

**Assessment of Freshmen Varsity Student-Athletes' Learning Style Preferences**

by

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## Abstract

Everyone learns, although everyone does not learn in the same manner; therefore, learning styles have become a major field of study drawing attention from a variety of researchers (Johnson, 2008; Keefe, 1987; Kolb & Hanley-Maxwell, 2003; Pallapu, 2008). The purpose of the study was to acquire information about freshmen varsity student-athletes' learning style preferences in relation to gender and sport. The population was comprised of freshmen varsity student-athletes at a major Division I, southern institution. There were a total of 205 participants (115 males and 90 females). The student-athletes were categorized by gender and sport participation, team ( $n = 132$ ) or individual ( $n = 73$ ). Felder and Soloman's Index of Learning Styles (ILS) Web-based version was used for this study. The results showed one significant interaction in the Active\_Reflective preference based on gender, but overall student-athletes effectively use a variety of learning style preferences. That is to say that when viewed as a group, freshmen varsity student-athletes do not prefer one learning style over another with any consequence. One conclusion was that there was no significant difference in learning styles preferences of student-athletes who participate on teams compared to those who participate in individual sports. Additional research is needed to identify possible trends in student-athletes learning style preferences after a year or more of college has been completed.

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## Chapter 1

### Introduction

The National Collegiate Athletic Association (NCAA) is responsible for enforcing strict regulations for college student-athletes. These regulations continue to be a concern for student-athletes proceeding toward their degree. Student-athletes are expected to be successful in the classroom and on the field of competition. Therefore, collegiate athletics programs must uphold and maintain the fundamental purpose of the NCAA as stated:

The competitive athletics programs of member institutions are designed to be a vital part of the educational system. A basic purpose of this Association is to maintain intercollegiate athletics as an integral part of the educational program and athletes as an integral part of the student body. (NCAA Division I Manual, 2008, p. 1)

Most student-athletes attend college with academic, emotional, and personal issues which are comparable to the non student-athlete (Ferrante, Etzel & Lantz 1991). However, student-athletes have two simultaneous foci during their academic tenure. First is the realm of academics. As a college student they are required to attend classes, read books, participate in discussions and earn acceptable grades. Second is the realm of athletics. As a varsity athlete they are expected to maintain a level of body control,

healthy living and succeed in their sport. These two foci are mandated through the NCAA as stated in the first purpose found in the 2008 NCAA Manual, “To initiate, stimulate and improve intercollegiate athletics programs for student-athletes and to promote and develop educational leadership, physical fitness, athletics excellence and athletics participation...” (NCAA Division I Manual, 2008, p. 1). According to Ferrante, et al. (1991),

College student-athletes represent a special population on hundreds of campuses across the nation. They are young people who lead stressful lives that are influenced by the unique demands of their lifestyles and the developmental challenges of college-age people. Special services are needed to assist them in coping with these demands and ultimately to become well-adjusted, successful adults. (p. 3)

As the concern over graduation and retention rates grow (Fritz, 2002; McKeachie, 1995), it is imperative that colleges have a team of Academic Counselors to assist and support these student-athletes as they navigate their way through the uncertainty of their college years. These Academic Counselors help the student-athletes by keeping track of eligibility and academic progress using NCAA regulations, local conference rules and specific university standards. To help these Academic Counselors (also referred to as Academic Advisors for Athletics or Athletic Academic Advisors) are several organizations whose sole purpose is to guide and support them. The National Association of Academic Advisors for Athletics (N4A) is one of these organizations. According to the N4A website:

The N4A is a diverse organization of service professionals who promote the integrity of their profession by providing guiding principles and quality services to support one another as they share information, resources and expertise in their efforts to empower student-athletes to become more productive individuals through educational and personal development. (N4A, 2009)

One of the numerous aspects of a collegiate student's experience is in the classroom. The collegiate classroom can be an exceptionally difficult place for those students who find themselves under-prepared for the college experience. Since students come from a variety of locations and college preparatory programs, there is no common level of preparedness found among the incoming freshmen (Petrie & Denson, 1999). The time that student-athletes could be spending on improving study skills and learning academic material is often taken up with practice, weight training, and team meetings. Therefore, the time that is spent in formal study is invaluable and needs to be as productive as possible. One way this can be accomplished is by understanding how each individual student learns best by exploring their learning style preferences.

Heffler (2001) pointed out that Kolb's Experience Learning Theory identifies learning as a process. Cano-Garcia and Hughes (2000) supposed that learning is associated to thinking, and as individuals get involved explicit styles are used when thinking and learning are executed. Felder and Silverman (1988) mentioned that some learners feel more comfortable when they are learning facts and data while others prefer to learn theories and principles. This means that some people learn better by doing something active with the information that they are attempting to learn rather than only

reading about it moreover others learn best by seeing the information rather than hearing it. Baldwin and Sabry (2003) signified that, “Learners are different and approach learning tasks differently and that individual differences can significantly affect an individual’s learning processes” (p. 325).

Individual learning styles are a directing and related factor in students’ ability to acquire knowledge and skill. Heffler (2001) believed that each individual’s learning style has strengths and weaknesses based on what is required to be learned. According to Jester and Miller (2000), learning styles have to do with the process in which the brain functions most efficiently when ascertaining new information. It is important to understand that there is no good or bad learning style (Jester & Miller, 2000). It is also imperative to note that the purpose for exploring one’s learning style preferences is not to categorize, but rather to help analyze and shape a student into a better learner by utilizing their strengths and improving on their weaknesses (Felder & Spurlin, 2005).

### Statement of the Problem

Learning styles have been studied in relation to topics such as gender, job choice, academic field of study, academic success and grade point average (Alumran, 2008; Cano-Garcia & Hughes, 2000; Curry 1991; Felder & Silverman, 1988; Gadzella & Masten, 1998; Jones, Reichard, & Mokhtari, 2003, Keri, 2002; Khan, 2009; Matthews, 1994; Mishra, 1998; Pallapu, 2008; Pettigrew & Zakrajesk 1984; Philbin & Meier 1995; Skogsberg & Clump, 2003; Slater, Lujan & DiCarlo, 2007). However, there is a lack of research involving learning style preferences in relation to sport participation in student-

athletes (Wesley, 2002). The lack of research in this area warrants the need for further research in understanding the interactions between gender and sport participation in regards to learning style preferences in student-athletes. Chio and Forde (2002) contend that the effective identification of learning styles in groups appears to be potentially important in the understanding of suitable teaching techniques; furthermore, this can be significant in groups that consist of students with both traditional and non-traditional backgrounds, varying entry level qualifications, diverse educational experiences, and different genders.

#### Purpose of the Study

The purpose of the study was to acquire information about freshmen varsity student-athletes' individual learning style preferences in relation to gender and sport participation. Felder and Soloman's Index of Learning Styles (ILS) Web-based version was used to measure the learning style preferences. Johnson (2008) declared that everyone has a preferred learning style and that learning styles have an impact on the way people take in and retain new information. Cassidy (2004) proposed that overall learning styles are considered stable over a long period of time but that they can change with situations and experience. This indicates that there is potential for adaptations or modifications of an individual's learning style preferences. Baldwin and Sabry (2003) stated,

The purpose of examining the learning styles of learners is to better understand the behavior patterns that learners exhibit so that they can be incorporated into

interactive learning systems and thus be more effective and efficient in helping learners to learn (p. 327).

Multiple researchers agree that students will learn better when the material is provided in a way that matches with their learning style preference (James & Maher, 2004; Kolb, 1984; Gardner, 1985; Griggs, 1985; Slavin, 2000). Also of importance is an instructor's ability to adjust pedagogic strategies according to the needs of the students in the class (Cuthbert, 2005). A study by Gadt-Johnson and Price (2000) signified that learning styles symbolize an individual learner's tendency to learning certain material and concluded that a powerful relationship exists between student's unique learning style and their academic success. Knowing and understanding learning styles can help an individual learn more efficiently (Silver, Strong & Perini, 1997).

### Significance of the Study

Many researchers have found that males and females have different learning styles from each other (Alumran, 2008; Hargrove, Wheatland, Ding & Brown, 2008; Honigsfeld & Dunn, 2006; Lau & Yuen, 2009; Van Zwanenberg, Wilkinson & Anderson, 2000). This study will consider the results of these completed studies and compare results with learning style preferences found in relation to sport participation in order to identify trends in student-athletes' learning style preferences.

This type of information can be made available and useful to individual student-athletes, academic counselors, tutors, coaches and others who work directly with student-

athletes in order to structure study time and develop strategies that are conducive to an individual student-athlete's learning style preferences. This examination can assist the student-athletes in better understanding how knowing their learning style preferences can impact their academic performance in the classroom (Honigsfeld & Dunn, 2006) and their athletic performance on the field of competition (Baribeau, 2006).

Results of this study will influence effective change in study table training for not only the students-athletes, but also for the tutors, mentors, and coaches who work directly with the student-athletes on a regular basis. By focusing on freshmen student-athletes, the effects of individualized study skills training based on their learning style preferences will benefit them by building a strong foundation as they begin their college academic and athletic career.

### Research Questions

The study is an attempt to answer the following research questions:

- RQ1. What are the differences in learning style preferences between male and female student-athletes?
- RQ2. What are the differences in learning style preferences of student-athletes who participate in team sports compared to those who participate in individual sports?
- RQ3. What are the interactions between gender and type of sport participation as measured by the Index of Learning Styles?

## Hypothesis

- H1. The difference in learning style preferences between male and female student-athletes will be significant in at least one domain.
- H2. The difference in learning style preferences of student-athletes who participate on team sports will be significantly different when compared to those who participate in individual sports in at least one domain.
- H3. There will be a significant interaction between gender and type of sport in at least one domain.

## Limitations

1. The data were collected through a self-reported instrument- Index of Learning Styles.
2. The results of the Index of Learning Styles were collected for freshmen varsity student-athletes only.
3. No data were gathered for international freshmen varsity student-athletes.
4. The data gathered and conclusions were based on the learning style preferences of students-athletes at a major Division I, southern institution.

## Assumptions

1. Typically self-reported data should be approached guardedly, however, there is no particular benefit to the participant so the assumption is made that data were provided accurately and without bias.
2. The representation of only freshmen student-athletes was due to the manner in which the data were gathered during the freshmen orientation sessions.
3. International student-athletes were not included in the study due to the general inconsistent attendance at the freshmen orientation sessions. This is due largely to the difficulty of arriving on campus in a timely manner.
4. The ability to generalize the results may be restricted and conclusions beyond the target group of study should be made with care.

## Definition of Terms

The following terms are provided to further explain terms used throughout his study,

1. Academic Counselor (Academic Advisor for Athletics, Athletic Academic Advisor):  
A professional who works in the Student Athlete Support Services (SASS) office. Each Academic Counselor is responsible for a particular set of student-athletes' eligibility. The students are divided by sport. The Academic Counselor works to support the student-athlete, but reports to the Director of SASS and to the coaches.

2. Academic Mentor: A graduate student or professional who has experience working with special populations of mainly freshmen or at-risk students. These individuals are trained specifically to work with student-athletes and assist them in maintaining time management, train them in study skills and overall monitor their study time to ensure effective use of time and effort.
  
3. Division I Institution or University: An institution that meets the criteria for membership in the definition set forth by the NCAA, must have at least 14 sports and grant athletic scholarships. It is the highest level of competition for intercollegiate athletics with approximately 330 institutions (September, 2007) competing at this level (NCAA Division I Manual, 2008).
  
4. Index of Learning Styles (ILS): The *Index of Learning Styles* is an instrument used to assess learning style preferences on four dimensions (Active\_Reflective, Sensing\_Intuitive, Visual\_Verbal, and Sequential\_Global). This model was formulated by Richard M. Felder and Linda K. Silverman. The instrument was developed by Richard M. Felder and Barbara A. Soloman of North Carolina State University. The pencil and paper version was created in 1991, while the Web-based version was created in 1997.
  
5. Individual Sport: Any sport in which the participants do not directly and consistently interact with each other on the field of play. For this study these sports are: Women's Gymnastics, Men's Golf, Women's Golf, Men's Tennis, Women's Tennis, Men's

Track & Field, Women's Track & Field, Men's Swimming & Diving, Women's Swimming & Diving, and Women's Equestrian.

6. Learning Specialist: A professional with expertise in the area of educational pedagogy. Each Learning Specialist is responsible for a particular set of student-athletes' academic progress. The students are assigned a Learning Specialist who helps them achieve appropriate levels of study skills and strategies in an effort to create an effective learning environment. They are responsible for training Academic Mentors. The Learning Specialist works as a liaison between the student and other resources on campus that can be utilized to enhance the learning experience.
  
7. Multivariate Analysis of Variance (MANOVA): Provides a simultaneous analysis of multivariate independent and dependent variables (Tabachnick & Fidell, 1989). MANOVA is appropriate when one's design involves one or more categorical independent variables and two or more continuous dependent variables (Grimm & Yarnold, 1995).
  
8. The National Association of Academic Advisors for Athletics (N4A): A diverse organization of service professionals who promote the integrity of their profession by providing guiding principles and quality services to support one another as they share information, resources and expertise in their efforts to empower student-athletes to become more productive individuals through educational and personal development (NCAA Division I Manual, 2008).

9. The National Collegiate Athletic Association (NCAA): The governing body of college athletics, which ultimately oversees all student-athletes and member institutions. According to the 2009-2010 NCAA Division I Manual, “By-Law 1.3.1 BASIC PURPOSE: The competitive athletics programs of member institutions are designed to be a vital part of the educational system. A basic purpose of this Association is to maintain intercollegiate athletics as an integral part of the educational program and the athlete as an integral part of the student body and, by so doing, retain a clear line of demarcation between intercollegiate athletics and professional sports. By-Law 1.3.2 OBLIGATIONS OF MEMBER INSTITUTIONS: Legislation governing the conduct of intercollegiate athletics programs of member institutions shall apply to basic athletics issues such as admissions, financial aid, eligibility, and recruiting. Member institutions shall be obligated to apply and enforce this legislation, and the enforcement procedures of the Association shall be applied to an institution when it fails to fulfill this obligation. (p. 1).
10. Reliability: Generally defined as the consistency of the results. In case study research, reliability is the measure to the extent that two different researchers come to the same conclusions using the same procedures (Gall, Borg, & Gall, 1996).
11. Student-Athlete Support Services (SASS): The system of support personnel including Academic Counselors, Academic Mentors and Content Tutors set up to support all

- varsity student-athletes while they are enrolled in college courses at a particular institution.
12. Team Sport: Any sport in which the participants directly and consistently interact with each other on the field of play. For this study these sports are: Men's Football, Men's Basketball, Women's Basketball, Men's Baseball, Women's Volleyball, Women's Soccer, and Women's Softball.
  13. Tutor (content tutor): An individual who has mastered a particular subject in which they are hired to tutor. A content tutor works mainly with subject matter, but also encourages improvement in a student's level of study skills while using the subject in which they are tutoring.
  14. Validity: Commonly defined as, the degree to which a test measures what it claims to measure. Test scores cannot be valid or invalid, but rather the inferences made from the test scores can be valid or invalid (Gall, et al. 1996).

### Organization of the Study

This study was conducted in order to acquire information about student-athletes' individual learning style preferences and to provide useful data to those who work with student-athletes. Chapter 1 addressed the statement of the problem, the purpose of the study, the significance of the study, the research questions, the hypothesis, the limitations

and the assumptions of the study, and the definition of terms. Chapter 2 reviewed the literature which considered the adult learner, the student-athlete, the instructor, an overview of learning styles, gender and sport participation studies, and learning style instruments. Chapter 3 reiterated the purpose of the study and the research questions. Further, this chapter addressed the hypothesis, the setting and participants, the procedures and the instrumentation - Index of Learning Styles (ILS). The chapter concluded with a discussion of the reliability and validity of the Index of Learning Styles Instrument and an explanation of the analysis of data. Chapter 4 focused on the test of the hypothesis and the results. Chapter 5 provided a summary, the findings and conclusions, discussion, implications, and recommendations for future research.

## Chapter 2

### Review of Literature

Chapter 1 addresses the statement of the problem, the purpose of the study, the significance of the study, the research questions, the hypothesis, the limitations and the assumptions of the study, and the definition of terms. Chapter 2 reviews the literature which considered the adult learner, the student-athlete and the instructor. This chapter also provides an overview of learning styles, gender and sport participation studies, and a summary of learning style instruments.

### Purpose of the Study

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- RQ3. What are the interactions between gender and type of sport participation as measured by the Index of Learning Styles?

### The Adult Learner

For the purposes of this study an adult learner is defined as a person who has recently (0-3 years) graduated from high school and is attending college. The average adult learner in this study is at the brink of independent learning. They are moving into a new realm of education which encourages and pushes them into new modes of theory, practice and independent thinking. In order to be successful in college, they must put together all that they have learned and embrace the value of their past experiences and personal motivation. The ultimate goal is for each of them to become self-directed learners by understanding their individual learning style preferences and adapting to a challenging educational environment.

John Dewey is commonly known as the father of education. As early as 1896 Dewey began to informally define and address the not yet named “learning style” diversity in regards to teaching styles in educators (Wesley, 2002). From there decades of research ensued to not only demonstrate how teachers should teach, but how students can learn.

