strategy preferences. Just as an individual can choose to turn just one of the disks, leaving the other one stationary, that individuals can also consciously choose to adopt a particular

learning strategy or develop additional problem solving strengths. That same individual could choose to turn both kaleidoscope disks simultaneously either in the same direction or even in opposite directions, which is analagous to selecting a new problem solving or learning strategy.

The artists who make kaleidoscopes speak eloquently in ways that relate to the discoveries of this study. John Culver creates hand-made kaleidoscopes and takes an artist's approach to echo the observation made by Blake and Mouton.

> They say if you hold a clear glass in front of yourself, you see the world through it, but if you take that piece of glass and put a thin veneer of silver (money) on it, then all you see is yourself. I especially like the way this parable relates to kaleidoscopes. Their magic transcends mirrors that see your image, to mirrors that see inside yourself. This beautiful glimpse both inward and outward, calms and quiets, relaxes and heals! — it awakens the sleeping dreams and calls them forth. (Baker, 1987, p. 74)

Culver and several other kaleidoscope artists acknowledge that the kaleidoscope can be used for personal reflection. Culver describes kaleidoscopes as "gentle miracles of reflection" (Baker, 1987, p. 72), and artist Tom Proctor adds that "with each new turn there is a new discovery" (p. 66). Yet another kaleidoscope maker, Doug Johnson, calls kaleidoscopes "invitations to go off into other lands where no one else is...They are private spaces, creative realms of intrigue" (p. 31). Kaleidoscope maker Carolyn Bennett also comments on the private reflection and intentional change involved in viewing this art form.

> "There is a very mystical and personal experience happening when a person looks through a kaleidoscope," she says. "Although I place the colors in the chamber, it is the viewer who controls the scope with his own karma. He steps into his own private world of vision and only he sees, feels, and understands that moment." (Baker, 1987, p. 33)

Other kaleidoscope artists comment on aspects of the kaleidoscope that differ from this view of private reflection and introspection. Several of these artists see the view through the kaleidoscope as reminiscent of the Vaill's comments about permanent white water. According to the author of a book titled Through the Kaleidoscope...and Beyond, "the word 'kaleidoscope' has become synonymous with anything involving rapid change, variation of colors and patterns, or even the thrill of the unexpected" (Baker, 1987, p. 96). Kaleidoscope maker Craig Musser adds that

> When I look into a kaleidoscope...I am reminded of such basic principles as the ever changing quality of the universe, the necessity for destruction of the old to generate the new, the complete unpredictability of existence and the underlying order that is inhumanly beautiful. (p. 38)

Artist Tom Proctor adds that "with each new turn there is a new discovery" (p. 66).

In addition to being a valuable art form, kaleidoscopes are used in more practical ways. Ned Herrmann, who is an artist, sculptor and director of the Whole Brain Corp, uses kaleidoscopes and new understandings of the brain for individual and organizational development for corporations and businesses worldwide (Baker, 1987, p. 123). Like Min Basadur and Edward de Bono (1982), Herrmann provides

workshops and training in applied creative thinking in order to teach participants how to observe and change their patterns of thinking and behaving. "To us, the turning of a kaleidoscope symbolizes the rearranging of stored information to constantly create new patterns — new approaches to problem solving —— different colors change patterns of feelings" (p. 123). Herrmann claims, "It is quite possible to change a person's brain dominance profile through education, skill training and life experiences" (p. 123). According to Herrmann, if a logical left-brained person wants to develop and stimulate the creative right-brained side, a kaleidoscope might be a useful tool.

> For most of us, it [the right brain] is the center of intuitive and insightful thinking...and where conceptual thinking can take place. It is the location of our ability to synthesize as opposed to analyze and this is where we can deal with holistic concepts. (p. 123)

Herrmann goes on to say that for individuals with right-hemisphere dominance "this is the day-dreamer's corner, the area that allows the thinker to 'see the big picture' — read signs of coming change, invent innovative solutions to problems and recognize new possibilities" (p. 124). The management students who participated in this study are so focused on action and implementation in their problem solving and learning strategies, that they will not tend to excel at these aspects of creative problem solving unless they develop their right-brain thinking.

Dean Kent, another kaleidoscope artist who creates both tiny wearable jewelry scopes and large table models, addresses the metaphor of the kaleidoscope for the complex differences of individuals:

> Too often people focus on the differences and problems that exist between us rather than recognize that the resolution of conflict exists in an acknowledgement of the universality of human experience. We believe that the kaleidoscope can be best understood as a metaphor for a new world perspective. It is as if you took the dizzying multiplicity of people, places, and things in the world and placed them in an object case. Where there was division difference and apparent chaos, there emerges integration, similarity and an organic unfolding. (Baker, 1987, p. 176)

Society is experiencing a rapid rate of change. Individuals who want to successfully navigate the permanent white water must be able to solve problems, work as members of teams, and be self-directed lifelong learners. Instrumented learning can be used by teachers, students in educational institutions, and workers in the corporate environment to identify their own preferences and to "speed read" others with whom they interact. Several options then exist. Some people may choose to focus on their preferences and select a career that matches their strengths. Others may choose to develop their under-utilized strategies. Still others may choose to surround themselves with people who have different strategies or preferences in order to compensate for any gaps. Helping management students become aware of these possibilities will assist them in their transition to the workplace.

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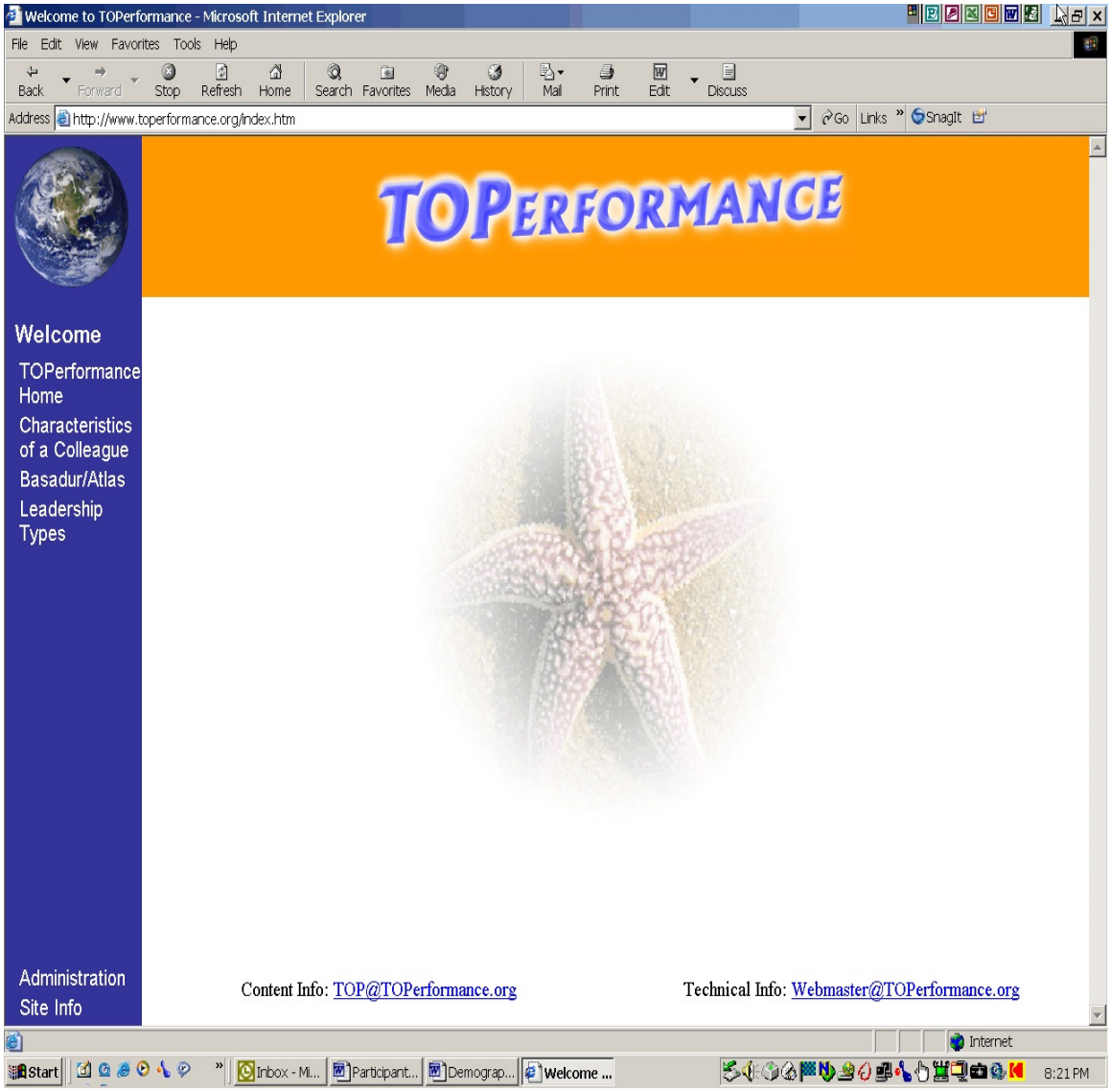
APPENDIX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OSU Creative Problem Solving

Electronic Consent Form

The purpose of this training is to make you aware of your creative problem solving preferences and ways to facilitate working with individuals or team members whose approach to problem solving is different than your own. To accomplish this, we need your responses on the instrument linked to this message. The instrument consists of 18 brief items that ask you to rank order 4 words, and a few questions about your preferred learning strategies. You will be able to complete all the items in approximately 15-20 minutes. For ease in completing the instrument, the study will be conducted on the Internet.

After you complete the instrument, a personalized problem solving profile will be created for you and be given to you at the training seminar. We will be asking your name so that you may receive your personalized profile when we meet face-to-face.

In addition, the trainer, Claudette Peterson, who is a graduate student at Oklahoma State University, hopes to use some of the data in a study to describe problem solving preferences of university staff members. The research results are to be included in a dissertation, articles, and presentations. Participation in this study is completely voluntary, and your responses will remain confidential. Your name will not be associated with your responses for the study in any form. Your name will be excluded from the data used for the research study.

By clicking on the box below, you are giving your electronic signature to the fact that you understand that participation in this research project is voluntary and that you will not be penalized if you choose not to participate. You also understand that you are free to withdraw your consent and end your participation in the project at any time without penalty by contacting Claudette Peterson. If you have any concerns or questions about your participation in this study you may contact: Claudette Peterson at OSU-Tulsa at either claudettepeterson@cox.net or (918)298-2714. You may also contact Carol Olson, Oklahoma State University Institutional Review Board, at (405)744-5700.

☑ Click here to accept this invitation to participate in the study.

Regardless of whether you choose to participate in the study, please click on the website address below to complete the problem solving profile for the training seminar:

Continue with Assessments

Thank you for your willingness to participate in this study. Your expertise is vital to the success of this study, and I trust we will all benefit from the results.

For questions or comments, please contact:
Claudette Peterson
Email: ClaudettePeterson@cox.net
Phone:(918)298-2714

OSU Creative Problem Solving

Eighteen sets of four words are listed horizontally below. In each horizontal set assign a 4 to the word which best characterizes your problem solving style, a 3 to the word which next best characterizes your problem solving style, a 2 to the next most characteristic word, and a 1 to the word which is least characteristic of you as a problem solver. Be sure to assign a different number to each of the four words in each horizontal set. Do not make ties.
When you have completed the survey, please press the "Submit" button at the bottom of the page.

	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
1	Alert	Poised	Ready	Eager
2	Patient	Diligent	Forceful	Prepared
3	Doing	Childlike	Observing	Realistic
4	Experiencing	Diversifying	Waiting	Consolidating
5	Reserved	Serious	Fun-Loving	Playful
6	Trial & Error	Alternatives	Pondering	Evaluating
7	Action	Divergence	Abstract	Convergence
8	Direct	Possibilities	Conceptual	Practicalities
9	Involved	Changing Perspectives	Theoretical	Focusing
10	Quiet	Trustworthy	Responsible	Imaginative
11	Implementing	Visualizing	Describing	Zeroing In
12	Hands On	Future-oriented	Reading	Detail-Oriented
13	Physical	Creating Options	Mental	Deciding
14	Impersonal	Proud	Hopeful	Fearful
15	Practicing	Transforming	Thinking	Choosing
16	Handling	Speculating	Contemplating	Judging
17	Sympathetic	Pragmatic	Emotional	Procrastinating
18	Contact	Novelizing	Reflection	Making Sure

Submit

Form Status:

18 rows with incomplete values.

Source: Basadur, M. 1990 Journal of Creative Behavior.

For questions or comments, please contact:
Claudette Peterson
Email: ClaudettePeterson@cox.net
Phone:(918)296-2714

OSU Creative Problem Solving

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When you have completed the survey, please press the "Submit" button at the bottom of the page.