Adult learners have become a fast growing learner population (Cross & McCartan, 1984; Shea, 2002; Symonds, 2003). The most prominent theorist to focus on

the individual adult learner was Malcolm Knowles (1980), who proposed the notion of andragogy, “the art and science of teaching adults,” as a learning theory unique to adults (Lawler, 2003). Knowles' theory of andragogy is an attempt to develop a theory specifically for adult learning. Knowles emphasizes that adults are self-directed and expect to take responsibility for decisions. The theory of andragogy makes the following assumptions about the design of learning:

1. Adults need to know why they need to learn something
2. Adults need to learn experientially
3. Adults approach learning as problem-solving
4. Adults learn best when the topic is of immediate value

In practical terms, andragogy means that instruction for adults needs to focus more on the process and less on the content being taught (Knowles, 1984). Adult learning programs must accommodate these fundamental features to be successful. Since the understanding of learning style preferences focuses on the process of learning, understanding the different learning styles should help adult learners in their pursuit of knowledge.

Knowles (1984) described adult learners as being self-directed, task-centered (or problem-centered) and as intrinsically motivated. Ausburn (2004) explained adult learners as those who have distinctive needs and expectations of learning which sets them apart from younger learners. Russell (2006) postulates that most adults enter into new learning experiences in order to create change and that each individual adult brings

personal motivation along with a vast collection of experience. The adult learner relies on their own motivation to be self-directed.

According to Mackeracher (1996), adult learning is a dynamic and interconnected set of processes that are emotional, social, physical, cognitive, and spiritual. Speck (1996) notes some important points to consider as part of adult learning theory, such as that when the goals or objectives are realistic to the adult learner, they will have a higher level of commitment. An adult learner has many components; therefore, there is not yet universal consensus in accepting a single definition of adult learner.

Since there are still multiple definitions of adult learners, Long (2004) states, “the goal is to arrive at a realistic balance between recognition of individual idiosyncratic characteristics and identification of those normative characteristics that allow us to consider adult learners as a group” (p. 25-26). Courtney (1989) concludes,

It is clear that, for the foreseeable future, adult education will remain an ambiguous term, sometimes being used to refer to the state of a society and its educational systems, sometimes being used to mean specific processes affecting individuals and their learning. What matters is how it is defined in a particular context and for a particular purpose. (p. 23)

For the purpose of this research, adult learners are synonymous with student-athletes. As Long (2004) explains, that adult learners view the role of student as a low priority. The adult learner often has other more important roles to fulfill. Many are parents, spouses, full time workers, or as in this study, student-athletes.

## The Student-Athlete

Freshmen student-athletes are on the threshold of becoming adult learners. They are required to function in a new environment and perform many unique tasks while being watched by the coaches and fans of college athletics. They need to navigate through college and decide what motivates them to succeed as an independent learner away from parents and familiar surroundings.

Student-athletes generally range in age from 17 to 25. Most student-athletes come directly to college from high school. However, there are several who attend junior college or preparatory school before enrolling at a four-year institution. There are also a small number of student-athletes who transfer from one four-year institution to another four-year institution. Regardless, all of these students would fall into the category of student-athlete whether on scholarship or as a walk-on. For this study only first time freshman varsity student-athletes were invited to participate.

As described by Gerdy, (2000), the term student-athlete is used to depict the direct balance of a full time student and a full time athlete. Therefore, for the purposes of this study, a student-athlete is a person who is attending college full time and participating in a varsity sport full time. Being a student-athlete does not distinguish between scholarship students and walk-on students. Scholarship student-athletes are those who receive any type of grant or monetary aide for tuition or room and board from the athletic department of their institution (NCAA Division I Manual, 2009). This does not include monetary grants or aid not provided by the athletic department of their institution.

Walk-on student-athletes are those who receive no tuition or room and board monies from their institution's athletic department.

All student-athletes are required to follow strict regulations set forth by several regulating bodies. The first is their individual university or institution; the second is their collegiate division, and lastly is The National Collegiate Athletic Association (NCAA). Each of these ruling bodies has specific regulations by which the student-athletes must abide. The 2009-2010 NCAA Division I Manual contains over 400 pages of rules and regulations that are to be upheld by member institutions and the student-athletes attending them. The basic eligibility requirements that a student-athlete must abide by include; being enrolled in no less than 12 hours per term, passing no less than six hours per term and no less than 18 hours per academic year (24 hours for freshmen), maintaining a grade point average (GPA) above a 2.00 (based on a 4.00 scale) and reaching set degree percentages after each academic year (20%, 40%, 60%, 80%). There are also many regulations describing how many hours each week they can participate in required practice or other team related activities. These hours change as the student-athletes move in and out of practice and competition seasons. It is difficult for a student-athlete to keep up with all of their own academic and athletic eligibility requirements, thus the Academic Counselors provide the adequate support required for student-athletes. The NCAA holds the member institutions responsible for controlling their intercollegiate athletics programs in compliance with the rules and regulations of the National Collegiate Athletic Association.

As student-athletes are learning how to become independent they need the support of academic counselors, advisors, coaches, mentors, tutors, professors and all university

personnel to instruct them in the art and science of how to become a successful independent adult learner and to assist them in navigating through college athletics.

According to Etzel, Ferrante and Pinkney, (2002),

We view student-athletes as a diverse group of “whole people” with numerous needs and concerns that can be both unique to this population and shared with college students in general. Collegiate athletics, as a microcosm of society, is an arena in flux, which intensifies the stresses placed on student-athletes and challenges the values, skills, and abilities they bring to campus. (p. xv)

Student-athletes have numerous demands placed on them. They are both full time students and full time athletes. As a full-time student, they must attend every class, read required materials and complete all assignments in a timely manner. Some academic courses require group work or assignments outside of class time, both of which place extra demands on their already packed schedule. Freshman students are also dealing with the issues of independence. They have left home where there was security and comfort. They are now in an environment of freedom, yet they may not have the skills required to handle this new freedom. They are now responsible for their own laundry, food, travel and friend choices. This can be a thrilling and yet daunting situation for many college freshmen.

As a full-time athlete, they must attend every practice and team related event. Many have physical treatment, which is done on their own time and based on their own needs. When they are in-season, the schedule can get even more demanding, as they will miss classes in order to travel to competitions. There are often requests to speak or appear

at different events around town and complete required community services hours. Many varsity college athletes were the best in their high schools and this was a large portion of their identity throughout high school. Now they are one of many superior athletes, fighting for a spot on the team. This can pose a unique dilemma in their lives as they deal with not being the star athlete. Also a new stress placed on them is the fan base that watches every move they make, for some sports it is more challenging than others.

When one combines the difficulty of being a full-time student and a full-time varsity athlete, it is evident that having effective time management skills is of the utmost importance (Finch & Gould, 2002). However, as many students find that they do not know how to be good managers of their time (Petrie & Denson, 2003) it becomes important that each study session they encounter be used to its fullest. In order to do this, each student would benefit from knowing how they learn best in order to master the material they need to learn (Fritz, 2002; Kiguwa & Silva, 2007; Liu, Magjuka, & Lee, 2008; Skogsberg & Clump, 2003). They do this with the assistance of academic counselors, mentors and tutors. By understanding their learning style preference, student-athletes can focus better on how to process and manage a maximum amount of material in an efficient manner. The academic counselors', mentors' and tutors' knowledge must include that of the student's learning style preferences and the modes in which to teach to those individual preferences. If the person providing assistance doesn't understand how the student-athlete learns best, they may not be assisting them with the most effective approach.

Unique to student-athletes is that they have been coached for years in their particular sport. Being coached indicates that they do what they are told, shown, or have

been modeled. Coaches instruct student-athletes by having a walk-through, looking at diagrams, watching film of themselves and of their opponents, and using physical practice (Baribeau, 2006; Pinkney, 2002). In a similar tone, Schroeder (1993) proclaimed, “Learning is not a spectator sport” (p. 21). Athletes are typically active when they are learning for their sport. Instead of merely listening in a lecture hall, they are running the plays and implementing the coach’s plan for success. Statt, Plummer and Marinelli (2001) declared “Sport does not adapt for players, rather players must adapt to the circumstances around them” (p. 35). Statt, et al. (2001) wrote a general guide for teaching athletes using a variety of learning styles, but did not research the learning style preferences of athletes.

The coached student-athlete is well-versed in combining listening and experiencing. Therefore, it is plausible that some student-athletes would struggle with lecture and readings but would thrive in a more active, or at least a more balanced (combined active and listening) learning environment than what is offered in typical college classrooms. Felder emphasized that learners with a strong preference for a specific learning style may have difficulties if the teaching style does not match their preferred learning style (Felder & Silverman, 1988; Felder & Soloman, 1991; Graf, Viola, Leo & Kinshuk, 2007). Moreover, Honigsfeld and Dunn (2006) stated, “Data generated by many experimental studies show statistically increased achievement test scores when college adults’ styles were responded to with complementary resources or approaches” (p. 1). This supports the concept that knowing one’s learning style preferences can benefit the learner directly and also by sharing this information with those who work daily with the student-athlete can produce more efficient study time.

## The Instructor

For years students and instructors have struggled to understand each other. As reported by Schroeder (1993)

Colleges and universities today show an increasing disparity between faculty and students, between teacher and learner. What suffers as a consequence is the learning process itself - an observation that pervades in numerous national reports on the status of higher education written in the 1980s. Unfortunately, the natural differences in learning patterns exhibited by new students are often interpreted by faculty as deficiencies. What may be happening, then, is a fundamental “mismatch” between the preferred styles of faculty and those of students. (p 25)

Many researchers agree that learning materials should not just reflect that of the teacher’s learning style, but should be designed for all types of students and a variety of learning styles (Franzoni & Assar, 2009). Kolb (1984) indicated that students succeed in academic settings that match their learning style. These are also important factors to consider when training academic mentors and tutors who work directly with students during their study times.

Research also suggests that instructors can change the way they teach to accommodate the students in their courses. According to Dunn (2003), most instructors are not mindful of the fact that less than a third of their students can recall what they see or hear during a classroom lecture. In higher education, it is common for an instructor to be an expert in the field, but may never have had formal instruction on how to teach the

content. The result is that many instructors either teach the way they were taught, or teach to their own learning style preference (James & Maher, 2004).

Moreover, some researchers believe that instructors can change or adapt their teaching styles to accommodate a variety of learning styles found in a single classroom (Felder, 1993; Fritz, 2002; McKeachie, 1995). They all agree that finding a balanced teaching method is best for everyone regardless of their preferred learning styles. Schroeder (1993) stated, “If we can expand the repertoire of learning activities open to us (the instructor), perhaps we can greatly increase both our own satisfaction and our students’ learning” (p. 26).

One of the challenges facing the college students and college instructors is the ability to adapt to different styles and strategies. The goal is to know their own learning or teaching style preferences while being aware of a variety of different learning and teaching styles, then adapting in order to learn and teach in different environments.

## Learning Styles

Dunn and Dunn (1998) described learning style as the way any particular person begins to concentrate on, process, internalize and preserve new and complex information. According to Loo (2002), “Learning style refers to the consistent way in which a learner responds to or interacts with stimuli in the learning context, (p. 252).” Furthermore, Sewall (1986) referred to learning style as a learners’ unique way of environmental interaction. Spoon and Schell (1998) stated,

Learning style refers to the characteristic ways in which individuals collect, organize, and transform data into useful information (as cited in Cross, 1976; Kolb, 1984). Many researchers believe that learning styles influence the choice of such things as the settings in which people wish to learn, the kinds of things they wish to learn, and how they will approach learning situations (as cited in Conti & Welborn, 1986). (p. 1)

All of these definitions refer to individuals in some form or another. That is the key to learning style preferences - the individual. Each individual can hear, see, and experience the exact same incident but come away with completely individualized ideas and perceptions of what they saw, heard and internalized. When discussing students, the onus is on the instructor to instruct, educate, coach, or train the students in a manner so that they learn, discover, ascertain, or internalize the material expected by the instructor. Keefe (1979) postulated that individualized instruction was a more rational option since learning style diagnosis was available. "It gives the most powerful leverage yet available to educators to analyze, motivate, and assist students in school. As such, it is the foundation of a truly modern approach to education" (p. 132).

The resurgence of the educational research concerning learning styles has become evident through recent literature. Cassidy (2004) proposed that research in the realm of learning styles dates back several (four) decades. However, within more recent years Cassidy claims to have seen a noticeable increase in the amount of research in the area of learning styles. Learning style research has begun in several fields of study. Smith (2002) mentioned a substantial concentration in adult learning. Wang, Wang, Wang and Huang

(2006) pointed to learning style research in the area of science education. Curry (1991) described the use of learning styles in the health professions. Finally, Zhang and Sternberg (2005) declared that the last decade has brought about an increase in learning styles research in both academic and non-academic fields. According to Van Zwanenberg, Wilkinson, and Anderson (2000),

There seems to be general agreement in the psychological literature that individuals do differ in the ways in which they prefer to gather and absorb data, and in how they process such data. Similarly, there is a measure of agreement that these differences are important and may have consequences for how successfully different students, for example, perform on a variety of educational programmes (sic). (p. 366)

Although there are several accepted definitions of a learning style, the common thread appears to refer to the individual and how they acquire and internalize information. Instructors can modify their teaching style to accommodate several different learning style preferences and reach a larger number of students if they take the time to investigate the learning style preferences of the students enrolled in the course (Schroeder, 1993). In addition to the traditional lecture, instructors can provide other modes of acquiring knowledge which include; watching videos, listening to podcasts, or reading a book or article. With the introduction and use of individual content tutors and Academic Mentors, there can be an even narrower focus on the students' learning style preferences while discussing and learning new material.

## Gender

Across the studies which considered gender as an Independent Variable (IV), some found minor differences while others found largely significant differences among gender and learning style preferences.

Keri conducted a study to investigate whether males and females learn differently. His sample consisted of 693 college students, 50.5% were male and 45.5% were female. He did not account for area of study in his investigation. Keri (2002) concluded that males and females do learn differently, and summarized his findings as,

In general, the studies on males' and females' learning differences have concluded that more females are relational learners, whereas more males are independent learners. Using Canfield's Learning Style Inventory (Canfield & Cafferty, 1988) more males indicated a preference for applied learning styles (i.e., using everyday-life experiences as a basis for learning), whereas females preferred abstract (i.e., where copious reading assignments are required, learning materials are organized, and instructors' demonstrate knowledge). The results provide validation for diversifying instructional styles to address the learning needs of students. (p. 433)

Keri (2002) concluded, "The common interest in terms of learning preferences between males and females is social; that is males and females (both) prefer to work with people, and associate with others on learning tasks" (p. 437).

Alumran (2008) conducted research with the aim to investigate the differences in preferred learning styles according to gender and field of study using the Index of Learning Styles with 877 college students at a Bahraini university. His sample consisted of 265 (30.2%) males and 610 (69.6%) females. Alumran (2008) contended that there were significant differences in learning styles according to gender. “Males were more intuitive learners, whereas females were more sensing learners” (p. 303).

Philbin and Meier (1995) completed a study that indicated there were significant differences in learning styles between males and females. They indicated that in general, males tend to prefer traditional analytical learning, but females prefer more nontraditional learning (concrete experience). Matthews and Hamby (1995) concluded that male students preferred abstract and active experimentation, while females preferred to generate ideas. Pettigrew and Zakrajsek (1984) found that males preferred hands-on learning tasks whereas females preferred a well organized presentation of course material. Slater, et al. (2007) found, “...the female student population tended to be more diverse than the male population, encompassing a broader range of sensory modality combinations within their preference profiles” (p. ii). Dunn, Thies, and Honigsfeld (2001) declared that research has shown gender to be an attribute that tends to differentiate among individuals' learning styles. Summarizing their findings, Honigsfeld and Dunn (2006) stated,

Globally speaking, in almost every study the following results were revealed: Adult males and females had significantly different learning styles from each other. For example, females in every nation were more auditory, motivated, persistent and responsible (conforming) than their male counterparts. Despite

societal misconceptions concerning males' propensity for variety, women require statistically more instructionally diverse approaches while learning. (p. 3)

#### Team or Individual Sport Participation/Area of Study

There were no specific studies completed in the area of learning styles in college settings with freshmen varsity student-athlete team or individual sport participation. However, Wesley (2002) conducted a study involving high school varsity student-athletes and their learning styles. Wesley (2002) reported in her results that within her population the active learning style was most preferred among student-athletes in general and gender had no influence on the learning style preferences of student-athletes. She did not categorize by sport participation.

There have been limited studies conducted in the area of using learning styles to teach sports. Harberts & Walker (2007) reported that by considering learning styles when teaching swimming, the coaching staff and students can build an alliance with each other, which in the long run benefits the students and the program. However, no research was conducted on what type of learning styles were found, rather just that they should be considered as helpful. The same is true for Konukman & Petrakis (2001) who expressed that by using different learning style techniques to teach tennis, all students were able to benefit. Coker (1997) stated that since the use of learning styles is effective in the academic classroom, it may also be effective for teaching motor skills in physical education classes.