	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
1	1 Alert	2 Poised	3 Ready	4 Eager
2	4 Patient	4 Diligent	2 Forceful	3 Prepared
3	1 Doing	2 Childlike	3 Observing	Realistic
4	1 Experiencing	2 Diversifying	3 Waiting	4 Consolidating
5	4 Reserved	3 Serious	2 Fun-Loving	1 Playful
6	2 Trial & Error	3 Alternatives	4 Pondering	1 Evaluating
7	1 Action	1 Divergence	2 Abstract	3 Convergence
8	Direct	3 Possibilities	2 Conceptual	4 Practicalities
9	1 Involved	2 Changing Perspectives	4 Theoretical	3 Focusing
10	1 Quiet	2 Trustworthy	3 Responsible	4 Imaginative
11	4 Implementing	3 Visualizing	2 Describing	1 Zeroing In
12	2 Hands On	3 Future-oriented	4 Reading	1 Detail-Oriented
13	3 Physical	3 Creating Options	3 Mental	3 Deciding
14	1 Impersonal	3 Proud	2 Hopeful	4 Fearful
15	4 Practicing	3 Transforming	2 Thinking	1 Choosing
16	2 Handling	3 Speculating	1 Contemplating	4 Judging
17	1 Sympathetic	2 Pragmatic	3 Emotional	4 Procrastinating
18	2 Contact	4 Novelizing	3 Reflection	2 Making Sure

Submit

Form Status:

2 rows with incomplete values.

4 rows with duplicate values.

12 rows with valid values.

Source: Basadur, M. 1990 Journal of Creative Behavior.

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	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4
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6	2 Trial & Error	3 Alternatives	4 Pondering	1 Evaluating
7	4 Action	1 Divergence	2 Abstract	3 Convergence
8	1 Direct	3 Possibilities	2 Conceptual	4 Practicalities
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14	1 Impersonal	3 Proud	2 Hopeful	4 Fearful
15	4 Practicing	3 Transforming	2 Thinking	1 Choosing
16	2 Handling	3 Speculating	1 Contemplating	4 Judging
17	1 Sympathetic	2 Pragmatic	3 Emotional	4 Procrastinating
18	1 Contact	4 Novelizing	3 Reflection	2 Making Sure

Submit

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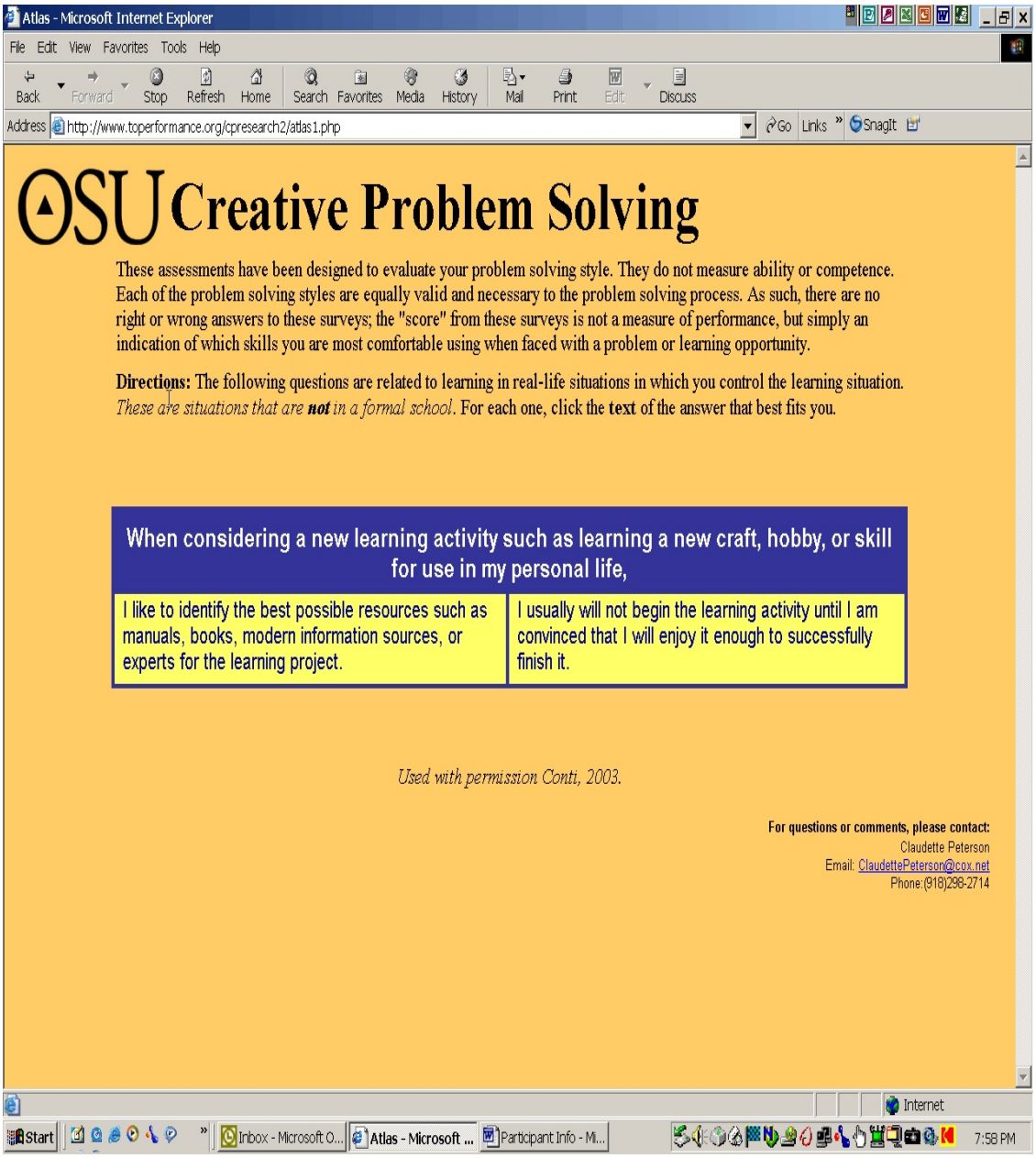
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OSU Creative Problem Solving
These assessments have been designed to evaluate your problem solving style. They do not measure ability or competence. Each of the problem solving styles are equally valid and necessary to the problem solving process. As such, there are no right or wrong answers to these surveys; the "score" from these surveys is not a measure of performance, but simply an indication of which skills you are most comfortable using when faced with a problem or learning opportunity.
Directions: The following questions are related to learning in real-life situations in which you control the learning situation. These are situations that are not in a formal school. For each one, click the text of the answer that best fits you.