Another connected area of research was directed at college students in sports-related fields of study. Peters, Jones and Peters (2008) conducted research in England involving college students who were in sports-related majors (Sport and Exercise Science, Sports Coaching Science, Physical Education, Sports Studies, Sports and Leisure Management, and Outdoor Recreation Management). Using the Perceptual Learning-Style Preference Questionnaire, they found that the students in their population preferred the modes of “auditory, kinaesthetic (sic) and group, although vast majority of students are multimodal in their learning preferences” (p.155). Another population observed for learning style preferences includes athletic trainers. Hansen (2001) profiled student athletic trainers and certified athletic trainers for their preferred learning style preferences using Kolb’s Learning Style Inventory. Both student and certified athletic trainers were found to be convergers (active problem solvers) and assimilators (able to understand a variety of information in a concise format), but the student athletic trainers also showed preference for being accommodators, which showed that they preferred hands-on experiences. Harrelson, Leaver-Dunn, and Wright (1998) studied the environmental preferences of learning for athletic trainers. Furthermore, Coker (2000) conducted a study to determine the difference between athletic trainers learning style in a classroom setting versus a clinical setting. Both studies revealed that well-lit rooms were preferred. Furthermore, Coker (2000) found that teaching methods needed to be different when teaching in a classroom versus a clinical setting.

Also of interest to this research was the concept of teamwork through the use of learning style instruments. Sharp (2003) presented a lesson plan with techniques for using the Index of Learning Styles (ILS) instrument to teach teamwork. She postulated that

knowing how your teammates learned would help individuals modify and develop teamwork proficiency. Irving and Williams (1995) found that active learners worked best in team situations. Liu, et al. (2008) stated, “Research suggests that teams with heterogeneous or flexible personality styles usually perform better than those with homogenous styles in a complex task environment” (p .831). In addition, Liu, et al. (2008) indicates that having a team mentality with a balance of different learning styles leads to enhanced team satisfaction. The general premise is to understand your coworker’s (teammate’s) learning styles which include their strengths and weaknesses in order to best work together. Not all individuals have the same strengths and not all teammates excel in the same tasks. It takes individual strengths working together as a whole team to be successful.

Students with different learning styles often choose to pursue different academic majors (Schroder, 1993). Research has been conducted with college age students focusing on academic fields or area of studies. Learning style research has been accomplished with a focus in the area of academics and or job related preferences and many have investigated what types of learning styles are employed by students in different majors. By noting and comparing how a similar group of individuals rate on learning style preferences, inferences can be made.

Alumran used the Index of Learning Styles to assess 877 college students, ages 17-30 years, to determine how an individual’s learning style was affected by both gender and field of study. Alumran (2008) maintained that students in different fields of study were found to have different learning styles. “Information technology students were

found to be more active learners than the law students and science students; whereas the education students were more active learners than the science students” (p. 303).

Jones, et al. (2003) used Kolb’s Learning Style Inventory to assess 105 college students enrolled in four different sections of an English Composition II course. Research results reported by Jones, et al. (2003), “Revealed significant differences in students’ learning style preferences across disciplines” (p. 363), moreover they reported that when learning different subjects, the students altered their preferred learning styles. Recent research among college students has demonstrated that students who select certain majors may have distinctly different learning-style preferences from those who major in other fields of study (Loo, 2002).

Additionally, Skogsberg and Clump (2003) asserted that there are major differences in the learning styles of students depending on the courses they took. All of these findings suggest that learning style preferences are responsive to subject area. Furthermore, there is a perception that different areas of study require different learning strategies, and that students are able to minimally adjust their learning style to meet the requirements of the learning task (Gadzella & Masten, 1998; Matthews, 1994; Mishra, 1998; Skogsberg and Clump, 2003; and Zakrajesk, Johnson, & Walker, 1984).

### Learning Style Instruments

Based on the findings of some of the earliest researchers of learning behavior, the Swiss psychiatrist Carl Jung wrote, “What appears to be random behavior is actually the result of differences in the way people prefer to use their mental capacities” (Myers &

Briggs Foundation, 2010). Jung identified distinct personality traits and introduced the psychological types called introversion and extroversion (Geyer, 2009). An extrovert's position is influenced by the outside world, or external factors. On the other hand, the introvert's position is influenced by the internal factors such as their own thoughts and feelings (Jung, 1971). Extroverts tend to think out loud and cannot solve problems in their head as well as introverts. There are also those who fall in between, which is considered more of a continuum. These types don't mind being alone or in large groups based on the situation. Jung then expanded his psychological types into four mental processes – two perception processes: sensing and intuition, and two judgment processes: thinking and feeling. Perception is the way in which people become aware of things, ideas or people around them through sensing or intuition. Sensing involves the five senses: seeing, feeling, smelling, tasting, and hearing, while intuition involves the unconscious mind of meanings and relationships. The judgment types are thinking and feeling. Thinking is used to decide impersonally in the basis of logical consequences, while feeling is based on one's personal or social values. Jung theorized that everyone uses all four processes but that we don't all use them equally (Jung, 1971).

Jung paved the way for the next generation of researchers which included, Isabel Briggs Myers & Katharine Cook Briggs, David Kolb, and Richard Felder & Linda Silverman. Myers & Briggs studied the works of Carl Jung in depth. Isabel Myers and her mother, Katherine Cook Briggs shared a vision of helping individuals develop healthy personalities by assisting them in appreciating individual differences and diverse personalities (Saunders, 1991). After reading Jung's book *Psychological Types* in 1923, they were inspired to create a constructive way to use Jung's theories. They worked for

over 20 years gathering personality data then developed the first personality questionnaire. In 1975 the MBTI ® instrument was published for use outside of research (Myers & Briggs Foundation, 2010). They continued to modify and adapt their instrument and today their instrument is used across the world in 30 different languages.

The Myers-Briggs Type Indicator (MBTI ®) is an assessment designed to help people better understand individual differences and how they interact with others. According to Geyer (2009), its purpose is to make this comprehensive theory of personality practical and useful in people's lives. The MBTI ® instrument is a forced-choice personality inventory based on Jung's theory of psychological types. The four types that are used in combination with each other to provide an individual personality type are as follows:

- Introversion (I)/Extraverson (E)
- Sensing (S)/Intuition (N)
- Thinking (T)/Feeling (F)
- Judgment (J)/Perceiving (P)

The 16 personality types of the Myers-Briggs Type Indicator can be found in what is called a “type table” which provides a visual of the combinations of the personality types (see Table 1). Each person scores one of the letters for each set of personality types which are then put together to form the four letter personality types.

Table 1

*Myers & Briggs Type Table*

ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESFJ	ENFJ	ENTJ

Source: Myers & Briggs Foundation

Briggs-Myers (1998) explained the 16 MBTI® Types as follows,

ISTJ

Quiet, serious, earn success by thoroughness and dependability. Practical, matter-of-fact, realistic, and responsible. Decide logically what should be done and work toward it steadily, regardless of distractions. Take pleasure in making everything orderly and organized – their work, their home, their life. Value traditions and loyalty.

ISFJ

Quiet, friendly, responsible and conscientious. Committed and steady in meeting their obligations. Thorough, painstaking, and accurate. Loyal, considerate, notice and remember specifics about people who are important to them, concerned with how others feel. Strive to create an orderly and harmonious environment at work and at home.

## INFJ

Seek meaning and connection in ideas, relationships, and material possessions.

Want to understand what motivates people and are insightful about others.

Conscientious and committed to their firm values. Develop a clear vision about how best to serve the common good. Organized and decisive in implementing their vision.

## INTJ

Have original minds and great drive for implementing their ideas and achieving their goals. Quickly see patterns in external events and develop long-range explanatory perspectives. When committed, organize a job and carry it through.

Skeptical and independent, have high standards of competence and performance –

for themselves and others.

## ISTP

Tolerant and flexible, quiet observers until a problem appears, then act quickly to find workable solutions. Analyze what makes things work and readily get through large amounts of data to isolate the core of practical problems. Interested in cause and effect, organize facts using logical principles, value efficiency.

## ISFP

Quiet, friendly, sensitive, and kind. Enjoy the present moment, what's going on around them. Like to have their own space and to work within their own time frame. Loyal and committed to their values and to people who are important to

them. Dislike disagreements and conflicts, do not force their opinions or values on others.

#### INFP

Idealistic, loyal to their values and to people who are important to them. Want an external life that is congruent with their values. Curious, quick to see possibilities, can be catalysts for implementing ideas. Seek to understand people and to help them fulfill their potential. Adaptable, flexible, and accepting unless a value is threatened.

#### INTP

Seek to develop logical explanations for everything that interests them.

Theoretical and abstract, interested more in ideas than in social interaction. Quiet, contained, flexible, and adaptable. Have unusual ability to focus in depth to solve problems in their area of interest. Skeptical, sometimes critical, always analytical.

#### ESTP

Flexible and tolerant, they take a pragmatic approach focused immediate results.

Theories and conceptual explanations bore them – they want to act energetically to solve the problem. Focus on the here-and-now, spontaneous, enjoy each moment that they can be active with others. Enjoy material comforts and style.

Learn best through doing.

#### ESFP

Outgoing, friendly, and accepting. Exuberant lovers of life, people, and material

comforts. Enjoy working with others to make things happen. Bring common sense and a realistic approach to their work, and make work fun. Flexible and spontaneous, adapt readily to new people and environments. Learn best by trying a new skill with other people.

#### ENFP

Warmly enthusiastic and imaginative. See life as full of possibilities. Make connections between events and information very quickly, and confidently proceed based on the patterns they see. Want a lot of affirmation from others, and readily give appreciation and support. Spontaneous and flexible, often rely on their ability to improvise and their verbal fluency.

#### ENTP

Quick, ingenious, stimulating, alert, and outspoken. Resourceful in solving new and challenging problems. Adept at generating conceptual possibilities and then analyzing them strategically. Good at reading other people. Bored by routine, will seldom do the same thing the same way, apt to turn to one new interest after another.

#### ESTJ

Practical, realistic, matter-of-fact. Decisive, quickly move to implement decisions. Organize projects and people to get things done, focus on getting results in the most efficient way possible. Take care of routine details. Have a clear set of logical standards, systematically follow them and want others to also. Forceful in implementing their plans.

## ESFJ

Warmhearted, conscientious, and cooperative. Want harmony in their environment, work with determination to establish it. Like to work with others to complete tasks accurately and on time. Loyal, follow through even in small matters. Notice what others need in their day-by-day lives and try to provide it. Want to be appreciated for who they are and for what they contribute.

## ENFJ

Warm, empathetic, responsive, and responsible. Highly attuned to the emotions, needs, and motivations of others. Find potential in everyone, want to help others fulfill their potential. May act as catalysts for individual and group growth. Loyal, responsive to praise and criticism. Sociable, facilitate others in a group, and provide inspiring leadership.

## ENTJ

Frank, decisive, assume leadership readily. Quickly see illogical and inefficient procedures and policies, develop and implement comprehensive systems to solve organizational problems. Enjoy long-term planning and goal setting. Usually well informed, well read, enjoy expanding their knowledge and passing it on to others. Forceful in presenting their ideas.

Kolb is best known for his research in the area of organizational behavior and experiential learning in higher education. His interests lay in exploring the processes linked with making sense of concrete experiences (Kolb's Learning Styles Inventory, 2010). Kolb (1984) with his associate Roger Fry researched and developed his

Experiential Learning Theory (ELT) which eventually led to the formation of his Learning Style Inventory (LSI). Kolb and Fry (1975) agreed that the learning cycle can begin at any one of the four points, therefore should be considered a continuous spiral. However, it generally starts with an action then an observation of the action's effect, followed by an understanding of a general principle for future gain.

Today Kolb's learning styles model and ELT are recognized by educators, managers and trainers as influential in promoting the general understanding of human behavior and how people learn (Jones, et al. 2003). Kolb's learning style model focuses on the role of experience as the foundation for learning (Cano-Garcia & Hughes, 2000). Kolb's theory sets out four distinct learning style preferences, which are based on a four-stage learning cycle. Kolb's model therefore works on two levels.

First is Kolb's four-stage cycle:

- Concrete Experience (CE) "Feeling"
- Reflective Observation (RO) "Watching"
- Abstract Conceptualization (AC) "Thinking"
- Active Experimentation (AE) "Doing"

Concrete Experience is the opposite of Abstract Conceptualization; meaning one cannot do both at the same time. Similarly, Reflective Observation is the opposite of Active Experimentation; therefore, one must decide whether to do or to watch because they cannot do both simultaneously.

Second is Kolb's four-type definition of learning styles:

- Diverging (CE/RO)
- Assimilating (AC/RO)

- Converging (AC/AE)
- Accommodating (CE/AE)

The second stage combines two of the first stage types to create a complex circle of learning. Diverging is described as feeling and watching, assimilating is thinking and watching, converging is thinking and doing, and lastly accommodating is feeling and doing.

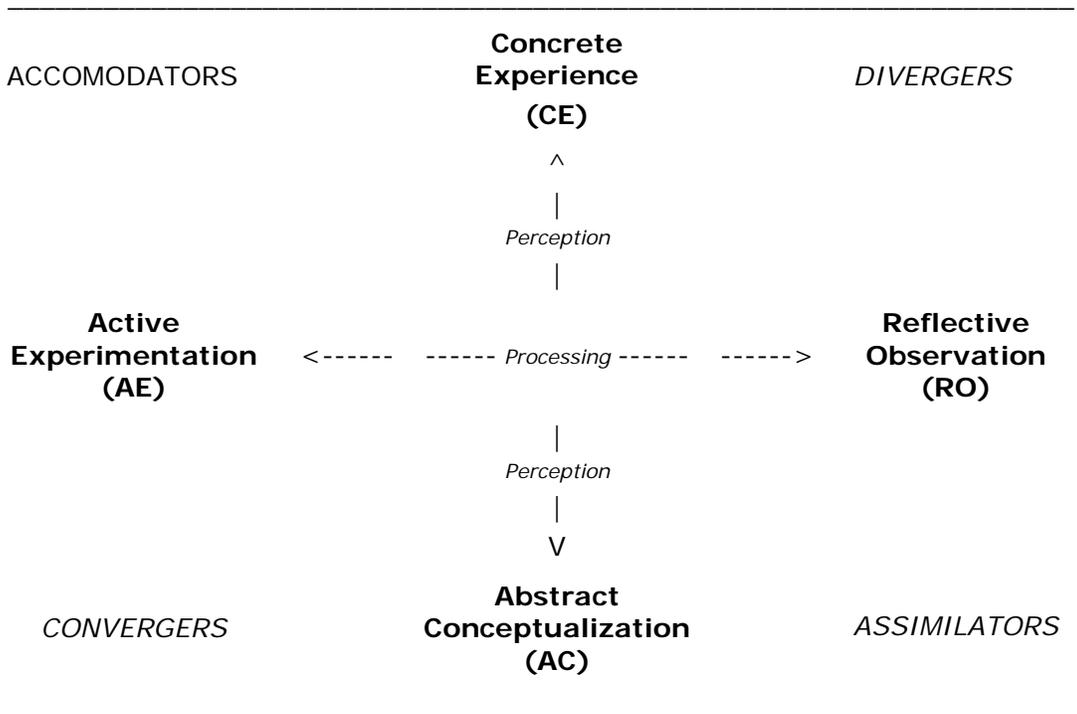


Figure 1: Kolb's Learning Cycle

Source: Kolb's Learning Styles

Descriptions of Kolb's four learning styles (Kolb's Learning Styles, 2010):

### Diverging (feeling and watching - CE/RO)

Divergers take experiences and think deeply about them, thus diverging from a single experience to multiple possibilities in terms of what this might mean. They like to ask 'why', and will start from detail to constructively work up to the big picture.

They enjoy participating and working with others but they like a calm ship and fret over conflicts. They are generally influenced by other people and like to receive constructive feedback.

They like to learn via logical instruction or hands-one exploration with conversations that lead to discovery.

### Assimilating (watching and thinking - AC/RO)

Assimilators have the most cognitive approach, preferring to think than to act.

They ask 'What is there I can know?' and like organized and structured understanding.

They prefer lectures for learning, with demonstrations where possible, and will respect the knowledge of experts. They will also learn through conversation that takes a logical and thoughtful approach.

They often have a strong control need and prefer the clean and simple predictability of internal models to external messiness.

The best way to teach an assimilator is with lectures that start from high-level concepts and work down to the detail. Give them reading material, especially

academic stuff and they'll gobble it down. Do not teach through play with them as they like to stay serious.

#### Converging (doing and thinking - AC/AE)

Convergers think about things and then try out their ideas to see if they work in practice. They like to ask 'how' about a situation, understanding how things work in practice. They like facts and will seek to make things efficient by making small and careful changes.

They prefer to work by themselves, thinking carefully and acting independently. They learn through interaction and computer-based learning is more effective with them than other methods.

#### Accommodating (doing and feeling - CE/AE)

Accommodators have the most hands-on approach, with a strong preference for doing rather than thinking. They like to ask 'what if?' and 'why not?' to support their action-first approach. They do not like routine and will take creative risks to see what happens.

They like to explore complexity by direct interaction and learn better by themselves than with other people. As might be expected, they like hands-on and practical learning rather than lectures.

Felder and Silverman (1988) took the complexity of Kolb's Learning Style Inventory and the practicality of the Myers-Briggs Type Indicator and created a simple

learning style model with four dimensions. The result was the easy to use Index of Learning Styles (ILS) questionnaire, created by Richard Felder and Barbara Soloman. The learning styles model developed by Felder and Silverman incorporates four dimensions, two of which replicate aspects of the Myers-Briggs and Kolb models (Felder, 1993; Felder & Silverman, 1988). To be specific, the perception of information dimension (Sensing\_Intuitive) is analogous to the perception dimension of both Myers-Briggs and Kolb; the information processing dimension (Active\_Reflective) is also found in Kolb's model. In addition, Felder & Silverman (Felder-Silverman Learning Styles Model, 2010) suggest additional dimensions: input of information (Visual\_Verbal) and understanding of information (Sequential\_Global). An in-depth examination of the ILS can be found in Chapter 3.