When considering a new learning activity such as learning a new craft, hobby, or skill for use in my personal life,
I like to identify the best possible resources such as manuals, books, modern information sources, or experts for the learning project.
I usually will not begin the learning activity until I am convinced that I will enjoy it enough to successfully finish it.
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Phone:(918)298-2714
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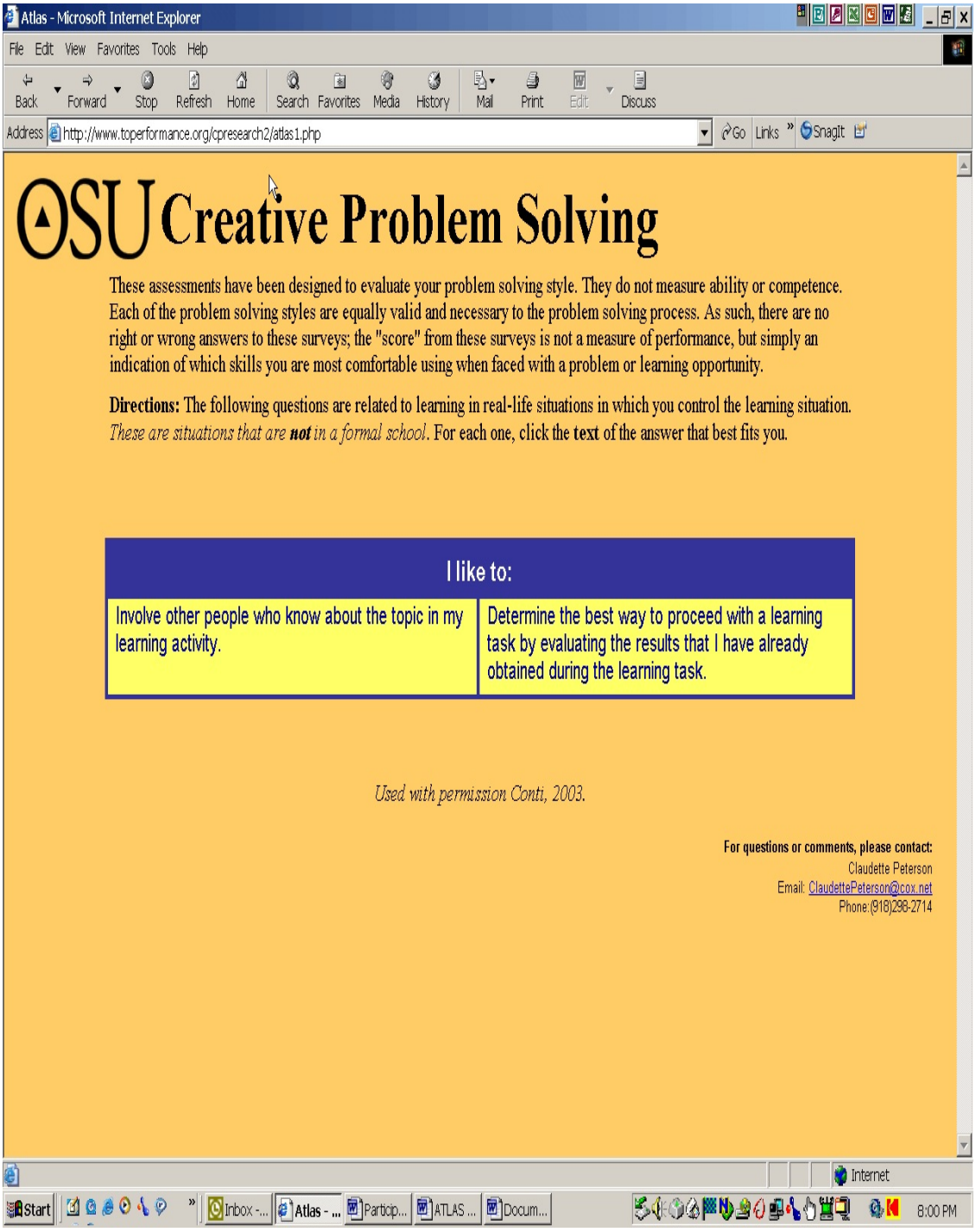
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Directions: The following questions are related to learning in real-life situations in which you control the learning situation. These are situations that are not in a formal school. For each one, click the text of the answer that best fits you.
I like to:
Involve other people who know about the topic in my learning activity.
Determine the best way to proceed with a learning task by evaluating the results that I have already obtained during the learning task.
Used with permission Conti, 2003.
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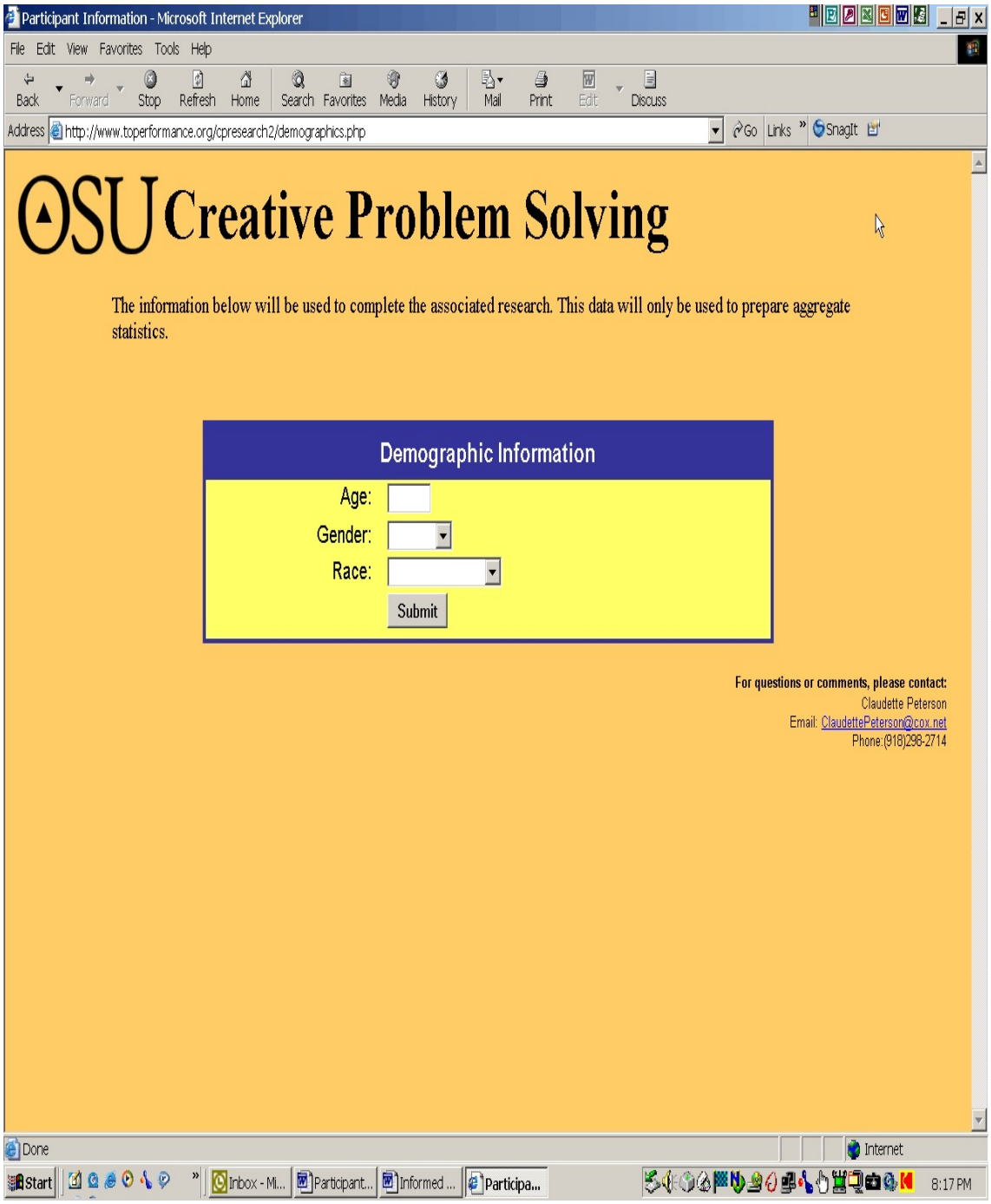
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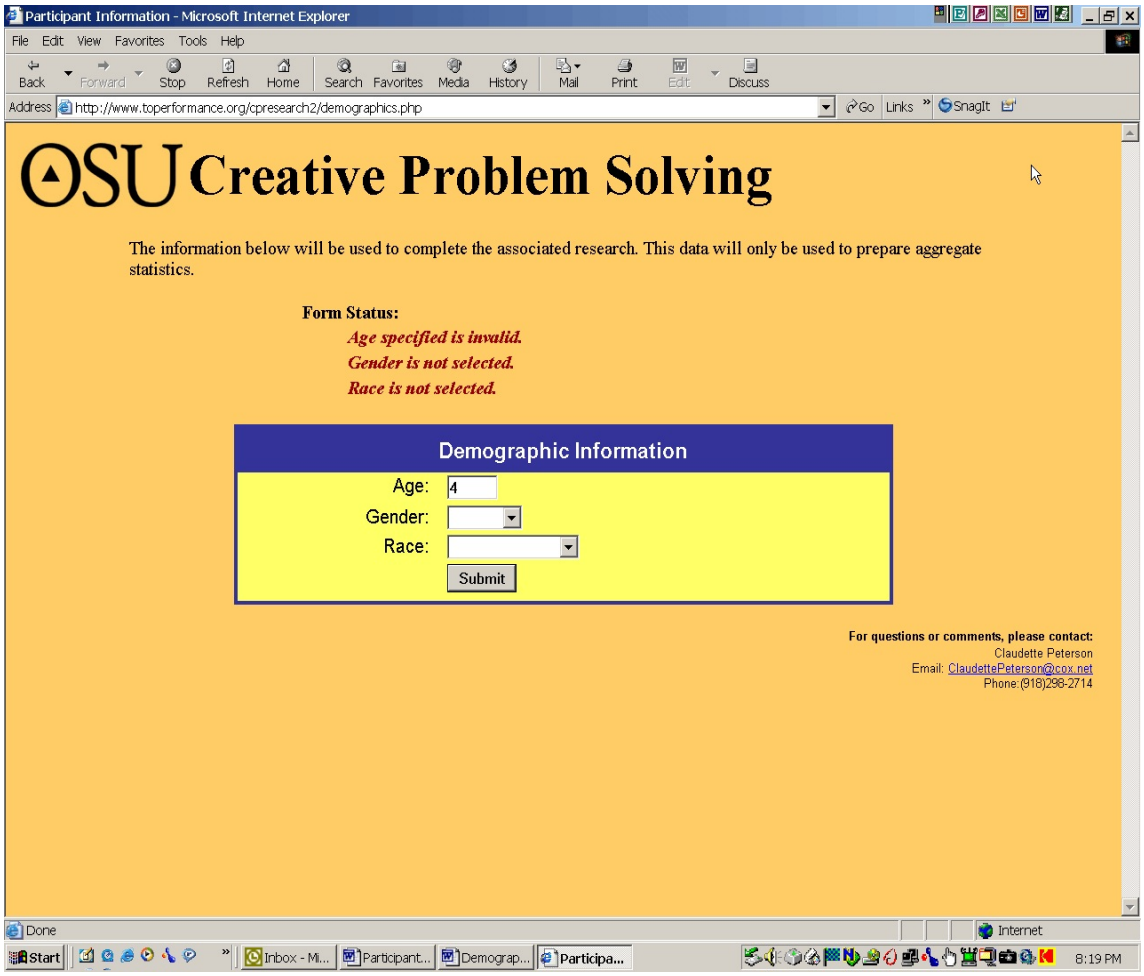
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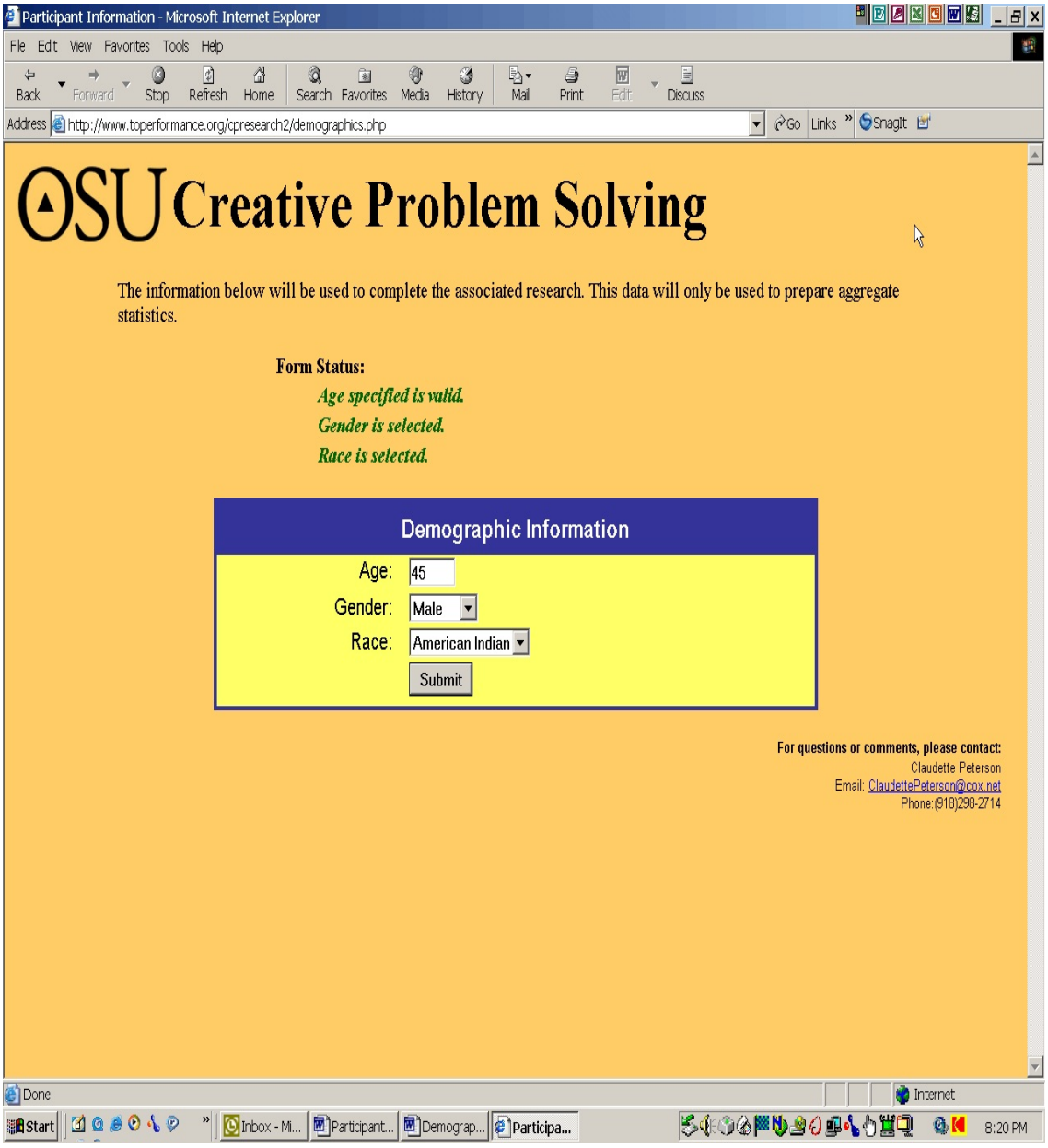
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Gender is selected.
Race is selected.
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For questions or comments, please contact:
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Email: ClaudettePeterson@cox.net