The popularity of learning style models has continued to grow and there are a variety of publicly accessible websites that offer quick learning styles assessments and applications for different learning style preferences. Many of these on-line assessments are similar in nature and also provide comparable results and practical learning strategies.

Coffield, Moseley, Hall, and Ecclestone (2004) stated, “The literature indicates that there is wide acceptance of the concept of learning styles; however, there is disagreement on how to best measure learning styles.” In 2007, Litzinger, Lee, Wise and Felder, identified 71 different learning style instruments. The underlying reality is that there is no ideal learning style assessment for every individual and every circumstance. Each person must decide what they are looking for in a method and choose what is right for them and their situation. There are other learning style assessments that provide easy

delivery with credible results. An example of four free on-line assessments follows (the websites can be found in the References section):

DVC (Diablo Valley College) on-line (Miller, 2000) has a quick and easy learning styles survey which categorizes four learning styles with a brief explanation of how to best use strengths to help improve learning in the classroom. When the learning styles are reported, the learners are one of the following four learning styles:

1. Visual/Verbal Learning Style
2. Visual/Nonverbal Learning Style
3. Tactile/Kinesthetic Learning Style
4. Auditory/Verbal Learning Style

The visual/verbal learner does best with spoken and written words. They prefer to study alone in a quiet place and can usually visualize their work in their mind's eye. The Visual/nonverbal learner benefits from color coding and the use of flashcards so they can form a mental picture of their material. They profit most from pictures, charts, or graphs. Tactile/kinesthetic learners thrive with action or hands on activities. Note taking is an effective way to stay engaged in lectures. Lastly, auditory/verbal learners are most suited for class lectures, as they learn best by listening and discussing new information.

The second free learning styles test is the VAK (Visual Auditory Kinesthetic). This learning style model is based on the concept of multiple intelligences. This multi-sensory approach was first developed to help children who could not learn in a conventional classroom. This model claims to provide a different perspective for understanding and explaining a person's preferred learning style. Visual is described as seeing and reading, auditory as listening and speaking, and kinesthetic as touching and

doing. The visual learning style involves the use of pictures, diagrams, demonstrations, displays, handouts, films and any other way to see the information. Auditory refers to the intake of information through hearing of sounds or spoken words (from others or yourself). Kinesthetic learners must touch, hold, feel or do something with the information in order to best retain and learn it. This model is sometimes known as VARK (Visual-Auditory-Reading-Kinesthetic) or VACT (Visual- Auditory-Kinesthetic-Tactile).

LDPride provides a free learning styles test on their web-site. There are also links for explanations of how to best use your learning style. Their learning style model is broken into three learning categories, identical to VAK:

1. Visual Learners who learn through seeing
2. Auditory Learners who learn through listening
3. Kinesthetic Learners who learn through moving, doing and touching

The Memletics learning style inventory focuses on using a student's preferred learning style but also promotes the use of secondary learning style preferences as well. After completing the learning style test, this web-site provides a graphic representation of a learning style circle with plotted points. However, to get the full assessment and recommendations this site requires paid membership. There are seven learning styles promoted by the Memletics inventory:

1. Visual (spatial)
2. Aural (auditory)
3. Verbal (linguistic)
4. Physical (bodily or kinesthetic)
5. Logical (mathematical)

6. Social (interpersonal)

7. Solitary (intrapersonal)

The Memletics process is complex which makes it more difficult to understand and apply. However, broken down, the Memletics learning styles are as follows. Visual learners use pictures, images, visualization and spatial relationships to learn. Aural learners use voice, sounds and music to learn. Verbal consists of using words and writing. The learner's body, hands and sense of touch are essential for the physical style. Logical learners use logic, reasoning and systems to solve and learn. Those who prefer to work in groups are social learners and those who prefer to work alone are solitary learners.

The Dunn and Dunn learning style model focuses on five categories of learning. First is the immediate environment, this includes light source, sounds, temperature, and seating design. The second is emotionality; this is an individual's motivation, perseverance, responsibility and need for internal or external structure to succeed. Third is the physiological factors which are comprised of auditory, visual, tactile and kinesthetic perceptual needs, along with energy levels, mobility needs and food intake. The fifth and final category is the identification of an individual's cognitive processes. These include global or analytical tendencies and impulsive versus reflective preferences.

Each separate mode of learning style assessment analyzes different characteristics and how they impact a student's ability to learn (Fritz, 2002). Content and population should be considered when choosing an assessment tool.

## Summary

Chapter 2 reviewed the literature which described the adult learner and introduced the student-athlete as a unique and complex adult learner (Ausburn, 2004; Baribeau, 2006; Courtney, 1989; Cross & McCartan, 1984; Etzel, et al. 2002; Felder & Silverman, 1988; Felder & Soloman, 1991; Finch & Gould, 2002; Fritz, 2002; Gerdy, 2000; Graf, et al. 2007; Honigsfeld & Dunn, 2006; Kiguwa & Silva, 2007; Knowles, 1980; Knowles, 1984; Lawler, 2003; Liu, et al. 2008; Long, 2004; Mackeracher, 1996; NCAA Division I Manual, 2009; Petrie & Denson, 2003; Pinkney, 2002; Russell, 2006; Schroeder, 1993; Shea, 2002; Skogsberg & Clump, 2003; Speck, 1996; Statt, et al. 2001; Symonds, 2003; Wesley, 2002). Also considered was the instructor as an important instrument in the teaching and learning process for students (Dunn, 2003; Felder, 1993; Franzoni & Assar, 2009; Fritz, 2002; James & Maher, 2004; Kolb, 1984; McKeachie, 1995; Schroeder, 1993). This chapter also provided an overview of what research asserts about learning styles and how they can help an individual to improve their learning (Cassidy, 2004; Conti & Welborn, 1986; Cross, 1976; Curry, 1991; Dunn & Dunn, 1998; Keefe, 1979; Kolb, 1984; Loo, 2002; Schroeder, 1993; Sewall, 1986; Smith, 2002; Zhang & Sternberg, 2005; Van Zwanenberg, et al. 2000; Wang, et al. 2006). Research connected to gender and sport related studies were discussed and found that males and females learn differently while those who study the same college courses tend to cluster in similar learning styles (Alumran, 2008; Coker, 1997, 2000; Dunn, et al. 2001; Gadzella & Masten, 1998; Hansen, 2001; Harberts & Walker, 2007; Harrelson, et al. 1998; Honigsfeld & Dunn, 2006; Irving & Williams, 1995; Jones, et al. 2003; Keri, 2002;

Konukman & Petrakis, 2001; Liu, et al. 2008; Loo, 2002; Matthews & Hamby, 1995; Matthews, 1994; Mishra, 1998; Peters, et al. 2008; Pettigrew & Zakrajesk, 1984; Philbin & Meier, 1995; Schroder, 1993; Sharp, 2003; Skogsberg & Clump, 2003; Slater, et al. 2007; Spoon & Schell, 1998; Wesley, 2002; Zakrajesk, Johnson, & Walker, 1984; Zhang & Sternberg, 2005). This chapter concluded with an examination of several learning style instruments and their descriptions or learning dimensions (Briggs-Myers, 1998; Cano-Garcia & Hughes, 2000; Coffield, et al. 2004; Felder, 1991; Felder & Silverman, 1988; Fritz, 2002; Kolb & Fry, 1975; Geyer, 2009; Kolb's Learning Style Inventory, 2010; Jones, et al. 2003; Jung, 1971; Kolb, 1984; Kolb's Learning Styles, 2010; Litzinger, Lee, Wise & Felder, 2007; Myers & Briggs Foundation 2010; Saunders, 1991).

## Chapter 3

### Methods

Chapter 1 introduced the purpose of the study, research questions, hypothesis, limitations, assumptions, and definition of terms. Chapter 2 reviewed the literature which considered the adult learner, the student-athlete, the instructor, an overview of learning styles, gender and sport participation studies, and an examination of learning style instruments.

This chapter reiterates the purpose of the study and the research questions. Further this chapter addresses the hypothesis, setting and participants, procedures, and instrumentation - the Index of Learning Styles. Reliability and validity of the Index of Learning Styles instrument are discussed, and the chapter concludes with a description of the analysis of data.

#### Purpose of the Study

The purpose of the study was to acquire information about freshmen varsity student-athletes' individual learning style preferences in relation to gender and sport participation. Felder and Soloman's Index of Learning Styles (ILS) Web-based version was used to measure the learning style preferences. Johnson (2008) declared that everyone has a preferred learning style and that learning styles have an impact on the way

people take in and retain new information. Cassidy (2004) proposed that overall learning styles are considered stable over a long period of time but that they can change with situations and experience. This indicates that there is potential for adaptations or modifications of an individual's learning style preferences. Baldwin and Sabry (2003) stated,

The purpose of examining the learning styles of learners is to better understand the behavior patterns that learners exhibit so that they can be incorporated into interactive learning systems and thus be more effective and efficient in helping learners to learn (p. 327).

Multiple researchers agree that students will learn better when the material is provided in a way that matches with their learning style preference (James & Maher, 2004; Kolb, 1984; Gardner, 1985; Griggs, 1985; Slavin, 2000). Also of importance is an instructor's ability to adjust pedagogic strategies according to the needs of the students in the class (Cuthbert, 2005). A study by Gadt-Johnson and Price (2000) signified that learning styles symbolize an individual learner's tendency to learning certain material and concluded that a powerful relationship exists between student's unique learning style and their academic success. Knowing and understanding learning styles can help an individual learn more efficiently (Silver, Strong & Perini, 1997).

## Research Questions

The study is an attempt to answer the following research questions:

- RQ1. What are the differences in learning style preferences between male and female student-athletes?
- RQ2. What are the differences in learning style preferences of student-athletes who participate in team sports compared to those who participate in individual sports?
- RQ3. What are the interactions between gender and type of sport participation as measured by the Index of Learning Styles?

## Hypothesis

- H1. The difference in learning style preferences between male and female student-athletes will be significant in at least one domain.
- H2. The difference in learning style preferences of student-athletes who participate on team sports will be significantly different when compared to those who participate in individual sports in at least one domain.
- H3. There will be a significant interaction between gender and type of sport in at least one domain.

Academic success of student-athletes continues to be a topic of discussion among Division I colleges (Etzel, et al. 2002). The focus on learning styles is not a new idea for college professors and researchers; however, in the realm of athletics it has not been

widely embraced. With the many demands placed on student-athletes, the value of time management becomes clear. The proposal of finding a way that student-athletes can use their study time more efficiently has influenced this study. Narrowing in on student-athletes learning style preferences may assist in developing a more efficient studying model. The results can also assist those who work directly with these student-athletes to help them focus more closely on the individual needs of each student-athlete and help them be successful college students.

### Setting and Participants

As a general practice, Student-Athlete Support Services (SASS) invites all incoming freshmen varsity student-athletes to complete the Index of Learning Styles. All of the participants for this study were either scholarship or walk-on varsity student-athletes at a major Division I, southern institution. It was explained to each group of participants that all of the information gathered during this evaluation period would be used to benefit the individual student-athletes. It was emphasized that the results of these evaluations would not affect their admission to the university or their ability to participate in their sport. It was explained that the information was being gathered only for the purposes of assembling an academic snapshot of their freshmen class and for providing appropriate services to each student-athlete. As part of the evaluation process, the student-athletes signed a release of information for the SASS office to obtain and use any pertinent academic information about them while they were student-athletes at this institution.

The data were gathered over three consecutive years (2006-2008). The aggregate data group consisted of 205 student-athletes, 115 were male, and 90 were female. Furthermore, 132 participated on team sports (men's football, men's basketball, women's basketball, men's baseball, women's volleyball, women's soccer, and women's softball) and 73 participated in individual sports (women's gymnastics, men's golf, women's golf, men's track and field, women's track and field, men's swimming and diving, women's swimming and diving, men's tennis, women's tennis, and women's equestrian). All sports were represented by no less than one member in the survey results. The final data numbers included all survey participants and there were no incomplete surveys, as the Web-based version will not allow results to be calculated and posted until all items are answered.

The participant sample of student-athletes who completed the ILS was moderately representative of the entire potential population which consisted of three years of incoming freshmen student-athletes. The male team sport population (36%) was considerably higher than the male individual sport population (17%) in the total participant sample of student-athletes. On the other hand, the female team sport population was lower for the participant sample (19%) than the potential population (27%). However, both male and female total populations were well represented by the participant samples (both were within 3%). Table 2 shows the final distribution of the participant sample compared to the potential population.

Table 2

*Distribution of Participant Sample and Population by Gender and Sport Participation*

Sport Participation:	Team		Individual		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<b>Male</b>						
Sample	91	44%	24	12%	115	56%
Population	127	36%	58	17%	185	53%
<b>Female</b>						
Sample	41	20%	49	24%	90	44%
Population	68	19%	96	27%	164	47%
<b>Total</b>						
Sample	132	64%	73	36%	205	100%
Population	195	56%	154	44%	349	100%

N = 205

Procedures

All incoming freshmen at this major Division I, southern institution attend a mandatory campus sponsored orientation in the summer prior to full time enrollment. During this three-day orientation, varsity student-athletes met with their Athletic Academic Counselor to discuss class times, practice schedules, NCAA regulations and a variety of other academically pertinent topics.

The Learning Specialists in the Student-Athlete Support Services office have established an ongoing structure of assessments for incoming student-athletes.

Approximately 58% of all incoming varsity freshmen at this Division I institution were assessed during summer orientation sessions over the three years of this research (2006-2008). These assessments include screening evaluations of reading and comprehension levels, attention issues and learning style preferences. This information is used to establish the need for additional assistance with course registration, study skills and in establishing each student's study table requirements. All of the data used for this research were gathered as part of this ongoing evaluation procedure. The individual results of the Index of Learning Styles Web-based assessment were printed by each student-athlete and turned in to this researcher at the completion of each assessment session. The data were input by this researcher electronically on an excel spreadsheet. All of the personal identifying information was removed. The results were sorted to the point that it was not possible to know which result was connected to which participant. The Senior Associate Athletics Director granted permission for use of the data from the Student-Athlete Support Services yearly information gathering procedures (see Appendix 1).

The participants were administered the ILS survey in a group setting. The link to the Web-based version of the ILS was presented to each group of participants in a computer lab located in the athletic academic center. They were provided verbal instructions on how to access and complete the survey (see Appendix 2). Each participant completed the survey independently and since the Web-based version of the ILS is a self-scoring instrument, it provided immediate results to the participants. A printed copy of the results was given to each student along with a copy being given to one of the Learning Specialists. The results for this study were coded by gender and type of sport participation. All other identifying marks were removed before the data was analyzed.

Individual counsel was offered to all participants to discuss their results or answer any questions.

The Learning Specialists in the SASS office were responsible for administering the evaluations over several different meetings spanning the summer orientation sessions. The Learning Specialists and their staff collected, examined and recorded the data. All data were maintained as anonymous in accordance with IRB protocol.

#### Instrumentation:

##### Index of Learning Styles (ILS)

In 2005, Felder and Spurlin noted that there were over 80 different established models in which one can analyze an individual's learning style. While numerous instruments have been developed to measure and identify individual learning styles, Jester and Miller (2000) stated, "While these (Kolb's & Myers-Briggs) are not without their critics or weaknesses, one of the most frequently used is the Index of Learning Styles developed by Felder and Soloman" (Index of Learning Styles, 2010).

Richard Felder indicated in a video conference on February 15, 2009, that there are 30 to 40 different learning style models from which to choose. He created the Index of Learning Styles after researching many of them. He doesn't claim that his is any better than the others, but it has worked for him in his college classroom conditions. Felder also indicated that he relied heavily on the work of Carl Jung and the Myers-Briggs Type Indicator while creating his instrument.

The first version of the Index of Learning Styles was created in 1991 by Richard Felder and Barbara Soloman of North Carolina State University (Felder & Spurlin, 2005). In 1997 the Web-based version was made available through the NC State website. This instrument identifies learning preferences on four dimensions from a learning style model formulated by Felder and Silverman:

1. Processing of Information: Active\_Reflective (A\_R)
2. Perception of Information: Sensing\_Intuitive (S\_I)
3. Input of Information: Visual\_Verbal (Vi\_Vr)
4. Understanding of Information: Sequential\_Global (S\_G)

According to Felder and Spurlin (2005), the ILS model parallels dimensions used in other models, but the combination is unique to this one. To meet the purpose of this research Felder and Soloman's Index of Learning Styles (ILS), Web-based version was used. It provided ease of delivery and self-scoring capability along with practical applications of how to use particular learning style preferences to benefit a variety of educational endeavors. The Index of Learning Styles website (2010) indicates that the ILS questionnaire works well to indicate the preference profile of a group, such as a class or a team. It is helpful for groups who depend on each other to understand the different learning style preferences of their group members in order to accommodate their own strengths and weaknesses to benefit the group as a whole. If each group member knows their own strengths and the strengths of other group members, then all members can function in the most efficient capacity to help the group to accomplish the given task (Harberts & Walker, 2007; Irving & Williams, 1995; Liu, et al. 2008; Sharp, 2003).

Vermunt and Vermetten (2004) contend that the ILS was developed on the basis of theoretical notions. The instrument was constructed in the context of a research project on students' regulation of learning processes in higher education. The first results of the research project were reported in a book written in Dutch (Vermunt, 1992). Later, the results were discussed at international conferences, the analyses were refined, new analyses were conducted, the theoretical background was elaborated, finally the results were reinterpreted from a growing understanding of the data (Vermunt, 1995, 1996, 1998; and Vermunt & Verloop, 1999). From 1992 onward, the ILS was used by researchers in the Netherlands, Belgium, Finland, England, Cyprus, USA, Brazil, Argentina, Indonesia, and Sri Lanka (Vermunt, 1992).

The Index of Learning Styles is a survey style instrument containing 44 forced-choice items (*a* or *b*). Each of the four dimensions (Active\_Reflective, Sensing\_Intuitive, Visual\_Verbal, Sequential\_Global), has 11 questions representing it. This allows for an easier categorization of items on a strength scale. The learning preferences were assigned a number on a scale of -11 to +11 for each item in the dimensions. For each item choice there was one answer (*a*) that would score a positive number (+1) while the other choice (*b*) scored a negative number (-1). Zero is not a choice, therefore causing the results to lean one way or the other. Upon completion, the participant's learning style was determined to be mild, moderate or strong for each domain. Either a positive or a negative rating would receive the same preference strength for either of the two different sides of each domain (-9 and +9 receive the same weight).

Mild scores are considered balanced, and are represented by -1, 1, -3, and 3, moderate scores are represented by -5, 5, -7, and 7, and strong scores are represented by

-9, 9, -11, and 11. Students with mild, or balanced, preferences tend to shift from one preference to another, using both types of preferences. The students with moderate and strong preferences tend to stay with those preferences. The learning style preferences are considered to be on a “continua not either/or categories” and they are considered to be learning tendencies not “infallible predictors of behavior” (Felder & Spurlin, 2005, p. 104).

Felder and Spurlin (2005) summarily defined and briefly explained the Learning Style preferences as follows:

#### Active\_Reflective

*Active:* learn by trying things out, enjoy working in groups

*Reflective:* learn by thinking things through and prefer working alone or with one or two familiar partners

Those who demonstrate to be active learners tend to learn better when they are doing something rather than just listening; therefore, sitting in lectures can be very difficult. Active learners tend to work well in groups where they can discuss new information. Those who fall into the Reflective Learner category want to take time to think about the new information. Furthermore, they generally enjoy working alone while figuring out how the new information fits into existing knowledge.

#### Sensing\_Intuitive

*Sensing:* concrete, practical, oriented toward facts and procedures

*Intuitive:* conceptual, innovative, and oriented toward theories and underlying meanings

Sensing Learners are partial to learning facts, they are acutely aware of details and they don't like surprises. They also have a tendency to remember information better if it can be related back to the "real world." Conversely, Intuitive Learners do not like memorizing facts but rather prefer exploring relationships and abstract notions. However, Intuitive Learners are inclined to work too quickly, often causing easily avoidable mistakes.

#### Visual\_Verbal

*Visual:* prefer visual presentations or presented material, such as pictures, diagrams, and flow charts

*Verbal:* prefer written and spoken explanations

As the name implies, Visual Learners remember what they see in pictures, graphs, charts and demonstrations. They can benefit from color-coding, or drawing arrows or boxes around important details in their notes and books. Verbal Learners remember what they hear in lectures and what is presented to them in words, either written or spoken. They can benefit from having a classmate tell them about the material or by reading their notes out loud.

#### Sequential\_Global

*Sequential:* linear thinking process, learn in incremental steps

*Global:* holistic thinking process, learn in large leaps

Sequential Learners have a propensity for logical steps that lead to the final solution; However, they may not always understand the final solution but they can get there utilizing the logical steps. Sequential Learners gain from outlines and flow charts. Global Learners want to know the “big picture” but they do not usually perceive the details on how they got there. It is also advantageous for Global Learners to skim over a reading assignment first, noting headlines and bold words, so they can get an overview of what they need to know before diving into the details.

See Appendix 3 for a replication of the Web-based version of the ILS and Appendix 4 for an example of the results sheet produced for each student upon completion of the questionnaire. For a more detailed description of these learning styles and suggested strategies for effective applications see Appendix 5.

As most learning style assessments confirm, the best way to learn is to balance out the different modalities instead of focusing on one particular preference over the others. For example, most students learn best when they are presented with both visual and verbal modes of instruction. Moreover, Felder and Silverman (1988) made it clear that a balance in all the preferences is most beneficial.

### Reliability and Validity of the ILS

Reliability is generally defined as the consistency of the results. In case study research, reliability is the measure to the extent that two different researchers come to the same conclusions using the same procedures (Gall, et al. 1996). Reliability can be

calculated in several different ways. Internal consistency is discussed in the study conducted by Litzinger, et al. (2007) internal consistency “provides an estimate of reliability for a single administration of an instrument and is based on the average correlation between items” (p. 310). This can be calculated using Cronbach’s coefficient alpha.

Validity is commonly defined as the degree to which a test measures what it claims to measure. Test scores cannot be valid or invalid, but rather the inferences made from the test scores can be valid or invalid (Gall, et al. 1996). When measuring a new instrument for validity, the most important type of validity is the construct-related validity, or construct validity. “Evidence of construct validity means evidence that the instrument is measuring the construct that it is intended to measure” (Litzinger, et al. 2007, p. 311).

The Index of Learning Styles (ILS) was studied to determine its validity and reliability based on data collected at Penn State (Litzinger, Lee, Wise, & Felder, 2005). Zywno (2003) revealed that the reliability estimates ranging from 0.56 to 0.77, based on Cronbach’s coefficient alpha. The test-retest reliability of the Index of Learning Styles (ILS) was assessed with as small as a four week interval and as long as an eight month interval between administrations. Both found test-retest reliability to be satisfactory (Felder & Spurlin, 2005; Zywno, 2003). Also, Litzinger, et al. (2007), found that the ILS provided, “Acceptable levels of internal consistency reliability, and that evidence for its construct validity from both factor analysis and student feedback is strong” (p. 316). Zywno (2003) concluded that the validity and reliability data warranted that the ILS was, “an appropriate and statistically acceptable tool for characterizing learning preferences”

(p. 2). According to Graf, et al. (2007), the Index of Learning Styles is often used to identify learning styles, and is well-investigated.

### Analysis of Data

The data, or dependent variables (DV), were provided electronically by the Web-based version of the Index of Learning Styles. The data consisted of the four learning style preferences obtained from 205 independent freshman student-athlete survey results. The 44 forced-choice questions were combined with the gender and type of sport participation of each student-athlete into an electronic spreadsheet for analysis (Appendix 6). Version 17 of SPSS was used to analyze the cumulative results of three years of data gathered from student-athletes. All data were handled in compliance with the Institutional Review Board at the university (see Appendix 7).

The research questions for this study necessitated the use of descriptive statistics. Gall, Gall, and Borg (2007) defined descriptive statistics as “mathematical techniques for organizing, summarizing, and displaying a set of numerical data” (p. 638). The descriptive statistics, or independent variables, used for this study included gender and sport participation. The use of any other identifying information was not necessary for the research to be analyzed; therefore, no data pertaining to name, age, grade point average, or area of study were collected for this research.

Multivariate Analysis of Variance (MANOVA) was used to measure the relationship between sport type and gender with the four dimensions of the learning style preferences. A MANOVA is a variation of an ANOVA that includes multiple dependent

variables. Testing the multiple dependent variables is accomplished by creating new dependent variables that maximize group differences. These artificial dependent variables are linear combinations of the measured dependent variables. According to French, Macedo, Poulsen Waterson and Yu (2008), a factorial MANOVA uses multiple nominal independent variables and multiple dependent variables. Furthermore, factorial MANOVA involves the calculation of several sets of composite variables and each set is specific to a particular effect. Conversely, a one-way MANOVA evaluates the relationship between a solitary between-subjects factor and two or more dependent variables. Therefore, for this research a 2x2 factorial MANOVA was used given that the scores were continuous.

Litzinger, et al. (2005), conducted research in which a sample of students were asked to respond to the ILS on-line and provide feedback as to their agreement of learning styles preference assigned to them by the ILS. The total number of participants was 572, and they were divided 50% male and 50% female. Therefore, the sample was balanced. The Cronbach's coefficient alpha was calculated for each of the ILS four dimensions in order to estimate internal consistency reliability of the scores. The Cronbach's alpha values showed a comparable pattern to past studies. The Sensing\_Intuitive (S\_I) scale and the Visual\_Verbal (Vi\_Vr) scale both had reliability in excess of 0.70, while the Active\_Reflective (A\_R) and Sequential\_Global (S\_G) scales reported 0.60 and 0.56 respectively. According to Tuckman (1990), a high correlation of items on a subject proficiency scale would result in a high Cronbach's alpha. However, on a scale of learning preferences, a lower correlation among items is expected. Therefore, Tuckman (1990) proposes that an alpha of 0.50 or greater is acceptable for

preference assessments. The four dimensions of the ILS all met this alpha value criterion. Therefore, internal consistency reliability was shown to be supported.

Based on the results of this research, a Cronbach's alpha test was conducted on the dimensions of Active\_Reflective and Sensing\_Intuitive since they were found to have significance. Also a Chi-Square was conducted to determine whether the distributions of categorical variables differed from one another.

### Summary

This chapter reiterated the purpose of the study, the research questions and the hypothesis. Further, this chapter described the setting as a major Division I southern institution and the population of participants as freshmen varsity student-athletes. The procedures of the study and the instrumentation - Index of Learning Styles (ILS) were investigated and discussed. The chapter concluded with a discussion of the reliability and validity of the Index of Learning Styles instrument and an explanation of the analysis of data that was used. The data dictated that descriptive statistics be used along with a 2x2 factorial MANOVA.

## Chapter 4

### Findings

Chapter 1 addressed the statement of the problem, the purpose of the study, the significance of the study, the research questions, the hypothesis, the limitations and the assumptions of the study, and the definition of terms. Chapter 2 reviewed the literature which considered the adult learner, the student-athlete, the instructor, an overview of learning styles, gender, sport participation studies and a consideration of the area of study as related to learning style preferences. The chapter ended with an examination of learning style instruments. Chapter 3 reiterated the purpose of the study and the research questions. Further, this chapter addressed the hypothesis, the setting and participants, the procedures and the instrumentation - Index of Learning Styles (ILS). The chapter concluded with a discussion of the reliability and validity of the Index of Learning Styles Instrument and an explanation of the analysis of data. Chapter 4 focuses on the test of the hypothesis, and the results of the data found regarding freshmen varsity student-athletes' learning style preferences.

### Purpose of the Study

The purpose of the study was to acquire information about freshmen varsity student-athletes' individual learning style preferences in relation to gender and sport

participation. Felder and Soloman's Index of Learning Styles (ILS) Web-based version was used to measure the learning style preferences. Johnson (2008) declared that everyone has a preferred learning style and that learning styles have an impact on the way people take in and retain new information. Cassidy (2004) proposed that overall learning styles are considered stable over a long period of time but that they can change with situations and experience. This indicates that there is potential for adaptations or modifications of an individual's learning style preferences. Baldwin and Sabry (2003) stated,

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Multiple researchers agree that students will learn better when the material is provided in a way that matches with their learning style preference (James & Maher, 2004; Kolb, 1984; Gardner, 1985; Griggs, 1985; Slavin, 2000). Also of importance is an instructor's ability to adjust pedagogic strategies according to the needs of the students in the class (Cuthbert, 2005). A study by Gadt-Johnson and Price (2000) signified that learning styles symbolize an individual learner's tendency to learning certain material and concluded that a powerful relationship exists between student's unique learning style and their academic success. Knowing and understanding learning styles can help an individual learn more efficiently (Silver, Strong & Perini, 1997).

## Research Questions

The study is an attempt to answer the following research questions:

- RQ1. What are the differences in learning style preferences between male and female student-athletes?
- RQ2. What are the differences in learning style preferences of student-athletes who participate in team sports compared to those who participate in individual sports?
- RQ3. What are the interactions between gender and type of sport participation as measured by the Index of Learning Styles?

## Hypothesis

- H1. The difference in learning style preferences between male and female student-athletes will be significant in at least one domain.
- H2. The difference in learning style preferences of student-athletes who participate on team sports will be significantly different when compared to those who participate in individual sports in at least one domain.
- H3. There will be a significant interaction between gender and type of sport in at least one domain.

## Results

The total participant sample consisted of 205 freshmen varsity student-athletes from a major Division I, southern institution. Of the participant sample, 90 were female and 115 were male. Represented in the sample group were seven team sports: men's football, men's basketball, women's basketball, men's baseball, women's volleyball, women's soccer and women's softball, totaling 132 student-athletes. The team group consisted of 41 (46%) females and 91 (79%) males. The participant sample group consisted of 10 individual sports: women's gymnastics, men's golf, women's golf, men's tennis, women's tennis, men's track & field, women's track & field, men's swimming & diving, women's swimming & diving, and women's equestrian. Within the individual sports there were 73 total students, 49 (54%) of whom were female and 24 (21%) of whom were male. The participant sample contained at least one student from each of the sports represented. The participant group of student-athletes who completed the ILS was moderately representative of the total sample of student-athletes. However the team effect is confounded by gender as there are more male team sport participants represented than male individual sport participants and more than all female sport participants (team and individual). Based on the frequency, team sports typically have more male participants.

These unbalanced numbers and the use of categorical variables warranted the use of Pearson's Chi Square. The percentage of participants' sport involvement did not differ by gender,  $\chi^2(1, N = 205) = 24.82, p < 0.001$ . These outcomes clarify that the results are not independent of each other. Table 3 presents the number of student-athletes who scored at each preference number for each learning style preference.

Table 3

*Learning Style Preferences among Student-Athletes*

Active, Sensing, Visual and Sequential are negative numbers						
	-11	-9	-7	-5	-3	-1
Reflective, Intuitive, Verbal and Global are positive numbers						
	11	9	7	5	3	1
Learning Style Preferences						
Active (-)	0	2	6	13	11	13
Reflective (+)	5	28	30	29	49	19
Sensing (-)	3	5	12	16	10	16
Intuitive (+)	8	23	26	36	30	20
Visual (-)	6	2	5	11	16	9
Verbal (+)	20	27	40	31	16	22
Sequential (-)	1	2	5	14	20	34
Global (+)	1	2	12	40	45	29

$N = 205$

Strong = -11, 11, -9, and 9

Moderate = -7, 7, -5, and 5

Balanced = -3, 3, -1, and 1

A multivariate analysis of variance (2x2 MANOVA) was conducted to undertake the research question of the relationship between gender and sport participation within learning style preference. The 2x2 MANOVA was chosen to determine the effect of multiple dependent variables (learning style preferences: Active\_Reflective (A\_R),

Sensing\_Intuitive (S\_I), Visual\_Verbal (Vi\_Vr) and Sequential\_Global (S\_G)), on two independent variables (gender and type of sport participation).

By administering the descriptive statistics a mean and standard deviation was established for each dimension. Table 4 displays the mean results.

Table 4

*Mean and Standard Deviation of Gender and Sport Interaction for Learning Style Preferences*

Learning Style Preference		Team		Individual	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Active_Reflective	Male	2.60	(4.68)	4.42	(2.98)
	Female	4.44	(4.47)	2.88	(4.72)
	Total	3.17	(4.68)	3.38	(4.26)
Sensing_Intuitive	Male	2.80	(5.46)	0.92	(5.39)
	Female	1.51	(5.32)	2.96	(5.30)
	Total	2.40	(5.43)	2.29	(5.38)
Visual_Verbal	Male	3.24	(6.37)	4.00	(4.93)
	Female	4.24	(4.58)	3.61	(5.17)
	Total	2.55	(5.87)	3.74	(5.06)
Sequential_Global	Male	0.91	(4.03)	0.42	(3.71)
	Female	1.76	(3.47)	1.94	(3.79)
	Total	1.17	(3.87)	1.44	(3.80)

N = 205

A statistically significant interaction was established between gender (male) and individual sport participation based on interactions in the Active\_Reflective preference (SD = 2.98), but none were found for Sensing\_Intuitive, Visual\_Verbal or Sequential\_Global preferences.

No reported mean score was considered strong (9, -9, 11, and -11) by the ILS and most scores were considered balanced (1, -1, 3, and -3). Of the sixteen reported mean scores, there were four that scored in the high mild range; they were reported as, 4.44, 4.42, 4.24 and 4.00, none of which reach the moderate range (5, -5, 7, and -7) according to the ILS. Therefore one conclusion was that the trend for student-athletes is to be well balanced.

A chi-square was conducted to establish the null hypothesis, which determines that there are no differences between the expected and observed results based on the participant sample and potential population (Statistics.com, 2010). The results yielded,  $\chi^2(1, N = 205) = 7.60, p < 0.001$ . The  $\chi^2$  did not exceed the critical value for the 0.01 probability level (3.84); therefore, we can accept the null hypothesis that the sample population and the potential population are significantly different.

A significant Box's *M*, ( $p = 0.005$ ) signified that the homogeneity of variance-covariance matrix assumption was violated (See Table 5). A possible univariate outlier was identified ( $\eta^2 = .033$ ) and a 2x2 MANOVA was considered to be an appropriate analysis procedure. No post hoc analysis was conducted.

Table 5

*Between Groups Homogeneity of Variance and Covariance*

---

Box's <i>M</i>	56.688
F	1.802
df1	30.00
df2	33041.378
Sig.	.005

---

p < .001.