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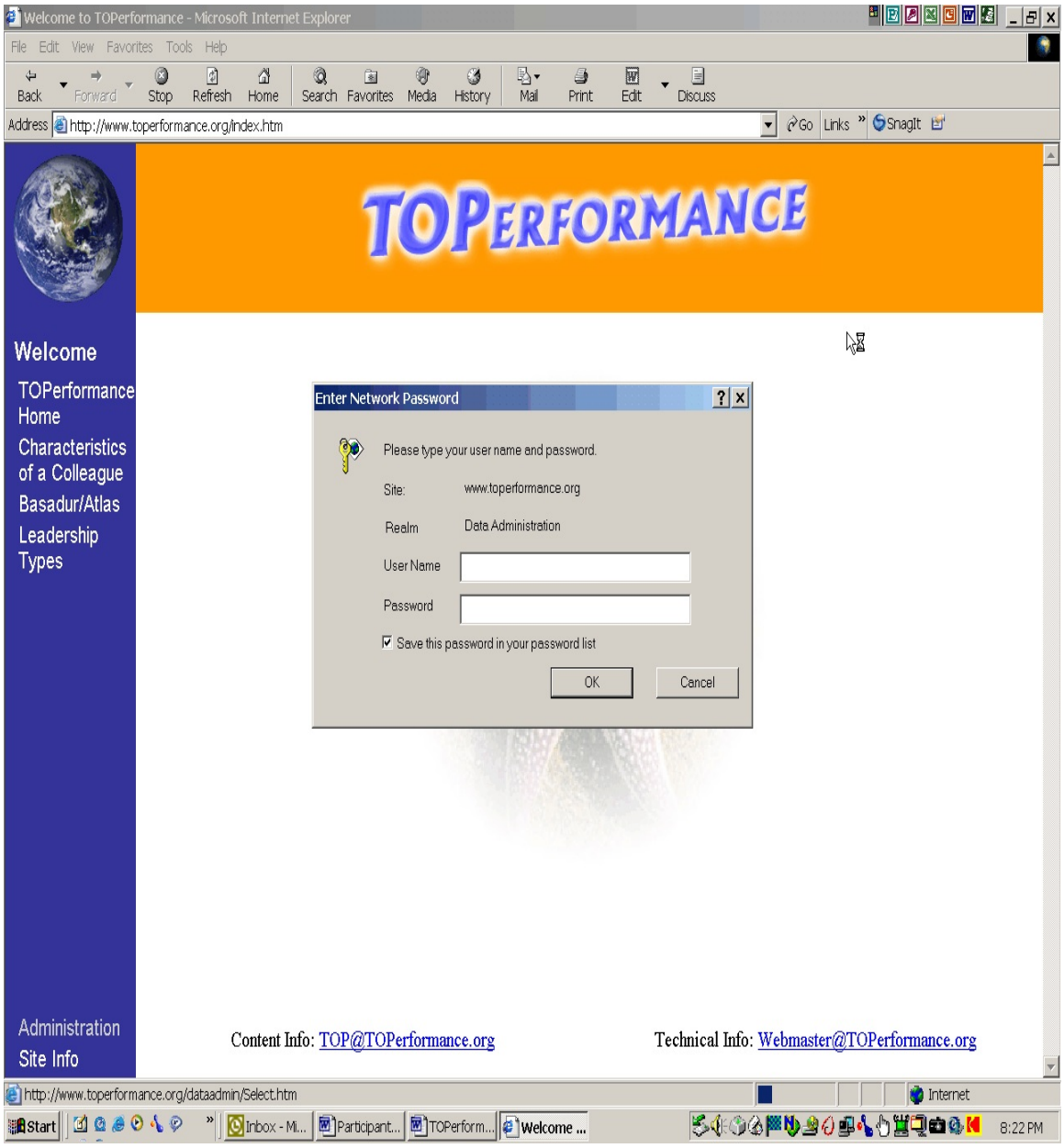
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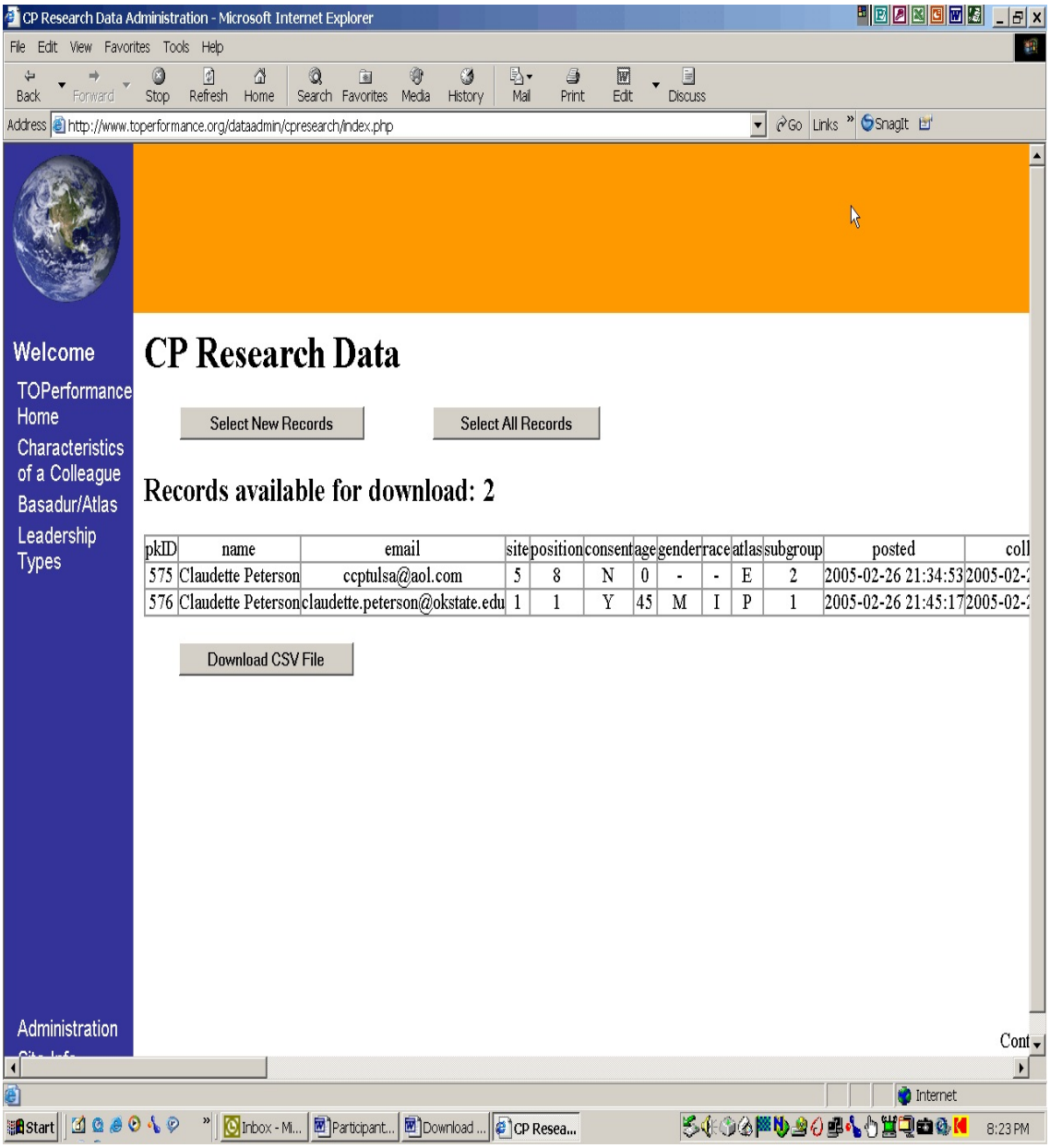
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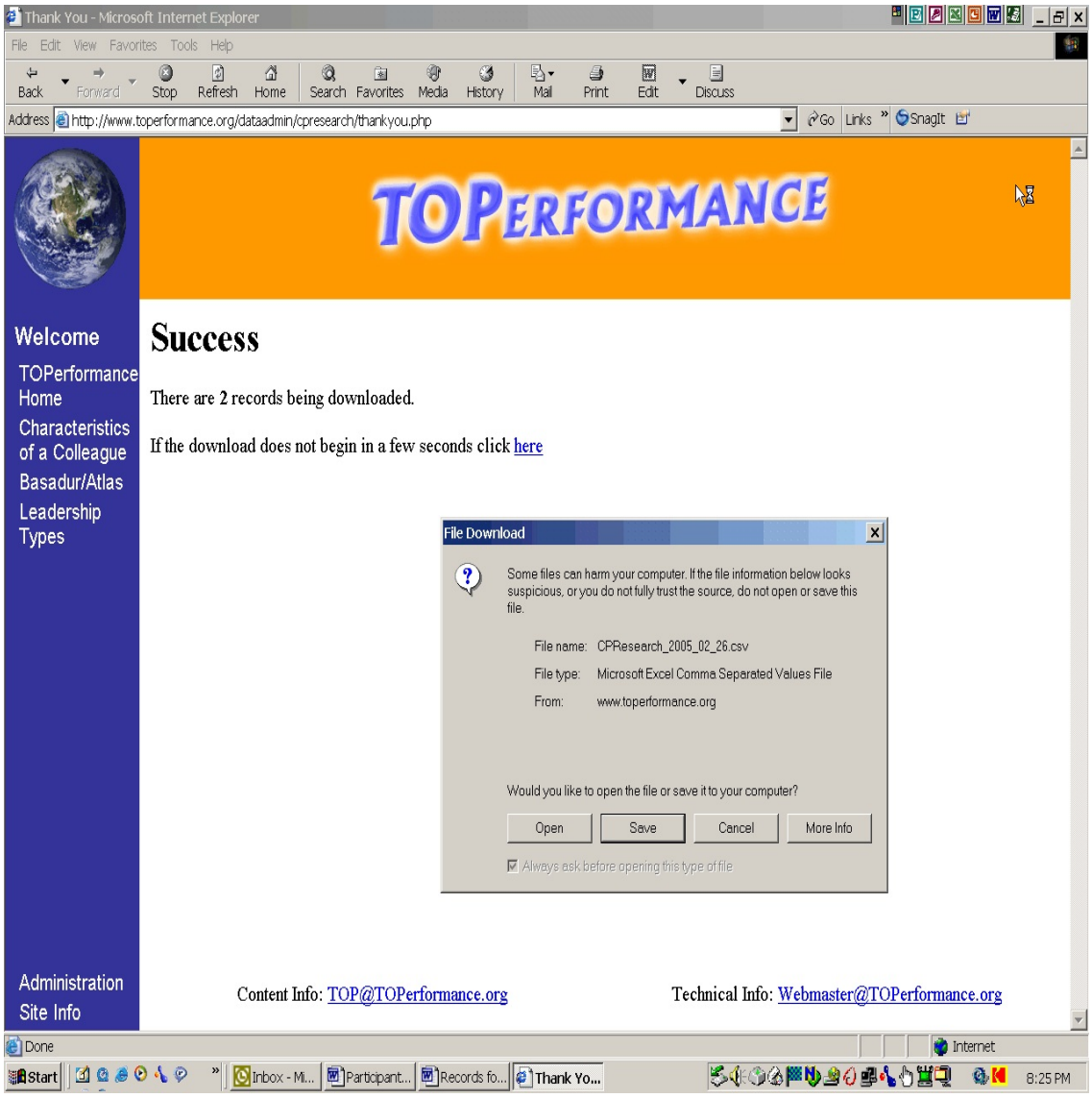
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If the download does not begin in a few seconds click here
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Some files can harm your computer. If the file information below looks suspicious, or you do not fully trust the source, do not open or save this file.
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From: www.toperformance.org
Would you like to open the file or save it to your computer?
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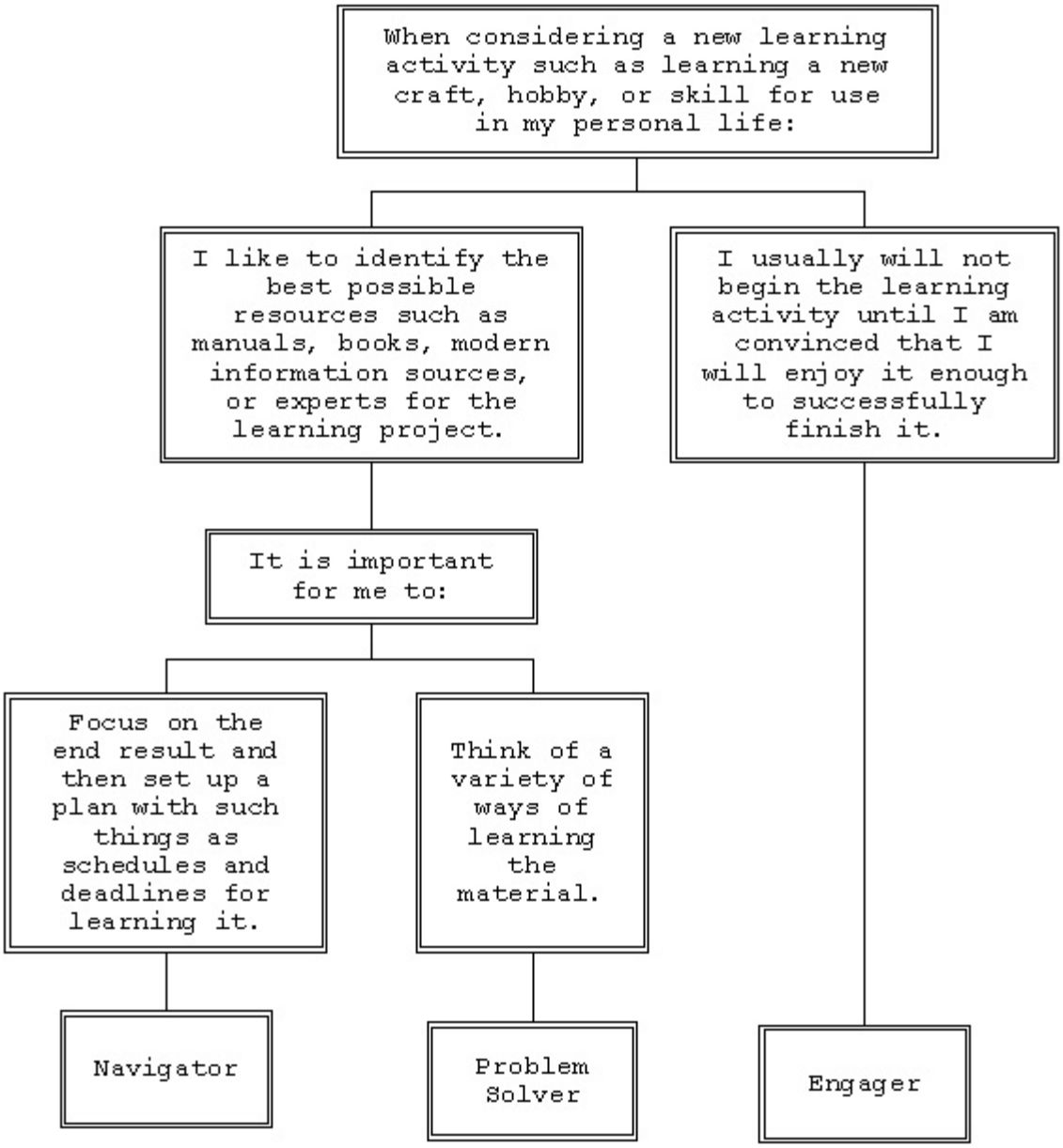
ATLAS Decision Tree