Box's *M* tests the Homoscedasticity (equal variation of data) assumption in a MANOVA analysis. Homoscedasticity tests the assumption that all covariances are the same for any category. This is also referred to as the normality assumption. Box's *M* is a specific test and was found too specific for this research since the Index of Learning Styles instrument utilizes a Likert type scale and does not have a normal distribution of scores. The multivariate calculations performed by SPSS help to robust (account for the unequal distribution) the equal variance of assumption, therefore allowing the results to be interpreted despite the lack of equal distribution.

Levene's Test for Equality of Variances was used to examine the assumption that variances are equal across the sample groups, also known as the Test for Homogeneity of Variances (Engineering Statistics Handbook, 2010). Levene's test was chosen for this research due to the lack of normal distribution across the sample. Results indicated that the homogeneity of variances was not violated.

## Test of the Hypothesis

The study was an attempt to answer the following research questions based on the hypotheses:

1. What are the differences in learning style preferences between male and female student-athletes? The hypothesis declared the difference in learning style preferences between male and female student-athletes will be significant in at least one domain. No statistically significant differences were found when gender was compared to the learning style preferences. Wilks'  $\lambda = 0.980$  ( $p = 1.406$ ).

2. What are the differences in learning style preferences of student-athletes who participate in team sports compared to those who participate in individual sports? The hypothesis declared the difference in learning style preferences of student-athletes who participate on team sports will be significantly different when compared to those who participate in individual sports in at least one domain. No statistically significant differences were found when type of sport participation was compared to learning style preferences. Wilks'  $\lambda = 0.999$  ( $p = 0.997$ ).

3. What are the interactions between gender and type of sport participation as measured by the Index of Learning Styles? The hypothesis declared there will be a significant interaction between gender and type of sport in at least one domain. Significant differences were found within the gender and sport interaction with the learning style preferences. Wilks'  $\lambda = 0.947$  ( $p = 0.028$ ) illustrates that statistically significant differences were noted for females who participated on a team sport. This group as a whole is more likely to be reflective than their male or individual team

counterparts. However, the significance might be explained by the low effect size ( $\eta^2 = .033$ ).

A summary of the 2x2 MANOVA results are found in Table 6. The results report the multivariate effects including the Wilks' lambda ( $\lambda$ ) for gender, sport and the interaction of gender and sport.

Table 6

*Summary of 2x2 MANOVA test*

	Gender	Sport Participation	Interaction Effect
<b>Multivariate Effects</b>			
Wilks' lambda ( $\lambda$ )	0.980	0.999	0.947
df between groups	1	1	1
df error	198.00	198.00	198.00
p	0.406	0.997	0.028
Eta Squared ( $\eta^2$ )	0.02	0.001	0.053

The 2x2 MANOVA test was followed up with a univariate test (ANOVA).

According to Grimm and Yarnold, (1995),

In the ANOVA there is a continuous dependent variable and one or more categorical independent variables. The purpose of the ANOVA is to determine whether the means of the dependent variable for each level of an independent variable are significantly different from each other. An interaction addresses

whether the influence of one independent variable is altered by the level of another independent variable. (p. 250)

The ANOVA results illustrate a significant interaction effect in the area of Active\_Reflective learning style preference when compared to gender and sport participation. The ANOVA test results are reported in Table 7.

Table 7

*Summary of ANOVA test*

	Gender			Sport			Gender*Sport		
	<i>F</i>	<i>p</i>	ES ( $\eta^2$ )	<i>F</i>	<i>p</i>	ES ( $\eta^2$ )	<i>F</i>	<i>p</i>	ES ( $\eta^2$ )
Univariate Effects									
A_R	0.05	0.83	0.000	0.02	0.86	0.000	5.81	0.02*	0.028
S_I	0.20	0.66	0.001	0.07	0.79	0.000	3.93	0.05	0.019
Vi_Vr	0.12	0.73	0.001	0.01	0.94	0.000	0.63	0.43	0.003
S_G	3.92	0.05	0.019	0.07	0.79	0.000	0.32	0.57	0.002

\*  $p < 0.05$

A\_R: Active \_ Reflective

S\_I: Sensing \_ Intuitive

Vi\_Vr: Visual \_ Verbal

S\_G: Sequential \_ Global

The overall statistical results ascertained one significant interaction effect between gender and sport. The results indicate that a male who participates in an

individual sport is most likely to be a strong reflective learner, followed by a female who participates on a team sport. No other data revealed a statistically significant difference in gender or sport participation within the learning style preferences. However, of note is that all student-athletes showed a preference for the reflective learning style over the active learning style preference.

As seen in the Figures that follow, the estimated marginal means illustrate the interaction between gender and sport for each learning style preference. The y-axis shows the gender type, the diamond represents male and the box represents female. The x-axis shows the sport participation (team or individual). The estimated marginal means were used for plot points (For a complete reporting of means see Table 4).

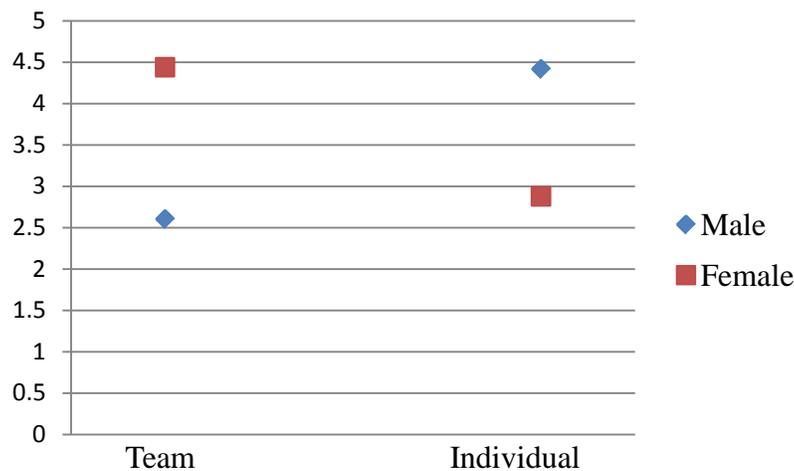


Figure 2: Estimated Marginal Means Plot for Active\_Reflective (A\_R)

The trend for student-athletes in the Active\_Reflective preference is to be more reflective than active. However, females who participate on team sports ( $M = 4.44$ ) and males who participate in individual sports ( $M = 4.42$ ) both exhibit stronger preferences

for reflective learning than females in individual sports ( $M = 2.88$ ) and males in team sports ( $M = 2.60$ ).

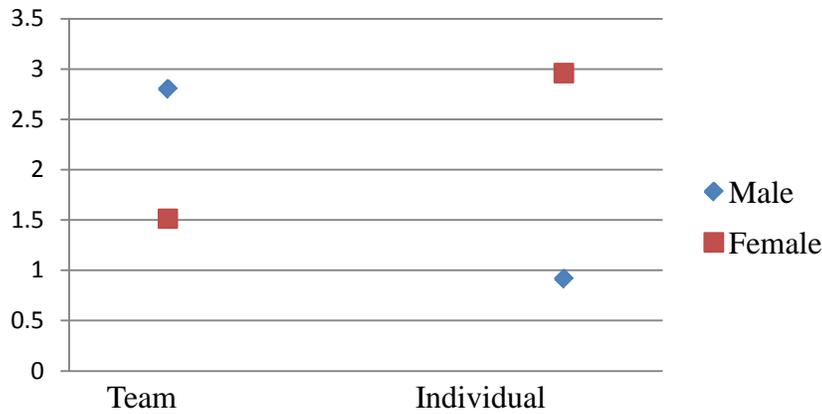


Figure 3: Estimated Marginal Means Plot for Sensing\_Intuitive (S\_I)

The tendency of student-athletes in the Sensing\_Intuitive preference is widely scattered across the preferences. For males ( $M = 2.80$ ) and females ( $M = 1.51$ ) on a team sport there is a moderate difference in the scores. However, for males ( $M = 0.92$ ) and females ( $M = 2.96$ ) participating in an individual sport the preferences are more significantly separated.

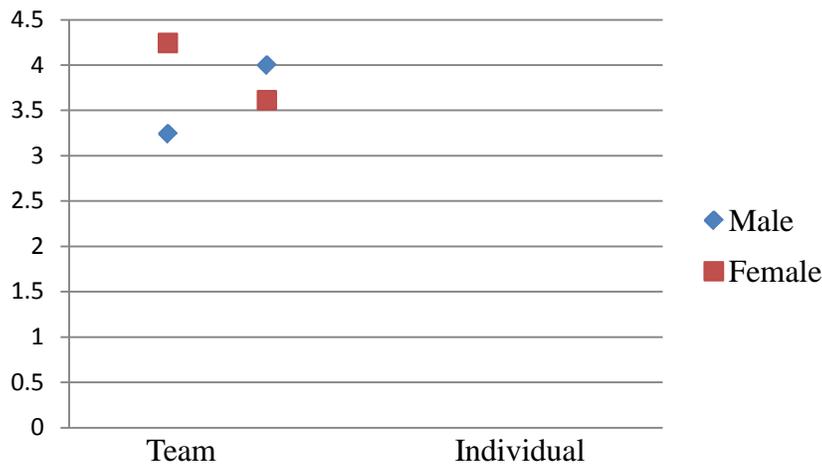


Figure 4: Estimated Marginal Means Plot for Visual\_Verbal (Vi\_Vr)

The student-athletes in the Visual\_Verbal preference are equally balanced. Females who participate on team sports ( $M = 4.24$ ) and males who participate in individual sports ( $M = 4.00$ ) both exhibit an inconsequentially stronger preferences for verbal learning than females in individual sports ( $M = 3.61$ ) and males in team sports ( $M = 3.24$ ). However, student-athletes as a whole prefer more verbal than visual learning.

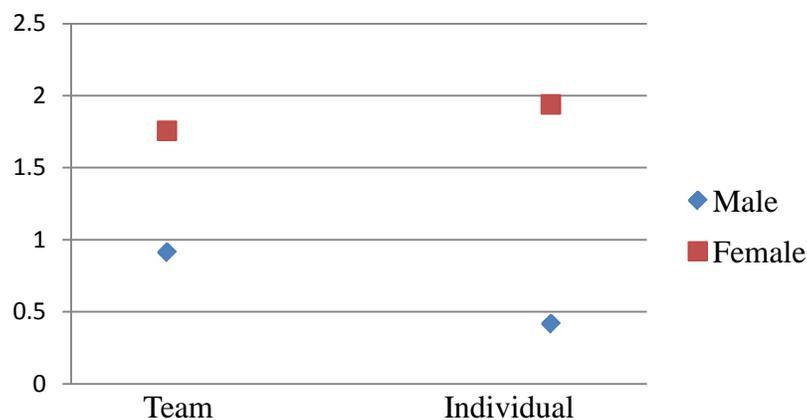


Figure 5: Estimated Marginal Means Plot for Sequential\_Global (S\_G)

All student-athletes are extremely balanced between the Sequential\_Global preferences. Females ( $M = 1.76$ ) and males ( $M = 0.91$ ) participating in an individual sport are remarkably balanced with females ( $M = 1.94$ ) and males ( $M = 0.42$ ) on a team sport. Of all the preferences, Sequential\_Global has the narrowest range of scores which indicate that it is the most balanced of all the learning style preferences for student-athletes. In other words, according to the results, most student-athletes should be able to learn using either the sequential or the global learning style preferences.

## Learning Style Preference Results

### Active\_Reflective

Of the 205 student-athletes surveyed, 21 showed an active preference, 92 showed a balanced preference and 92 showed a reflective preference. Table 8 exhibits the association between student-athlete's Active\_Reflective learning style and gender. The data illustrate that males tend to be more balanced ( $n = 57$ ) and reflective ( $n = 48$ ), and females tend to be mostly reflective ( $n = 44$ ), and balanced ( $n = 35$ ).

Table 8

*Association between Student-Athletes' Active\_Reflective Learning Style and Gender*

Gender		Active	Balanced	Reflective	Total
Male	Count	10	57	48	115
	% within Gender	8%	49%	42%	100%
	% within Learning Style	48%	62%	52%	100%
	% of Total	5%	28%	23%	56%
Female	Count	11	35	44	90
	% within Gender	12%	39%	49%	100%
	% within Learning Style	52%	38%	48%	100%
	% of Total	5%	17%	21%	44%
Total	Count	21	92	92	205
	% of Total	10%	45%	45%	100%

*Note.* Balanced = number of scores obtained from 1, 3, -1, and -3.

$N = 205$

Similar to the gender results, the data in Table 9 demonstrate that team sport participants tend to be more balanced ( $n = 62$ ) and reflective ( $n = 57$ ) on the Active\_Reflective scale. Individual sport participants tend to be reflective ( $n = 35$ ) and balanced ( $n = 30$ ). Table 9 exhibits the association between student-athlete's Active\_Reflective learning style and sport participation.

Table 9

*Association between Student-Athletes' Active\_Reflective Learning Style and Sport Participation*

Sport Participation		Active	Balanced	Reflective	Total
Team	Count	13	62	57	132
	% within Sport	10%	47%	43%	100%
	% within Learning Style	62%	67%	62%	100%
	% of Total	6%	30%	28%	64%
Individual	Count	8	30	35	73
	% within Sport	11%	41%	48%	100%
	% within Learning Style	38%	33%	38%	100%
	% of Total	4%	15%	17%	36%
Total	Count	21	92	92	205
	% of Total	10%	45%	45%	100%

*Note.* Balanced = number of scores obtained from 1, 3, -1, and -3.

$N = 205$

## Sensing\_Intuitive

Of the 205 student-athletes surveyed, 36 showed a sensing preference, 76 showed a balanced preference and 93 showed an intuitive preference. Table 10 exhibits the association between student-athlete's Sensing\_Intuitive learning style and gender. The data in Table 10 reveal that both males ( $n = 51$ ) and females ( $n = 42$ ) tend to be more intuitive on the Sensing\_Intuitive scale. Balanced preference scores were males with 43 and females with 33.

Table 10

### *Association between Student-Athletes' Sensing\_Intuitive Learning Style and Gender*

Gender		Sensing	Balanced	Intuitive	Total
Male	Count	21	43	51	115
	% within Gender	18%	37%	44%	99%
	% within Learning Style	58%	57%	55%	56%
	% of Total	10%	21%	25%	56%
Female	Count	15	33	42	90
	% within Gender	17%	37%	47%	101%
	% within Learning Style	42%	43%	45%	44%
	% of Total	7%	16%	21%	44%
Total	Count	36	76	93	205
	% of Total	18%	37%	45%	100%

*Note.* Balanced = number of scores obtained from 1, 3, -1, and -3.

$N = 205$

The data in Table 11 display that both team sport participants ( $n = 58$ ) and individual sport participants ( $n = 35$ ) tend to be more intuitive on the Sensing\_Intuitive scale. Also both preferred a balanced learning style (team  $n = 50$  and individual  $n = 26$ ). Table 11 exhibits the association between student-athlete's Sensing\_Intuitive learning style and sport participation.

Table 11

*Association between Student-Athletes' Sensing\_Intuitive Learning Style and Sport Participation*

Sport Participation		Sensing	Balanced	Intuitive	Total
Team	Count	24	50	58	132
	% within Sport	18%	38%	44%	100%
	% within Learning Style	67%	66%	62%	100%
	% of Total	12%	24%	28%	64%
Individual	Count	12	26	35	73
	% within Sport	33%	36%	48%	100%
	% within Learning Style	38%	34%	38%	100%
	% of Total	6%	13%	17%	36%
Total	Count	36	76	93	205
	% of Total	18%	37%	45%	100%

*Note.* Balanced = number of scores obtained from 1, 3, -1, and -3.

$N = 205$

Visual\_Verbal

Of the 205 student-athletes surveyed, 24 showed a visual preference, 63 showed a balanced preference and 118 showed a verbal preference. Table 12 exhibits the association between student-athlete's Visual\_Verbal learning style and gender. The data in Table 12 demonstrate that both males ( $n = 67$ ) and females ( $n = 51$ ) are more verbal with a tendency toward balanced on the Visual\_Verbal scale (males  $n = 30$ ; females  $n = 33$ ).

Table 12

*Association between Student-Athletes' Visual\_Verbal Learning Style and Gender*

Gender		Visual	Balanced	Verbal	Total
Male	Count	18	30	67	115
	% within Gender	16%	26%	58%	100%
	% within Learning Style	75%	48%	57%	56%
	% of Total	9%	15%	33%	56%
Female	Count	6	33	51	90
	% within Gender	6%	37%	57%	100%
	% within Learning Style	25%	52%	43%	44%
	% of Total	3%	16%	33%	44%
Total	Count	24	63	118	205
	% of Total	12%	31%	58%	101%

*Note.* Balanced = number of scores obtained from 1, 3, -1, and -3.

$N = 205$

The data in Table 13 illustrate that both team sport participants ( $n = 79$ ) and individual sport participants ( $n = 39$ ) are more verbal and balanced on the Visual\_Verbal scale (team  $n = 36$  and individual  $n = 27$ ). Table 13 exhibits the association between student-athlete's Visual\_Verbal learning style and sport participation.

Table 13

*Association between Student-Athletes' Visual\_Verbal Learning Style and Sport Participation*

Sport Participation		Visual	Balanced	Verbal	Total
Team	Count	17	36	79	132
	% within Sport	13%	27%	60%	100%
	% within Learning Style	71%	57%	67%	100%
	% of Total	8%	17%	38%	64%
Individual	Count	7	27	39	73
	% within Sport	10%	37%	53%	100%
	% within Learning Style	29%	43%	33%	100%
	% of Total	3%	13%	19%	36%
Total	Count	24	63	118	205
	% of Total	12%	31%	58%	100%

*Note.* Balanced = number of scores obtained from 1, 3, -1, and -3.

$N = 205$

## Sequential\_Global

Of the 205 student-athletes surveyed, 21 showed a sequential preference, 129 showed a balanced preference and 55 showed a global preference. Table 14 exhibits the association between student-athlete's Sequential\_Global learning style and gender. The data in Table 14 illustrate that both males ( $n = 69$ ) and females ( $n = 60$ ) are more balanced than either of the other preferences on the Sequential\_Global scale.

Table 14

### *Association between Student-Athletes' Sequential\_Global Learning Style and Gender*

Gender		Sequential	Balanced	Global	Total
Male	Count	16	69	30	115
	% within Gender	14%	60%	26%	100%
	% within Learning Style	76%	53%	55%	56%
	% of Total	8%	34%	15%	56%
Female	Count	5	60	25	90
	% within Gender	5%	67%	28%	100%
	% within Learning Style	24%	47%	45%	44%
	% of Total	2%	29%	12%	44%
Total	Count	21	129	55	205
	% of Total	10%	63%	27%	100%

*Note.* Balanced = number of scores obtained from 1, 3, -1, and -3.

$N = 205$

The data in Table 15 display that both team sport participants ( $n = 80$ ) and individual sport participants ( $n = 49$ ) are more balanced than either of the other preferences on the Sequential\_Global scale. Table 15 exhibits the association between student-athlete's Sequential\_Global learning style and sport participation.

Table 15

*Association between Student-Athletes' Sequential\_Global Learning Style and Sport Participation*

Sport Participation		Sequential	Balanced	Global	Total
Team	Count	15	80	37	132
	% within Sport	11%	61%	28%	100%
	% within Learning Style	71%	62%	67%	100%
	% of Total	7%	39%	18%	64%
	Count	6	49	18	73
Individual	% within Sport	8%	67%	25%	100%
	% within Learning Style	29%	38%	33%	100%
	% of Total	3%	24%	9%	36%
	Count	21	129	55	205
Total	% of Total	10%	63%	27%	100%

*Note.* Balanced = number of scores obtained from 1, 3, -1, and -3.

$N = 205$

## Summary

A 2x2 MANOVA was conducted on each of the four scales of the Index of Learning Styles to test whether there were significant differences between gender or sport participation. The results indicated that there was an interaction effect between sport participation and gender in the learning style preference of Active\_Reflective. In other words, there is a greater difference in the Active\_Reflective learning style preference based on the student's sport participation rather than the student's gender. Therefore, males and females in team or individual sports had more in common with each other than they had in common with their gender counterparts in other sports; thereby providing verification of construct validity.

## Chapter 5

### Findings and Conclusions, Discussion, Implications and Recommendations for Future Research

Chapter 1 addressed the statement of the problem, the purpose of the study, the research questions, the hypothesis, the limitations and assumptions of the study, definition of terms and the organization of the study. Chapter 2 reviewed the literature which considered the adult learner, the student-athlete, the instructor, an overview of learning styles, gender and sport participation studies, and an examination of learning style instruments. Chapter 3 reiterated the purpose of the study, the research questions, addressed the hypothesis, the setting and participants, the procedures, and the chosen instrumentation - Index of Learning Styles. The chapter concluded with a discussion of the reliability and validity of the Index of Learning Styles Instrument and an explanation of the analysis of data. Chapter 4 focused on the test of the hypothesis and the results. Chapter 5 provided the findings and conclusions, discussion, implications and recommendations for future research.

#### Purpose of the Study

The purpose of the study was to acquire information about freshmen varsity student-athletes' individual learning style preferences in relation to gender and sport

participation. Felder and Soloman's Index of Learning Styles (ILS) Web-based version was used to measure the learning style preferences. Johnson (2008) declared that everyone has a preferred learning style and that learning styles have an impact on the way people take in and retain new information. Cassidy (2004) proposed that overall learning styles are considered stable over a long period of time but that they can change with situations and experience. This indicates that there is potential for adaptations or modifications of an individual's learning style preferences. Baldwin and Sabry (2003) stated,

The purpose of examining the learning styles of learners is to better understand the behavior patterns that learners exhibit so that they can be incorporated into interactive learning systems and thus be more effective and efficient in helping learners to learn (p. 327).

Multiple researchers agree that students will learn better when the material is provided in a way that matches with their learning style preference (James & Maher, 2004; Kolb, 1984; Gardner, 1985; Griggs, 1985; Slavin, 2000). Also of importance is an instructor's ability to adjust pedagogic strategies according to the needs of the students in the class (Cuthbert, 2005). A study by Gadt-Johnson and Price (2000) signified that learning styles symbolize an individual learner's tendency to learning certain material and concluded that a powerful relationship exists between student's unique learning style and their academic success. Knowing and understanding learning styles can help an individual learn more efficiently (Silver, Strong & Perini, 1997).

## Research Questions

The study was an attempt to answer the following research questions:

- RQ1. What are the differences in learning style preferences between male and female student-athletes?
- RQ2. What are the differences in learning style preferences of student-athletes who participate in team sports compared to those who participate in individual sports?
- RQ3. What are the interactions between gender and type of sport participation as measured by the Index of Learning Styles?

## Summary

The purpose of the study was accomplished as the information about freshmen varsity student-athletes' individual learning style preferences in relation to gender and sport participation was obtained and analyzed. The participants were freshmen varsity student-athletes, both scholarship and walk-on, from a major Division I, southern institution. There were 17 sports represented with 205 total participants. Most of the student-athletes completed the survey in a group setting when they attended a freshmen orientation session before enrolling full time at the university. All of the data collected were coded by sport participation and gender with no other identifying information.

A multivariate analysis of variance (2x2 MANOVA) was performed to determine the effect of dependent variables (learning style preferences: Active\_Reflective, Sensing\_Intuitive, Visual\_Verbal and Sequential\_Global), on two independent variables

(gender and type of sport participation). A Pearson's Chi Square was performed based on the unbalanced distribution of data. No post hoc analysis was conducted.

This study revealed one significant interaction demonstrating that similar learning style preferences were found to be strong within sport participation in the Active\_Reflective learning style preference.

### Findings and Conclusions

This study investigated the relationship between gender and sport participation among freshmen varsity student-athletes. The Index of Learning Styles created by Felder and Soloman (1991) was chosen for this study due to the ease of delivery and relevant strategies and applications provided. The hypothesis was made that student-athletes as a whole would rate high in the active learning style preference. However, this was not confirmed through statistical analysis. The results of this study found student-athletes were reasonably well balanced in their preference of learning styles according to the Index of Learning Styles. Overall, this study revealed that student-athletes cannot be categorized based on their type of sport participation; however, there are minor trends for the Active\_Reflective learning style preference based on sport participation and gender.

The data summarized in Table 16 reveals learning style preferences for all student-athletes. Scoring occurs in such a way that negative numbers represent active, sensing, visual and sequential learning styles, while positive numbers represent reflective, intuitive, verbal and global learning styles. A learning style is considered balanced if it scores -3, -1, 1, or 3 as those numbers lie in the middle and are considered a continuum

not immovable scores. Table 16 displays the number of student-athletes who scored within the range for each learning style preference.

Table 16

*Freshmen Varsity Student-Athletes' Learning Style Preference Totals*

Active	21
Balanced	92
<u>Reflective</u>	<u>92</u>
Sensing	36
Balanced	76
<u>Intuitive</u>	<u>93</u>
Visual	24
Balanced	63
<u>Verbal</u>	<u>118</u>
Sequential	21
Balanced	129
<u>Global</u>	<u>55</u>

*Note.* Balanced = number of scores obtained from -3, -1, 1, and 3.

*N* = 205

The statistical results showed that there was an interaction effect between sport participation and gender in the Active\_Reflective learning style preference. Regardless of the interaction, when looking at the student-athlete freshmen population as a whole, there

was no particular learning style preference that was favored over any other. Therefore, one conclusion was that the trend for student-athletes is to be well balanced.

## Discussion

The review of literature discussed in Chapter 2 established that males and females learn differently. These results were consistent with the results in this study conducted on freshmen student-athletes. When the interaction of sport participation was considered, the students-athletes had more common learning style preferences with others in their type of sport rather than within the same gender. This is also consistent with the research in area of learning style trends and field of study (Alumran, 2008; Hargrove, et al. 2008; Jones, et al. 2003; Khan, 2009, Kiguwa & Silva, 2007; Skogsberg & Clump, 2003). These studies indicated that those who choose the similar areas of study also have similar learning style preferences. Furthermore, the student-athlete research participants were found to be dispersed over the learning style preference scale, which represents a balanced outcome.

Some potential reasons for the results of this study are that the representation of team participants was over-represented by males. This confounds the team effect by gender. However, female participants were equally represented on team and individual sports. The sample population was small as it was only 58% of the potential population; however, the distributions of gender and sport participants were represented fairly from the potential pool.

The expectation was for the student-athletes as a whole to be active learners. It stands to reason that athletes who are active in their sport would also be active in their overall learning preferences. This was not the case according to the results of this study.

### Implications

The results of this study can be used to provide appropriate resources and services to all types of learning style preferences. This can most effectively be provided by allowing for all types of learning strategies to be taught and utilized throughout a tutoring or study session focusing on the techniques that the student-athlete is most comfortable with while exposing them to a variety of methods.

For this study, many student-athletes could benefit from the reframing of their thought processes as far as their education and learning is concerned. Many student-athletes feel that whatever study skills worked in high school will also work in college. As illustrated in a scenario by Petrie and Denson (1999), some students who enter college are lacking some of the basic academic skills needed for classroom success. It is not that they are unintelligent or that they do not have the ability to succeed, they just haven't learned strategies to succeed in the college environment. They have been carefully guided through high school on what to read and what to study, and now they must think for themselves. Fritz (2002), reiterates the idea that instructors must make adjustments to their own teaching styles in order to accommodate the specific needs of their students' individual learning styles. Felder (1993) and McKeachie (1995) recommend that

instructors (mentors or tutors) use a variety of teaching styles and find a balance in their method of instruction in order to reach as many students as possible.

Another dilemma new college student-athletes face is that they are playing at the next level, not only in their sport but in the classroom. If one were to take the top five athletically gifted students from 50 high schools and place them all together in one college, who would rise to the top? What would the level of competition be now? Take the same concept to the academic level. The top academically gifted students tend to go to college. Now the students who are athletically gifted are competing in the classroom against those that are academically gifted. How do these athletically gifted students succeed in this new environment? Many college success handbooks point to the use of learning styles as a starting point (Gardner & Jewler, 1997; Groccia, 1992; Petrie & Denson, 1999, 2003). They must understand not only how they learn but also what strategies will work best with their individual learning style preferences.

Since the student-athletes as a whole demonstrate balanced scores which illustrated they were not strong in any particular learning style preference type; they should be capable of learning in diverse environments. The most effective academic environment would be one in which the instructor or coach utilized a mixture of instructional strategies. The results of this study are important to share with those who work with student-athletes in academic and sport settings. Instructors, mentors, tutors and coaches should approach a new task, skill or mission keeping in mind that there is never only one way to learn or to teach. If a student does not seem to understand or grasp a new concept, it would benefit them and the instructor to try a different method of instruction. In an academic setting, the student can draw a picture, teach it someone else, write it

down, or make an outline. On the field of play, the coach can have the athlete run the play, draw the play, explain the play or visualize the play. The tutor or coach should ask questions to ascertain the level of understanding by the student-athlete, and then they can proceed with determining what is preventing the student-athlete from learning the new material.

There has been a trend in higher educational settings to pay closer attention to personal learning preferences in an effort to influence educators to adapt their teaching strategies to better suit a wider variety of learning style preferences (Schroeder, 1993). According to Bacon (2004),

One of the major educational movements of the past 25 years has been the increased attention to student learning styles (Lemire, 2000). The learning style paradigm holds that when course delivery is tailored to the different learning styles of students, student learning is enhanced. The learning style paradigm assumes that when the learning environment matches a student's learning style, the student's learning is enhanced. (p. 205)

Honigsfeld and Dunn (2006) reported that data produced by many investigational studies showed an increase in achievement test scores when college students' learning styles were considered and used appropriate methods and approaches. Kolb (1984) recommends that educators use a variety of learning strategies, and encourage students to be more receptive to diverse learning techniques, rather than attempting to continuously link specific learning styles with specific learning methods. There may be a learning style strategy that a student has not ever tried and it may be the one that ends up working best.

Since the learning style preferences are intended to be viewed on a sliding scale, they should be considered as learning tendencies not steadfast predictors of literal behavior. Many students can effectively employ the techniques recommended by each learning style preference based on the situational needs.

The paradox lies in that many college professors are naturally going to teach to their learning style preferences and may not consider the learning style preferences of those in their class (James & Maher, 2004). Moreover, many of the college classes are too large to teach to every different kind of learning style preference. Most college educators do not receive formal training in teaching to different learning style preference (Franzoni & Assar, 2009; Matthews & Jones, 1994). Hargrove et al. (2008) reported that traditionally male dominated studies, such as engineering, are taught by predominantly male faculty and their teaching style tends to resemble male learning style preferences more often than female learning style preferences.

Student-athletes also must learn in their sport. Football and basketball student-athletes must learn plays for a wide variety of situations. Those who compete in gymnastics and equestrian must learn and memorize detailed routines; baseball, softball and soccer athletes must learn to read the field and anticipate movements of their opponents, while making split second decisions. Swimmers, golfers and tennis players must focus for extended amounts of time while using techniques and strategies to succeed in their sport. Most of this becomes natural for them as they practice it a multitude of times until they can reflexively accomplish the task. Some athletes learn best by seeing a play drawn out on a board, some like to hear the plays, some need to get out there and do it, while others keep a journal of plays. The best strategy is to combine many of the

techniques into one practice. The coach could talk about the plays as the athletes move around the floor or field and they can see it written or write it themselves before or after practice. How does their ability to learn their sport affect or influence their ability to learn in the classroom? How can we merge the learning styles and techniques used during sport preparation to help the not-so-fun academic workouts by using similar techniques and strategies? Many believe that just as in the classroom, a balance is paramount. On the field of play the coaches need to focus on multiple learning styles and employ many techniques in order to reach the most student-athletes.

To overcome the problem of reaching everyone, coaches should strive for a balance of instructional methods, as opposed to trying to teach each athlete according to his or her preferences. If the balance is achieved, all athletes will be taught partly in a manner they prefer, which will lead to an increased comfort level and willingness to learn (Baribeau, 2006). Harberts & Walker (2007) emphasized the importance of building and community while teaching swimming. They also affirm that we all are constantly learning from each other and that we are not all alike in the way that we learn. They have found that by understanding learning styles that they can create a safe and effective place to learn swimming, which promotes team and loyalty to their program.

Just as on the field of play, using a variety of procedures also works in the classroom. One student learns best by listening, another by writing, and another still by talking about it aloud. A combination of strategies provides maximum success. Maybe instructors and coaches alike could reach more of their students if they recall the Chinese proverb, "I hear, and I forget. I see, and I remember. I do, and I understand."

In the athletic academic center there are things that can be done to move student-athletes into the future. First, a consistent effort to provide a learning styles assessment to all incoming student-athletes which should include providing feedback to them about what the results signify and discuss different recommendations for strategies they may not have considered in the past. Second, the academic mentors who work directly with the student-athletes should be supplied with the training to model and teach a variety of study skills based on various learning style preferences. Third, the ILS assessment can be administered to all mentors, tutors and others who work with student-athletes so they can understand their own learning style preferences. Fourth, by providing the educators the learning style preference of their students, it will assist them in understanding how to instruct someone who may have a different leaning style preference than themselves. Fifth, make available informational and instructional training to all those who work with student-athletes including not only mentors and tutors, but also trainers and even coaches.

Out of reach of the athletic academic center, the university could provide workshops or training sessions to inform and educate the professors and instructors about how to utilize a variety of teaching techniques. The day of direct lecture with no interaction between the instructor and the students is quickly coming to a close. Each new generation requires more and more action and interaction with material and information in to order to absorb and retain it.

## Recommendations for Future Research

Bacon (2004) reiterates that although there is an enormous amount of published research on learning styles, there is a need for more studies that critically evaluate the premise that learning style affects learning outcomes. Just the mere fact of knowing your learning style will not increase your performance, but rather how that information is used has the potential to increase achievement. This is an excellent point to consider as one ponders future research options. For all who work with not only student-athletes but with any college students, it is imperative to not only gather the data, but then to apply it. The data must be considered and strategies developed to facilitate success in any situation.

Based on the study conducted by Jones, et al. (2003), and this study, a recommendation for future research would be to collect and compare achievement test scores, grade point averages and chosen area of study of student-athletes with learning style preferences. Also, comparing these items between student-athletes with those of non student-athletes would be of interest.

Another relevant direction for research would include the administration of the Index of Learning Styles in two settings. The first would be for the students-athlete in regards to their academic learning and a second would be in regards to their sport activity learning. Then a comparison of these two learning styles for each individual would take place. The question is do students learn one way for athletically related material and another way for academically related material.

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Appendix 1

Site Permission Letter

August 28, 2009  
Institutional Review Board  
c/o Office of Human Subjects Research

Dear IRB Members,

After reviewing the proposed study, “Assessment of Freshmen Varsity Student-Athletes Learning Style Preferences”, presented by Ms. Kirsten Perkins, an AU graduate student, I have granted authorization for anonymous student-athletes ILS assessment results to be utilized in her research.