VITA

Claudette Marie Peterson

Candidate for the Degree of

Doctor of Education

Thesis: CREATIVE PROBLEM SOLVING STYLES AND LEARNING STRATEGIES OF MANAGEMENT STUDENTS: IMPLICATIONS FOR TEACHING, LEARNING, AND WORK

Major Field: Occupational and Adult Education

Education: Received Bachelor of Science degree from University of Texas at San Antonio, San Antonio, Texas in 1981; received Master of Science degree from Texas A&M University, College Station, Texas in 1987. Completed the requirements for the Doctor of Education degree at Oklahoma State University, Stillwater, Oklahoma in May, 2006.

Experience: Currently Lecturer for Mays Business School at Texas A&M University. Previously was an adjunct lecturer for the Management Department, Spears School of Business, Oklahoma State University; Lecturer and Graduate Advisor the Department of Information and Operations Management at Texas A&M University; HIV Prevention Case Manager for Tulsa C.A.R.E.S.; Nutrition Services Director for Tulsa C.A.R.E.S.; Program Director for Montgomery AIDS Outreach; Programmer and Systems Analyst at Federal Express, Texas A&M University Computing Services Center, the Bass Anglers Sportsman Society.

Professional Memberships: American Association of Adult and Continuing Education; Southwest Academy of Management; Institute of Behavioral and Applied Management

Professional Certifications: Graduate of Oklahoma Aging Advocacy Leadership Academy (2004); The Oklahoma Geriatric Education Center Aging and Disabilities Scholars Program (2004); Certified HIV/AIDS Counselor and Tester, Oklahoma State Department of Health; Certified HIV/AIDS Educator and Instructor Trainer, American Red Cross.