The purpose of the study is to acquire information about student-athletes’ individual learning style preferences. This information may be used to structure study time and develop study strategies that are conducive to an individual student-athlete’s learning style preference.

Ms. Perkins will conduct the following activities: introduce, explain, collect, record and analyze the data. There is no limit to the time frame in which this information may be collected.

To ensure that the students are protected, Ms. Perkins has agreed to provide to me a copy of any IRB-approved, stamped consent document. Ms. Perkins has agreed to provide a copy of her study results, in aggregate, to our department.

If the IRB has any concerns about the permission being granted by this letter, please contact me at the phone number listed below.

Sincerely,

Bernard Hill  
Senior Associate Athletics Director

## Appendix 2

### Verbal Instructions

## Verbal Instructions to present the ILS questionnaire

How many of you know how you learn best? (Observe hands)

How many of you have never thought about it? (Observe hands)

Well, we think it is important for you to be familiar with the way you learn and how you can maximize your study time now that you are in college. Most of you will take 12-18 hours in your first semester here at Auburn. Does anybody know how many hours of study time that should require? (Take guesses)

Are you ready for this?

For every 1 hour you are in class, you should study for 2 hours! That means if you are taking the required minimum of 12 hours – you should study for 24! Of course, not all at one time, but divided throughout the week. So now we are looking at 12 hours in class plus 24 hours studying - we are up to 36 hours MINIMUM to be dedicated to your studying. Now let's add in your sport requirements and your desire to have a social life... and you are going to be exhausted!

This is why we think it is important for you to understand your basic learning style preferences. You will need to be productive in the classroom and in study table. In order to do this, we want for you take a survey questionnaire that will give you an idea of your learning style preferences.

Here is the website (written on the board)

<http://www.engr.ncsu.edu/learningstyles/ilsweb.html>

It is only 44 questions. Put your name and sport at the top where indicated and answer all 44 questions. When you get to the bottom, hit “submit” – if you missed a question, it will not submit. You will have to complete the missed items. Be sure you PRINT the results. We do not have access to your responses electronically – so again, please be sure you print your results. If you would like to set up a meeting to discuss your individual results, please stop by on your way out and we can set a time. Go ahead and begin the questionnaire – if you have any questions, raise your hand and someone will come to you.

## Appendix 3

### Index of Learning Styles Questionnaire

(Web-based version)

# **Index of Learning Styles Questionnaire**

**Barbara A. Soloman**

**First-Year College**

**North Carolina State University**

**Raleigh, North Carolina 27695**

**Richard M. Felder**

**Department of Chemical Engineering**

**North Carolina State University**

**Raleigh, NC 27695-7905**

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## **Directions**

Please provide us with your full name. Your name will be printed on the information that is returned to you.

## **Full Name**

For each of the 44 questions below select either "a" or "b" to indicate your answer.

Please choose only one answer for each question. If both "a" and "b" seem to apply to you, choose the one that applies more frequently. When you are finished selecting answers to each question please select the submit button at the end of the form.

1. I understand something better after I
  - (a) try it out.
  - (b) think it through.
  
2. I would rather be considered
  - (a) realistic.
  - (b) innovative.
  
3. When I think about what I did yesterday, I am most likely to get
  - (a) a picture.
  - (b) words.
  
4. I tend to
  - (a) understand details of a subject but may be fuzzy about its overall structure.
  - (b) understand the overall structure but may be fuzzy about details.
  
5. When I am learning something new, it helps me to
  - (a) talk about it.
  - (b) think about it.
  
6. If I were a teacher, I would rather teach a course

- (a) that deals with facts and real life situations.
  - (b) that deals with ideas and theories.
7. I prefer to get new information in
- (a) pictures, diagrams, graphs, or maps.
  - (b) written directions or verbal information.
8. Once I understand
- (a) all the parts, I understand the whole thing.
  - (b) the whole thing, I see how the parts fit.
9. In a study group working on difficult material, I am more likely to
- (a) jump in and contribute ideas.
  - (b) sit back and listen.
10. I find it easier
- (a) to learn facts.
  - (b) to learn concepts.
11. In a book with lots of pictures and charts, I am likely to
- (a) look over the pictures and charts carefully.

(b) focus on the written text.

12. When I solve math problems

(a) I usually work my way to the solutions one step at a time.

(b) I often just see the solutions but then have to struggle to figure out the steps to get to them.

13. In classes I have taken

(a) I have usually gotten to know many of the students.

(b) I have rarely gotten to know many of the students.

14. In reading nonfiction, I prefer

(a) something that teaches me new facts or tells me how to do something.

(b) something that gives me new ideas to think about.

15. I like teachers

(a) who put a lot of diagrams on the board.

(b) who spend a lot of time explaining.

16. When I'm analyzing a story or a novel

(a) I think of the incidents and try to put them together to figure out the themes.

**(b)** I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.

17. When I start a homework problem, I am more likely to

**(a)** start working on the solution immediately.

**(b)** try to fully understand the problem first.

18. I prefer the idea of

**(a)** certainty.

**(b)** theory.

19. I remember best

**(a)** what I see.

**(b)** what I hear.

20. It is more important to me that an instructor

**(a)** lay out the material in clear sequential steps.

**(b)** give me an overall picture and relate the material to other subjects.

21. I prefer to study

**(a)** in a study group.

(b) alone.

22. I am more likely to be considered

(a) careful about the details of my work.

(b) creative about how to do my work.

23. When I get directions to a new place, I prefer

(a) a map.

(b) written instructions.

24. I learn

(a) at a fairly regular pace. If I study hard, I'll "get it."

(b) in fits and starts. I'll be totally confused and then suddenly it all "clicks."

25. I would rather first

(a) try things out.

(b) think about how I'm going to do it.

26. When I am reading for enjoyment, I like writers to

(a) clearly say what they mean.

- (b) say things in creative, interesting ways.
27. When I see a diagram or sketch in class, I am most likely to remember
- (a) the picture.
- (b) what the instructor said about it.
28. When considering a body of information, I am more likely to
- (a) focus on details and miss the big picture.
- (b) try to understand the big picture before getting into the details.
29. I more easily remember
- (a) something I have done.
- (b) something I have thought a lot about.
30. When I have to perform a task, I prefer to
- (a) master one way of doing it.
- (b) come up with new ways of doing it.
31. When someone is showing me data, I prefer
- (a) charts or graphs.

(b) text summarizing the results.

32. When writing a paper, I am more likely to

(a) work on (think about or write) the beginning of the paper and progress forward.

(b) work on (think about or write) different parts of the paper and then order them.

33. When I have to work on a group project, I first want to

(a) have "group brainstorming" where everyone contributes ideas.

(b) brainstorm individually and then come together as a group to compare ideas.

34. I consider it higher praise to call someone

(a) sensible.

(b) imaginative.

35. When I meet people at a party, I am more likely to remember

(a) what they looked like.

(b) what they said about themselves.

36. When I am learning a new subject, I prefer to

- (a) stay focused on that subject, learning as much about it as I can.
  - (b) try to make connections between that subject and related subjects.
37. I am more likely to be considered
- (a) outgoing.
  - (b) reserved.
38. I prefer courses that emphasize
- (a) concrete material (facts, data).
  - (b) abstract material (concepts, theories).
39. For entertainment, I would rather
- (a) watch television.
  - (b) read a book.
40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
- (a) somewhat helpful to me.
  - (b) very helpful to me.
41. The idea of doing homework in groups, with one grade for the entire group,

- (a) appeals to me.
- (b) does not appeal to me.
42. When I am doing long calculations,
- (a) I tend to repeat all my steps and check my work carefully.
- (b) I find checking my work tiresome and have to force myself to do it.
43. I tend to picture places I have been
- (a) easily and fairly accurately.
- (b) with difficulty and without much detail.
44. When solving problems in a group, I would be more likely to
- (a) think of the steps in the solution process.
- (b) think of possible consequences or applications of the solution in a wide range of areas.

When you have completed filling out the above form please click on the Submit button

below. Your results will be returned to you. If you are not satisfied with your answers above please click on Reset to clear the form.

---

*Dr. Richard Felder, [felder@ncsu.edu](mailto:felder@ncsu.edu)*

<http://www.engr.ncsu.edu/learningstyles/ilsweb.html>

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## Appendix 4

### Sample Student Results

NC STATE UNIVERSITY

Learning Styles Results

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Results for: Student-Athlete

ACT            X            REF  
11 9 7 5 3 1 1 3 5 7 9 11  
                 <-- -->

SEN            X            INT  
11 9 7 5 3 1 1 3 5 7 9 11  
                 <-- -->

VIS            X            VRB  
11 9 7 5 3 1 1 3 5 7 9 11  
                 <-- -->

SEQ            X            GLO  
11 9 7 5 3 1 1 3 5 7 9 11  
                 <-- -->

If your score on a scale is 1-3, you are fairly well balanced on the two dimensions of that scale.

If your score on a scale is 5-7, you have a moderate preference for one dimension of the scale and will learn more easily in a teaching environment which favors that dimension.

If your score on a scale is 9-11, you have a very strong preference for one dimension of the scale. You may have real difficulty learning in an environment which does not support that preference.

We suggest you print this page, so that when you look at the explanations of the different scales you will have a record of your individual preferences.

## Appendix 5

### Learning Styles And Strategies (applications)

## LEARNING STYLES AND STRATEGIES

Richard M. Felder

Hoechst Celanese Professor of Chemical Engineering

North Carolina State University

Barbara A. Soloman

Coordinator of Advising, First Year College

North Carolina State University

## ACTIVE AND REFLECTIVE LEARNERS

Active learners tend to retain and understand information best by doing something active with it--discussing or applying it or explaining it to others. Reflective learners prefer to think about it quietly first.

"Let's try it out and see how it works" is an active learner's phrase; "Let's think it through first" is the reflective learner's response.

Active learners tend to like group work more than reflective learners, who prefer working alone.

Sitting through lectures without getting to do anything physical but take notes is hard for both learning types, but particularly hard for active learners.

*Everybody is active sometimes and reflective sometimes.* Your preference for one category or the other may be strong, moderate, or mild. A balance of the two is desirable.

If you always act before reflecting you can jump into things prematurely and get into trouble, while if you spend too much time reflecting you may never get anything done.

How can active learners help themselves?

If you are an active learner in a class that allows little or no class time for discussion or problem-solving activities, you should try to compensate for these lacks when you study. Study in a group in which the members take turns explaining different topics to each other. Work with others to guess what you will be asked on the next test and figure out how you will answer. You will always retain information better if you find ways to do something with it.

How can reflective learners help themselves?

If you are a reflective learner in a class that allows little or no class time for thinking about new information, you should try to compensate for this lack when you study. Don't simply read or memorize the material; stop periodically to review what you have read and to think of possible questions or applications. You might find it helpful to write short summaries of readings or class notes in your own words. Doing so may take extra time but will enable you to retain the material more effectively.

## SENSING AND INTUITIVE LEARNERS

Sensing learners tend to like learning facts, intuitive learners often prefer discovering possibilities and relationships.

Sensors often like solving problems by well-established methods and dislike complications and surprises; intuitors like innovation and dislike repetition. Sensors are more likely than intuitors to resent being tested on material that has not been explicitly covered in class.

Sensors tend to be patient with details and good at memorizing facts and doing hands-on (laboratory) work; intuitors may be better at grasping new concepts and are often more comfortable than sensors with abstractions and mathematical formulations.

Sensors tend to be more practical and careful than intuitors; intuitors tend to work faster and to be more innovative than sensors.

Sensors don't like courses that have no apparent connection to the real world; intuitors don't like "plug-and-chug" courses that involve a lot of memorization and routine calculations.

*Everybody is sensing sometimes and intuitive sometimes.* Your preference for one or the other may be strong, moderate, or mild. To be effective as a learner and problem solver, you need to be able to function both ways. If you overemphasize intuition, you may miss important details or make careless mistakes in calculations or hands-on work; if you overemphasize sensing, you may rely too much on memorization and familiar methods and not concentrate enough on understanding and innovative thinking.

How can sensing learners help themselves?

Sensors remember and understand information best if they can see how it connects to the real world. If you are in a class where most of the material is abstract and theoretical, you may have difficulty. Ask your instructor for specific examples of concepts and procedures, and find out how the concepts apply in practice. If the teacher does not provide enough specifics, try to find some in your course text or other references or by brainstorming with friends or classmates.

How can intuitive learners help themselves?

Many college lecture classes are aimed at intuitors. However, if you are an intuitor and you happen to be in a class that deals primarily with memorization and rote substitution in formulas, you may have trouble with boredom. Ask your instructor for interpretations or theories that link the facts, or try to find the connections yourself. You may also be prone to careless mistakes on test because you are impatient with details and don't like repetition (as in checking your completed solutions). Take time to read the entire question before you start answering and be sure to check your results

## VISUAL AND VERBAL LEARNERS

Visual learners remember best what they see--pictures, diagrams, flow charts, time lines, films, and demonstrations. Verbal learners get more out of words--written and spoken explanations. Everyone learns more when information is presented both visually and verbally.

In most college classes very little visual information is presented: students mainly listen to lectures and read material written on chalkboards and in textbooks and handouts. Unfortunately, most people are visual learners, which means that most students do not get nearly as much as they would if more visual presentation were used in class. Good learners are capable of processing information presented either visually or verbally.

How can visual learners help themselves?

If you are a visual learner, try to find diagrams, sketches, schematics, photographs, flow charts, or any other visual representation of course material that is predominantly verbal. Ask your instructor, consult reference books, and see if any videotapes or CD-ROM displays of the course material are available. Prepare a concept map by listing key points, enclosing them in boxes or circles, and drawing lines with arrows between concepts to show connections. Color-code your notes with a highlighter so that everything relating to one topic is the same color.

How can verbal learners help themselves?

Write summaries or outlines of course material in your own words. Working in groups can be particularly effective: you gain understanding of material by hearing classmates' explanations and you learn even more when you do the explaining.

### SEQUENTIAL AND GLOBAL LEARNERS

Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it."

Sequential learners tend to follow logical stepwise paths in finding solutions; global learners may be able to solve complex problems quickly or put things together in novel ways once they have grasped the big picture, but they may have difficulty explaining how they did it.

Many people who read this description may conclude incorrectly that they are global, since everyone has experienced bewilderment followed by a sudden flash of understanding. What makes you global or not is what happens before the light bulb goes on. Sequential learners may not fully understand the material but they can nevertheless do something with it (like solve the homework problems or pass the test) since the pieces they have absorbed are logically connected. Strongly global learners who lack good sequential thinking abilities, on the other hand, may have serious difficulties until they

have the big picture. Even after they have it, they may be fuzzy about the details of the subject, while sequential learners may know a lot about specific aspects of a subject but may have trouble relating them to different aspects of the same subject or to different subjects.

How can sequential learners help themselves?

Most college courses are taught in a sequential manner. However, if you are a sequential learner and you have an instructor who jumps around from topic to topic or skips steps, you may have difficulty following and remembering. Ask the instructor to fill in the skipped steps, or fill them in yourself by consulting references. When you are studying, take the time to outline the lecture material for yourself in logical order. In the long run doing so will save you time. You might also try to strengthen your global thinking skills by relating each new topic you study to things you already know. The more you can do so, the deeper your understanding of the topic is likely to be.

How can global learners help themselves?

If you are a global learner, it can be helpful for you to realize that you need the big picture of a subject before you can master details. If your instructor plunges directly into new topics without bothering to explain how they relate to what you already know, it can cause problems for you. Fortunately, there are steps you can take that may help you get the big picture more rapidly. Before you begin to study the first section of a chapter in a text, skim through the entire chapter to get an overview. Doing so may be time-consuming initially but it may save you from going over and over individual parts later.

Instead of spending a short time on every subject every night, you might find it more productive to immerse yourself in individual subjects for large blocks. Try to relate the subject to things you already know, either by asking the instructor to help you see connections or by consulting references. Above all, don't lose faith in yourself; you will eventually understand the new material, and once you do your understanding of how it connects to other topics and disciplines may enable you to apply it in ways that most sequential thinkers would never dream of.

Appendix 6

Collection Sheet

## Collection Sheet

	A/R	S/I	Vi/Vr	S/G	gender	T/I
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

**A/R** Active (-11) or Reflective (11)

**S/I** Sensing (-11) or Intuitive (11)

**Vi/Vr** Visual (-11) or Verbal (11)

**S/G** Sequential (-11) or Global (11)

**gender** Male (1) or Female (0)

**T/I** Team (0) or Individual (1) sport

Appendix 7

Institutional Review Board Approval Letter (copy)

From: Human Subjects

To: Kirsten Perkins

CC: Sherri Downer, James Witte

Subject: Protocol #09-318 EX 0912, approved

Dear Ms. Perkins,

Your protocol entitled "Assessment of Varsity Student-Athletes Learning Style Preferences: A Longitudinal Study" has been reviewed by the IRB. The protocol has now been approved as "Exempt ".

We will soon be forwarding your approval letter to you in care of your faculty advisor. Please note that you may begin your research at your convenience. You do not have to wait for the receipt of the approval letter.

Your protocol will expire on December 5, 2010. Put that date on your calendar now. About three weeks before that time you will need to submit a final report or renewal request.

If you have any questions, please let us know.

Best wishes for success with your research!

Office of Research Compliance